Exhibit A

In the
United States Court of Appeals
For the Eleventh Circuit

No. 26-12027

JEFFERY LEE,

Plaintiff-Appellee,

versus

COMMISSIONER, ALABAMA DEPARTMENT OF CORRECTIONS,
WARDEN, HOLMAN CORRECTIONAL FACILITY,

Defendants-Appellants.

Appeal from the United States District Court
for the Middle District of Alabama
D.C. Docket No. 2:25-cv-00680-ECM

Before JORDAN, LUCK, and KIDD, Circuit Judges.

BY THE COURT:

In *Lee v. Commissioner*, No. 26-11864, 2026 WL 1651147 (11th Cir. June 8, 2026) (*Lee II*), we held, based on the district court's factual findings following a bench trial, that Alabama's nitrogen hypoxia protocol, *see* Ala. Code § 15-18-82.1, presents a "'substantial

risk of serious harm'—severe pain over and above death itself." *Lee II*, 2026 WL 1651147, at *8 (quoting *Glossip v. Gross*, 576 U.S. 863, 877 (2015)). As a result, we concluded that Jeffery Lee had satisfied the first prong of his Eighth Amendment challenge under *Glossip*. We remanded to the district court to address the second prong of *Glossip* based on the evidence that the parties had presented at trial.

On remand, the district court found that the firing squad is a feasible alternative that is readily implemented, that the firing squad would significantly reduce the risk of harm posed by Alabama's nitrogen hypoxia protocol, and that Alabama does not have a valid penological reason for rejecting the firing squad. The district court entered a permanent injunction prohibiting Alabama from executing Mr. Lee through the nitrogen hypoxia protocol. It also denied the Commissioner's motion to stay the injunction.

The Commissioner of the Alabama Department of Corrections has appealed, and seeks an emergency stay of the district court's permanent injunction so that it can execute Mr. Lee by nitrogen hypoxia tomorrow or Friday. Following review of the parties' briefs, the record, and the district court's orders, we deny the Commissioner's motion.

I

In 2000, a jury convicted Mr. Lee of two counts of capital murder, and attempted murder, after a two-day trial. *See Lee v. State*, 898 So. 2d 790, 807 (Ala. Crim. App. 2001). The trial court overrode the jury's recommendation of life and sentenced him to death. *See id.*

Mr. Lee exhausted his direct and collateral appeals. He then sought to challenge Alabama's lethal injection protocol as violative of the Eighth Amendment, *see Lee v. Dunn*, 731 F. App'x 885 (11th Cir. 2018), but that action became moot when Mr. Lee elected to be executed by nitrogen hypoxia, which the Alabama Legislature authorized in 2018. *See Lee v. Dunn*, No. 16-473, D.E. 38 (order granting joint motion to dismiss) (S.D. Ala. July 20, 2018).

"Nitrogen hypoxia, as set out in Alabama's protocol, causes death by introducing pure nitrogen gas to the condemned inmate through an industrial-use respirator mask until the inmate is declared dead." *Grayson v. Comm'r, Ala. Dep't of Corr.*, 121 F.4th 894, 896 (11th Cir.) (internal quotation marks omitted and alteration adopted), *cert. denied sub nom. Grayson v. Hamm*, 145 S. Ct. 586 (2024). In August of 2025, Mr. Lee brought this action under 42 U.S.C. § 1983, seeking to prevent the State from executing him using nitrogen hypoxia on the ground that this method violates the Eighth Amendment's prohibition on cruel and unusual punishment. At that time, no execution date had been set for Mr. Lee. In his amended complaint, Mr. Lee proposed that execution by firing squad is a feasible and readily implemented alternative method that would significantly reduce the substantial risk of severe pain associated with nitrogen hypoxia.

On February 9, 2026, the State moved the Supreme Court of Alabama to set Mr. Lee's execution. The Governor later set a 30-hour time frame for the execution, beginning at 12:00 a.m. on

Thursday, June 11, 2026, and ending at 6:00 a.m. on Friday, June 12, 2026.

From April 27 to April 29, 2026, the district court held a bench trial, at which it heard the testimony of eleven witnesses and admitted hundreds of exhibits. The district court assessed Mr. Lee's Eighth Amendment claim under the test set out in *Glossip*, 576 U.S. at 877–81—requiring an inmate to show (1) that a challenged method of execution presents a substantial risk of severe harm and (2) that there is "a feasible and readily implemented alternative method . . . that would significantly reduce a substantial risk of severe pain and that the State has refused to adopt without a legitimate penological reason." *Bucklew v. Precythe*, 587 U.S. 119, 134 (2019).

The district court found that an inmate executed under the protocol "experiences severe air hunger and corresponding emotional distress, anxiety, physiological stress, and physical discomfort." *Lee v. Lovelace*, No. 25-cv-680, 2026 WL 1493098, at *25 (M.D. Ala. May 28, 2026) (*Lee I*). The district court also found that an inmate "consciously experiences air hunger and associated distress for not significantly more than one to three minutes." *Id.*[1]

[1] "Dyspnea is a medical term for breathing difficulty or breathing discomfort." *Lee I*, 2026 WL 1493098, at *24. "The most severe form of dyspnea is 'air hunger,' the sensation of needing to take in more air." *Id.* "For many people, air hunger causes extreme emotional distress, panic, anxiety, and fear because breathing is essential to human life." *Id.*

On these factual findings, the district court held that Mr. Lee had "failed to show by a preponderance of the evidence that the [Alabama] nitrogen hypoxia execution protocol causes severe pain or suffering 'well beyond what's needed to effectuate a death sentence.'" *Id.* at *25 (quoting *Bucklew*, 587 U.S. at 137). Because it reached this conclusion, the district court did not address Mr. Lee's proposed alternative of execution by firing squad. *See id.* at *22.

Mr. Lee immediately appealed the district court's judgment, and sought a stay of execution. *See Lee II*, 2026 WL 1651147, at *2. We expedited briefing, heard oral argument by videoconference on June 5, 2026, and reversed the district court's determination of substantial risk of severe pain on June 8, 2026. *See id.*

We concluded that, based on "the facts found by the district court, Alabama's nitrogen hypoxia protocol presents a substantial risk of serious harm—severe pain over and above death itself." *Id.* at *8 (internal quotation marks and citation omitted). We reasoned that suffering "one to three minutes of severe air hunger and corresponding emotional distress, anxiety, physiological stress, and physical discomfort" is sufficient to satisfy the first prong of the *Glossip* standard. *See id.* at *7 (internal quotation marks omitted).

We could not, however, resolve the second prong of the *Glossip* standard because the district court "did not address whether Mr. Lee had shown that the firing squad was a feasible and readily implemented alternative method that would significantly reduce the risk of harm." *Id.* at *8. We therefore "remand[ed] the case to the district court with instructions to immediately address the

second prong of *Glossip*," and issued the mandate together with the opinion. *See id.* And "because we [could not] make a determination about likelihood of success on that prong on this record, we [denied] without prejudice Mr. Lee's [ ] motion for a stay of his execution." *Id.*

On remand, the district court immediately addressed the second prong, ruled that the firing squad was a feasible and readily-implemented alternative method of execution, and entered a permanent injunction and final judgment in favor of Mr. Lee. The Commissioner moved the district court to stay its injunction pending appeal, but the district court denied that request, explaining that the Commissioner had not shown a likelihood of success on the merits or that the equities favored a stay of the injunction. *See* Fed. R. App. P. 8(a)(1); Fed. R. Civ. P. 62(d).

II

The Commissioner has now filed a motion asking us to stay the district court's permanent injunction pending appeal, thereby permitting the State to execute Mr. Lee by nitrogen hypoxia. A motion to stay a permanent injunction is governed by the stay factors from *Nken v. Holder*, 556 U.S. 418, 426 (2009). *See Hand v. Scott*, 888 F.3d 1206, 1207 (11th Cir. 2018). *Accord Rose v. Raffensperger*, 143 S. Ct. 58, 59 (2022) (analyzing emergency motion to stay the district court's permanent injunction pending appeal).

We may grant a stay pending an appeal on the merits only if the stay applicant establishes that (1) it has a substantial likelihood of success on the merits, (2) it will suffer irreparable injury unless

the stay issues, (3) the stay would not substantially harm the other litigant, and (4) if issued, the stay would not be adverse to the public interest. *See Barwick v. Governor of Fla.*, 66 F.4th 896, 900 (11th Cir. 2023). "A stay is not a matter of right, even if irreparable injury might otherwise result." *Nken*, 556 U.S. at 433. "The party requesting a stay bears the burden of showing that the circumstances justify an exercise of that discretion." *Id.* at 433–44. In assessing a motion for stay, we do not definitively address the merits. *See Robinson v. Att'y Gen.*, 957 F.3d 1171, 1177 (11th Cir. 2020); *Ritter v. Smith*, 726 F.2d 1505, 1512 n.17 (11th Cir. 1984).

A district court's decision to grant permanent injunctive relief is reviewed deferentially for abuse of discretion. *See Barrett v. Walker Cnty. Sch. Dist.*, 872 F.3d 1209, 1221 (11th Cir. 2017). "By definition . . . under the abuse of discretion standard of review there will be occasions in which we affirm the district court even though we would have gone the other way had it been our call." *United States v. Frazier*, 387 F.3d 1244, 1259 (11th Cir. 2004) (en banc) (citation omitted). "That is how an abuse of discretion standard differs from a *de novo* standard of review." *Id.* (citation omitted).

As a general matter, factual findings are reviewed for clear error. *See Glossip*, 576 U.S. at 881; *Mills v. Hamm*, 102 F.4th 1245, 1248 (11th Cir. 2024). That means that a finding "that is 'plausible' in light of the full record—even if another is equally or more so—must govern." *Cooper v. Harris*, 581 U.S. 285, 293 (2017). *See also Bucklew v. Precythe*, 883 F.3d 1087, 1094 (8th Cir. 2018) (stating that

the factual findings regarding a proposed alternative method of execution are reviewed for clear error), *aff'd*, 587 U.S. 119 (2019).

Once the underlying facts are determined, whether the second prong of *Glossip* is met is a question of law. *See id.* We review legal questions *de novo*. *See Nance v. Comm'r, Ga. Dep't of Corr.*, 169 F.4th 1312, 1317 (11th Cir. 2026).

III

The second prong of *Glossip* requires Mr. Lee to "show a feasible and readily implemented alternative method of execution that would significantly reduce a substantial risk of severe pain and that the State has refused to adopt without a legitimate penological reason." *Bucklew*, 587 U.S. at 134. "Distinguishing between constitutionally permissible and impermissible degrees of pain . . . is a necessarily comparative exercise." *Id.* at 136 (emphasis and citations omitted). "To decide whether the State has cruelly 'superadded' pain to the punishment of death isn't something that can be accomplished by examining the State's proposed method in a vacuum, but only by 'compar[ing]' that method with a viable alternative." *Id.* (brackets omitted). "An inmate seeking to identify an alternative method of execution is not limited to choosing among those presently authorized by a particular State's law." *Id.* at 139–40.

A

"[T]o establish that a proposed alternative method is available, an inmate must do more than show that it is theoretically feasible; he must also show that it is readily implemented." *Price v. Comm'r, Ala. Dep't of Corr.*, 920 F.3d 1317, 1327 (11th Cir. 2019)

(internal quotation marks omitted). "To meet this burden, the inmate's proposed alternative must be sufficiently detailed to permit a finding that the State could carry it out relatively easily and reasonably quickly." *Id.* (internal quotation marks omitted). In addition, an inmate "cannot make a successful challenge by showing a slightly or marginally safer alternative." *Id.* In other words, "[a] minor reduction in risk is insufficient; the difference must be clear and considerable." *Bucklew*, 587 U.S. at 143.

Finally, the State "may refuse to adopt a prisoner's proposed alternative method of execution for a legitimate penological reason." *Nance v. Comm'r, Ga. Dep't of Corr.*, 59 F.4th 1149, 1155–56 (11th Cir. 2023) (citing *Bucklew*, 587 U.S. at 143–44).

Mr. Lee asserted that execution by firing squad is a feasible, readily implementable, and a substantially less painful (i.e., less severe) alternative within the meaning of the Eighth Amendment. Five states authorize execution by firing squad. Mr. Lee proposes a protocol, similar to Utah's, in which the firing squad is comprised of five trained marksmen, one of whom is the firing squad team leader. He suggests that the firing squad be set up at a distance of 21 feet from the inmate, armed with .30-caliber rifles. He proposes that one of the rifles be loaded with blanks so that it is unknown which firing squad member fires a fatal shot.

In Mr. Lee's proposal, the warden or his designee would give an order to fire. The firing squad team leader would then ready the weapons in a controlled and safe manner. After the first volley, the protocol shifts based on whether the prisoner is conscious. If the

prisoner appears to be unconscious, the medical examiner enters the execution chamber and checks the prisoner's vital signs. If vital signs are detected, the firing squad would fire a second volley. Alternatively, if the prisoner is obviously conscious after the first volley, the warden or his designee would immediately instruct the first squad team leader to prepare the weapons and fire again.

B

On June 9, 2026, on remand and based on the testimony and evidence presented at the bench trial, the district court entered final judgment in favor of Mr. Lee on the second prong of the *Glossip* test, and permanently enjoined the State from executing him via nitrogen hypoxia. As explained below, the district court reviewed all the evidence adduced at the bench trial and weighed the credibility of witnesses.

Specifically, Mr. Lee introduced the testimony of Dr. James Williams, an emergency physician with expertise in gunshot wounds, firearms, and ballistics. The district court found that "Dr. Williams testified to a reasonable degree of medical certainty that execution by firing squad: (1) causes a quick and painless death; and (2) is feasible and readily implemented." D.E. 187 at 4.

Dr. Williams testified that "an execution by firing squad directed at the cardiac bundle—the area of the body that includes the heart and great vessels—will very likely cause immediate disruption of blood flow to the brain, resulting in loss of consciousness within three to five seconds and death shortly thereafter." *Id.* at 5 (footnote omitted). He further explained that, in his opinion, "an

inmate shot in the heart is unlikely to feel pain in the three to five seconds before he loses consciousness" because of "two related phenomena: (1) the delay in the brain's processing of novel stimuli into a subjective experience such as pain; and (2) the effects of 'neural stunning.'" *Id.* The district court found that "Dr. Williams' testimony is credible, persuasive evidence that an inmate executed by [Mr.] Lee's proposed firing squad protocol would experience no pain." *Id.* at 15.

Significantly, the district court rejected the testimony of Dr. Joseph F. Antognini, the Commissioner's expert, about the firing squad. It recounted that it had excluded some of Dr. Antognini's trial testimony because he "conceded that nothing in his expert report supported his contention that an inmate executed by firing squad would consciously suffer severe pain for eight to ten seconds after bullet entry." *Id.* at 14.

Moreover, the district court found that his—and the Commissioner's—reliance on the "botched" firing squad execution of Mikal Mahdi in South Carolina was misplaced for two reasons. *Id.* at 5, 14–15, 19. First, Mr. "Lee's proposed method relies heavily on Utah's protocol, which is meaningfully different than South Carolina's." *Id.* at 19. "Second, assuming without deciding that Mahdi's execution was 'botched,' an 'isolated mishap alone' does not render the firing squad constitutionally suspect" given the other testimony about the efficacy of the firing squad. *Id.*

The district court also addressed the State's purported penological reasons for refusing to implement the firing squad: (1) the

inability to source volunteers willing and capable of serving in a firing squad; and (2) the potential inability to procure materials used in firing squad executions. The district court found that the testimony at trial was contrary to these two asserted reasons and credited the testimony of the former Commissioner himself that the Alabama Department of Corrections "would be able to staff a firing squad execution team with five capable shooters." *Id.* at 18. And "Dr. Williams and the State's own witnesses testified that the materials required to carry out an execution by firing squad could be readily procured." *Id.* at 21 (emphasis omitted).

Thus, the district court made the ultimate factual finding that Mr. Lee's "proposed firing squad alternative, involving four .30-caliber bullets fired at the heart, renders an inmate unconscious in three to five seconds." *Id.* at 23. "Due to the related phenomena of delayed brain processing and neural stunning, an inmate executed under [Mr.] Lee's firing squad alternative is rendered unconscious before his brain can process any pain." *Id.* Mr. Lee's proposed alternative method, therefore, "produces a quick and painless death." *Id.*

Regarding the feasibility and ease of implementation, the district court found that "[t]he State can readily obtain rifles, ammunition, and other materials necessary to carry out a firing squad execution." *Id.* "Additionally, the State would be able to modify space at Holman to carry out executions by firing squad." *Id.* "The State is also able to source and train volunteers willing to carry out such an execution." *Id.*

Given these factual findings, the district court concluded that Mr. "Lee has shown by a preponderance of the evidence that his proposed firing squad alternative is feasible, readily implemented, and significantly reduces the substantial risk of serious harm posed by" the nitrogen hypoxia protocol. *Id.* at 24. The district court therefore entered a permanent injunction, prohibiting the State from executing Mr. Lee using the nitrogen hypoxia protocol.[2]

C

The Commissioner has not made a substantial showing that the district court clearly erred in its factual findings. These findings, amply supported by the evidence presented, establish that Mr. Lee demonstrated that execution by firing squad is a feasible, readily implementable, and significantly less painful alternative to nitrogen hypoxia. On initial review, we find plausible the factual findings underlying the "necessarily comparative exercise" between the potential for three minutes of severe air hunger caused by nitrogen hypoxia and the upper limit of five seconds for the inmate to be "rendered unconscious *before* his brain can process any pain" due to the neural stunning and novel stimuli reaction. *See* D.E. 187 at 23 (emphasis added). *See also Cooper*, 581 U.S. at 293 ("A finding that is

[2] The district court did not grant Mr. Lee's requested relief in full. Mr. Lee had asked to enjoin the State from executing him by "any method *other than one of the alternatives provided by his attorneys*." D.E. 40 at 23 (emphasis added).

'plausible' in light of the full record—even if another is equally or more so—must govern.") (citation omitted).[3]

The Commissioner is not substantially likely to succeed on his argument that the district court clearly erred by crediting Dr. Williams' extensive testimony over that of Dr. Antognini. We "accept the factfinder's choice of whom to believe unless it is contrary to the laws of nature, or is so inconsistent or improbable on its face that no reasonable factfinder could accept it." *United States v. Braddy*, 11 F.4th 1298, 1313 (11th Cir. 2021) (internal quotation marks and citation omitted). When it is faced with a choice between "dueling experts," a district court does not clearly err by crediting one expert (here Dr. Williams) over another (Dr. Antognini) because that choice is "reasonably based on evidence found in the record." *United States v. Stein*, 964 F.3d 1313, 1322 (11th Cir. 2020). *See also Grayson*, 121 F.3d at 900. Simply put, Dr. Antognini's opinion—that "for the 8 [to] 10 seconds of consciousness after bullet entry, the injury would be severely painful, especially related to shattering of bone and damage to the spinal cord"—lacks supporting authority. *See* D.E. 173-141 at 26. In contrast, the record supports Dr. Williams' vast experience and well-sourced expert opinion.

The Commissioner continues to question Dr. Williams' credibility in his appeal, but the district court denied his motion to

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[3] The Commissioner's contention that Mr. "Lee knows it hurts to be shot" because he has witnessed shootings is irrelevant to the district court's factual findings. *See* Br. for Appellants at 44.

strike, and he does not meaningfully argue why this evidentiary ruling was an abuse of discretion. In particular, the Commissioner fails to specifically address how Dr. Williams' previous consultation with the Mahdi family weighs on his ultimate conclusions about the three to five seconds to unconsciousness, or the neurological delay in the inmate registering the pain or undermines the studies on which Dr. Williams relies.

Dr. Williams' opinion makes the record in this case unlike the record in *Hoffman v. Wescott*, 131 F.4th 332, 336 (5th Cir. 2025), where "experts for both parties agreed that death by firing squad can cause pain." On this record, the Commissioner has not shown a strong likelihood of success. Based on the three to five seconds to unconsciousness and the neurological delay in the inmate registering the pain, we agree that execution by firing squad significantly reduces the risk of severe harm posted by execution by nitrogen hypoxia. *See also Arthur v. Dunn*, 580 U.S. 1141, 1154 (2017) (Sotomayor, J., joined by Breyer, J., dissenting from denial of certiorari) ("[T]he available evidence suggests 'that a competently performed shooting may cause nearly instant death.' In addition to being near instant, death by shooting may also be comparatively painless.") (citation omitted).[4]

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[4] The Commissioner does not confront the parties' agreement to admit Dr. Brian McAlary's declaration testimony from two previous nitrogen asphyxiation challenges. Dr. McAlary stated that execution by firing squad is "significantly more humane" than execution by nitrogen hypoxia. *See* D.E. 173-19 ¶ 34. He explained that there is objective evidence and relevant literature demonstrating that "the loss of consciousness is nearly instantaneous with the

Moreover, the Commissioner has not substantially shown that any difficulties with retrofitting an execution chamber and assembling a team of five marksmen would make this method unfeasible or unimplementable. We have said that, to meet his burden, "a petitioner can identify a well-established protocol in another State as a potentially viable option." *Price*, 920 F.3d at 1326 (internal quotation marks omitted). Mr. Lee admitted into evidence Utah's firing squad protocol, and the district court credited his expert's testimony examining how a similar protocol would be feasible in Alabama.

The Commissioner's arguments on feasibility amount to a suggestion that if a State would need time and resources to implement a protocol for an alternative method, then that method is not feasible. But if that were the test, then, *Bucklew*'s statement that an inmate "is not limited to choosing among those presently authorized by a particular State's law," 587 U.S. at 140, would be rendered meaningless.

As the district court explained, "the State concedes that it can procure guns and ammunition of a variety of calibers" and "materials such as bullet-proof glass are commonly used in construction, thus undermining any supply chain concerns." D.E. 187 at 21 (internal quotation marks omitted). And "even if the [State] chose to use marksmen who were more skilled than required," the court credited the testimony that Alabama "would be able to staff

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impact of the projectiles" and death criteria are present "within a minute." *See id.* ¶ 33.

a firing squad execution team with five capable shooters." *Id.* at 18. These findings do not appear to be erroneous, much less clearly so.[5]

III

It goes without saying that Mr. Lee would suffer irreparable harm if he were executed pursuant to a method that the district court has found unconstitutional. To him, loss of life is not compensable by legal remedies like damages. *See Ne. Fla. Chapter of Ass'n of Gen. Contractors v. Jacksonville*, 896 F.2d 1283, 1285 (11th Cir. 1990) ("An injury is 'irreparable' only if it cannot be undone through monetary remedies."). *Cf. Ramirez v. Collier*, 595 U.S. 411, 433 (2022).

We recognize, of course, that the State has a "significant interest in meting out a sentence of death in a timely fashion." *Nelson v. Campbell*, 541 U.S. 637, 644 (2004). But the State's arguments concerning delay, on this record, are not well taken.

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[5] The Commissioner faults the district court for crediting Dr. Williams' testimony on feasibility because "he has never visited Holman, does not know the dimensions of its execution chamber, does not know how that chamber is oriented relative to the rest of the facility, and has no familiarity with the structural constraints that would govern any modification." Br. for Appellants at 27. As we have explained, however, the district court relied on the testimony of others witnesses who were familiar with Holman—for example, the Commissioner himself. Even so, it is unclear to us how Dr. Williams' testimony about, for example, the common-sense availability of firearms and bullet-proof glass would require him to have visited the facility.

Mr. Lee filed his nitrogen hypoxia challenge within the statute of limitations, and the State chose to set Mr. Lee's execution date while the parties were in active litigation. Indeed, Mr. Lee filed his lawsuit on the same day (August 22, 2025) as seven other Alabama death row inmates claiming the protocol violated the Eighth Amendment. *See In Re: Alabama Nitrogen Hypoxia Protocol Litigation*, 2:24-cv-111-ECM (M.D. Ala.). Mr. Lee's case was briefly consolidated with those cases.

On January 14, 2026, however, the State notified the district court, Mr. Lee, and Mr. Lee's counsel—for the first time—that Mr. Lee was the next person for whom the State would move to set an execution date. Two weeks later, on January 28, 2026, the State represented that it anticipated moving to set Mr. Lee's execution date by mid-February. The next day, on January 29, 2026, the district court deconsolidated Mr. Lee's case and set it on a separate, expedited schedule for the bench trial in late April.

On February 9, 2026, the State moved the Supreme Court of Alabama to authorize Mr. Lee's execution. On April 15, 2026, the Governor set the execution for a date less than two months away. After the late April bench trial, the district court issued its findings of fact and conclusions of law on May 28, 2026. Mr. Lee sought relief from this Court immediately.

Any delay in obtaining relief after the State moved to set the execution date is not attributable to Mr. Lee. *Cf. Dunn v. Ray*, 586 U.S. 1138, 1138 (2019) (vacating a stay of execution where the inmate waited until one week before his execution date to seek

relief). June 11 is not a magical date, and the injury to the State caused by a delay would not be irreparable because the district court's injunction allows it to execute Mr. Lee by any other authorized method (including lethal injection or the electric chair). The State could have attempted to show why having to execute Mr. Lee by another authorized method, lethal injection for example, would constitute irreparable harm. But it has made no effort to do so. *See* D.E. 146 at 238 (then-Commissioner Hamm testified that the State "still [has] electrocution, lethal injection, nitrogen hypoxia, so all those methods are still available").

Beyond the timing, the Commissioner argues that we should hold the fact that Mr. Lee elected for execution by nitrogen hypoxia over lethal injection against him because of his litigious challenges to both methods. Although we factor this point into the balance of the equities, we cannot say that Mr. Lee knew the extent to which he would suffer conscious severe air hunger for approximately one to three minutes as laid out by physicians eight years after he made this election. In 2018, when Mr. Lee had to elect nitrogen hypoxia as the method of execution, the State had not yet come up with a protocol. And it would not be until 2023 when that protocol was completed.

The public and the State undoubtedly have an expectation that capital punishment will be effectuated. "To unsettle these expectations is to inflict a profound injury to the 'powerful and legitimate interest in punishing the guilty,' an interest shared by the State and the victims of crime alike." *Calderon v. Thompson*, 523 U.S.

538, 556 (1998) (quoting *Herrera v. Collins*, 506 U.S. 390, 421 (1993)). But the public, the State, and Mr. Lee all have an interest in ensuring that executions are carried out consistently with the Constitution. And we note that the effect of the Commissioner's requested stay, if granted, would be to moot this appeal and prevent this Court from reaching the constitutionality of execution by nitrogen hypoxia.

Ultimately, it is Mr. Lee who would be executed under a likely-unconstitutional method—one that we held met the first *Glossip* prong and that the district court held unconstitutional under the Eighth Amendment—if we granted the stay. *See e.g.*, *Enmund v. Florida*, 458 U.S. 782, 798 (1982) (stating that the unconstitutional imposition of a death sentence "is nothing more than the purposeless and needless imposition of pain and suffering"); *Glossip*, 576 U.S. at 877 (indicating that "needless suffering" can create "an objectively intolerable risk of harm that prevents prison officials from pleading that they were subjectively blameless for purposes of the Eighth Amendment") (internal quotation marks omitted).

The equities, we believe, favor Mr. Lee. And even if they do not favor Mr. Lee, they do not favor the Commissioner.

IV

The Commissioner's motion to stay the district court's permanent injunction is **DENIED.**

LUCK, Circuit Judge, dissenting:

Twenty-six years ago, Jeffery Lee was sentenced to die for robbing and murdering Jimmy Ellis and Elaine Thompson. Unlike his victims, Lee was allowed to choose his method of execution. Eight years ago, he did that by electing nitrogen hypoxia. His execution is fixed for tomorrow.

Or it was. Two days before Lee's sentence was finally set to be carried out, the district court declared that the state's nitrogen hypoxia protocol facially violated the Eighth Amendment and enjoined the state from executing Lee using the protocol. The state appeals the injunction and moves for a stay pending appeal. I would grant the motion. Because the majority opinion doesn't, I respectfully dissent.

"A court considering whether to issue a stay 'considers four factors: (1) whether the stay applicant has made a strong showing that he is likely to succeed on the merits; (2) whether the applicant will be irreparably injured absent a stay; (3) whether issuance of the stay will substantially injure the other parties interested in the proceeding; and (4) where the public interest lies.'" *Swain v. Junior*, 958 F.3d 1081, 1088 (11th Cir. 2020) (quoting *Nken v. Holder*, 556 U.S. 418, 426 (2009)). Here, the state has met its burden as to each factor.

I.

"A death row inmate may attempt to show that a [s]tate's planned method of execution, either on its face or as applied to him, violates the Eighth Amendment's prohibition on 'cruel and

unusual' punishment." *Nance v. Ward*, 597 U.S. 159, 164 (2022). "To succeed on that claim . . . he must satisfy two requirements." *Id.* "First, he must establish that the [s]tate's method of execution presents a 'substantial risk of serious harm'—severe pain over and above death itself." *Id.* (quoting *Glossip v. Gross*, 576 U.S. 863, 877 (2015)). Second, "he 'must identify an alternative [method] that is feasible, readily implemented, and in fact significantly reduce[s]' the risk of harm involved." *Id.* (alterations in original) (quoting *Glossip*, 576 U.S. at 877).

In an earlier appeal, we concluded that Lee met his burden as to the first requirement. And on remand, the district court concluded that he met his burden as to the second requirement. Here, the state has made a strong showing that the district court likely erred in finding: that a firing squad was a readily implemented alternative method of execution; that it would significantly reduce the risk of harm involved; and that the state lacked legitimate reasons for not adopting a firing squad as an alternative method.

A.

To be "readily implemented," the alternative method of execution must be one the state could carry out "relatively easily and reasonably quickly." *Bucklew v. Precythe*, 587 U.S. 119, 141 (2019) (first quoting *Glossip*, 576 U.S. at 877; and then quoting *McGehee v. Hutchinson*, 854 F.3d 488, 493 (8th Cir. 2017), and *Arthur v. Comm'r, Ala. Dep't of Corr.*, 840 F.3d 1268, 1300 (11th Cir. 2016)). Even if the state completely adopted Utah's protocol, it could not relatively easily and reasonably quickly carry out a firing squad execution.

First, Lee presented no evidence that the state has a facility for a firing squad execution. As the state explains, under the Utah protocol, it would need a restraint chair, stacked sandbags sufficient to absorb .30-caliber rifle fire, a large enough firing line between the riflemen and the prisoner, a viewing area, and structural reinforcement to prevent ricochets and ensure the safety of the surrounding area. The state would have to build this structure from scratch because its current facility—Holman Correctional Facility—doesn't have these necessary elements. And the state would then have to test the new elements before they could become operational. For reference, when the state adopted nitrogen hypoxia as a method of execution, that method took five years to implement. At best, the evidence shows that a firing squad execution would eventually be done. But there's no evidence that it would be relatively easy or reasonably quick to do so.

The same is true for finding five marksmen to serve as executioners. Lee presented no evidence that it would be relatively easy and reasonably quick to find five people who are willing to pull the trigger and have the skill to shoot accurately. The marksmen must hit a target the size of a heart from at least twenty feet. Again, at best, the evidence shows that the state would train five people to do the job, but not that it could do so relatively easily and reasonably quickly.

These concerns are not the kind of "incidental delay" that comes with "enact[ing] legislation approving what a court has found to be a fairly easy-to-employ method of execution." *See*

Nance, 597 U.S. at 170. In *Nance*, the prisoner alleged that "Georgia ha[d] enough qualified personnel." *Id.* at 166. Here, on the other hand, there's no evidence that the state currently has enough qualified personnel to relatively easily and reasonably quickly carry out the execution. And there was no allegation in *Nance* that Georgia did not have the structural facilities to carry out the execution. Here, the evidence shows that the state does not presently have a facility fit for a firing squad. Instead, we are left with some of the same open questions the Supreme Court found dispositive in *Bucklew*, like how the state should build the new facility to ensure the safety of staff, witnesses, and other prisoners. *See Bucklew*, 587 U.S. at 141. Lee's alternative method of execution doesn't say how that should be done. Because he has not met his burden to provide the answers, as in *Bucklew*, it is likely the district court erred in concluding that a firing squad execution could be readily implemented.

B.

The district court also likely erred in concluding that a firing squad in fact significantly reduces the risk of harm involved in the execution. It reached this conclusion based on its finding that there was no evidence contradicting Dr. Williams's opinion that a prisoner executed by firing squad would experience no pain.

This was wrong. There was evidence contradicting Dr. Williams's opinion, supplied by Dr. Williams himself.

> Dr. James Williams, [Lee's] expert in ballistics, emergency medicine, and firearms, described an execution by firing squad at the evidentiary hearing. The

> inmate is first fitted with a target over his heart and a hood is placed over his head. Five riflemen then take aim and fire at the inmate's heart. When the bullets hit the inmate, they tear the heart muscle to pieces and blow apart the tissue, which causes a rapid and total disruption of blood flow to the brain, and when that blood supply is stopped, loss of consciousness follows. Before falling unconscious, the inmate feels the physical pain of the bullets' impact.
>
> [. . .]
>
> [Dr. Williams'] report [also] supports the inference that the inmate *would* experience physical pain during the three to five seconds before he became unconscious.

Boyd v. Comm'r, Ala. Dep't of Corr., No. 25-13545, 2025 WL 2970017, at *4 (11th Cir. Oct. 20, 2025) (citation modified). Based on Dr. Williams's description, we explained that "the firing squad subjects the inmate to intense, albeit brief, physical pain. The firing squad would very likely carry both intense physical pain as well as the psychological and emotional harm to the inmate . . . ." *Id.*

This is not a controversial conclusion. The Fifth Circuit—reviewing a similar method of execution challenge to Louisiana's nitrogen hypoxia protocol—noted the undisputed evidence "that death by firing squad can cause pain." *Hoffman v. Westcott*, 131 F.4th 332, 336 (5th Cir. 2025). The South Carolina Supreme Court—reviewing a cruel and unusual punishment claim under the

state constitution—cited evidence from the prisoner's expert that the outer limit of the period of time in which an inmate will suffer pain, absent a botched execution, is "hardly more than fifteen seconds." *Owens v. Stirling*, 904 S.E.2d 580, 600 (S.C. 2024). In *Bucklew*, the Supreme Court lumped in a firing squad with hanging and electrocution as arguably less humane methods of execution compared to lethal injection. *See* 587 U.S. at 135. And even the district court acknowledged that its finding was "not intuitive." Indeed, it wasn't. It was contradicted by the testimony of the same expert the district court relied on. We ourselves previously credited the testimony of Lee's "own expert, Dr. Williams" that, when a prisoner is executed by firing squad, "four bullets strike the [prisoner's] heart, . . . tear[ing] the heart muscles to pieces and blow[ing] apart the tissue," causing the prisoner "pain and suffering." *Boyd*, 2025 WL 2970017, at *4 (citation omitted).

Because there's evidence that a prisoner executed by a firing squad will feel pain and suffering, the district court erred in concluding Dr. Williams's no-pain opinion was uncontradicted. And that error tainted the district court's conclusion that a firing squad would significantly reduce the risk of harm to Lee.

C.

There's another likely error in the district court's conclusion that the state had no legitimate reasons for declining to switch to a firing squad. The state had a very good reason—the error rate of firing squad executions.

The district court rejected this legitimate reason because, it found, the reason was based on an isolated mishap alone, pointing to the firing squad execution of Mahdi in South Carolina. But the Mahdi execution was not an isolated mishap. Dr. Williams testified that, since 1860, there have been forty-three firing squad executions in Utah and six in South Carolina; of those forty-nine, he said four had been "botched." In other words, a little over eight percent of those firing squad executions went wrong.

Lee presented no evidence of how that figure compared to the frequency of mishaps with the nitrogen hypoxia protocol. But the state did, and the evidence showed that there had been no mishaps since Alabama and Louisiana began using their protocols. Given this evidence, the district court erred in rejecting the state's error-rate reason for not adopting firing squads as the method of execution in Alabama.

II.

Putting these three likely errors together, the state is likely to succeed in its appeal. Combined with the equitable factors, we should stay the district court's injunction.

First, Lee chose to be executed by nitrogen hypoxia, so he "waived any objection he might have to it." *Stewart v. LaGrand*, 526 U.S. 115, 119 (1999). In *Stewart*, the prisoner was afforded a choice between lethal injection and lethal gas, and he "decided to be executed by lethal gas." *Id.* The Supreme Court vacated the lower court's injunction partly because, "[b]y declaring his method of execution, picking lethal gas over the [s]tate's default form of

execution—lethal injection—[the prisoner] . . . waived any objection he might have to it." *Id.*

We have a similar situation here. Lee had two constitutionally approved default methods of execution—electrocution and lethal injection. He selected nitrogen hypoxia, instead. As in *Stewart*, when making the equitable call on a lower court's injunction, Lee should be held to that choice.

Second, despite the fact that Alabama has two other methods of execution that are constitutionally sound, Lee chose as an alternative method an execution protocol that Alabama does not offer. If Lee was concerned about the nitrogen hypoxia protocol and genuinely wanted a constitutionally assured method of execution, he would have chosen one of the two authorized in Alabama. But he didn't. He sought an alternative that only two states have used over the last one hundred years and sought an injunction that barred any method other than one Alabama doesn't authorize. Even the district court found this was inequitable. So should we. *See Gomez v. U.S. Dist. Ct. for N. Dist. of Cal.*, 503 U.S. 653, 654 (1992) ("Equity must take into consideration the [s]tate's strong interest in proceeding with its judgment and Harris' obvious attempt at manipulation.").

Third, Lee delayed bringing his Eighth Amendment claim. He selected nitrogen hypoxia as his method of execution in 2018. Alabama established its protocol in 2023. And it executed five prisoners in 2024 and 2025 before Lee attacked the method of execution. We're in this last-minute scramble because Lee delayed

months and years before bringing his claim on the eve of the statute-of-limitations deadline. We have regularly denied equitable relief where the prisoner waited months or years to bring his claim. *See, e.g.*, *Grayson v. Allen*, 491 F.3d 1318, 1326 (11th Cir. 2007); *Williams v. Allen*, 496 F.3d 1210, 1215 (11th Cir. 2007). We should do so here too.

Fourth, "[b]oth the [s]tate and the victim's family have a strong interest in the timely enforcement of [Lee's] death sentence." *See Williams*, 496 F.3d at 1214. "[E]quity must be sensitive to the [s]tate's strong interest in enforcing its criminal judgment[s] without undue interference from the federal courts." *Bowles v. Desantis*, 934 F.3d 1230, 1247 (11th Cir. 2019) (quoting *Hill v. McDonough*, 547 U.S. 573, 584 (2006)). And, specifically, we have "rejected the argument that" a prisoner "will suffer irreparable harm if he is executed, whereas the state will only suffer a minimal inconvenience, because the state, the victim, and the victim's family also have an important interest in the timely enforcement of [the prisoner's] sentence." *Id.* at 1247–48 (citation modified).

* * *

For as long as we've had an Eighth Amendment, the Supreme Court has never held that a state's method of execution qualifies as cruel and unusual under the Eighth Amendment. *See Bucklew*, 587 U.S. at 113. Because we shouldn't do so here, I would grant the state's motion to stay the injunction.

Exhibit B

NOT FOR PUBLICATION

In the
United States Court of Appeals
For the Eleventh Circuit

No. 26-11864

JEFFERY LEE,

Plaintiff-Appellant,

versus

COMMISSIONER, ALABAMA DEPARTMENT OF CORRECTIONS,
WARDEN, HOLMAN CORRECTIONAL FACILITY,

Defendants-Appellees.

Appeal from the United States District Court
for the Middle District of Alabama
D.C. Docket No. 2:25-cv-00680-ECM

Before JORDAN, LUCK, and KIDD, Circuit Judges.

PER CURIAM:

Alabama is one of a number of states—the others are Arkansas, Louisiana, Mississippi, and Oklahoma—which currently

authorize nitrogen hypoxia as a method of execution. *See* Ala. Code §§ 15-18-82(a), 15-18-82.1(a)–(b). This appeal presents another challenge to the constitutionality of nitrogen hypoxia.

In *Grayson v. Comm'r, Ala. Dep't of Corr.*, 121 F. 4th 894 (11th Cir. 2024), we affirmed the denial of a preliminary injunction to prohibit an execution in Alabama by nitrogen hypoxia. Without determining the merits of the inmate's Eighth Amendment claim, we held that, given the evidence in the record and its factual findings, the district court had not abused its discretion in ruling that the inmate had not shown a substantial likelihood of success on that claim. First, the inmate's expert had testified that the nitrogen hypoxia protocol only inflicted psychological pain, a pain which would exist regardless of the method of execution. Second, the district court had credited the testimony of a state expert that unconsciousness would result within 10 to 40 seconds. Third, the district court rejected the testimony of the inmate's expert that the protocol would result in negative pressure pulmonary edema. *See id.* at 898–900.

We noted in *Grayson*, however, that there "may exist a form of execution that induces psychological terror or pain that is severe enough to support an Eighth Amendment claim." *Id.* at 900 n.3. And we expressed "no view on what the result would have been had the district court's factual findings been different." *Id.* at 901 n.4.

In this case, Jeffery Lee, an Alabama inmate under sentence of death, filed an action under 42 U.S.C. § 1983 in August of 2025,

alleging that the nitrogen hypoxia protocol violated the Eighth Amendment. *See generally* D.E. 1. On February 2, 2026, Mr. Lee filed an amended complaint, where he proposed execution by firing squad, similar to Utah's protocol, as an alternative method of execution. *See* D.E. 40. *See also* D.E. 173-40.

One week later, on February 9, 2026, Alabama moved to set his execution. On April 15, 2026, the Governor set Mr. Lee's execution for a 30-hour period beginning on June 11, 2026, at 12:00 a.m., and concluding on June 12, 2026, at 6:00 a.m. *See* D.E. 127-1.

From April 27–29, 2026, the district court held a three-day bench trial on the constitutionality of Alabama's nitrogen hypoxia protocol, the first such trial in the country. The parties introduced voluminous evidence, including testimony from seven lay witnesses and four expert witnesses, and hundreds of exhibits totaling thousands of pages.

After weighing the evidence presented, the district court entered an order rejecting Mr. Lee's Eighth Amendment claim. The district court found that an inmate who is executed under the nitrogen hypoxia protocol "consciously" experiences "severe air hunger and corresponding emotional distress, anxiety, physiological stress, and physical discomfort" for "one to three minutes," but concluded that the protocol does not violate the Eighth Amendment by causing "severe pain or suffering 'well beyond what's needed to effectuate a death sentence.'" *Lee v. Lovelace*, No. 25-cv-680, ___ F. Supp. 3d ___, 2026 WL 1493098, at *22, *25 (M.D. Ala. May 28, 2026). Given its ruling, the district court did not address

whether execution by firing squad pursuant to Utah's protocol constitutes a feasible and readily implemented alternative method of execution that significantly reduces a substantial risk of severe pain. *See id.* at *22.

Mr. Lee appealed the district court's judgment, and sought a stay of execution. We expedited briefing and heard oral argument by videoconference on Friday, June 5, 2026.

We hold that, given the district court's factual findings—which are not clearly erroneous—Mr. Lee has shown that the protocol "presents a 'substantial risk of serious harm'—severe pain over and above death itself." *Nance v. Ward*, 597 U.S. 159, 164 (2022) (quoting *Glossip v. Gross*, 576 U.S. 863, 877 (2015)). *See also Nance v. Comm'r, Ga. Dep't of Corr.*, 169 F. 4th 1312, 1318 (11th Cir. 2016) (explaining that the question is whether the method of execution "creates a substantial risk of serious harm, an objectively intolerable risk of harm that prevents prison officials from pleading that they were subjectively blameless for purposes of the Eighth Amendment"). We therefore reverse the district court's judgment and remand for consideration of the firing squad alternative proposed by Mr. Lee.

I

A jury found Mr. Lee guilty of the 1998 murders of Jimmy Ellis and Elaine Thompson, as well as the attempted murder of Helen King, during a robbery. *See Lee v. State*, 898 So. 2d 790, 807 (Ala. Crim. App. 2001). After the penalty phase of the trial, the jury

recommended by a vote of 7 to 5 that he be sentenced to imprisonment for life without the possibility of parole for the murders. *See id.* at 807–808. Under then-governing Alabama law, the trial court exercised its discretion to override the jury's recommendation and sentence Mr. Lee to death. *See id.* at 808.

After exhausting his direct and collateral remedies, *see, e.g.*, *Lee v. Comm'r, Alabama Dep't of Corr.*, 726 F.3d 1172 (11th Cir. 2013), Mr. Lee filed an action under 42 U.S.C. § 1983 challenging Alabama's lethal injection protocol as violative of the Eighth Amendment. *See Lee v. Dunn*, No. 16-473, 2017 WL 1483530 (S.D. Ala. Apr. 24, 2017), *vacated in part*, 731 F. App'x 885 (11th Cir. 2018). That lawsuit became moot in 2018 when Mr. Lee elected to be executed by nitrogen hypoxia, which had recently been authorized by the Alabama Legislature for the first time. *See Lee*, No. 16-473, D.E. 38 (order granting joint motion to dismiss) (S.D. Ala. July 20, 2018).

On August 22, 2025, Mr. Lee filed the present § 1983 action against the Commissioner of Alabama's Department of Corrections challenging Alabama's nitrogen hypoxia protocol. Although Alabama had not yet set his execution date, Mr. Lee explained that he brought his suit "to avoid being denied relief . . . on timeliness grounds." D.E. 1 at ¶ 3.

After the district court granted in part and denied in part the Commissioner's motion to dismiss, Mr. Lee filed an amended complaint in February of 2026. He alleged that "[e]xecution by nitrogen hypoxia" induces "conscious suffocation" that "is cruel and unusual because it superadds terror and pain during the execution." D.E.

40 at ¶ 63. He proposed that execution by firing squad similar to Utah's protocol is a feasible and readily implemented alternative method that would significantly reduce the substantial risk of severe pain associated with nitrogen hypoxia. *See id.* at ¶¶ 69–72. *See also* D.E. 173-40. About a week later, the state asked the Alabama Supreme Court to set Mr. Lee's execution date. *See* D.E. 176 at 9. The Alabama Supreme Court granted the motion, and on April 15, 2026, the Governor declared that Mr. Lee's execution would take place during a 30-hour window commencing on June 11, 2026, at 12:00 a.m.[1]

Following discovery, the district court held a three-day bench trial, at which it heard the testimony of eleven witnesses, admitted hundreds of exhibits totaling thousands of pages, and viewed video demonstrations of the nitrogen hypoxia systems of Alabama and Louisiana. *See Lee*, 2026 WL 1493098, at *6. Mr. Lee called three experts, two of whom were Dr. Richard Schwartzstein and Dr. Julie Bastarache. Dr. Schwartzstein was admitted as an expert in pulmonology, critical care medicine, physiology, hypoxia, dyspnea, and air hunger. Dr. Bastarache was admitted as an expert in pulmonology, critical care medicine, and pathology. For its part,

[1] As the district court explained, a number of other Alabama inmates also filed a similar action challenging the nitrogen hypoxia protocol. Their cases were initially consolidated with Mr. Lee's, but when the state indicated that it was going to move to set an execution date for Mr. Lee, his case was deconsolidated. *See Lee*, 2026 WL 1493098, at *4.

the Commissioner called Dr. Joseph F. Antognini, an expert in anesthesiology. *See id.* at *5. We summarize the evidence and the district court's findings of fact below.[2]

A

"Nitrogen hypoxia, as set out in Alabama's protocol, causes death by introducing 'pure nitrogen gas . . . to the condemned inmate through an industrial-use respirator mask until the inmate is declared dead.'" *Grayson*, 121 F.4th at 896. The parties generally agree on how Alabama's nitrogen hypoxia protocol is carried out.

As the district court explained, the execution team escorts the inmate to the execution chamber. *See Lee*, 2026 WL 1493098, at *3. They then secure the inmate to the gurney with a chest and shoulder harness made of nylon straps, attach pulse oximeters, and secure a mask to the inmate's face. *See id.* After the death warrant is read and the inmate makes his final statement, the warden activates the nitrogen hypoxia system, which causes ultra-high purity nitrogen gas to flow into the mask. *See id.* The nitrogen gas displaces breathable air until the inmate is breathing almost pure nitrogen. *See id.* The mask allows exhaled carbon dioxide to exit via a one-way valve, which prevents the inmate from rebreathing carbon dioxide. *See id.* When the brain is deprived of oxygen for long enough, unconsciousness and death ensue. *See id.*

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[2] We thank the district court for its comprehensive order. Given time constraints, we do not summarize all of the evidence presented at the bench trial.

Mr. Lee is scheduled to be the eighth inmate in Alabama executed by nitrogen hypoxia. In March of 2025, Louisiana executed Jessie Hoffman, Jr. via a nitrogen hypoxia protocol similar to Alabama's. *See id.* at *4.

B

The district court credited the following opinions of Dr. Schwartzstein and/or Dr. Bastarache regarding severe air hunger caused by the nitrogen hypoxia protocol.

- Inmates executed under the nitrogen hypoxia protocol "likely experience severe air hunger, which evokes distress and anxiety." *Id.* at *14. Specifically, the district court credited Dr. Bastarache's opinion that "air hunger triggers the body's 'extreme physiologic need to get more oxygen' and produces 'intense physiologic stress that causes intense suffering.'" *Id.* (record citations omitted). "Because the inmate cannot respond to his 'basic survival instincts' to address the air hunger, a 'vicious cycle of increasing air hunger and panic symptoms' can occur." *Id.* (record citations omitted).
- "Unlike pain, which is normally localized to a specific body part, air hunger is 'a holistic discomfort sensation,' and individuals struggle to distract themselves from their dyspnea." *Id.* at *15 (record citation omitted). "Because it evokes a fear of dying, air hunger can be worse than pain." *Id.*
- "[A]t a partial pressure of oxygen (PO_2) below 60 mm Hg . . . , a person's drive to breathe 'takes off,' making him

or her 'desperate to try to do something to correct the hypoxemia.'" *Id.* (record citations omitted). Given that the goal of the nitrogen hypoxia protocol "is to take the inmate's PO_2 all the way down to 0 mm Hg," the protocol "evokes an 'incredibly strong stimulus' to breathe." *Id.* And, "while only a minor factor, the inmate's awareness that he cannot alleviate his dyspnea . . . would exacerbate his anxiety and the air hunger itself." *Id.*

- "[F]our inmates executed under the [p]rotocol had flash pulmonary edema, which would have exacerbated their dyspnea." *Id.* "[F]lash pulmonary edema is a condition triggered by extreme distress in which the lungs 'almost instantaneously' fill with fluid, making it 'extremely difficult to breathe.'" *Id.* "Of the inmates executed under the [p]rotocol who have had autopsies performed . . . , all four had evidence of flash pulmonary edema caused by a sudden rise in blood pressure," which is "an abnormal autopsy finding." *Id.* "Flash pulmonary edema indicates severe physiological stress; exacerbated the inmates' dyspnea; and would have occurred 'very early on in the executions' while the inmates were conscious and 'when air hunger was occurring and reaching its peak[.]'" *Id.*

- "[H]ypoxia causes dyspnea even when carbon dioxide levels are normal and, therefore, the lack of carbon dioxide buildup in the mask does not eliminate or reduce the possibility of severe air hunger." *Id.* at *16.

- "Several factors can alleviate air hunger, including taking larger breaths and reducing anxiety. In the clinical and research settings, mitigating the dyspneic subject's anxiety is possible. In the research setting, for example, researchers can reassure the subjects that the air hunger is merely part of the experiment, and this reassurance helps the subjects tolerate the discomfort of air hunger. And in the clinical setting, doctors can reassure many patients that the patients' dyspnea is a consequence of their condition and that it does not mean they are going to die. In an execution setting, such reassurance is not possible because the goal is to cause the inmate's death." *Id.* at *25.

Mr. Lee and the Commissioner "vigorously contest[ed]" how long it takes an inmate being executed by nitrogen hypoxia to become unconscious and how long he is capable of experiencing suffering. *See id.* at *16. Dr. Antognini opined that inmates are rendered unconscious within 60 to 75 seconds after the nitrogen gas is turned on, while Dr. Bastarache posited that four inmates previously executed by nitrogen hypoxia remained conscious for three to seven minutes. *See id.*

Ultimately, after considering the conflicting evidence, the district court found that an inmate who is executed under the protocol "experiences severe air hunger and corresponding emotional distress, anxiety, physiological stress, and physical discomfort" for "not significantly more than one to three minutes." *Id.* at *25. It explained that "air hunger causes extreme emotional distress,

panic, anxiety, and fear because breathing is essential to human life. Patients often describe air hunger as akin to suffocation or drowning." *Id.* at *24 (internal quotation marks omitted).[3]

C

After making these factual findings, the district court concluded that Alabama's nitrogen hypoxia protocol does not cause needless suffering and therefore does not violate the Eighth Amendment. *See id.* Although the protocol "likely causes severe air hunger—the most severe form of breathing discomfort—for one to three minutes," that "pain, anxiety, and dread" is primarily a result of inmates "know[ing] they are going to die" and "their body's survival instincts" kicking in. *See id.* at *22–23. Thus, the district court reasoned, the nitrogen hypoxia protocol does not cause suffering "well beyond what's needed to effectuate a death sentence." *Id.* at *22 (quoting *Bucklew v. Precythe*, 587 U.S. 119, 136–37 (2019)). *See also id.* at *23 ("[T]he physiological discomfort caused by the Protocol does not violate the Constitution.").

[3] Dr. Schwartzstein opined that a person being executed by nitrogen hypoxia continues to suffer pain for three to five minutes after becoming unconscious. The district court did not address whether that opinion was persuasive or not. *See id.* at *17. Instead, it declined to consider the opinion because, in its view, an unconscious person "does not experience or perceive dyspnea of a constitutionally relevant kind." *Id.* At oral argument, counsel for Mr. Lee asserted (without waiving any argument in his brief) that this Court could grant him relief without addressing that ruling. We agree, and express no view on the alleged unconscious suffering.

Because it concluded that the nitrogen hypoxia protocol did not cause needless suffering in violation of the Eighth Amendment, the district court did not reach Mr. Lee's proposed alternative of execution by firing squad. *See id.* at *25. *See also Nance,* 169 F.4th at 1318 ("If the planned method does not present a substantial risk of serious harm, the officials may use it regardless of the proposed alternatives.").

II

In an appeal from a bench trial, we review factual findings for clear error and legal conclusions de novo. *See Dish Network, LLC v. Fraifer*, 171 F.4th 1344, 1351 (11th Cir. 2026).

Under clear error review, a factual "finding that is 'plausible' in light of the full record—even if another is equally or more so—must govern." *Cooper v. Harris*, 581 U.S. 285, 293 (2017). "This standard does not entitle us to overturn a finding simply because we are convinced that we would have decided the case differently." *Glossip*, 576 U.S. at 881 (internal quotation marks and brackets omitted).

Once the relevant underlying facts are determined, whether a method of execution violates the Eighth Amendment presents a question of law. *See Grayson v. Warden, Comm'r, Ala. Dep't of Corr.*, 869 F.3d 1204, 1239 (11th Cir. 2017). *Accord Bucklew v. Precythe*, 883 F.3d 1087, 1094 (8th Cir. 2018) ("[W]hether a method of execution 'constitutes cruel and unusual punishment is a question of law.'") (citation omitted), *aff'd*, 587 U.S. 119 (2019).

III

Under governing Supreme Court precedent,

> [t]he Eighth Amendment "does not demand the avoidance of all risk of pain in carrying out executions." To the contrary, the Constitution affords a "measure of deference to a State's choice of execution procedures" and does not authorize courts to serve as "boards of inquiry charged with determining 'best practices' for executions." The Eighth Amendment does not come into play unless the risk of pain associated with the State's method is "substantial when compared to a known and available alternative."

Bucklew, 587 U.S. at 134 (citations omitted).

To succeed on a method-of execution claim, an inmate must satisfy two requirements. First, he "must establish that the . . . method of execution presents a 'substantial risk of serious harm'—severe pain over and above death itself." *Nance*, 597 U.S. at 164 (quoting *Glossip*, 576 U.S. at 877). Second, he "'must identify an alternative method that is feasible, readily implemented, and in fact significantly reduces' the risk of harm involved." *Id.* (quoting *Glossip*, 576 U.S. at 877) (brackets omitted). *See Bucklew*, 587 U.S. at 136 ("Distinguishing between constitutionally permissible and impermissible degrees of pain . . . is a *necessarily* comparative exercise. To decide whether the State has cruelly 'superadded' pain to the punishment of death isn't something that can be accomplished by examining the State's proposed method in a vacuum, but only by

'compar[ing]' that method with a viable alternative."). "Where a prisoner claims a safer alternative to the State's . . . protocol, he cannot make a successful challenge by showing a 'slightly or marginally safer alternative.'" *Price v. Comm'r, Ala. Dep't of Corr.*, 920 F.3d 1317, 1326 (11th Cir. 2019) (quoting *Glossip*, 576 U.S. at 877). Nevertheless, he may identify "an alternative method that is not [currently] authorized" by state law. *See Nance*, 597 U.S. at 163–64, 173. *See also Bucklew*, 587 U.S. at 139–40.

The district court found that the nitrogen hypoxia protocol causes one to three minutes of "severe air hunger and corresponding emotional distress, anxiety, physiological stress, and physical discomfort." *Lee*, 2026 WL 1493098, at *25.

> Air hunger involves activation of brain regions dedicated to basic survival instincts, which include the need to breathe adequately. When breathing is insufficient, severe distress, anxiety, and panic are normal and expected human sensations that, under typical circumstances, highly motivate an individual to improve [his] breathing immediately or face imminent death.

Id. at *24. "Many people find air hunger worse than pain because it is associated with the fear of dying." *Id.*

A

The parties challenge some of the district court's factual findings. Mr. Lee, for example, asserts that the district court should have found, based on the expert testimony he presented, that inmates subjected to execution by nitrogen hypoxia could remain

conscious for three to seven minutes. The Commissioner, for his part, attacks the district court's finding that the protocol causes an inmate to experience air hunger and associated distress for not significantly more than one to three minutes. *See* Brief for Appellant at 26; Brief for Appellee at 35.

We discern no clear error in any of the district court's factual findings. As noted, a finding that is plausible, even if another is equally or more so, must govern. *See Cooper*, 581 U.S. at 293. And we cannot "overturn a finding simply because we are convinced that we would have decided the case differently." *Glossip*, 576 U.S. at 881 (internal quotation marks and brackets omitted).

A district court in a bench trial is not required to accept an expert's opinion even if unimpeached. *See, e.g., Eason v. Weaver*, 484 F.2d 459, 460 (5th Cir. 1973). And, like a jury, when a district court performs the role of factfinder it "is not required to accept 'all or none' of a witness'[ ] testimony; rather, [it] may accept those portions of a witness'[ ] testimony which it considers credible and reject other portions which it finds to be improbable." *Rixey v. W. Paces Ferry Hosp., Inc.*, 916 F.2d 608, 616 (11th Cir. 1990). The district court here did not err, much less clearly err, in accepting some of the expert testimony and in rejecting other aspects of that same testimony. *See United States v. Stein*, 964 F.3d 1313, 1322 (11th Cir. 2020) ("Our case law is . . . unambiguous: the district court frequently must choose between dueling experts, and if that decision is reasonably based on evidence found in the record, the choice is not clear error.").

B

Based upon the district court's factual findings, we hold that Alabama's nitrogen hypoxia protocol "presents a 'substantial risk of serious harm'—severe pain over and above death itself." *Nance*, 597 U.S. at 164. Mr. Lee has therefore satisfied the first prong of the *Glossip* Eighth Amendment standard.[4]

As intended, the protocol causes death by introducing pure nitrogen gas through a respirator mask until the inmate is declared dead. The district court found that an inmate executed under the protocol suffers one to three minutes of "severe air hunger and corresponding emotional distress, anxiety, physiological stress, and physical discomfort." *Lee*, 2026 WL 1493098, at *25. This mental distress, physiological suffering, and physical discomfort, the district court found, will likely take place. There is, in other words, a substantial risk of serious harm. The risk is not conjectural, speculative, or doubtful.

The Eighth Amendment does not "guarantee a prisoner a painless death." *Bucklew*, 587 U.S. at 132. Yet at the Founding, "cruel" was "often defined to mean . . . '[d]isposed to give pain to others, in body or mind[.]'" *Id.* at 130 (quoting 1 Noah Webster, An

[4] Mr. Lee challenges the district court's order allowing the testimony of Dr. Antognini, the Commissioner's expert, on the ground that he did not sufficiently explain the extrapolation underlying some of his opinions. *See Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997). Given our resolution on the first prong of *Glossip*, we need not address this issue.

American Dictionary of the English Language (1828) (first set of brackets in original)).

In our view, the overall suffering described by the district court, which lasts for one to three minutes, presents a substantial risk of serious harm over and above death itself. Counting to 60 or 180 seconds is not a quick exercise, and constitutionally speaking, that timeframe is intolerable given the suffering that would likely take place under Alabama's nitrogen hypoxia protocol. Such suffering, we believe, is over and above the mental distress that typically accompanies the knowledge of impending death by execution.

The Fifth Circuit's 2-1 decision in *Hoffman v. Westcott*, 131 F.4th 332 (5th Cir. 2025), does not call for a different result.

In *Hoffman*, Louisiana appealed a preliminary injunction that prevented state officials from executing an inmate through nitrogen hypoxia. The Fifth Circuit vacated the preliminary injunction. It held that the inmate failed to meet the two requirements demanded under Supreme Court precedent—namely, that the method of execution "presents a risk that is '*sure or very likely* to cause serious illness and needless suffering,'" *id.* at 335 (quoting *Glossip*, 576 U.S. at 877), and that the State could use "a feasible and readily implemented alternative method of execution that would significantly reduce a substantial risk of severe pain" which it "has refused to adopt without a legitimate penological reason," *id.* (quoting *Bucklew*, 587 U.S. at 134).

As to the first requirement, the Fifth Circuit explained that "the district court heard expert testimony from both parties that nitrogen hypoxia is painless." *Id.* at 336. With respect to the second requirement, the Fifth Circuit concluded that "experts for both parties agreed that death by firing squad"—Mr. Hoffman's proposed alternative means of execution—would "be *more* painful than execution by nitrogen hypoxia." *Id.*[5]

Here, in contrast, the district court found that nitrogen hypoxia causes an inmate to suffer "profound physiological discomfort and distress"—in addition to mental distress—through severe air hunger, *see Lee*, 2026 WL 1493098 at *22, and physiological distress is at least partly physical. *See* Webster's Third New World Dictionary (Unabridged) 1707 (2012) (defining "physiological" in part as "characteristic of or appropriate for an organism's healthy or normal functioning"); The American Heritage Dictionary of the English Language 1325 (4th ed. 2009) (defining "physiological" in part as "[b]eing in accord with or characteristic of the normal functioning of a living organism"); 2 Shorter Oxford English Dictionary 2194 (5th ed. 2002) (defining "physiological" in part as "[p]ertaining

[5] The dissent in *Hoffman* believed that the majority had failed to address the district court's findings that inmates executed by nitrogen hypoxia faced conscious terror and a sense of suffocation for 35 to 40 seconds on the low end and conscious psychological suffering for three to five minutes if they held their breath. *See id.* at 337 (Haynes, J., dissenting).

to the material universe or to natural science; physical"). The district court here also did not make any findings about the firing squad as an alternative method of execution.

C

Under the second prong of *Glossip*, Mr. Lee must also identify an alternative method that "is feasible, readily implemented, and in fact significantly reduces the risk of harm involved." *Nance*, 597 U.S. at 164 (quotations and brackets omitted). He asserts that execution by firing squad pursuant to the Utah protocol is a feasible, readily implementable, and less painful alternative within the meaning of the Eighth Amendment. As noted, an "inmate seeking to identify an alternative method of execution is not limited to choosing among those presently authorized by a particular State's law." *Bucklew*, 587 U.S. at 139–40. *Cf. Nance v. Comm'r, Ga. Dep't of Corr.*, 59 F. 4th 1149, 1155–56 (11th Cir. 2023) (holding that a Georgia inmate set for execution by lethal injection sufficiently pled that the firing squad was an alternative method of execution, but not addressing whether the state had a "legitimate penological reason" for refusing to use the firing squad and allowing district court to address that issue on remand).

The district court, as noted, did not address whether Mr. Lee had shown that the firing squad was a feasible and readily implemented alternative method that would significantly reduce the risk of harm. Mr. Lee asks us to resolve that issue now, but we are not equipped to do so. As an appellate tribunal, it is not our "role to find facts," *United States v. Barnette*, 10 F.3d 1553, 1558 (11th Cir.

1994), and we cannot therefore make findings with respect to feasibility given the conflicting testimony on matters that might affect that issue (e.g., the risk of failure with the firing squad, and whether the need for volunteer marksmen from the correctional staff amounts to a valid penological reason to reject that method). *Compare* Br. for Appellant at 50–52, *with* Br. for Appellee at 39–46. Nor are we able to make factual determinations about what pain, if any, an inmate will suffer if executed by firing squad. Mr. Lee seems to grudgingly recognize some of these problems, as he alternatively requests a remand to the district court to address the firing squad. *See* Reply Br. of Appellant at 12 ("To the extent this Court doubts whether Mr. Lee met his burden of identifying an alternative method of execution, the appropriate remedy is to remand for further proceedings, not to dismiss [the] Eighth Amendment claim.").

We therefore remand the case to the district court with instructions to immediately address the second prong of *Glossip*. And because we cannot make a determination about likelihood of success on that prong on this record, we deny without prejudice Mr. Lee's current motion for a stay of his execution.

IV

Under the facts found by the district court, Alabama's nitrogen hypoxia protocol "presents a 'substantial risk of serious harm'—severe pain over and above death itself." *Nance*, 597 U.S. at 164 (quoting *Glossip*, 576 U.S. at 877). As a result, Mr. Lee has satisfied the first prong of *Glossip*, and we reverse the district court's judgment in favor of the Commissioner.

Given the parties' disputes on prong two of *Glossip*, some of which are factual, the district court will now need to determine in the first instance whether Mr. Lee has demonstrated that the firing squad is an alternative method of execution that "is feasible, readily implemented, and in fact significantly reduce[s]" the risk of harm posed by nitrogen hypoxia. *See id.* If Mr. Lee files a motion for stay of execution, the district court will have to rule on that as well.

Given the impending execution window for Mr. Lee, we order the clerk to issue the mandate immediately (i.e., along with the filing of this opinion). That way the district court will reacquire jurisdiction right away. *See United States v. Sears*, 411 F.3d 1240, 1241 (11th Cir. 2005) ("Issuance of the mandate g[ives] the district court jurisdiction over the case again.").[6]

REVERSED AND REMANDED.

[6] If we issued a published opinion in this case, we could not expedite the issuance of the mandate without providing "reasonable notice" to the other members of this Court. *See* 11th Cir. R. 41-2.

Exhibit C

IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF ALABAMA
NORTHERN DIVISION

JEFFERY LEE, Plaintiff, v. GREG LOVELACE, Commissioner, Alabama Department of Corrections, *et al.*, Defendants.	)	CASE NO. 2:25-cv-680-ECM [WO]

MEMORANDUM OPINION and ORDER

I. INTRODUCTION

This case is before the Court on remand from the United States Court of Appeals for the Eleventh Circuit to address whether Plaintiff Jeffery Lee's ("Lee") proposed alternative method of execution—firing squad—is feasible, is readily implemented, and significantly reduces the substantial risk of serious harm caused by the Alabama Department of Corrections' ("ADOC") nitrogen hypoxia protocol (the "Protocol"). *See generally Lee v. Comm'r, Ala. Dep't of Corr.*, 2026 WL 1651147 (11th Cir. June 8, 2026) (per curiam).

After a three-day bench trial, the Court found that the Protocol causes one to three minutes of severe air hunger but ultimately concluded that the Protocol did not constitute cruel and unusual punishment in violation of the Eighth Amendment. *Lee v. Lovelace*, 2026 WL 1493098, at *24–25 (M.D. Ala. May 28, 2026). The Eleventh Circuit disagreed and concluded that the Protocol causes "a substantial risk of serious harm." *Lee*, 2026 WL

1651147, at *8. The Eleventh Circuit remanded with explicit instructions to immediately address whether Lee's proposed alternative method significantly reduces that substantial risk of serious harm. *Id.* Following the issuance of the Eleventh Circuit's mandate, Lee moved this Court to enter judgment in his favor or, in the alternative, to stay his execution. (Doc. 185). The State opposes that motion.[1] (Doc. 186). On this record, and given the Eleventh Circuit's legal conclusion that the Protocol poses an unconstitutional risk of pain, the Court finds that Lee has shown by a preponderance of the evidence that firing squad is feasible, readily implemented, and significantly reduces the substantial risk of serious harm posed by the Protocol, and that the State failed to proffer a legitimate penological reason not to adopt it. Accordingly, the Court enters judgment in Lee's favor and denies his motion to stay his execution as moot.

II. JURISDICTION AND VENUE

The Court has original subject matter jurisdiction over this case pursuant to 28 U.S.C. § 1331. Personal jurisdiction and venue are uncontested, and the Court concludes that venue properly lies in the Middle District of Alabama. *See* 28 U.S.C. § 1391.

III. PROCEDURAL HISTORY AND BACKGROUND

The Court summarized the relevant procedural history and background in its May 28, 2026 Memorandum Opinion and Order, *see Lee*, 2026 WL 1493098, and does not repeat it here. The Court sets forth below the relevant evidence presented at trial regarding

[1] Because the Defendants are state officials sued in their official capacities, the Court refers to them as the State.

Lee's proposed firing squad alternative, in particular Dr. James Williams' ("Dr. Williams") expert testimony.[2]

A. Firing Squad

Five states—including Utah—authorize execution by firing squad.[3] At trial, Lee introduced Utah's and the United States Army's ("U.S. Army") firing squad protocols into evidence.[4] (*See* doc. 173-46 (Utah's protocol); doc. 174-35 (U.S. Army protocol)). Lee's proposal largely tracks Utah's firing squad protocol, which was used as recently as 2010.[5] (*Compare* doc. 40 at 20–22, paras. 70–72, *with* doc. 173-46 at 55, 89–92); *see Boyd v. Warden, Holman Corr. Facility*, 856 F.3d 853, 881 n.4 (11th Cir. 2015) (Wilson, J., concurring) (taking judicial notice of the fact that Utah executed Kirk Johnson by firing squad in 2010). Below, the Court summarizes how Lee's proposed alternative would proceed.

[2] As discussed below, the Court also heard testimony from various ADOC employees, including former-Commissioner John Q. Hamm ("Hamm"), Deputy Commissioner Charles Williams ("Charles Williams"), and Warden Terry Raybon ("Raybon") regarding Lee's proposed firing squad protocol and whether the ADOC could feasibly and readily implement such a protocol.

[3] The other four states are Idaho, Mississippi, Oklahoma, and South Carolina. *See* IDAHO CODE § 19-2716; MISS. CODE § 99-19-51; OKLA. STAT. tit. 22, § 1014; S.C. CODE § 24-3-530. Lee's proposed alternative and Dr. Williams' expert opinion do not rely on the Idaho, Mississippi, Oklahoma, or South Carolina protocols.

[4] The Court pretermits discussion of the U.S. Army protocol because Lee's expert and proposed supplemental findings of fact rely heavily on Utah's protocol. (*See* doc. 173-40 at 16–21 (Dr. Williams' expert report); doc. 147 at 49:9–12 (Dr. Williams' trial testimony ("I rely heavily on the Utah state protocol for executions.")); doc. 167-1 at 36, para. 76) (Lee's proposed supplemental findings of fact)).

[5] Lee introduced a redacted copy of Utah's firing squad protocol into evidence at trial. (*See* doc. 173-46).

First, a member of the execution team would restrain the condemned inmate to a chair placed "between stacked sandbags." (Doc. 40 at 20, para. 71). Next, an execution team member would place a hood over the inmate's head and a target over his heart. (*Id.*). The firing squad team leader would then direct the execution team to stand at attention twenty-one feet from the condemned inmate. (*Id.* at 21, para. 72). Five trained marksmen armed with .30-caliber rifles would take aim and fire. (*Id.*). If, after the first volley, the condemned "is obviously conscious," the warden "shall immediately instruct the firing squad team leader to prepare the weapons and fire again." (Doc. 40 at 21–22, para. 72; *see also* doc. 173-46 (Utah's protocol)).

B. Dr. James Williams

Dr. Williams is an emergency physician, and much of his practice involves treating patients injured by gunshot wounds. (Doc. 147 at 5:21–6:8). At trial, he was accepted as an expert in emergency and family medicine, gunshot wounds, firearms, and ballistics. (*Id.* at 8:6–12). Dr. Williams testified to a reasonable degree of medical certainty that execution by firing squad: (1) causes a quick and painless death; and (2) is feasible and readily implemented. (*Id.* at 8:15–23). His opinion that firing squad causes a quick and painless death is based on scientific literature, his clinical experience treating gunshot victims in the emergency room, and his own experience being shot. (*Id.* at 27:16–28:7 (clinical experience); *id.* at 30:1–17 (personal experience); *id.* at 36:10–11, 37:16–24 (scientific literature); *see also* docs. 173-55, 173-90).

Dr. Williams opines that an execution by firing squad directed at the cardiac bundle[6]—the area of the body that includes the heart and great vessels—will very likely cause immediate disruption of blood flow to the brain, resulting in loss of consciousness within three to five seconds and death shortly thereafter. (Doc. 147 at 31:18–32:10, 36:15–37:9). Dr. Williams further opines that an inmate shot in the heart is unlikely to feel pain in the three to five seconds before he loses consciousness. (*Id.* at 18:7–15, 29:1–3). He bases this opinion on two related phenomena: (1) the delay in the brain's processing of novel stimuli into a subjective experience such as pain; and (2) the effects of "neural stunning." (*Id.* at 15:1–26:25). Dr. Williams testified that the 2025 firing squad execution of Mikal Mahdi ("Mahdi")[7] in South Carolina does not change his opinions because it was one purportedly botched execution out of forty-six firing squad executions in the United States since 1860. (Doc. 147 at 69:23–70:4, 71:7–18, 106:18–19).[8]

[6] For simplicity, this Opinion will refer to the cardiac bundle as the "heart" with the understanding that it also includes the great vessels.

[7] Pathologists have opined that the riflemen largely missed Mahdi's heart and that Mahdi remained conscious for approximately thirty to sixty seconds after he was shot. (*See* doc. 147 at 103:16–25, 104:15–25 (Dr. Williams' testimony); doc. 173-189 at 7).

[8] On cross-examination, the State questioned Dr. Williams regarding Mahdi's firing squad execution. (*See generally* doc. 147 at 88:13–104:9). During his testimony, Dr. Williams revealed that he is "currently retained by counsel for Mr. Mahdi and his estate" as a consulting expert for a potential lawsuit. (*Id.* at 75:4–7, 84:9–15). Dr. Williams has not been paid for his services and does not expect to be paid unless and until a lawsuit is filed, which had not occurred at the time of trial. (*Id.* at 84:7–8, 122:7–19). Although best practices counsel in favor of disclosing potential conflicts, any prejudice to the State was ameliorated through vigorous cross-examination and probing questions regarding Dr. Williams' potential bias. (*See, e.g.*, *id.* at 122:7–123:23). As noted above, Lee did not offer South Carolina's protocol as his proposed alternative. (*See, e.g.,* doc. 147 at 53:6–54:2 (Dr. Williams' testimony that there are significant differences between South Carolina's firing squad protocol and Utah's that renders South Carolina's protocol inferior)). The Court denied the State's oral motion to strike Dr. Williams' testimony. (*See id.* at 75:14–18, 78:23–79:2). Having personally observed Dr. Williams' testimony, the Court further finds that he was credible.

Dr. Williams further opines that execution by firing squad is feasible and can be readily implemented by the ADOC. (*See* doc. 147 at 55:22–56:3). He explains that a firing squad execution can either be done outdoors or indoors, as in Utah, (*id.* at 54:5–8), and that the weapons and materials required to conduct firing squad executions indoors—including .30-caliber rifles, sandbags, and steel plates—are "[v]ery commonly available," (*see, e.g.*, *id.* at 50:21–51:1, 54:8–55:18).

IV. LEGAL STANDARDS

A. Bench Trial

"In an action tried on the facts without a jury . . . the court must find the facts specially and state its conclusions of law separately." FED. R. CIV. P. 52(a)(1). In a bench trial, "it is the exclusive province of the judge . . . to assess the credibility of witnesses and to assign weight to their testimony." *Childrey v. Bennett*, 997 F.2d 830, 834 (11th Cir. 1993); *see also Sidman v. Travelers Cas. & Sur.*, 841 F.3d 1197, 1201 (11th Cir. 2016) (explaining, in the bench trial context, that "the district court has the advantage of observing the witnesses and evaluating their credibility firsthand," and that "[t]he credibility of a witness is in the province of the factfinder" (alteration in original) (first quoting *Fischer v. S/Y NERAIDA*, 508 F.3d 586, 592 (11th Cir. 2007), then quoting *Crystal Ent. & Filmworks, Inc. v. Jurado*, 643 F.3d 1313, 1320 (11th Cir. 2011))). Additionally,

"[a] trial judge sitting without jury is entitled to great latitude concerning the admission or exclusion of evidence." *Wright v. Sw. Bank*, 554 F.2d 661, 663 (5th Cir. 1977).[9]

B. Method of Execution Claims

To prevail on his method of execution claim, Lee must show by a preponderance of the evidence that (1) the Protocol creates a substantial risk of severe pain; and (2) "there is an alternative [method of execution] that is feasible, readily implemented, and in fact significantly reduces a substantial risk of severe pain." *Nance v. Comm'r, Ga. Dep't of Corr.*, 169 F.4th 1312, 1318 (11th Cir. Mar. 19, 2026) (quoting *Barber v. Governor of Ala.*, 73 F.4th 1306, 1318 (11th Cir. 2023)). If Lee makes these showings and the State refuses to adopt his proposed alternative "without a legitimate penological justification," then Lee's Eighth Amendment claim succeeds. *See Baze v. Rees*, 553 U.S. 35, 52 (2008) (plurality op.) ("If a State refuses to adopt [a feasible, readily implemented, and less painful] alternative in the face of these documented advantages, without a legitimate penological justification for adhering to its current method of execution, then a State's refusal to change its method can be viewed as 'cruel and unusual' under the Eighth Amendment.").

V. DISCUSSION

Because the Eleventh Circuit concluded that the Protocol poses a substantial risk of severe pain, *Lee*, 2026 WL 1651147, at *8, the issues before the Court are whether the

[9] In *Bonner v. City of Prichard*, 661 F.2d 1206, 1209 (11th Cir. 1981) (en banc), the Eleventh Circuit adopted as binding precedent all decisions of the former Fifth Circuit handed down prior to the close of business on September 30, 1981.

firing squad is feasible, readily implemented, and significantly reduces the substantial risk of severe pain posed by the Protocol, and whether the State has refused to adopt it without a legitimate penological reason. *See Bucklew*, 587 U.S. at 134; *Nance*, 169 F.4th at 1318. Because each of those issues resolves in Lee's favor on this record, the Court concludes that the Protocol violates the Eighth Amendment. The Court addresses each issue in turn and then addresses the specific injunctive relief Lee seeks in this case.

A. Feasible and Readily Implemented

"[A]n inmate must show that his proposed alternative method is not just theoretically 'feasible' but also 'readily implemented.'" *Bucklew*, 587 U.S. at 141 (quoting *Glossip v. Gross*, 576 U.S. 863, 877 (2015)). "This means the inmate's proposal must be sufficiently detailed to permit a finding that the State could carry it out 'relatively easily and reasonably quickly.'" *Id.* (citation omitted).

Lee's proposed alternative passes muster. In his amended complaint, after noting that the firing squad is an authorized method of execution in five states (indeed, one that is currently in use), Lee drew up a blueprint for the State to follow that largely tracks Utah's current firing squad protocol:

- "[T]he prisoner shall be seated in a chair set up between stacked sandbags to prevent bullets from ricocheting. A designated person on the execution team shall pin a target over the prisoner's heart and a hood over the prisoner's head."

- "The firing squad shall be comprised of five trained marksmen, one of whom is the firing squad team leader. The firing squad shall set up at a distance of [twenty-one] feet from the inmate, armed with .30-caliber rifles. One of the rifles shall be loaded with blanks so that it is unknown which firing squad member kills the prisoner."

- "The warden or his designee shall order the firing squad team leader to begin the cadence for the firing squad to fire. The firing squad team leader shall ready the weapons in a controlled and safe manner."

- "If the prisoner appears to be unconscious [after the first volley], the warden or his designee shall call for the medical examiner to enter the execution chamber and check the prisoner's vital signs. . . . If the prisoner is obviously conscious, the warden or his designee shall immediately instruct the fir[ing] squad team leader to prepare the weapons and fire again."

(Doc. 40 at 20–22, paras. 71–72; *see* doc. 173-46 at 55, 62, 89–92 (Utah's protocol)). These procedures are to be "repeat[ed] . . . until no vital signs are detected." (Doc. 40 at 22, para. 72; *see* doc. 173-46 at 91–92).

Lee also presented the testimony of Dr. Williams. Dr. Williams testified that multiple states use firing squad as a method of execution, and firing squad's prevalence is due, at least in part, to the ease with which it can be accomplished. (*See* doc. 147 at 49:25–50:11 ("A military tribunal or an officer capriciously may say, this soldier needs to be executed. The means of execution could be assembled in a . . . minute or two, and the execution could be carried out quickly and expeditiously.")). He also opined that the firing squad protocol Lee proposes—involving five shooters firing four live rounds from .30-caliber rifles at a target placed over the inmate's heart—would be effective. (*See id.* at 50:12–51:24). And he stated that he was familiar with Alabama's rifle qualification course and that "anyone who could shoot that course of fire and achieve a score of [eighty] percent or more . . . is going to be capable of performing a firing squad execution effectively." (*Id.* at 52:11–17).

The State concedes that it can "procure guns and ammunition of a variety of calibers." (Doc. 148 at 29). Still, it claims that, for various reasons, "[f]iring squad is not feasible and readily available." (*Id.*). The Court is not persuaded.

The State argues that firing squad is not readily implemented because it is not presently an authorized method of execution under Alabama law. (*Id.* (citing ALA. CODE §§ 15-18-82, 15-18-82.1)). But that argument has been rejected by the Supreme Court—twice. *See Bucklew*, 587 U.S. at 139–40 ("An inmate seeking to identify an alternative method of execution is not limited to choosing among those presently authorized by a particular State's law."); *Nance v. Ward*, 597 U.S. 159, 164 (2022) ("The prisoner may, for example, 'point to a well-established protocol in another State as a potentially viable option.'" (quoting *Bucklew*, 587 U.S. at 140)). After all, "the Eighth Amendment is the supreme law of the land, and the comparative assessment it requires can't be controlled by the State's choice of which methods to authorize in its statutes." *Bucklew*, 587 U.S. at 140.

The thrust of the State's remaining arguments is that implementing a firing squad protocol would take time—time to (1) develop its own firing squad protocol, (2) construct a proper facility, and (3) source volunteers to serve on the execution team. (Doc. 148 at 30–33). This Court has previously considered and rejected these same arguments:

> If a condemned inmate may point to another state's protocol as a "viable option" even if it is not currently authorized in his jurisdiction—and the Supreme Court says he can—it necessarily follows that there would be some incidental delay involved in implementing the "new" method in the inmate's jurisdiction. Thus, it cannot be the case that the firing squad is not readily implemented merely because the State is not presently or immediately prepared to carry out a firing squad

> execution. To conclude otherwise would render the Supreme Court's guidance a dead letter.

Boyd v. Hamm, 2025 WL 2884410, at *22 (M.D. Ala. Oct. 9, 2025). Suffice it to say that if an inmate can propose an alternative method that is not presently authorized by the law of the executing state, then the "'incidental delay' involved in changing a procedure"—which the Supreme Court has recognized "may take some real work"—is not enough to invalidate that method as a suitable alternative. *Nance*, 597 U.S. at 170. What's more, several ADOC employees testified that the ADOC *could* carry out a firing squad execution, if the Alabama Legislature authorized it. (*See, e.g.*, doc. 146 at 229:4–22 (Hamm's testimony that the ADOC could "train people to use .30-caliber rifles for firing squad if approved by the legislature" and could procure the required materials); *id.* at 230:9–13 (Hamm's testimony that the ADOC could modify space at Holman Correctional Facility[10] to carry out executions by firing squad)).

In sum, Lee has provided Alabama with a "pathway forward," *see Nance*, 597 U.S. at 169, and thus he has satisfied his burden to show that firing squad is feasible and readily implemented. *Cf. Bucklew*, 587 U.S. at 141–42 (concluding that the plaintiff's "bare-bones proposal f[ell] well short of" the relevant standard because he "presented *no evidence* on essential questions" (emphasis added)).

[10] Executions in Alabama are carried out at Holman Correctional Facility ("Holman").

B. Significant Reduction of Substantial Risk of Severe Pain

The Eleventh Circuit determined that the Protocol poses a substantial risk of severe pain. *See Lee*, 2026 WL 1651147, at *7 ("In our view, the overall suffering described by the district court, which lasts for one to three minutes, presents a substantial risk of serious harm over and above death itself."). The question is whether the firing squad will significantly reduce that risk. *See Nance*, 597 U.S. at 164. On this record, Lee has made that showing. To show how the Court reached this conclusion, the Court compares the evidence proffered by Lee with the State's evidence to the contrary.

1. Lee's Evidence

Lee relies primarily on the testimony of Dr. Williams, who credibly opined that death by firing squad is quick and painless, rendering the inmate unconsciousness in three to five seconds and before he can perceive any pain. Dr. Williams' expertise is twofold. He is an emergency physician who has treated "[m]any thousands" of gunshot wounds. (Doc. 147 at 5:21–6:5). He is also a firearms expert, boasting "lifelong experience as a shooter and hunter" and "extensive training in the use of defensive firearms in the law enforcement and civilian context[s]." (*Id.* at 7:15–8:2). As indicated above, he also bases his opinions on scientific literature and his own experience being shot.

Dr. Williams testified that execution by firing squad would rapidly induce a deep state of unconsciousness. A .30-caliber bullet "deliver[s] something in the area of 2,000 foot-pounds of energy," which Dr. Williams likened to "being struck by a three-quarter-ton truck." (*Id.* at 20:3–9). The firing squad protocol that Lee proposes calls for four .30-

caliber bullets—four three-quarter-ton trucks—to be fired at the heart simultaneously. When the bullets strike the heart, according to Dr. Williams, the result will be an immediate and total loss of blood flow to the brain, producing unconsciousness within three to five seconds. (*Id.* at 31:18–32:10, 35:6–9, 105:11–25).

But Dr. Williams also opines that execution by firing squad is painless. In support of his opinion that an inmate would not feel pain, Dr. Williams cites two phenomena: (1) the delay in the brain's processing of novel stimuli into a subjective experience such as pain; and (2) the effects of "neural stunning." (*Id.* at 15:1–26:25; doc. 173-40 at 6–9). Regarding the processing delay, Dr. Williams testified as follows: Pain is a noxious stimulus that is "transmitted to the brain via sensory nerves." (Doc. 173-40 at 5). But pain is not felt instantaneously upon exposure to a noxious stimulus. (Doc. 147 at 16:15–18:15). Rather, the stimulus must travel from the sensory nerves to the cerebral cortex, where the individual perceives the stimulus as pain. (*Id.* at 16:15–17:22). And when a stimulus is novel, the brain's processing delay is substantially longer, potentially "several seconds." (*Id.* at 15:4–21, 18:7–15). Because multiple bullets striking the heart is "a novel neurological stimulus," the inmate's brain will not complete the processing required to experience pain in the three to five seconds before he loses consciousness. (*Id.* at 18:7–15, 29:1–3).

Regarding the effects of neural stunning, Dr. Williams testified as follows: When a person is shot, the bullet "stretche[s], compresse[s], and otherwise disrupt[s]" all the nerves "near to the impact of the bullet," thereby "stunning" the nerves and preventing the

transmission of neural impulses of pain. (*Id.* at 26:4–16). This disruption of neural impulses or "stunning" lasts "several hours if not days." (*Id.* at 24:11–17, 26:19–25; *see also* doc. 173-60). Because of neural stunning, an inmate executed by firing squad will be unconscious and dead long before he can process the pain from the gunshot wounds. (Doc. 147 at 26:2–25). Thus, due to the twin phenomena of delayed processing and neural stunning, an inmate executed by firing squad would lose consciousness without perceiving *any pain*. (*Id.* at 26:19–25; *see also id.* at 28:23–29:3 (Dr. Williams reiterating that a condemned inmate would experience no conscious pain)). Dr. Williams' testimony on these points was as consistent as it was credible. (*See id.* at 18:5–15, 19:12–22, 69:11–18).

2. The State's Evidence

Before trial, Dr. Antognini opined that an inmate executed by firing squad would consciously suffer severe pain for eight to ten seconds due to "shattering of bone and damage to the spinal cord." (Doc. 173-141 at 26, para. 47). Dr. Antognini purportedly relied in part on South Carolina's execution of Mahdi to bolster his opinion that death by firing squad would be extremely painful. (*Id.* at 26–27, para. 47; *see also* doc. 149 at 62:22–64:4). At trial, Dr. Antognini conceded that nothing in his expert report supported his contention that an inmate executed by firing squad would consciously suffer severe pain for eight to ten seconds after bullet entry. (*See* doc. 149 at 102:3–9). Dr. Antognini agreed that he did not cite any scientific articles in support of his theory, either. (*Id.* at 102:10–13). Dr. Antognini could not identify the names of any studies or authors he relied on to form his opinion that an inmate's consciousness would persist for eight to ten seconds after

being shot. (*Id.* at 102:14–17). Considering Dr. Antognini's concessions, the Court excluded Dr. Antognini's opinions regarding pain caused by a firing squad execution. (*Id.* at 102:18–103:14).

3. Firing Squad Significantly Reduces a Substantial Risk of Severe Pain

On this record, Dr. Williams' testimony is credible, persuasive evidence that an inmate executed by Lee's proposed firing squad protocol would experience no pain. The State offered no admissible evidence to the contrary. Of course, the Court need not accept expert testimony solely because it goes unrebutted. *See Eason v. Weaver*, 484 F.2d 459, 460 (5th Cir. 1973) ("The weight to be accorded unimpeached expert opinion evidence is solely for the judge sitting without a jury."). But the Court is persuaded by Dr. Williams' testimony, which is based on his extensive experience and supported by science. The undersigned acknowledges that its finding—getting shot multiple times in the heart causes a painless death—is not intuitive. Nevertheless, having listened to the witnesses' testimony and reviewed all the parties' materials, the record in this case supports this finding.

The Protocol causes one to three minutes of severe air hunger, which the Eleventh Circuit concluded is a substantial risk of serious harm. *Lee*, 2026 WL 1651147, at *8. On this record, the firing squad produces a painless death.[11] This difference is "clear and

[11] In *Hoffman v. Westcott*, a divided panel of the Fifth Circuit, in a preliminary injunction posture, rejected a challenge to Louisiana's nitrogen hypoxia protocol in which the plaintiff, as here, proposed firing squad as an alternative method. 131 F.4th 332, 335–36 (5th Cir. 2025). The Eleventh Circuit concluded that the Fifth Circuit's reasoning on the first prong (whether nitrogen hypoxia presents a substantial risk of severe pain) is inapplicable given this Court's factual findings. *Lee*, 2026 WL 1651147, at *7. *Hoffman*'s reasoning on the second prong (whether firing squad significantly reduces that risk) is also inapposite on this record, as the record in *Hoffman* indicated that nitrogen hypoxia was painless and that firing squad was not. *See* 131 F.4th at 336. The Court agrees with the Fifth Circuit that the Eighth Amendment "does not require State officials to favor more painful methods of execution over less painful ones." *Id.* But the

considerable," *see Bucklew*, 587 U.S. at 143, and the Court therefore finds that Lee's proposed firing squad protocol "significantly reduce[s] a substantial risk of severe pain," *Glossip*, 576 U.S. at 877 (quoting *Baze*, 553 U.S. at 52).

C. Legitimate Penological Reasons

Lee's Eighth Amendment claim faces a final hurdle. The State "may refuse to adopt a prisoner's proposed alternative method of execution for a legitimate penological reason." *Nance v. Comm'r, Ga. Dep't of Corr.*, 59 F.4th 1149, 1155–56 (11th Cir. 2023). The Constitution "affords a 'measure of deference to a State's choice of execution procedures' and does not authorize courts to serve as 'boards of inquiry charged with determining 'best practices' for executions." *Bucklew*, 587 U.S. at 134 (quoting *Baze*, 553 U.S. at 51 & nn.2–3). That includes, for example, where an inmate requests an alternative that is "untried and untested," as a state can legitimately "choos[e] not to be the first to experiment with a new method of execution." *Id.* at 142 (quoting *Baze*, 553 U.S. at 41). Of course, such an argument would have no purchase here, where the proposed alternative has been in use for centuries. *Cf. Wilkerson v. Utah*, 99 U.S. 130 (1878); (doc. 173-40 at 14 (Dr. Williams' expert report ("Death by [firing squad] . . . has been a common means of military execution since at least the Napoleonic era.")).

The State articulates two penological reasons for refusing to adopt Lee's method: (1) the ADOC cannot reliably source volunteers "willing and capable of serving in a firing

Eleventh Circuit has concluded that, on *this* record, nitrogen hypoxia poses a substantial risk of severe pain, and this Court finds that the firing squad does not.

squad"; and (2) the ADOC may be unable to procure materials used in firing squad executions.[12] (*See* doc. 148 at 31–33; doc. 149 at 137:17–19). Neither reason is persuasive.

1. Execution Volunteers

The State contends that it would be unable to execute Lee by firing squad because the ADOC cannot reliably locate volunteers "willing and capable of serving in a firing squad." (Doc. 148 at 31). The State asserts that it would not only face staffing shortages but also raises concerns regarding the ability for volunteer marksmen to effectively administer death by firing squad. The Court addresses each of these arguments in turn.

Citing Hamm's testimony, the State points out that the ADOC cannot compel ADOC staff to participate in a firing squad execution. (*See* doc. 146 at 237:16–238:3). Notwithstanding the State's argument, Hamm and Charles Williams both testified that if firing squad were an approved method of execution, the ADOC would be able to train and staff an execution team capable of executing an inmate by firing squad. (*See id.* at 229:1–11 (Hamm's trial testimony); *id.* at 256:25–258:1 (Charles Williams' trial testimony)). And the State's concern regarding the use of volunteers would apply to all methods of execution—the State cannot compel staff to participate in *any* execution, regardless of the method. (*See id.* at 237:16–238:3). The inability to compel participation apparently has not presented an issue in the past, and the State has identified no reason it would pose one

[12] In its closing argument at trial, the State also claimed an interest in "preserving the dignity of the proceedings." (*See* doc. 149 at 137:17–19). However, the State did not elaborate or present evidence regarding how an execution by firing squad would inhibit this interest. Thus, to the extent the State relies on this asserted legitimate penological interest, the Court finds it unavailing on this record.

now. (*See* doc. 173-40 at 13 (Dr. Williams expert report) (stating that "there are roughly 14,000 sworn law enforcement officers in the state of Alabama")).

The State also asserts that even if it could find five volunteers, those volunteers would be unable to meet the "exacting degree of proficiency necessary for a firing squad execution." (Doc. 148 at 32). The Alabama Peace Officers Standards Training Commission ("APOSTC") scores law enforcement officers' (including ADOC personnel) marksmanship on a numerical scale. (*See* doc. 146 at 236:20–237:8 (Hamm's trial testimony); doc. 148 at 32 (the State's proposed findings of fact and conclusions of law)). Officers are required to receive a score of "at least a 70 to pass" with "100 [being] the top score." (Doc. 146 at 236:20–237:3). Dr. Williams opined that any APOSTC qualified marksman "is . . . capable of performing a firing squad execution effectively." (Doc. 147 at 52:14–17). But, on cross-examination, Dr. Williams—consistent with Utah's protocol—testified that the ADOC would need to locate "riflemen who can shoot considerably more accurately than" the minimum APOSTC certification. (*Id.* at 113:1–7). Dr. Williams conceded that he could not testify regarding whether this heightened shooting requirement would limit the number of qualified marksmen in Alabama but testified that Utah's volunteer pool did not shrink as a result of the heightened skill requirement. (*Id.* at 113:21–23). In any event, even if the ADOC chose to use marksmen who were more skilled than required, Hamm and Charles Williams testified that the ADOC would be able to staff a firing squad execution team with five capable shooters. The Court credits their testimony.

Finally, the State contends that Dr. Williams' testimony that "glitches" may occur during firing squad executions constitutes a legitimate penological reason to reject Lee's proposed alternative—in other words, it submits that the risk that a firing squad may go awry is a sufficient reason to reject it entirely. (Doc. 148 at 32–33). The State cites Mahdi's recent execution in South Carolina as an example of a firing squad execution gone wrong. (*Id.*). It is true, as Dr. Williams conceded, that even a method that dates to the Napoleonic era can be botched.[13] (*See* doc. 173-40 at 14; doc. 147 at 110:2–8). Nonetheless, on this record the State's concern about potential problems with firing squad executions is unavailing for several reasons. First, Lee's proposed method relies heavily on Utah's protocol, which is meaningfully different than South Carolina's. (*See* doc. 147 at 53:15–23 (Dr. Williams noting that South Carolina's protocol uses fewer and different-caliber bullets)). Second, assuming without deciding that Mahdi's execution was "botched," an "isolated mishap alone" does not render the firing squad constitutionally suspect. *See Baze*, 553 U.S. at 50 (noting that the Supreme Court had previously "upheld a second attempt at executing a prisoner by electrocution after a mechanical malfunction had interfered with the first attempt" (citing *Louisiana ex rel. Francis v. Resweber*, 329 U.S. 459 (1947))). Further, the State fails to adequately identify any unique concerns regarding the efficacy of firing squad—a method that Dr. Williams opines rarely results in botched executions. (Doc. 147 at 71:9–18).

[13] The Court expresses no view as to whether Mahdi's execution was "botched."

2. Supply Concerns

The State also expresses concern that it would be unable to easily procure and maintain the materials necessary to carry out executions by firing squad. (*See* doc. 148 at 31–32). In support, the State asserts that execution by firing squad faces similar "supply concerns" that "have hampered the use of lethal injection." (*Id.* at 32). In recent years, death penalty opponents have successfully "pressured pharmaceutical companies to refuse to supply the drugs used to carry out" lethal injection executions. *Glossip*, 576 U.S. at 870. In response, many states, including Alabama, have moved away from methods of execution that require reliance on third party suppliers. *See Frazier v. Hamm*, 2025 WL 361172 at *13 (M.D. Ala. Jan. 31, 2025). Courts have found that supply-chain difficulties can constitute legitimate penological reasons to move away from methods of execution that require such reliance. *See id.*; *see also Price v. Comm'r, Dep't of Corr.*, 920 F.3d 1317, 1327 (11th Cir. 2019) (per curiam) (noting that "[n]o supply concerns exist for nitrogen"). But here, the State does not identify which materials necessary to carry out firing squad executions would be subject to "supply concerns," (*see* doc. 148 at 31–32), so the Court must assume that the State's concern applies to rifles, ammunition, and the materials necessary to fortify an execution chamber, such as sandbags, lumber, and some form of a ballistic barrier. (*See* doc. 173-40 at 18–19). To the extent these are the State's concerns—and, again, the State has not adequately articulated what, exactly, its concerns on this point are—the Court finds them unavailing. It is true that death penalty opponents have successfully lobbied certain pharmaceutical companies into refusing to provide Alabama

with lethal injection drugs. But the State has presented no evidence that this same concern exists as to the materials necessary to carry out firing squad executions.

And importantly, Dr. Williams and *the State's own witnesses* testified that the materials required to carry out an execution by firing squad could be readily procured. Indeed, the State concedes that it can "procure guns and ammunition of a variety of calibers." (Doc. 148 at 29). And materials such as bullet-proof glass are "commonly used in construction," thus undermining any supply chain concerns. (*See, e.g.*, doc. 147 at 54:16–23 (Dr. Williams' trial testimony)). Nor has the State presented evidence that its current supply of firearms and ammunition are insufficient to carry out firing squad executions. (*See* doc. 173-40 at 18 (Dr. Williams noting that "[s]ervice rifles of the types currently used by Alabama law enforcement agencies . . . would be suitable for firing squad executions")).

Although the State cites the unreliability of supply as a reason for refusing to implement firing squad, the State is inconsistent on this point. In its proposed findings of fact and conclusions of law, the State notes that on April 24, 2026, the Department of Justice ("DOJ") released a report "recommending policy changes within the Federal Bureau of Prisons as to capital punishment" wherein the DOJ explored "adding different methods of execution in *case of supply chain issues*, such as . . . firing squad."[14] (Doc. 148 at 30 n.5) (emphasis added). While the State *could* articulate supply chain concerns as a

[14] *See* U.S. DEP'T OF JUST. OFF. OF LEGAL POLICY, *Restoring and Strengthening the Federal Death Penalty* 19–38 (2026), https://www.justice.gov/ag/media/1437806/dl?inline.

legitimate penological reason for refusing to adopt a plaintiff's proposed alternative, it has not done so here.

D. Lee's Requested Permanent Injunctive Relief

In the operative complaint, Lee seeks a declaration that the Protocol is facially unconstitutional and an injunction prohibiting the ADOC from executing him by nitrogen hypoxia or "any method other than one of the alternatives provided by his attorneys." (Doc. 40 at 23). He seeks similar relief in his pending motion, asking the Court to "permanently enjoin [the State] from executing him by nitrogen [hypoxia] *or any other method other than firing squad*." (Doc. 185 at 1 (emphasis added)). But Alabama law authorizes two other methods of execution: lethal injection and electrocution. *See* ALA. CODE § 15-18-82.1. Here, Lee challenged only the ADOC's nitrogen hypoxia protocol—not lethal injection or electrocution. After carefully considering traditional equitable principles, and given the Court's legal conclusions, the Court concludes that a permanent injunction should issue prohibiting the State from executing Lee using the Protocol. *See eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 391 (2006) (explaining that a plaintiff seeking a permanent injunction must show (1) irreparable injury; (2) that "remedies available at law, such as monetary damages, are inadequate to compensate for that injury"; (3) that an equitable remedy is warranted "considering the balance of hardships between the plaintiff and defendant[s]"; and (4) that "the public interest would not be disserved by a permanent injunction"); *Angel Flight of Ga., Inc. v. Angel Flight Am., Inc.*, 522 F.3d 1200, 1208 (11th Cir. 2008) (same). But because Lee has not established that Alabama's other statutorily

authorized methods violate the Eighth Amendment, he is not entitled to an injunction barring the State from executing him using one of those methods.[15]

VI. FINDINGS OF FACT AND CONCLUSIONS OF LAW[16]

A. Findings of Fact[17]

An execution pursuant to Lee's proposed firing squad alternative, involving four .30-caliber bullets fired at the heart, renders an inmate unconscious in three to five seconds. Due to the related phenomena of delayed brain processing and neural stunning, an inmate executed under Lee's firing squad alternative is rendered unconscious before his brain can process any pain. Thus, Lee's proposed alternative produces a quick and painless death.

The State can readily obtain rifles, ammunition, and other materials necessary to carry out a firing squad execution. Additionally, the State would be able to modify space at Holman to carry out executions by firing squad. The State is also able to source and train volunteers willing to carry out such an execution.

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[15] That the State will be prohibited only from executing Lee using nitrogen hypoxia bolsters the Court's conclusion that entry of this permanent injunction is appropriate, as it is narrowly tailored to remedy the specific harm at issue here: that the Protocol violates the Eighth Amendment.

[16] To the extent that any findings of fact may constitute conclusions of law, they are adopted as such, and to the extent that any conclusions of law may constitute findings of fact, they are adopted as such.

[17] The Eleventh Circuit discerned no error in the Court's prior findings of fact. *Lee*, 2026 WL 1651147, at *6. The Court accordingly incorporates its previous factual findings into this Memorandum Opinion and Order, *see Lee*, 2026 WL 1493098, at *24–25, with one clarification. The Court did not find that air hunger is "worse than pain" but instead recounted patients' descriptions in a clinical setting that air hunger can be "'worse than pain' because it is associated with the fearing of dying." *See id.* at *24.

B. Conclusions of Law

Consistent with the Eleventh Circuit's opinion, Lee has shown by a preponderance of the evidence that the Protocol "presents a 'substantial risk of serious harm'—severe pain over and above death itself." *Lee*, 2026 WL 1651147, at *2 (quoting *Nance*, 597 U.S. at 164). Additionally, Lee has shown by a preponderance of the evidence that his proposed firing squad alternative is feasible, readily implemented, and significantly reduces the substantial risk of serious harm posed by the Protocol. The State has failed to articulate a legitimate penological reason for refusing to adopt Lee's proposed alternative. Therefore, Lee has shown by a preponderance of the evidence that the Protocol constitutes cruel and unusual punishment in violation of the Eighth Amendment.

VII. CONCLUSION

On this record, and in this posture, Lee has shown that the ADOC's nitrogen hypoxia execution protocol violates the Eighth Amendment. Consequently, the Court will enter judgment in Lee's favor and enjoin the State from executing Lee pursuant to the Protocol.

To be clear, the Court's decision does not disturb the State's ability to administer capital punishment. Lee successfully challenged only the ADOC's nitrogen hypoxia protocol, not its electrocution or (this time) its lethal injection protocol. *Cf. Lee v. Comm'r, Ala. Dep't of Corr.*, 731 F. App'x 885 (11th Cir. 2018) (per curiam) (Lee's challenge to the ADOC's lethal injection protocol). An Eighth Amendment method of execution claim is a "*necessarily* comparative exercise," *Bucklew*, 587 U.S. at 136 (emphasis in original), and Lee only asks this Court to compare nitrogen hypoxia and firing squad. On this record, and in light of the Eleventh Circuit's opinion, Lee has shown that his proposed firing squad

alternative significantly reduces a substantial risk of severe pain *as compared to* nitrogen hypoxia. The result is that the State of Alabama cannot execute Lee by nitrogen hypoxia—no more, no less.

Federal courts are routinely placed in the difficult position of comparing methods of execution, both old and new alike. This Court is intimately familiar with the history of method of execution claims in this State. As methods evolve and change, so too do the challenges to each method. The only constant is litigation. Were Alabama to adopt firing squad as a method of execution, that method would likely be challenged as well. Indeed, there is likely no method—no matter how humane—that would be immune to constitutional challenge. *Cf. Bucklew*, 587 U.S. at 140 (acknowledging in passing that a condemned inmate may have just as much motivation to forestall his execution entirely as to "avoid[] unnecessary pain"). But the Constitution does not guarantee a painless death, *see id.* at 132, and human life cannot be purposefully extinguished without some risk of pain. The Court, the condemned, and the State must all confront that sobering reality.

Accordingly, the Court DECLARES and ORDERS as follows:

1. The ADOC's nitrogen hypoxia execution protocol violates the Eighth Amendment;

2. The State is PERMANENTLY ENJOINED from executing Lee using the Protocol;

3. Judgment is entered in favor of Lee and against the State;

4. Lee's motion to enter judgment in his favor or, in the alternative, to stay his execution (doc. 185) is DENIED as moot;

5. Costs are taxed as paid.

A separate Final Judgment will be entered.

DONE this 9th day of June, 2026.

/s/ Emily C. Marks
EMILY C. MARKS
UNITED STATES DISTRICT JUDGE

Exhibit D

IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF ALABAMA
NORTHERN DIVISION

JEFFERY LEE, Plaintiff, v. GREG LOVELACE, Commissioner, Alabama Department of Corrections, *et al.*, Defendants.	)	CASE NO. 2:25-cv-680-ECM [WO]

O R D E R

On June 9, 2026, following remand from the United States Court of Appeals for the Eleventh Circuit, this Court concluded that the Alabama Department of Corrections' nitrogen hypoxia execution protocol ("Protocol") violates the Eighth Amendment and permanently enjoined the State from executing Plaintiff Jeffery Lee ("Lee") using the Protocol. *Lee v. Lovelace*, 2026 WL 1664095 (M.D. Ala. June 9, 2026); (docs. 187, 188). The State has appealed to the Eleventh Circuit. (Doc. 189). Now pending before the Court is the State's motion to stay the Court's injunction pending appeal. (Doc. 193). After careful consideration, and for the following reasons, the Court concludes that the motion is due to be denied.

Federal Rule of Civil Procedure 62(d) permits a district court, in its discretion, to "suspend, modify, restore, or grant an injunction" while an appeal is pending. FED. R. CIV. P. 62(d). In deciding whether to stay an injunction pending appeal, the Court analyzes four factors: "(1) whether the stay applicant has made a strong showing that he is likely to

succeed on the merits; (2) whether the applicant will be irreparably injured absent a stay; (3) whether issuance of the stay will substantially injure the other parties interested in the proceeding; and (4) where the public interest lies." *Hilton v. Braunskill*, 481 U.S. 770, 776 (1987); *accord Ruiz v. Estelle*, 650 F.2d 555, 565 (5th Cir. Unit A June 26, 1981) (per curiam).[1] "The first two factors . . . are the most critical," and "[i]t is not enough that the chance of success on the merits be 'better than negligible.'" *Nken v. Holder*, 556 U.S. 418, 434 (2009) (citation omitted).

Regarding likelihood of success on the merits, the State does little more than repeat the arguments it made previously. The Court carefully considered each of these arguments and the entire record but ultimately concluded—based on the Eleventh Circuit's legal conclusion that the Protocol "presents a 'substantial risk of serious harm,'" *Lee v. Comm'r, Ala. Dep't of Corr.*, 2026 WL 1651147, at *8 (11th Cir. June 8, 2026) (per curiam) (quoting *Nance v. Ward*, 597 U.S. 159, 164 (2022)), and the factual record here about the firing squad—that Lee met his burden to establish that the Protocol violates the Eighth Amendment. *See Glossip v. Gross*, 576 U.S. 863, 877 (2015). That other courts have concluded that a firing squad execution entails some risk of pain is not dispositive given the record in this case. Therefore, on this record the State has not made a strong showing that it is likely to succeed on the merits. *See Hilton*, 481 U.S. at 776.

[1] In *Bonner v. City of Prichard*, 661 F.2d 1206, 1209 (11th Cir. 1981) (en banc), the Eleventh Circuit adopted as binding precedent all decisions of the former Fifth Circuit handed down prior to the close of business on September 30, 1981.

The Court also carefully considered the equities. For the reasons stated in the Court's June 9 Memorandum Opinion and Order, the narrowly tailored injunctive relief the Court granted is appropriate under the circumstances of this case. The State appears to believe that it can only execute Lee using the firing squad and argues that it could not do so by Lee's scheduled execution date of June 11, 2026, but that is not the injunctive relief this Court granted.[2] *See Lee*, 2026 WL 1664095, at *9, *11. To the extent the State complains about the Court's "eleventh hour" injunction, (doc. 193 at 6), it bears repeating that the State moved to set Lee's execution during the pendency of this litigation, nearly six months after Lee first challenged the Protocol, thus requiring the Court to set Lee's case on an "expedited schedule," *see Lee v. Lovelace*, 2026 WL 1493098, at *4 (M.D. Ala. May 28, 2026). Accordingly, the State has not shown that the equities favor a stay of the Court's injunction. Consequently, the State's motion is due to be denied.

Accordingly, it is

ORDERED that the State's motion to stay injunction pending appeal (doc. 193) is DENIED.

DONE this 10th day of June, 2026.

/s/ Emily C. Marks
EMILY C. MARKS
UNITED STATES DISTRICT JUDGE

[2] To the extent the State argues that it could not utilize any other method at this late date, including lethal injection or electrocution, the Court is not persuaded that this merits the relief sought.

Exhibit E

IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF ALABAMA
NORTHERN DIVISION

JEFFERY LEE,	)	
	)	
Plaintiff,	)	
	)	
v.	)	CASE NO. 2:25-cv-680-ECM
	)	[WO]
GREG LOVELACE, Commissioner, Alabama Department of Corrections, *et al.*,	)	
	)	
Defendants.	)	

MEMORANDUM OPINION and ORDER

I. INTRODUCTION

On December 12, 1998, Jeffery Lee ("Lee") murdered Jimmy Ellis ("Ellis") and Elaine Thompson ("Thompson"). A jury convicted Lee of capital murder. As punishment for his crimes, the State of Alabama will end Lee's life. The question before the Court is whether the nitrogen hypoxia protocol the State plans to use to execute Lee is cruel and unusual in violation of the Eighth Amendment to the United States Constitution.

The Court held a three-day bench trial on that question—the first trial in this Court, and in the entire country, examining the constitutionality of nitrogen hypoxia.[1] This method of execution causes death via oxygen deprivation by replacing the condemned inmate's breathing air with 100% nitrogen.[2] Our bodies need adequate oxygen to function,

[1] The undersigned presided over two earlier Eighth Amendment challenges to this nitrogen hypoxia protocol without the benefit of a trial. *See Frazier v. Hamm*, 2025 WL 361172 (M.D. Ala. Jan. 31, 2025); *Boyd v. Hamm*, 2025 WL 2884410 (M.D. Ala. Oct. 9, 2025).

[2] Our normal breathing air comprises 78% nitrogen, 21% oxygen, and 1% other gases.

and an environment with little to no oxygen results in death. And while nitrogen itself is not harmful, nitrogen can kill by displacing the oxygen that would otherwise be present.

Lee claims that the Alabama Department of Corrections' ("ADOC") nitrogen hypoxia protocol ("Protocol") causes inmates to experience prolonged air hunger and feelings of suffocation, which evoke severe anxiety, fear, and physiological distress. Lee does not argue that nitrogen hypoxia is physically painful like a broken bone. Rather, Lee claims that nitrogen hypoxia triggers inmates' survival instincts to breathe oxygen while also preventing them from doing so. The State disagrees,[3] arguing that inmates executed under the Protocol experience only the suffering necessary to carry out a death sentence.

Because the Constitution does not guarantee inmates a painless death, Lee must do more than show a risk of pain—he must show that the Protocol causes *severe* pain, pain that is "well beyond what's needed to effectuate a death sentence." *Bucklew v. Precythe*, 587 U.S. 119, 136–37 (2019). While Lee has shown that executions under the Protocol involve some suffering, on this record he has failed to prove that the Protocol causes more than "the necessary suffering involved in any method employed to extinguish life humanely." *Louisiana ex rel. Francis v. Resweber*, 329 U.S. 459, 464 (1947). Because Lee has not shown that the Protocol cruelly superadds pain, his claim that the Protocol violates the Eighth Amendment fails as a matter of law.

[3] Because the Defendants are state officials sued in their official capacities, this Opinion refers to them as "the State."

II. JURISDICTION AND VENUE

The Court has original subject matter jurisdiction over this case pursuant to 28 U.S.C. § 1331. Personal jurisdiction and venue are uncontested, and the Court concludes that venue properly lies in the Middle District of Alabama. *See* 28 U.S.C. § 1391.

III. PROCEDURAL HISTORY AND BACKGROUND

The Court begins by summarizing Lee's crimes, capital litigation history, and prior lawsuit challenging the ADOC's lethal injection protocol. The Court concludes this section by explaining the Protocol, reciting the relevant procedural history in this case, and summarizing the witness testimony and evidence presented during the three-day bench trial on Lee's Eighth Amendment claim.

A. Lee's Capital Litigation History

On the morning of December 12, 1998, Lee walked into a pawn shop and, without warning, began firing his sawed-off shotgun. *Lee v. Thomas*, 2012 WL 1965608, at *1 (S.D. Ala. May 30, 2012). He fired multiple rounds at Ellis, the store's owner, and Ellis' employees, Thompson and Helen King ("King"). *Id.* Ellis and Thompson were killed. *Id.* Lee then tried and failed to dislodge the cash register before fleeing, leaving behind his shotgun and the carnage he had caused. *Id.* Miraculously, King survived the attack and alerted the authorities. *Id.* Lee was apprehended the following day and confessed. *Id.*

Lee was charged with three counts of capital murder—one count apiece for Ellis' and Thompson's murders during the commission of an attempted robbery, and a third count for murdering Ellis and Thompson pursuant to a single scheme or course of conduct—and one count of attempted murder. *Lee v. Comm'r, Ala. Dep't of Corr.*, 726 F.3d 1172, 1177–

78 (11th Cir. 2013) (citing ALA. CODE §§ 13A-4-2, 13A-5-40(a)(2), (10), 13A-6-2)). He was convicted on all four counts. *Lee v. Comm'r, Ala. Dep't of Corr.*, 731 F. App'x 885, 886 (11th Cir. 2018) (per curiam). The jury recommended a sentence of life imprisonment without the possibility of parole by a seven-to-five vote. *Lee v. State*, 898 So. 2d 790, 807–08 (Ala. Crim. App. 2001). However, the trial court overrode the jury's recommendation and sentenced Lee to death.[4] *See Lee*, 898 So. 2d at 808.

Lee spent the better part of the following two decades unsuccessfully challenging his convictions in state and federal court. *See Lee*, 726 F.3d at 1188–91, 1228. In 2017, Lee challenged the ADOC's lethal injection protocol,[5] arguing that it violated the Eighth Amendment's prohibition on cruel and unusual punishment. *Lee v. Dunn*, 2017 WL 1483530, at *1 (S.D. Ala. Apr. 24, 2017), *vacated in part by Lee*, 731 F. App'x 885. That claim became moot in 2018, however, when Lee elected to be executed by a new method

[4] The Alabama Legislature has since amended the Alabama Code to make a jury's sentencing verdict binding on the trial court. *See* ALA. CODE §§ 13A-5-45, 13A-5-46, and 13A-5-47 But because Lee was charged, convicted, and sentenced to death for capital murder before April 11, 2017, his jury's sentencing verdict was merely advisory. *See* ALA. CODE § 13A-5-47.1 ("Sections 13A-5-45, 13A-5-46, and 13A-5-47 shall apply to any defendant who is charged with capital murder after April 11, 2017, and shall not apply retroactively to any defendant who has previously been convicted of capital murder and sentenced to death prior to April 11, 2017.").

[5] When Lee was convicted and sentenced, electrocution was Alabama's default method of execution. In July 2002, the Alabama Legislature amended Alabama Code § 15-18-82 to make lethal injection the default method. *See* 2002 Alabama Laws Act 2002-492; *Ziegler v. State*, 886 So. 2d 127, 148–49 (Ala. Crim. App. 2003). The change "applie[d] to all persons . . . on Alabama's death row." *Turner v. State*, 924 So. 2d 737, 783 (Ala. Crim. App. 2002) (citation omitted). Thus, even an inmate like Lee, convicted and sentenced before July 2002, would be executed by lethal injection unless he "affirmatively elect[ed] to be executed by electrocution." ALA. CODE § 15-18-82.1(a) (2002); *see also Turner*, 924 So. 2d at 783.

of execution authorized by the Alabama Legislature: nitrogen hypoxia. (*See* doc. 38 in *Lee v. Dunn*, 1:16-cv-473-WS (S.D. Ala. July 20, 2018)); *see also* ALA. CODE § 15-18-82.1(a).[6]

B. The ADOC's Nitrogen Hypoxia Protocol

Executions by all three statutorily authorized methods—electrocution, lethal injection, and nitrogen hypoxia—occur at the Holman Correctional Facility ("Holman") in Atmore, Alabama.[7] *See* ALA. CODE § 15-18-82(b); (doc. 173-7 at 3). Once Alabama's Governor sets an execution timeframe, the ADOC prepares to carry out the inmate's death sentence.[8]

After the execution date is set, the Warden briefs the members of the execution team on the Protocol and provides them with training materials on the hazards associated with nitrogen gas. (Doc. 173-7 at 5–6). Next, the ADOC inspects and calibrates "[a]ll portable [oxygen] monitors and/or gas-measurement devices." (*Id.* at 6–7). The Warden also examines the nitrogen and breathing air tanks and verifies "that the volume of gas in each bank . . . exceeds the minimum acceptable thresholds." (*Id.* at 7).

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[6] "When Alabama added nitrogen hypoxia as an alternative method of execution, it did not . . . have a protocol in place for nitrogen-hypoxia executions." *See Woods v. Comm'r, Ala. of Corr.*, 951 F.3d 1288, 1291 (11th Cir. 2020). In August 2023, approximately five years after Alabama authorized nitrogen hypoxia as an execution method, the ADOC finalized and released a redacted, publicly available version of the Protocol. (Doc. 40 at 10, para. 39).

[7] During discovery, Lee moved to compel "inspection of the nitrogen hypoxia delivery system . . . , the control room from which the delivery of nitrogen hypoxia is initiated, the nitrogen storage area, and any other equipment and locations associated with nitrogen hypoxia executions." (Doc. 70 at 1). The Court granted Lee's motion. (Doc. 79). The undersigned attended the parties' inspection at Holman and observed several key rooms, including the control room, the execution chamber, the viewing rooms, and the nitrogen tank storage room. (*See id.*; *see also* doc. 173-7).

[8] In Alabama, once a death sentence is imposed, the Attorney General must move the Alabama Supreme Court to authorize the Commissioner of the ADOC to carry out the execution, which is only then set "within a time frame set by the governor." ALA. R. APP. P. 8(d)(1).

The week of the execution, the execution team meets to "walk through the steps of the procedure." (*Id.* at 8). At least two ADOC officers observe the condemned inmate at all times during this period. (*Id.* at 9). The officers' observations are memorialized in "duty post logs" which chronicle various events, including the inmate's meals, phone calls, and visits. (*Id.* at 9–10; *see, e.g.*, doc. 173-8 (Anthony Boyd's Duty Post Log)). These duty post logs also describe the executions themselves, albeit at a high level of generality. (*See, e.g.*, doc. 173-14 at 9 (Geoffrey West's Duty Post Log)).

On the day of the execution, the Protocol proceeds as follows: The Warden, Assistant Warden, or Execution Team Captain (1) pressurizes the nitrogen hypoxia system, (2) connects an industrial-use respirator mask to the breathing gas tubing, and (3) inspects the oxygen monitors to ensure they are functioning properly. (Doc. 173-7 at 14). The execution team escorts the condemned inmate to the execution chamber and secures him to the gurney. (*Id.* at 15). The condemned inmate is secured to the gurney by a chest and shoulder harness and one or more nylon straps ("chest restraints")—"the same type [of] material that you would make a seat belt out of." (Doc. 147 at 187:14–25; *see also* doc. 173-5 at 20–21, paras. 77–82).

Execution team members attach pulse oximeters, devices that measure the oxygen saturation in the blood, to the condemned inmate on the gurney. (Doc. 173-7 at 15). The mask is secured to the inmate's face and adjusted as necessary. (*Id.* at 16). The Warden then enters the execution chamber and reads the death warrant. (*Id.*). Shortly thereafter, the inmate is given two minutes to make a final statement. (*Id.*). After a series of final safety checks, the execution begins. The Warden activates the nitrogen hypoxia system,

starting the flow of ultra-high purity nitrogen gas into the mask, which lasts for the longer of fifteen minutes or five minutes after a flatline indication on the inmate's EKG. (*Id.* at 16–17). Once the nitrogen gas begins to flow, it displaces the breathing air in the mask until the inmate is breathing almost pure nitrogen. (Doc. 173-141 at 5, para. 8). And when the brain is deprived of oxygen for long enough, unconsciousness and death ensue. (*Id.*). Additionally, the mask allows exhaled carbon dioxide to exit via a one-way valve, which eliminates "rebreathing" of carbon dioxide by the inmate. (*Id.* at 6, para. 9).

Lee is scheduled to be the eighth inmate executed by this Protocol.[9] Additionally, in March 2025, the State of Louisiana executed Jessie Hoffman Jr. via nitrogen hypoxia under a substantially similar protocol to Alabama's.

C. Lee's Nitrogen Hypoxia Challenge

Lee initiated this lawsuit on August 22, 2025, naming as Defendants John Q. Hamm ("Commissioner Hamm"), then-Commissioner of the ADOC,[10] and Terry Raybon ("Warden Raybon"), the Warden of Holman, in their official capacities. (Doc. 1). Lee's sole remaining claim, brought pursuant to 42 U.S.C. § 1983, is that the Protocol facially violates the Eighth Amendment. (Doc. 40 (operative complaint)). And the only alternative

[9] The others were Kenneth Smith ("Smith"), Alan Miller ("Miller"), Carey Grayson ("Grayson"), Demetrius Frazier ("Frazier"), Gregory Hunt ("Hunt"), Geoffrey West ("West"), and Anthony Boyd ("Boyd").

[10] While this case was pending, Hamm retired from his position as Commissioner of the ADOC. (*See* doc. 144 at 1). On May 1, 2026, Greg Lovelace became the Commissioner of the ADOC and was substituted as a named Defendant pursuant to Federal Rule of Civil Procedure 25(d). (*Id.*).

method of execution he now proposes is the firing squad. (*Id.* at 20–22; *see also* doc. 98).[11] Lee seeks a declaration that the Protocol is unconstitutional and an injunction prohibiting the ADOC from executing him by nitrogen hypoxia or "any method other than one of the alternatives provided by his attorneys." (Doc. 40 at 23).

On the same day that Lee filed his lawsuit, seven other Alabama death row inmates filed § 1983 actions claiming (among other things) that the Protocol violates the Eighth Amendment.[12] The parties in all eight lawsuits filed joint motions to consolidate the cases for purposes of case management and discovery. (*See, e.g.*, doc. 22). On January 14, 2026, the Court held a hearing on the motions to consolidate. At that hearing, the State notified the Court and Lee's counsel for the first time that Lee was the next person for whom the State would move to set an execution date. At a later status conference, the State represented that it anticipated moving to set Lee's execution date by mid-February. Accordingly, although Lee's case was briefly consolidated with the others (*see* doc. 35), on January 29, 2026, the Court deconsolidated his case and set it on a separate, expedited schedule (*see* doc. 36).

[11] Lee originally raised other claims arising under the federal and Alabama constitutions. (*See* doc. 1). The Court dismissed those claims on the State's motion. (Doc. 33). Likewise, Lee's original and amended complaints identified medical-aid-in-dying as an alternative method of execution (doc. 1 at 21, para. 72; doc. 40 at 22, para. 72), but he filed a notice prior to trial withdrawing that method as an alternative (doc. 98). The Court construed that notice (doc. 98) as containing a motion to amend the operative complaint (doc. 40), which the Court granted (*see* doc. 172).

[12] *Van Pelt v. Hamm*, 2:25-cv-671-ECM; *Belisle v. Hamm*, 2:25-cv-673-ECM; *Brooks v. Hamm*, 2:25-cv-674-ECM; *George v. Hamm*, 2:25-cv-675; *Jenkins v. Hamm*, 2:25-cv-676-ECM; *Williams v. Hamm*, 2:25-cv-677-ECM; and *Taylor v. Hamm*, 2:25-cv-678-ECM. These seven cases have since been consolidated with another § 1983 method of execution case, *Wilson v. Hamm*, 2:24-cv-111-ECM ("*Wilson*"), and recaptioned *In Re: Alabama Nitrogen Hypoxia Protocol Litigation*, 2:24-cv-111-ECM (M.D. Ala.).

True to its word, on February 9, 2026, the State moved to set Lee's execution. (*See* doc. 106-1). On April 2, 2026, the Alabama Supreme Court granted that motion and authorized Alabama's Governor to set Lee's execution date. (*Id.*). On April 15, 2026, the Governor declared that Lee's execution would take place in the thirty-hour timeframe commencing on June 11, 2026 at 12:00 a.m., and concluding on June 12, 2026 at 6:00 a.m. (Doc. 127-1).

During discovery in *Wilson*, it was brought to the Court's attention that the pulse oximeters used in previous executions retained residual data from those executions. Specifically, the pulse oximeters retained periodic readings of the inmates' blood oxygen saturation levels and pulse rates. And on April 21, 2026—six days before the start of Lee's bench trial—the State filed a notice in *Wilson* notifying the Court that data from what appeared to be prior executions had been extracted from the pulse oximeters. (Doc. 118 in 2:24-cv-111-ECM (M.D. Ala.)). Lee filed a motion to exclude, seeking to preclude the State from offering at trial the pulse oximeter data and any testimony or evidence related to pulse oximeter readings. (Doc. 136).

At the pretrial conference, the parties agreed to bifurcate the trial as follows: Phase 1 would commence on April 27 and address all matters not related to the pulse oximeter data; and Phase 2, if necessary, would address matters related to the pulse oximeter data and would be set later pending an opportunity for Lee to conduct additional discovery. The parties reserved the right to recall witnesses, call new witnesses, or both during Phase 2. The Court denied Lee's motion to exclude the pulse oximeter evidence without prejudice.

(Doc. 142). As discussed further below, the parties submitted evidence regarding the new pulse oximeter data but did not reconvene for additional in-court testimony.

D. Overview of Trial Evidence

Eleven witnesses testified during the bench trial: seven lay witnesses and four experts.[13] Lee called as experts three medical doctors: (1) Dr. Richard Schwartzstein ("Dr. Schwartzstein"), an expert in pulmonology, critical care medicine, physiology, hypoxia, dyspnea,[14] and air hunger; (2) Dr. Julie Bastarache ("Dr. Bastarache"), an expert in pulmonology, critical care medicine, and pathology; and (3) Dr. James Williams ("Dr. Williams"), an expert in emergency and family medicine, gunshot wounds, firearms, and ballistics.[15] (Doc. 146 at 10:17–20; *id.* at 129:15–17; doc. 147 at 8:6–10). The State proffered Dr. Joseph F. Antognini ("Dr. Antognini") as an expert in anesthesiology.[16] (Doc. 147 at 251:2–5). Lee filed a motion to exclude Dr. Antognini (doc. 103), which the Court held in abeyance pending the conclusion of trial and ultimately denied (*see* doc. 175).

[13] The parties also stipulated to the admission of Dr. Brian McAlary's ("Dr. McAlary") declaration testimony from two previous nitrogen hypoxia lawsuits. (Doc. 128 at 2); *see Frazier*, 2025 WL 361172; *see also Boyd*, 2025 WL 2884410. Dr. McAlary is a board-certified anesthesiologist who witnessed Grayson's execution by nitrogen hypoxia. (*See* doc. 173-19 at 2–4, paras. 1–18).

[14] As explained further below, dyspnea is breathing difficulty or breathing discomfort, the most severe form of which is air hunger.

[15] Dr. Williams testified regarding the firing squad, Lee's proposed alternative method of execution. Specifically, Dr. Williams testified to a reasonable degree of medical certainty that execution by firing squad (1) causes a quick and painless death and (2) is feasible and readily implemented. (Doc. 147 at 8:15–23). But because Lee fails to show that the Protocol poses a substantial risk of severe pain, the Court pretermits discussion of Dr. Williams' opinions on the firing squad.

[16] The State also sought to offer Dr. Antognini as an expert "in the field of general medicine." (Doc. 147 at 251:2–4).

The Court also admitted hundreds of exhibits totaling thousands of pages, including scientific literature, ADOC records, news articles about prior nitrogen hypoxia executions, witness testimony from prior nitrogen hypoxia litigation, and video demonstrations of Alabama's and Louisiana's nitrogen hypoxia execution systems. Among the exhibits are the pulse oximeter data and expert witness declarations interpreting aspects of the data, which the Court addresses *infra* Section III.E.

The Court does not exhaustively summarize each piece of evidence or each witness's testimony. However, the Court describes the following evidence and testimony: (1) information about nitrogen and oxygen as atmospheric gases, (2) demonstrations of Alabama's and Louisiana's nitrogen hypoxia execution systems, (3) background about different types of pain, (4) background about dyspnea and air hunger, (5) an overview of the experts' opinions on the effects of the Protocol, and (6) an overview of the lay witnesses testimony.

1. Nitrogen and Oxygen

Our bodies need oxygen to function. The normal oxygen concentration in the air is around 21%. (Doc. 173-141 at 15, para. 25 (Declaration of Dr. Antognini)). But the most abundant atmospheric gas is nitrogen, comprising approximately 78% of air. (*Id.* at 5, para. 7). Nitrogen itself is not harmful under normal circumstances, but it can kill via displacement of the oxygen that is normally present in our breathing air. (*Id.*).

An oxygen concentration of 6.2% is "just sufficient to maintain consciousness." (*Id.* at 22, para. 40). If the oxygen concentration is less than 5%, "you start to get critically low oxygen levels of inspired gas." (Doc. 146 at 132:15–16 (Dr. Bastarache trial testimony)).

An oxygen concentration of 2.1% would "rapidly cause death." (Doc. 173-141 at 16, para. 26). An atmosphere containing 0.8% oxygen is not "supportive of human life," and exposure to an atmosphere with 0.8% oxygen would result in unconsciousness very quickly and death soon thereafter. (Doc. 149 at 17:16–23 (Dr. Antognini trial testimony)).

2. Demonstrations of Nitrogen Hypoxia Systems

At trial, the State presented video demonstrations of Louisiana's and Alabama's nitrogen hypoxia systems (doc. 173-198, doc. 173-197), as well as Dr. Antognini's written account of another demonstration of the Alabama system (doc. 173-141 at 11–12, para. 19). The Louisiana video depicts a masked mannequin with an oxygen monitor attached to a tube placed inside the mask, which tracks the decrease in oxygen level after the nitrogen gas is turned on. (*Id.* at 16:6–25; doc. 173-196). The video shows the oxygen level inside the mask rapidly decreasing to 0.8% within one minute after the nitrogen began to flow. (Doc. 149 at 17:1–15; doc. 173-196).[17]

The Alabama video is similar, depicting a mask strapped to a gas tank and an oxygen monitor attached to a tube inside the mask. (Doc. 173-197). Like the Louisiana video, the Alabama video shows the oxygen concentration in the mask quickly plummeting: around twenty-five seconds after the breathing air supply is cut off and nitrogen is turned on, the oxygen concentration is less than 6%. (*Id.*; *see also* doc. 147 at 143:24–144:2 (Houts trial testimony)). Approximately thirty to thirty-three seconds after the nitrogen gas is turned

[17] The oxygen level inside the mask reached 0.8% despite a "gap" in the mask seal caused by the tube attached to the oxygen monitor (*see* doc. 149 at 18:3–5), which would not be present in an execution under the Protocol.

on, the oxygen concentration in the mask is less than 3%. (Doc. 173-197). And thirty-five to forty seconds in, the oxygen concentration is less than 2%. (*Id.*). In the separate demonstration witnessed by Dr. Antognini, "an oxygen monitor was placed in the mask and surrounded by sheets and a towel." (Doc. 173-141 at 11, para. 19). According to Dr. Antognini, this demonstration showed results similar to those in the video: less than twenty-four seconds after nitrogen gas was turned on, the oxygen concentration in the mask was 5%; and approximately forty-two seconds in, the oxygen concentration was 2%. (Doc. 173-141 at 11–12, para. 19).

3. Types of Pain

To explain how the medical community understands pain, Dr. Williams testified regarding how pain is processed by the brain. (Doc. 147 at 10:9–13). Dr. Williams defined pain as a noxious stimulus that is "transmitted to the brain via sensory nerves." (Doc. 173-40 at 5). There are four types of noxious stimuli: (1) mechanical (like a gunshot, stabbing, or pressure); (2) thermal (like placing your hand on a hot stove); (3) chemical (like the reaction to capsaicin in food); and (4) visceral or homeostatic, including nausea, itching, and air hunger. (Doc. 147 at 11:3–12:5). As relevant here, the visceral or homeostatic receptors—"the systems which give the brain input on things such as the state of oxygen in the blood"— can result in "sensations as simple as hunger, air hunger, nausea, cramping, [and] itching." (*Id.* at 11:24–12:5).

4. Dyspnea and Air Hunger

Dr. Schwartzstein, a pulmonary and critical care physician and a professor, has treated and studied dyspnea for decades. (Doc. 146 at 7:12–9:19). He has treated over

15,000 dyspneic patients; written numerous articles on dyspnea; and served on the writing committees for multiple "consensus statements" (the official positions by leading medical organizations) on dyspnea. (*Id.* at 7:23–8:18, 9:14–19, 23:5–24:22; 29:17–31:20). Dr. Bastarache, also a pulmonary and critical care physician as well as a professor of pathology, regularly treats dyspnea from hypoxia and studies lung injury and disease. (*Id.* at 127:10–29:14, 175:13–76:14). Based on their training, clinical experience, and research, Dr. Schwartzstein and Dr. Bastarache testified about how hypoxia can cause dyspnea, and how humans experience and respond to dyspnea and air hunger, as follows:

Dyspnea is a symptom generally understood as breathing difficulty or breathing discomfort. (Doc. 146 at 8:12–14 (Dr. Schwartzstein trial testimony)). "With few exceptions, dyspnea will provoke increases in respiratory rate (breathing faster) and tidal volume (the size of the breath) in healthy individuals." (Doc. 173-43 at 7, para. 20 (parentheticals in original)). Although dyspnea shares similar features with pain, dyspnea is "a more holistic discomfort sensation" without a specific source, whereas pain is often associated with "a particular injury to a portion of the body." (Doc. 146 at 11:4–12 (Dr. Schwartzstein trial testimony)). And similar parts of the brain are activated in response to dyspnea as are activated when a person is experiencing pain. (*See id.* at 33:20–23 (Dr. Schwartzstein trial testimony)).

The experience of dyspnea can range from minor to very severe. (*Id.* at 11:11–12 (Dr. Schwartzstein trial testimony)). The most severe form of dyspnea is air hunger,[18]

[18] Because air hunger is a form of dyspnea, this Opinion occasionally uses those terms interchangeably.

which is "associated with severe gas exchange changes." (Doc. 173-43 at 6, para. 18). Clinical patients and research subjects have described the distressing sensation that accompanies air hunger in numerous ways, including feeling "starved for air" or like your "[b]reaths are too small," feeling like you "[c]annot get enough air," feeling like there is "an elephant on your chest," "like running in a race . . . and feel[ing] like you are going to collapse," "a feeling of suffocation," and "a smothering feeling akin to drowning," (Doc. 146 at 19:9–13, 32:11–20, 63:1–5); (doc. 173-82 at 6 ("Patients often describe air hunger as akin to suffocation or drowning . . . ."); *see also* doc. 173-74 at 9 fig. 6 (research subjects describing hypoxia as air hunger, starved for air, short of breath, and "a feeling of suffocation")).[19]

For many people, air hunger causes extreme emotional distress, panic, anxiety, and fear. (Doc. 146 at 18:18–24, 20:3–14, 22:19–23:2, 29:9–15 (Dr. Schwartzstein trial testimony); *see also* doc. 149 at 70:9–19 (Dr. Antognini agreeing that dyspnea "can cause terror," "panic," and "ranks among the most distressing experiences that human beings can endure")). Dr. Schwartzstein testified that dyspnea is one of the "most severe forms of threat to [one's] very existence," triggering the brain's survival instincts and evoking a primal fear response due to the inability to take in enough air. (Doc. 146 at 11:17–18; *see id.* at 133:14–20 (Dr. Bastarache defining air hunger as "the primal urge to get more air," which corresponds with the body's "extreme physiologic need to get more oxygen"); *id.* at

[19] One accepted medical definition of suffocation is "death from deprivation of oxygen, either from a lack of the gas in a breathable environment or from obstruction of the external air passages." (Doc. 149 at 74:17–75:1).

156:23–24 (Dr. Bastarache testifying that air hunger produces "intense physiologic stress that causes intense suffering")). Indeed, many people find air hunger "worse than pain" because it is associated with the fear of dying. (*Id.* at 28:4–5 (Dr. Schwartzstein trial testimony); *see also* doc. 173-57 at 1 ("Although it shares many similarities with pain, dyspn[]ea can be far worse than pain in that it summons a primal fear response.")).

Several factors cause or exacerbate air hunger, including hypercapnia (too much carbon dioxide), hypoxia, and restrictions on the size of one's breath. (Doc. 173-43 at 7, para. 21; *id.* at 9–10, para. 28). Anxiety can also exacerbate air hunger. (*Id.* at 9, para. 27). Several factors can alleviate air hunger, including taking larger breaths and reducing anxiety. (*Id.* at 9–10, paras. 27–30). In the clinical and research settings, mitigating the dyspneic subject's anxiety is possible. In the research setting, for example, researchers can reassure the test subjects that their feelings of air hunger are merely part of the experiment. (Doc. 173-74 at 3). And in the clinical setting, doctors can reassure many patients that the patients' dyspnea is a consequence of their condition and does not mean they are going to die. (Doc. 173-57 at 17 tbl. 2). In an execution setting, however, such reassurance is not possible because the goal is to cause the inmate's death.

5. Expert Testimony on the Protocol's Effects

Except for Dr. Williams, each of the parties' experts testified generally about the effects of nitrogen hypoxia, with particular focus on the time it takes to render an inmate unconscious and any suffering involved. The parties' experts agree that the Protocol

creates a hypoxic environment,[20] the Protocol causes some level of air hunger, and air hunger is extremely distressing. But the parties presented conflicting expert testimony about the air hunger's severity, the time to unconsciousness, and (relatedly) how long inmates are able to experience air hunger.

Dr. Antognini, an anesthesiologist, opines that the Protocol renders a condemned inmate unconsciousness in approximately sixty to seventy-five seconds from when the nitrogen is turned on and begins to flow into the mask.[21] (Doc. 149 at 88:11–19). He bases this opinion on his clinical career; his personal experience testing various aspects of the Protocol; demonstrations of the Alabama and Louisiana nitrogen hypoxia systems; and various articles, reports, reviews, and studies. Across the scientific literature on which he relies, hypoxia resulted in unconsciousness in approximately one minute or less. Additionally, he opines that because unconsciousness occurs quickly under the Protocol, "any distress or suffering [from air hunger] . . . is going to be very, very brief if at all present"—on the order of ten to twenty seconds. (Doc. 149 at 61:17–19, 109:20). He further claims that any air hunger would only be "mild" and akin to the shortness of breath one might expect to have "on an exercise bike." (*Id.* at 28:16–22, 54:25–55:3). In support, he contends that air hunger results primarily from the buildup of carbon dioxide and not

[20] Dr. Schwartzstein noted that the Protocol causes "hypoxemia," or "low oxygen levels in the blood." (*See* doc. 146 at 8:19–22). Dr. Schwartzstein noted that hypoxemia and hypoxia "are often used interchangeably." (*See id.* at 8:22–9:2). While the Court uses the term hypoxia, the Court understands the terms hypoxia and hypoxemia to mean the same thing when used by the experts.

[21] Elsewhere, Dr. Antognini estimates it takes sixty to seventy seconds. (Doc. 149 at 12:25–13:1).

oxygen deprivation, and that the Protocol prevents carbon dioxide buildup because exhaled carbon dioxide exits the mask via a one-way valve.

In contrast to Dr. Antognini, Dr. Schwartzstein and Dr. Bastarache opine that inmates executed under the Protocol likely experience severe air hunger and associated emotional suffering and physiological distress. (Doc. 146 at 63:1–7 (Dr. Schwartzstein); *id.* at 156:23–25 (Dr. Bastarache)). They claim that air hunger is severe because of the extent of oxygen deprivation; the human body's primal physiological response to not getting enough oxygen; the associated fear of dying; the inmate's inability to alleviate air hunger; restrictions on the inmate's breathing from the chest restraints; and the occurrence of flash pulmonary edema, a condition triggered by a sudden rise in blood pressure in which the lungs "almost instantaneously" fill with fluid and make it "extremely difficult to breathe," (*id.* at 28:16–22, 54:25–55:3).

Lee's experts further claim that inmates executed under the Protocol remain conscious, and therefore able to experience air hunger, for much longer than Dr. Antognini estimates. Regarding time to unconsciousness, Dr. Bastarache opines that the theoretical "floor," under idealized conditions with a healthy person breathing 100% nitrogen and having no breathing restrictions, is two minutes and eighteen seconds. (*Id.* at 138:3–39:9). But based on her interpretations of eyewitnesses' observations of past executions, Dr. Bastarache estimates that four inmates previously executed under the Protocol remained conscious for between three and seven minutes. (*Id.* at 144:14–51:1). In particular, witnesses observed the inmates making certain movements during the executions, which Dr. Bastarache interprets as "purposeful" movements and thus evidence of consciousness

(*id.* at 141:12). Additionally, citing brain imaging data and studies of patients who later developed PTSD attributable to dyspnea experienced during mechanical ventilation, Dr. Schwartzstein opines that the human brain can continue to process "respiratory-related brain suffering"—i.e., distress evoked by dyspnea—even when the person is apparently unconscious or "unawake." (*See id.* at 48:18–24, 55:15–25, 78:20–24, 90:18–92:18). He testified that unconsciousness "does not prevent [a person] from *experiencing* dyspnea and the associated suffering," because the brain continues to process the stimuli. (*Id.* at 95:10–12, 97:20–21 (emphasis added)). He claims that an inmate's brain likely continues processing dyspnea-related stimuli for three to five minutes after the inmate is "unawake." (*Id.* at 53:15–17).

6. Lay Witnesses

The seven lay witnesses who testified were: (1) Sarah Clifton ("Clifton"), a reporter for the Montgomery Advertiser; (2) Commissioner Hamm; (3) Charles Williams ("Williams"), Deputy Commissioner of the ADOC; (4) James Houts ("Houts"), a former Alabama Assistant Attorney General; (5) Warden Raybon; (6) Warden Brandon McKenzie ("Warden McKenzie"), a member of the ADOC's execution team; and (7) Warden Fitzgerald Clemons ("Warden Clemons"), another member of the ADOC's execution team. (Doc. 146 at 191:18–22, 216:7–11, 244:23–45:2; doc. 147 at 128:4–21, 159:12–19, 171:2–17, 210:22–11:7).

Clifton testified live about her observations as a media witness to the past nitrogen hypoxia executions of Frazier, West, and Boyd, including her observations of the inmates' movements during the executions. (Doc. 146 at 191:25–192:16). The Court also received

affidavit testimony and news articles detailing witnesses' observations of past nitrogen hypoxia executions, including their observations of the inmates' movements. (*See, e.g.*, docs. 173-19, 173-31, 173-88, 173-129, 173-130). The other lay witnesses provided background information regarding the ADOC's adoption of the Protocol and testimony regarding their own observations of nitrogen hypoxia executions. (*See, e.g.*, doc. 146 at 246:5–255:3). For example, Warden McKenzie testified about pulse oximeter readings he personally observed during past executions. Additionally, Houts, Warden McKenzie, and Warden Clemons testified that they each had been strapped to the gurney under execution conditions in terms of the tightness of the straps, and that the straps did not restrict their ability to breathe deeply. (*See, e.g.*, doc. 147 at 221:5–24).

E. Pulse Oximeter Data

After the bench trial, the parties offered additional exhibits—including the pulse oximeter data and updated declarations from Dr. Bastarache and Dr. Antognini—but did not seek to reconvene for further in-court testimony. The pulse oximeter data appear to show blood oxygen saturation readings from three past nitrogen hypoxia executions, although it is not clear which executions. (*See* doc. 173-139 at 70–79, 113–20, 215–24). All three data points show the same pattern: oxygen saturation levels plunge rapidly—within thirty seconds—then continue to decline gradually for several minutes before measurements completely cease.

Although the Court cannot, on this record, determine which executions these data represent, the Court finds it noteworthy that they consistently show a rapid decline in oxygen saturation levels. Beyond that general trend, however, the Court gives no weight

to the pulse oximeter data—including Warden McKenzie's testimony about pulse oximeter readings he personally observed during past executions—because the parties have not provided the necessary context for the data's interpretation, particularly at what oxygen saturation level consciousness ceases, whether and at what level consciousness begins fading, and how any continuum of consciousness might impact the inmates' experience of any distress. *Cf. Boyd*, 2025 WL 2884410, at *7 & n.37 (relaying expert's testimony that "consciousness fades for most people around 50% oxygen saturation, and that some people can lose consciousness before they feel any distress"; and observing that, because "consciousness 'starts to fluctuate"' when the oxygen saturation level drops below 50%," inmates may not be fully conscious the entire period after nitrogen begins to flow).[22] For this reason, neither the data nor the related exhibits have impacted the Court's analysis or conclusion.

IV. LEGAL STANDARDS

A. Bench Trial

"In an action tried on the facts without a jury . . . the court must find the facts specially and state its conclusions of law separately." FED. R. CIV. P. 52(a)(1). In a bench trial, "it is the exclusive province of the judge . . . to assess the credibility of witnesses and to assign weight to their testimony." *Childrey v. Bennett*, 997 F.2d 830, 834 (11th Cir. 1993); *see also Sidman v. Travelers Cas. & Surety*, 841 F.3d 1197, 1201 (11th Cir. 2016)

[22] Besides Dr. Antognini's statement that consciousness is "a continuum," (doc. 149 at 66:9–11), on which he did not elaborate, the Court heard no expert testimony in this case about whether consciousness fluctuates during a nitrogen hypoxia execution. Moreover, as discussed *infra* note 26, the Court heard little evidence about whether the level of air hunger remains consistent or varies during the execution.

(explaining, in the bench trial context, that "the district court has the advantage of observing the witnesses and evaluating their credibility firsthand," and that "[t]he credibility of a witness is in the province of the factfinder" (alteration in original) (first quoting *Fischer v. S/Y NERAIDA*, 508 F.3d 586, 592 (11th Cir. 2007), then quoting *Crystal Ent. & Filmworks, Inc. v. Jurado*, 643 F.3d 1313, 1320 (11th Cir. 2011))). Additionally, "[a] trial judge sitting without jury is entitled to great latitude concerning the admission or exclusion of evidence." *Wright v. Sw. Bank*, 554 F.2d 661, 663 (5th Cir. 1977).[23]

B. Eighth Amendment Method of Execution Claims

Capital punishment is unquestionably constitutional. *See Bucklew*, 587 U.S. at 129. And states are permitted to carry out executions by any method that is not "cruel and unusual." U.S. CONST. amend. VIII. When a federal court evaluates whether a state's method of execution violates the Constitution, it may not act as a "board[] of inquiry charged with determining 'best practices' for executions" or "intrude on the role of state legislatures in implementing their execution procedures," and it must refrain from becoming "embroil[ed] . . . in ongoing scientific controversies beyond [its] expertise." *See Baze v. Rees*, 553 U.S. 35, 51 (2008) (plurality op.).

"The cruelty against which the Constitution protects a convicted man is cruelty inherent in the method of punishment, not the necessary suffering involved in any method employed to extinguish life humanely." *Resweber*, 329 U.S. at 464. Cruelty

[23] In *Bonner v. City of Prichard*, 661 F.2d 1206, 1209 (11th Cir. 1981) (en banc), the Eleventh Circuit adopted as binding precedent all decisions of the former Fifth Circuit handed down prior to the close of business on September 30, 1981.

"implies . . . something inhuman and barbarous[]—something more than the mere extinguishment of life." *In re Kemmler*, 136 U.S. 436, 447 (1890). It requires the "superadd[ition]" of "terror, pain, or disgrace" to death. *Wilkerson v. Utah*, 99 U.S. 130, 135 (1878); *cf. Baze*, 553 U.S. at 48 ("What each of the forbidden punishments had in common was the deliberate infliction of pain for the sake of pain—'superadd[ing]' pain to the death sentence through torture and the like." (alteration in original) (quoting *Wilkerson*, 99 U.S. at 135)). The United States Supreme Court has provided instructive examples of cruelty: drawing and quartering, public dissection, burning at the stake, crucifixion, breaking on the wheel, flaying, scourging, starving, gibbeting, or rending asunder with horses. *See Bucklew*, 587 U.S. at 131; *In re Bonner*, 151 U.S. 242, 258 (1894); *In re Kemmler*, 136 U.S. at 446; *Wilkerson*, 99 U.S. at 135; *Baze*, 553 U.S. at 95–96 (Thomas, J., concurring); *see also id.* at 50 (plurality op.) (reasoning that "a series of abortive attempts at electrocution" would likely run afoul of the Eighth Amendment (citing *Resweber*, 329 U.S. at 471 (Frankfurter, J., concurring))).

"It's instructive, too, to contrast the modes of execution the Eighth Amendment was understood to forbid with those it was understood to permit[] . . . [a]t the time of the Amendment's adoption . . . ." *Bucklew*, 587 U.S. at 132. Among those permitted methods was hanging, which was "no guarantee of a quick and painless death." *Id.* Hanging more often than not caused death from "loss of blood flow to the brain, which could produce unconsciousness usually within seconds, or suffocation, which could take several minutes." *Id.* Even though "hanging could and often did result in significant pain," it was not cruel in the constitutional sense because it was not intended to cause pain, and the risks

were considered unfortunate but inevitable—necessarily concomitant to the act of carrying out capital punishment. *See id.* (citations omitted). The same unfortunate but inevitable risks attend execution by firing squad. *See Wilkerson*, 99 U.S. at 134–35. And electrocution. *See Resweber*, 329 U.S. at 463–64; *In re Kemmler*, 136 U.S. at 446–47, 449. And lethal injection. *See Bucklew*, 587 U.S. at 147–49; *Glossip v. Gross*, 576 U.S. 863, 878 (2015); *Baze*, 553 U.S. at 62.[24] In short, "what unites the punishments the Eighth Amendment was understood to forbid, and distinguishes them from those it was understood to allow, is that the former were long disused (unusual) forms of punishment that intensified the sentence of death with a (cruel) 'superadd[ition]' of 'terror, pain, or disgrace.'" *Bucklew*, 587 U.S. at 133 (parentheticals and alteration in original) (quoting *Baze*, 553 U.S. at 48).

To show that the ADOC's nitrogen hypoxia protocol is cruel and unusual, Lee must first show that the Protocol poses "a 'substantial risk of serious harm,' an 'objectively intolerable risk of harm' that prevents prison officials from pleading that they were 'subjectively blameless for purposes of the Eighth Amendment.'" *Glossip*, 576 U.S. at 877

[24] Cyanide gas was also not free from unfortunate risks—yet multiple federal courts upheld the constitutionality of this execution method. The Fifth Circuit's decision in *Gray v. Lucas*, though nonbinding, is instructive. 710 F.2d 1048 (5th Cir. 1983), *cert. denied*, 463 U.S. 1237 (1983). That court, accepting "as proven" that execution by cyanide gas caused more than seven minutes of physical pain, held that "the pain and terror from death by cyanide gas is [not] so different in degree or nature from that resulting from other traditional modes of execution as to implicate the [E]ighth [A]mendment." *Id.* at 1061. The Fourth Circuit reached a similar conclusion. *See Hunt v. Nuth*, 57 F.3d 1327, 1337–38 (4th Cir. 1995), *cert. denied*, 516 U.S. 1054 (1996); *see also id.* at 1338 (collecting cases, and corresponding denials of certiorari, in which courts held lethal gas not violative of the Eighth Amendment). The Ninth Circuit disagreed and held that execution by cyanide gas was unconstitutional, but thereafter, the State of California amended its statute to allow inmates to choose execution by lethal injection instead; consequently, the Supreme Court vacated the Ninth Circuit's judgment and remanded in light of the amended statute. *See Fierro v. Gomez*, 77 F.3d 301, 306–08 (9th Cir. 1996), *cert. granted, judgment vacated*, 519 U.S. 918 (1996).

(quoting *Baze*, 553 U.S. at 50).[25] "Simply because an execution may result in pain, either by accident or as an inescapable consequence of death, does not establish the sort of 'objectively intolerable risk of harm' that qualifies as cruel and unusual." *Baze*, 553 U.S. at 50 (quoting *Farmer v. Brennan*, 511 U.S. 825, 846 (1994)). Instead, Lee must show that the Protocol "presents a risk that is '*sure or very likely* to cause serious illness and needless suffering,' and give[s] rise to 'sufficiently *imminent* dangers.'" *Glossip*, 576 U.S. at 877 (emphases in original) (quoting *Baze*, 553 U.S. at 50). To prevail, Lee must also "show a feasible and readily implemented alternative method of execution that would significantly reduce a substantial risk of severe pain." *Bucklew*, 587 U.S. at 134. But if the Protocol does not present a substantial risk of severe pain, the State "may use it regardless of the proposed alternatives." *Nance v. Comm'r, Ga. Dep't of Corr.*, 169 F.4th 1312, 1318 (11th Cir. Mar. 19, 2026). After all, "[a]n 'alternative method' cannot 'reduce a substantial risk of severe pain' when there was no substantial risk in the first place." *Id.*

In sum, Lee must show by a preponderance of the evidence that the Protocol (1) creates a substantial risk of severe pain and (2) "there is an alternative that is feasible, readily implemented, and in fact significantly reduces a substantial risk of severe pain." *Id.* (quoting *Barber v. Governor of Ala.*, 73 F.4th 1306, 1318 (11th Cir. 2023)). Lee's claim

[25] That Lee brings a facial challenge rather than an as-applied challenge does not change the applicable substantive rule of law. *See Bucklew*, 587 U.S. at 138–39. "Rather than requiring differing substantive rules, 'classifying a lawsuit as facial or as-applied affects the extent to which the invalidity of the challenged law must be demonstrated and the corresponding 'breadth of the remedy.'" *Boyd*, 2025 WL 2884410, at *15 (quoting *Bucklew*, 587 U.S. at 138). Lee insists that the Defendants cannot defeat his claim by merely identifying one hypothetical scenario in which an execution under the Protocol would be constitutional—but the Defendants have not made that argument here. Instead, Lee's framing only shifts the Court's focus from what is likely to happen to *Lee* under the Protocol (i.e., as applied) to what is substantially likely to happen to *any inmate* executed under the Protocol (i.e., facial). The Court analyzes his claim accordingly.

"faces an exceedingly high bar," *see Barr v. Lee*, 591 U.S. 979, 980 (2020) (per curiam), and the United States Supreme Court has "yet to hold that a State's method of execution qualifies as cruel and unusual," *Bucklew*, 587 U.S. at 133.

V. DISCUSSION

The Court must determine whether this record supports the conclusion that the Protocol causes severe suffering well beyond what is necessary to extinguish human life, thus rendering it cruel and unusual in violation of the Eighth Amendment. *See Bucklew*, 587 U.S. at 132, 134. Even without a showing of physical pain, Lee may succeed if the Protocol "induces psychological terror or pain that is severe enough to support an Eighth Amendment claim," *Grayson v. Comm'r, Ala. Dep't of Corr.*, 121 F.4th 894, 900 n.3 (11th Cir. 2024), because the Founders broadly understood pain to encompass psychological terror or disgrace, *see Bucklew*, 587 U.S. at 130 ("[A] reader at the time of the Eighth Amendment's adoption would have understood" the word "cruel" to mean "[d]isposed to give pain to others, in body or mind." (second alteration in original) (quoting 1 NOAH WEBSTER, AN AMERICAN DICTIONARY OF THE ENGLISH LANGUAGE (1828))).

The parties agree that the Protocol causes some level of air hunger and corresponding emotional suffering and physiological distress. (Doc. 146 at 63:1–2 (Dr. Schwartzstein opining that "it is highly likely that individuals succumbing to th[e] [P]rotocol will experience severe air hunger"); *id.* at 156:19–20 (Dr. Bastarache stating that the Protocol's "forced nitrogen hypoxia causes extreme air hunger"); doc. 149 at 73:19–20 (Dr. Antognini acknowledging that "there could be a few seconds where [air hunger] might occur" during a nitrogen hypoxia execution)). But the parties bitterly dispute both the

severity of the air hunger and how long inmates can experience it. *Cf. Bucklew*, 587 U.S. at 137 ("[T]he relevant question isn't how long it will take for [the inmate] to die, but how long he will be capable of feeling pain.").

Lee does not argue that air hunger entails physical pain like a broken bone—though, again, he need not establish the occurrence of physical pain to prevail. Instead, he claims that air hunger causes emotional suffering and physiological distress, producing a "more holistic discomfort sensation" that shares similar features with pain, (doc. 146 at 11:4–14 (Dr. Schwartzstein trial testimony)), but that air hunger is also "worse than pain" because it is associated with the fear of dying, (*id.* at 28:13–15 (Dr. Schwartzstein trial testimony); (*see also* doc. 173-57 at 1 ("Although it shares many similarities with pain, dyspnea can be far worse than pain in that it summons a primal fear response.")). Dr. Williams explains that although "[p]ain is a specific type of noxious stimulus," the body may experience something "extremely noxious" that results in bodily discomfort without experiencing what we might traditionally call pain. (Doc. 147 at 12:12–25; *see id.* at 13:1–6 (explaining that if a person eats very hot food, they may have "the experience of chemical burning, which is extremely uncomfortable, but most of us would not actually describe that as pain")). Lee elaborates that the Protocol causes emotional suffering and physiological distress because the inability to take in sufficient oxygen activates the body's survival instincts to try to get more air, which cannot be satisfied—the Protocol produces an urgent need for the very thing it takes away. (*See, e.g.*, doc. 146 at 133:15–20). Because nitrogen hypoxia triggers inmates' physiological need to breathe oxygen while also preventing them

from doing so, Lee claims that this method of execution is unique, and uniquely distressing, and constitutes cruel and unusual punishment.

Lee further claims that inmates experience air hunger for six to twelve minutes—although inmates are unconscious or "unawake" for three to five minutes of that time.[26] (*See* doc. 146 at 53:12–17). By contrast, Dr. Antognini claims that the Protocol induces unconsciousness in sixty to seventy-five seconds from when the nitrogen gas begins to flow into the mask, and that any air hunger would be mild. (Doc. 149 at 28:16–22, 88:11–19).

To determine whether the Protocol causes unconstitutional suffering, the Court must resolve certain factual disputes and make credibility determinations, which require further examination of the expert witnesses' testimonies. Then, the Court sets forth its findings of fact and conclusions of law.

A. Severity of Air Hunger

The State claims that any air hunger induced by the Protocol would only be "mild" and akin to the shortness of breath one might expect to have "on an exercise bike." (Doc. 149 at 28:19–22, 54:25–55:3 (Dr. Antognini trial testimony)). In support, the State relies on Dr. Antognini's opinions that air hunger is primarily caused by carbon dioxide buildup,

[26] Dr. Bastarache opines that air hunger begins ten to twelve seconds after the nitrogen gas is turned on. (Doc. 146 at 133:10–13). She further testified that the Protocol causes "extreme air hunger that lasts up to minutes, during minutes of consciousness," (*id.* at 156:20–21), from which one could infer that air hunger persists at the same severity until the inmate becomes unconscious. Aside from this testimony, the Court fails to discern record evidence as to whether the level of air hunger remains constant or fluctuates after the nitrogen begins to flow. *But cf. Boyd*, 2025 WL 2884410, at *7 (expert testifying that "consciousness fades for most people around 50% oxygen saturation, and that some people can lose consciousness before they feel any distress"). Based on this record, and because it does not alter the Court's conclusion, the Court assumes without deciding that the level of air hunger is the same throughout.

and because the mask eliminates carbon dioxide buildup via the one-way exhalation valve, inmates executed under the Protocol do not experience more than mild air hunger. (*See id.* at 4:17–21, 33:23–34:10, 43:24–44:9). Lee claims that an inmate's air hunger is severe because of the total oxygen deprivation; the activation of the body's basic survival instinct to breathe more oxygen and the physiological response to the inability to do so; the associated fear of dying; the inmate's inability to alleviate air hunger; restrictions on the inmate's breathing from the chest restraints; and the occurrence of flash pulmonary edema. Based on Dr. Schwartzstein and Dr. Bastarache's opinion, Lee further claims lack of oxygen alone causes air hunger even when carbon dioxide levels are normal, and thus the lack of carbon dioxide buildup in the mask does not eliminate the possibility of severe air hunger. (*See* doc. 146 at 36:5–37:6, 45:3–22 (Dr. Schwartzstein trial testimony); *see also* doc. 173-74 (S.H. Moosavi et al., *Hypoxic and Hypercapnic Drives to Breathe Generate Equivalent Levels of Air Hunger in Humans*, 94 J. APPLIED PHYSIOL. 141 (2003) (hereinafter, the "Moosavi study")); doc. 173-42 at 1 (Dr. Bastarache rebuttal report)).

Below, the Court explains why it credits Lee's experts that inmates executed under the Protocol likely experience severe air hunger. But the Court begins by addressing one factor upon which Lee relies which, on this record, does not contribute to or exacerbate air hunger: the chest restraints.

On this record, the Court does not credit Dr. Schwartzstein's opinion that the chest restraints prevent inmates from breathing deeply, thus exacerbating their feelings of breathlessness. (Doc. 146 at 55:24–56:10, 86:21–87:7; doc. 173-43 at 9–10, para. 28). The Court did find credible his testimony that restrictions on a person's ability to take deep

breaths may exacerbate air hunger. But Houts, Warden McKenzie, and Warden Clemons all testified consistently that they have been strapped to the gurney under execution conditions in terms of tightness, and they were not restricted in their abilities to breathe deeply. (Doc. 147 at 149:23–150:9 (Houts trial testimony); *id.* at 187:14–188:17 (Warden McKenzie trial testimony); *id.* at 221:5–222:3 (Warden Clemons trial testimony)). By contrast, Dr. Schwartzstein acknowledged that, while he has seen photographs of individuals strapped to the gurney (doc. 146 at 26:20–27:1), he has not seen or examined the chest restraints in person or been strapped to the gurney (*id.* at 99:7–17). Thus, considering the testimony of Houts, Warden McKenzie, and Warden Clemons, which is based on their firsthand experience and which the Court finds credible, the Court finds that the chest restraints used in executions under the Protocol do not restrict inmates from breathing deeply—which Dr. Schwartzstein said was a significant factor exacerbating dyspnea. Thus, the Court finds that the chest restraints do not contribute to or exacerbate any air hunger the inmates may experience.

Notwithstanding this finding, the Court credits Dr. Schwartzstein and Dr. Bastarache's opinion that inmates executed under the Protocol likely experience severe air hunger, which evokes distress and anxiety.[27] (Doc. 146 at 56:24–57:1, 63:1–7 (Dr.

[27] The Court affords less weight to Dr. Antognini's opinion that any air hunger induced by the Protocol would *only* be "mild" and akin to the shortness of breath one might expect to have "on an exercise bike" because he did not persuasively support his opinion. (Doc. 149 at 28:19–22, 54:25–55:3). To the extent his opinion was based on the premise that air hunger is primarily caused by carbon dioxide buildup (which is not expected to occur under the Protocol), the Court rejects this view for the reasons explained *infra* pages 33–34. Further, the other data on which he relied, such as the Occupational Safety and Health Administration ("OSHA") reports, case reports of inert gas suicides, and the Ernsting study, did not consider whether and to what extent the subjects experienced dyspnea. (*See, e.g.*, docs. 173-186, 173-187

Schwartzstein trial testimony); *id.* at 156:19–25 (Dr. Bastarache trial testimony)). Dr. Schwartzstein's opinion is based, among other things, on his experience studying dyspnea for forty years and treating more than 15,000 dyspneic patients. The Court finds persuasive Dr. Schwartzstein's opinion that air hunger "involves activation of brain regions dedicated to basic survival instincts, which include the need to breathe adequately," and that when an individual's breathing is inadequate, "severe distress, anxiety and panic are normal and expected human sensations" because the individual fears death is imminent. (Doc. 173-43 at 7, para. 22 (emphasis omitted)). Dr. Bastarache echoes this view, explaining that air hunger triggers the body's "extreme physiologic need to get more oxygen" and produces "intense physiologic stress that causes intense suffering." (Doc. 146 at 133:14–20, 156:19–25). Because the inmate cannot respond to his "basic survival instincts" to address the air hunger, a "vicious cycle of increasing air hunger and panic symptoms" can occur. (Doc. 173-43 at 10, para. 29 (Dr. Schwartzstein report) (quotation marks omitted)).

Unlike pain, which is normally localized to a specific body part, air hunger is "a holistic discomfort sensation," and individuals struggle to distract themselves from their dyspnea. (Doc. 146 at 11:4–12). Because it evokes a fear of dying, air hunger can be worse than pain. And unlike "anticipatory anxiety" about something bad that will happen in the future, air-hunger-induced anxiety is evoked by the underlying problem—shortness of breath—and cannot be treated with anti-anxiety medication. (*See id.* at 56:21–57:7 (Dr. Schwartzstein trial testimony)).

(OSHA reports); docs. 173-165, 173-166, 173-167 (inert gas suicide reports); doc. 173-162 (Ernsting study)).

The total oxygen deprivation in these executions also supports the Court's finding that air hunger is severe. Dr. Schwartzstein opines that, at a partial pressure of oxygen (PO_2) below 60 mm Hg (which corresponds to a blood oxygen saturation below 90%), a person's drive to breathe "takes off," making him or her "desperate to try to do something to correct the hypoxemia." (Doc. 146 at 42:11–43:2, 43:17–44:6; *see also* doc. 173-81 at 81 fig. 5-8, 110 fig. 6-6). The Court thus credits Dr. Schwartzstein's view that the Protocol evokes an "incredibly strong stimulus" to breathe (doc. 146 at 44:18–23), given that the goal is to take the inmate's PO_2 all the way down to 0 mm Hg.[28] Dr. Schwartzstein further opines that, while only a minor factor, the inmate's awareness that he cannot alleviate his dyspnea, given the execution context, would exacerbate his anxiety and the air hunger itself. (Doc. 173-43 at 9, para. 27; doc. 146 at 86:11–20, 87:3–7).

The Court also credits Dr. Bastarache's opinion, given her training and experience, that four inmates executed under the Protocol had flash pulmonary edema, which would have exacerbated their dyspnea. (Doc. 146 at 153:1–13, 155:5–15). As indicated above, flash pulmonary edema is a condition triggered by extreme distress in which the lungs "almost instantaneously" fill with fluid, making it "extremely difficult to breathe." (*Id.* at 155:5–156:2). Dr. Bastarache opines as follows: Of the inmates executed under the Protocol who have had autopsies performed (Smith, Miller, Grayson, and Boyd), all four had evidence of flash pulmonary edema caused by a sudden rise in blood pressure. (*Id.* at

[28] Further, in the Moosavi study, subjects who were exposed to hypoxic conditions corresponding to 75% to 90% blood oxygen saturation reported, on average, mild air hunger when allowed to breathe freely (10% to 15% on the scale used) and moderate air hunger (around 40% on the scale used) when breathing was restricted. (Doc. 173-74 at 4–12). These hypoxic conditions were much less severe than those experienced in executions under the Protocol.

153:1–13, 155:13–15; doc. 173-41 at 4, para. 5). Pulmonary edema is an abnormal autopsy finding. (Doc. 146 at 153:10–13; doc. 173-41 at 4, para. 5). Flash pulmonary edema indicates severe physiological stress; exacerbated the inmates' dyspnea; and would have occurred "very early on in the executions" while the inmates were conscious and "when air hunger was occurring and reaching its peak," because when consciousness is lost, heart rate and blood pressure are low. (Doc. 146 at 155:19–156:25 (Dr. Bastarache trial testimony); doc. 173-41 at 4, para. 6 (Dr. Bastarache report); *cf.* doc. 149 at 27:7–8 (Dr. Antognini opining that pulmonary edema can cause shortness of breath and air hunger "in an awake person"); *id.* at 98:18–21 (Dr. Antognini acknowledging that "a sudden severe rise in blood pressure can be explained by a sudden extreme level of physiological stress")).[29] Dr. Bastarache, who has been to dozens of autopsies and reviewed hundreds of autopsy reports (doc. 146 at 128:11–14), methodically explained the different types of pulmonary edema and credibly explained how the four inmates' autopsies showed evidence of flash pulmonary edema (*see* doc. 146 at 153:4–155:15).[30]

Finally, the Court credits Dr. Schwartzstein and Dr. Bastarache's opinion that hypoxia causes dyspnea even when carbon dioxide levels are normal and, therefore, the

[29] Dr. Shante Hill, the pathologist who autopsied Smith, testified in prior litigation that pulmonary edema is "expected in cases of asphyxia or hypoxia" and is a very common finding in autopsies. (Doc. 173-143 at 7:11–8:10). Further, Dr. Antognini asserts that "[p]ulmonary edema at autopsy is common and is a non-specific finding in a variety of causes of death." (Doc. 173-141 at 20, para. 36). However, neither Dr. Hill nor Dr. Antognini offered an opinion about flash pulmonary edema. Additionally, Dr. Hill did not offer an opinion about whether pulmonary edema can exacerbate dyspnea, nor did she address the autopsies of Miller, Grayson, or Boyd. For these reasons, the Court assigns less weight to Dr. Hill's and Dr. Antognini's opinions on these issues.

[30] Dr. Bastarache does not claim that flash pulmonary edema causes traditional physical pain.

lack of carbon dioxide buildup in the mask does not eliminate or reduce the possibility of severe air hunger. The Court bases this finding on Dr. Schwartzstein's and Dr. Bastarache's expertise, their extensive experience studying dyspnea and treating dyspneic patients, and the scientific literature. According to Dr. Schwartzstein, the opinion that dyspnea is primarily caused by carbon dioxide buildup—an opinion Dr. Antognini espouses—used to be the prevailing view, but more recent research has altered that understanding. (*See id.* at 36:5–37:2 (Dr. Schwartzstein trial testimony); doc. 173-74 at 1 ("There is a commonly held notion, prevalent in the altitude literature, that dyspnea does not accompany hypoxia.")).[31] Additionally, in Dr. Schwartzstein's experience, the "vast majority of patients who are short of breath have normal or low levels of carbon dioxide." (Doc. 146 at 36:7–8). And in Dr. Bastarache's clinical experience, providing supplemental oxygen is a common treatment for air hunger, and in her over twenty years of experience, "[a] near universal feature of hypoxic patients is that when their supplemental oxygen is removed, they become panicked, breathless, voice distress over 'not getting enough air,' and plead for their supplemental oxygen to be replaced even if their carbon dioxide levels are normal." (Doc. 173-42 at 1, para. 1). For these reasons, the Court finds that the Protocol likely causes severe air hunger.

[31] Dr. Schwartzstein relies on the Moosavi study (doc. 173-74), which Dr. Antognini does not address. In that study, which sought to study humans' relative responses to hypoxia and hypercapnia, sixteen subjects underwent experiments in which they breathed either through a mouthpiece or a face mask. (*Id.* at 1–2). The subjects were exposed, at different times, to hypoxic gas mixtures and hypercapnic gas mixtures. (*Id.* at 2). The study found that, when ventilatory drive was the same, "both the quality and intensity of air hunger were the same" with hypoxia and hypercapnia. (*Id.* at 9).

B. Duration of Air Hunger

The parties also vigorously contest how long it takes inmates to become unconscious under the Protocol, and relatedly, how long they are capable of experiencing suffering. In earlier cases, the time component was based on the time to unconsciousness because no one argued that an unconscious person can feel pain. *See, e.g.*, *Boyd*, 2025 WL 2884410, at *17 ("A key question is how long a person will experience emotional terror and psychological distress when he is executed under the Protocol. Resolving this question depends on how long it will take for the inmate to become unconscious, as no party contends that an unconscious person can feel pain or distress."). Here, however, Lee contends that the relevant time extends beyond apparent unconsciousness based on Dr. Schwartzstein's opinion that people can experience dyspnea even while apparently unconscious or "unawake." (*But cf.* doc. 147 at 41:7–16 (Dr. Williams' testimony that people do not experience pain after losing consciousness, whether they are rendered unconscious by a loss of blood flow to the brain or by anesthesia); doc. 149 at 27:7–10 (Dr. Antognini opining that a person who has pulmonary edema while unconscious will not experience sensations of shortness of breath or air hunger)).

Based on his opinion that inmates are rendered unconscious within approximately sixty to seventy-five seconds after the nitrogen gas is turned on, Dr. Antognini claims that "any distress or suffering" from air hunger "is going to be very, very brief if at all present because of the rapid onset of unconsciousness." (Doc. 149 at 61:17–19, 88:11–19). While Dr. Bastarache posits a theoretical "floor" of two minutes and eighteen seconds to unconsciousness, she claims that four inmates previously executed under the Protocol

remained conscious for between three and seven minutes. (*See* doc. 146 at 145:1–8 (Smith), 146:16–19 (Miller), 148:21–23 (Grayson), 150:15–19 (Hunt)). Citing brain imaging studies and studies of hospital patients who later developed PTSD attributable to the dyspnea experienced during mechanical ventilation, Dr. Schwartzstein opines that the human brain can continue to process "respiratory-related brain suffering"—i.e., distress evoked by dyspnea—even when the person is apparently unconscious or "unawake," and that the brain likely continues processing these stimuli for three to five minutes after the inmate is no longer "awake." (*See* doc. 146 at 47:8–20, 48:15–49:13, 53:15–17, 78:20–24). Thus, considering Dr. Bastarache's and Dr. Schwartzstein's opinions together, Lee contends that inmates executed under the Protocol experience dyspnea-induced suffering for six to twelve minutes.

The Court first addresses Dr. Schwartzstein's view on the unconscious experience of suffering and explains why, on this record, any unconscious experience of dyspnea does not rise to the level of an Eighth Amendment violation.

1. Unconscious Brain Processing of Dyspnea

Dr. Schwartzstein uses terms like "consciousness" and "experiences" in ways that are unfamiliar to an ordinary English speaker. According to him, an "unawake" person "experiences" and is "conscious." (*See, e.g.*, doc. 146 at 48:18–21 (Dr. Schwartzstein explaining that when he says "not awake," he means "colloquially unconscious")); *id.* at 51:23–24 (Dr. Schwartzstein noting that patients still experience dyspnea "in the unawake state")). Dr. Schwartzstein's view is premised upon his definitions of "experience" and "consciousness" as the "processing of stimuli by the brain"—specifically here, the brain's

"processing" of dyspnea while unawake but before the onset of death. (*Id.* at 48:20–22 ("[I]f they're not awake, colloquially unconscious – we cannot exclude respiratory-related brain suffering.")). In support, Dr. Schwartzstein cites studies of ventilated, sedated hospital patients who later "woke up" and suffered from mental health issues, including PTSD, attributable to the dyspnea experienced during mechanical ventilation. (*See id.* at 49:4–13; doc. 173-43 at 10–11, paras. 32–33; *see also* doc. 173-82; doc. 173-57). He further relies on data from brain imaging, which he says shows that "adverse experiences are processed by the brain even when the patient is unconscious from sedation." (Doc. 173-57 at 5). And under Dr. Schwartzstein's definitions, the movements of a person who is unawake or anesthetized and reacts to a stimulus in a controlled manner (i.e., by rolling over or flinching) are "purposeful" movements which evidence brain processing of stimuli. (*See* doc. 146 at 48:22–24; *see also* doc. 173-43 at 12, para. 37)

The Court does not suggest that Dr. Schwartzstein's opinion is, in the clinical context, incorrect, unworthy of credence, or lacking in value. But, on this record, three to five minutes of unconscious brain suffering (*see* doc. 146 at 53:15–17) is merely "an inescapable consequence of death" that would attend virtually every other method of execution and, therefore, does not amount to a significant experience of pain or suffering, *see Baze*, 553 U.S. at 50.[32] And for purposes of this Opinion, a person who is "unawake"

[32] The Supreme Court has not squarely addressed whether the brain's processing of suffering during a period of unconsciousness, or "unconscious brain suffering," is cognizable under the Eighth Amendment. The Court does not suggest that inflicting abuse upon an unconscious inmate during an execution would be constitutionally permissible. *See Wilkerson*, 99 U.S. at 135. Yet absent actions by the State superadding disgrace in such a manner, it is questionable whether unconscious brain suffering can qualify as unconstitutional pain or suffering.

is unconscious, and a person who is unconscious does not experience or perceive dyspnea of a constitutionally relevant kind.

2. Time to Unconsciousness

Having addressed the issue of unconscious brain suffering, the Court focuses on what the record supports regarding how long inmates remain conscious and capable of feeling air hunger. Considering all of the evidence in this case, the Court finds that, more likely than not, inmates lose consciousness in not significantly more than one to three minutes after nitrogen begins to flow into the mask. This timeframe considers both the data on which Dr. Antognini relies, including the hypoxia system demonstrations and literature which consistently shows hypoxia resulting in unconsciousness in one minute or less, and Dr. Bastarache's two minute and eighteen second baseline, with a reasonable margin to account for variability among individuals. Even if consciousness may persist for slightly longer than three minutes in some instances, which the Court doubts, the record does not support a finding that consciousness persists for five, six, or seven minutes. The Court examines Dr. Antognini's and Dr. Bastarache's opinions on time to unconsciousness in more detail below.

But here, even if unconscious brain suffering without any actions that superadd disgrace could amount to constitutionally cognizable pain, the unconscious brain suffering that Dr. Schwartzstein says occurs under the Protocol is not "well beyond what's needed to effectuate a death sentence," *Bucklew*, 587 U.S. at 136–37, so it is not cruel in the constitutional sense, *cf. Baze*, 553 U.S. at 50 (excluding suffering that is "an inescapable consequence of death").

Additionally, the Court finds noteworthy that Dr. Williams—another of Lee's experts—testified that people *do not* experience pain after losing consciousness. (Doc. 147 at 41:9–16). While not dispositive, the Court is also mindful that it should not become "embroil[ed] . . . in ongoing scientific controversies beyond [its] expertise." *See Baze*, 553 U.S. at 51.

a. Dr. Antognini on Time to Unconsciousness

In addition to his clinical training and experience, Dr. Antognini bases his opinions regarding time to unconsciousness on: (1) the demonstrations of Louisiana's and Alabama's nitrogen hypoxia systems (docs. 173-198; doc. 173-41 at 11–12, para. 19); (2) the Ernsting study of three subjects inhaling nitrogen gas (doc. 173-162); (3) case reports of suicides using inert gas (docs. 173-165, 173-166, 173-167); and (4) studies of hypoxia in pilots (doc. 173-161).[33] The demonstration of Louisiana's system shows that the oxygen level inside the mask rapidly decreased to 0.8% oxygen within one minute after nitrogen began to flow. (Doc. 149 at 17:1–15; doc. 173-198). A person subjected to a 0.8% oxygen environment "would become unconscious very quickly from that, and if it's sustained, they would die." (Doc. 149 at 17:16–23). Like Louisiana's, the Alabama demonstration shows the oxygen concentration in the mask quickly plummeting: less than twenty-four seconds after the breathing air supply is cut off and nitrogen is turned on, the oxygen concentration is less than 6%, which is "just sufficient to maintain consciousness." (Doc. 173-41 at 11–12, para. 19 (Dr. Antognini discussing ADOC demonstration); *id.* at 22, para. 40; *see also* doc. 146 at 132:15–16 (Dr. Bastarache testifying that an oxygen concentration of less than 5% is "where you start to get critically low oxygen levels of inspired gas")). And forty-two seconds after the nitrogen gas is turned on, the concentration is 2%, which would rapidly cause death. (Doc. 173-141 at 11–12, para. 19; *id.* at 16, para. 26 (Dr. Antognini declaration)).

[33] While this is not an exhaustive list of materials upon which Dr. Antognini relies, these are the materials the Court finds most probative.

In addition to the demonstrations, Dr. Antognini relies on studies and reports of several real-world examples of hypoxia causing unconsciousness relatively quickly. In the Ernsting study, three healthy male subjects were instructed the empty their lungs of air, after which nitrogen began to flow, and they then were instructed to breathe as deeply as possible. (Doc. 173-162 at 1–2). The subjects lost consciousness in seventeen to twenty seconds, during which they exhibited convulsions. (*Id.* at 4, 10). Further, the suicide case reports involved subjects breathing inert gas, including nitrogen and helium; some of the subjects were directed to empty their lungs of air and then take a deep breath of the gas. (*See, e.g.*, doc. 173-167 at 3–4). Time until loss of consciousness ranged from ten to fifty-five seconds. (*See* doc. 173-166 at 4; doc. 173-167 at 4 tbl. 3). And in the pilot studies, military pilots lost consciousness in approximately five to six seconds at high altitudes. (*See* doc. 173-161 at 5–6; *see also* doc. 149 at 35:16–20 (Dr. Antognini trial testimony explaining that rapid decompression could occur "in the order of five, six, [or] seven seconds")).

Regarding movements observed in past nitrogen hypoxia executions, Dr. Antognini testified that "[i]t's hard to know . . . if some of these movements are just spontaneous movement even before the nitrogen starts," and that "there can be a lot of movement associated with the decreased oxygen" after the inmate becomes unconscious. (Doc. 149 at 19:16–21). He explains that when the brain and spinal cord are not getting enough oxygen, their neurons start "fir[ing] off," which causes twitching and other movements, such as leg raising. (*Id.* at 19:21–20:3). He opines that unconscious movement when a person is dying is "common," and he was "not surprised" that movements have been

observed during hypoxia executions. (*Id.* at 20:3–7). He did not, however, offer an opinion about how long any inmate had remained conscious during past executions under the Protocol. (*See id.* at 89:8–11 (Dr. Antognini agreeing that he "cannot tell the precise moment when any individual inmate became unconscious during execution by nitrogen hypoxia")).

b. Dr. Bastarache on Time to Unconsciousness

In formulating her opinion that the baseline minimum time to unconsciousness is two minutes and eighteen seconds, Dr. Bastarache's analysis proceeds in three steps: (1) the amount of time it takes, after the nitrogen gas is turned on, for oxygen to be purged from the mask; plus (2) the amount of time it takes for the inmate to exchange the oxygen in his lungs with 100% nitrogen; plus (3) the amount of time it takes for blood to circulate and deliver oxygen throughout the body. (*See* doc. 146 at 130:11–24, 138:3–8).

Dr. Bastarache calculates that Step 1 takes thirty-three seconds based on Dr. Antognini's testing of the ADOC's nitrogen hypoxia system, represented in a chart, and her general knowledge that an oxygen concentration in the air of less than 5% (compared to the norm of 21%) is "really where you start to get to critically low oxygen levels of inspired gas." (*See id.* at 132:15–16; *see also* doc. 173-141 at 11). In Step 2, Dr. Bastarache estimates that it will take approximately forty-five seconds for the lungs of an older inmate—in his 50s, 60s, or 70s—to displace any residual oxygen present when the Protocol begins and to completely fill with nitrogen. (Doc. 146 at 133:23–34:10). In Step 3, because oxygen is delivered to the body by blood circulation, Dr. Bastarache estimates that it will take several circulatory cycles—totaling another sixty seconds—for the oxygen in the

blood to reach a level where the inmate would lose consciousness. (*Id.* at 136:8–137:2). In her view, these three time intervals are additive and largely do not overlap. (*Id.* at 135:12–36:2; 137:10–19).[34]

Based on her review and analysis of eyewitness accounts of four earlier executions (Smith's, Miller's, Grayson's, and Hunt's), Dr. Bastarache opines that inmates have remained conscious for between three and seven minutes, and that, accordingly, inmates in future executions would likely also remain conscious for between three and seven minutes. (*See, e.g.*, doc. 146 at 146:16–19, 148:21–23). As explained above, her three-to-seven-minute estimate is based on her interpretations of reports of the inmates' movements after nitrogen apparently began flowing into the mask, including reports from media witnesses and from Dr. McAlary. She interprets certain reported movements as "purposeful" and thus evidence of consciousness. (Doc. 146 at 141:12). She testified that she interprets lay witnesses' observations "every day" when treating patients. (*Id.* at 128:20–29:5). Her methodology consisted of reviewing the reports from prior executions, noting when the author estimated that nitrogen began to flow, and then identifying which of the inmate's movements as described by the author were "purposeful." (*Id.* at 140:24–42:1). In particular, she looked for movements such as rolling, attempting to sit up to breathe, legs

[34] Dr. Antognini disagrees with this analysis, contending that Steps 1 and 2 have substantial overlap because the oxygen in the lungs "is decreasing during that 30-second period when the mask is beginning to fill with the nitrogen." (Doc. 149 at 11:1–12:1). He further disagrees with Step 3, explaining that the "red blood cell that she talks about is coming down, going up to the brain and then coming back down, there's blood behind it that . . . has less oxygen in it. It's picking up less oxygen from the lungs and then getting into the brain." (*Id.* at 12:13–17). In contrast to Dr. Bastarache, he contends that these three steps are "happening all at the same time." (*Id.* at 12:19).

lifting up, lifting of the head, clenching of the fists, and pulling against the restraints. (*Id.* at 141:2–14, 144:18–25, 146:2–11).

Based on her review of the witness accounts, she estimates that Smith was conscious for four minutes, Miller for seven minutes, Grayson for "[b]etween three and five minutes," and Hunt for "approximately six minutes." (Doc. 146 at 143:20–145:8; 146:16–19; 148:21–23; 150:15–19). Regarding Smith's execution, she relies on a media witness's report that, in the four minutes after nitrogen apparently began flowing, Smith made movements such as writhing and convulsing, shaking, and clenching his fists and legs, which she considers purposeful movements. (*Id.* at 144:18–25; *see* doc. 173-31). For Miller's, she similarly relies on a media witness's report, which indicated that Miller exhibited what she deems purposeful movements—lifting his head from the gurney and struggling against his restraints—for approximately seven minutes. (Doc. 146 at 146:2–19; *see* doc. 173-129). For Grayson's, she cites Dr. McAlary's report that Grayson lifted both legs off the gurney around three minutes after nitrogen apparently began flowing, which she considers a purposeful movement. (Doc. 146 at 148:4–23; *see* doc. 173-19). And for Hunt's, she cites a media witness's report that Hunt's body shook approximately two minutes after nitrogen gas presumably began to flow, that he lifted his feet into the air approximately two minutes later, and that his "left fist was balled tightly" another two minutes after that, all of which she considers purposeful. (Doc. 146 at 150:10–14; *see* doc. 173-88).

When asked why, in her view, these four inmates remained conscious for longer than her theoretical baseline, Dr. Bastarache explained that many factors can increase the

time it takes for a person exposed to a hypoxic environment to lose consciousness. One factor is the variability among individuals. "Each patient is going to have a different experience in time to loss of consciousness. People vary in their sensitivity to hypoxia, their sensitivity to hypercarbia, [and] the time it takes for them to pass out after getting hypoxic. So there's a lot of individual variability." (Doc. 146 at 138:14–18; *see also id.* at 173:10–11 ("[T]here's a wide variability in people's response to hypoxia.")). Additionally, she asserts that because the oxygen concentration in the mask never reaches 0%, an inmate will continue to breathe some minimal oxygen during the execution, thereby extending the time beyond her theoretical estimate. (*Id.* at 171:3–13). Further, she opines that the ADOC's use of chest restraints can increase the time to unconsciousness *if* the inmate cannot take full breaths. (*Id.* at 151:24–25 ("[I]f the inmates aren't able to breathe deeply, that would also prolong the time [to unconsciousness].")).

c. Discussion on Time to Unconsciousness

The Court has not excluded Dr. Antognini's opinions for the reasons explained in its separate Opinion (*see* doc. 175), and the Court finds the data underlying his opinions helpful to the extent they illustrate how human beings react to hypoxia. (*See generally* docs. 173-159; 173-162, 173-165, 173-166, 173-167). And the data consistently show unconsciousness from hypoxia occurring in approximately one minute or less. Nonetheless, the Court questions some of the data on which Dr. Antognini relies because he does not adequately explain how he extrapolated from the data in those studies to reach his conclusions about nitrogen hypoxia executions. Regarding the pilot studies, he acknowledges that the low barometric pressures at high altitudes accelerate the hypoxia

process, and that Holman (where executions occur) is at sea level. (*See* doc. 149 at 81:6–82:1). However, he did not explain whether or to what extent he accounted for this distinction in forming his opinion. Further, regarding the Ernsting studies and suicide case reports, he did not articulate whether or to what extent he accounted for the fact that the subjects received breathing instructions and took deep breaths of the inert gas, despite his acknowledging that inmates in the execution context are "not given any instructions, in terms of inhaling or exhaling." (*Id.* at 79:13–15). And he also acknowledges that the subjects in the suicide case reports were voluntarily ending their lives, which differs from the execution context. (*Id.* at 79:16–18). While extrapolation is permitted, the expert must provide a sufficient basis for the extrapolation. *Arthur v. Comm'r, Ala. Dep't of Corr.*, 840 F.3d 1268, 1311–12 (11th Cir. 2016) (citing *Glossip*, 576 U.S. at 883), *abrogated in part by, Bucklew*, 587 U.S. 119, *as recognized in*, *Nance v. Comm'r, Ga. Dep't of Corr.*, 981 F.3d 1201 (2020). As indicated above, the Court does find the studies on which he relies relevant and helpful to the extent that they demonstrate, relatively consistently, how the human body reacts to low oxygen environments. While the Court finds his opinions worthy of some weight, these unanswered questions create some doubt about the reliability of his sixty to seventy-five second figure.

But the Court also has concerns about aspects of Dr. Bastarache's opinions—in particular, her conclusion that inmates have remained conscious for three to seven minutes after nitrogen gas began to flow, which she justifies based on (1) restrictions on inmates' ability to breathe deeply; (2) the fact that the oxygen concentration in the mask is not 0%; and (3) the inherent variability among individuals. As the Court explained above and

specifically finds below, the record in this case does not support a finding that the chest restraints prevent inmates from breathing deeply during a nitrogen hypoxia execution. Thus, while the Court has no reason to doubt Dr. Bastarache's opinion that inability to breathe deeply could extend the time to unconsciousness, the record does not establish that inmates *are* unable to breathe deeply due to the chest straps—thus, in this case, the inmates' inability to breathe deeply does not help explain her proffered prolonged time to unconsciousness.

As for the oxygen concentration in the mask, it is undisputed that the oxygen concentration reaches 2%, and likely lower. Dr. Bastarache did not explain the extent to which an oxygen concentration of 2% would prolong the time to unconsciousness, nor did she opine that it could account for several additional minutes of consciousness. Given this evidence and the undisputed evidence that an oxygen concentration of 2.1% would rapidly cause death, on this record the Court is skeptical that a 2% (versus 0%) oxygen concentration would significantly prolong the time to unconsciousness beyond her baseline of two minutes and eighteen seconds—and certainly not to five, six, or seven minutes.

That leaves the variability among individuals. According to Dr. Bastarache, different people respond to hypoxia differently (*see* doc. 146 at 172:23–73:11), which Dr. Antognini does not refute. Moreover, Dr. Bastarache testified that hypoxia and loss of consciousness will occur faster in someone with an underlying lung disease than a young, healthy person, based on the "reserves" in the body of a healthy versus unhealthy person. (*Id.* at 189:5–22).

To recap, Dr. Bastarache offers conclusions about the time to unconsciousness in past executions based on witnesses' observations about inmates' movements, in conjunction with her two minute and eighteen second theoretical baseline, which is based on her knowledge, training, and experience. The Court acknowledges that Dr. Bastarache has ample experience interpreting lay witness observations about patients. But in the clinical setting, Dr. Bastarache is *also* able to physically observe her patients, so her conclusions are not solely informed by lay observations. And even if they were, Dr. Bastarache did not testify that she frequently makes *consciousness determinations* based purely on lay observations. Additionally, the State presented conflicting expert testimony from Dr. Antognini that inmates can be expected to exhibit twitching and movement—including leg raising—after becoming unconscious because the brain's and spinal cord's neurons are "fir[ing] off" due to decreased oxygen. (Doc. 149 at 19:19–20:3).

Considering the unchallenged evidence about near-zero oxygen levels and her theoretical baseline, the Court finds that Dr. Bastarache has not adequately supported her opinion that consciousness persisted for five, six, or seven minutes while inmates breathed nearly 100% nitrogen gas. The Court acknowledges her testimony that the inmates' "purposeful" movements are evidence of prolonged consciousness, and the State did not directly rebut her testimony about time to unconsciousness for these inmates. Nonetheless, the Court does not find her opinion on this point plausible in light of the record as a whole and the other uncontested evidence. *See Mims v. United States*, 375 F.2d 135, 140 & n.2 (5th Cir. 1967) (observing that "questions of the credibility and weight of expert opinion testimony are for the trier of fact, and that such testimony is ordinarily not conclusive even

where it is uncontradicted," and collecting cases); *Negron v. City of Miami Beach*, 113 F.3d 1563, 1570 (11th Cir. 1997) (observing that "the district court as factfinder was free to reject [the] expert testimony, even if it was uncontradicted" (citing *Gregg v. U.S. Indus., Inc.*, 887 F.2d 1462, 1469–70 (11th Cir. 1989))). Moreover, the prolonged times to unconsciousness which Dr. Bastarache identifies—five, six, and seven minutes—are far afield from much of the data Dr. Antognini cites on time to unconsciousness in hypoxic environments. While not dispositive, Dr. Antognini's data are relevant and inform the Court's consideration of the prolonged times to unconsciousness posited by Dr. Bastarache. Even if Dr. Antognini's sixty-to-seventy-five second figure is not exactly right, it does not follow that this record supports figures of five, six, or seven minutes.

In sum, the Court does find Dr. Bastarache's baseline figure plausible, as it concretely describes the mechanism by which consciousness is lost under the Protocol. However, she did not provide a sufficient basis for the Court to find that inmates are likely to remain conscious for as many as five, six, or even seven minutes while breathing nearly 100% nitrogen gas.

Having resolved these factual disputes and explained its findings, the Court now turns to the legal issue of whether the Protocol causes unconstitutional suffering.

C. Whether the Protocol Causes Unconstitutional Suffering

To prevail on his method of execution claim, Lee must show by a preponderance of the evidence that the Protocol (1) creates a substantial risk of severe pain, and (2) "there is an alternative that is feasible, readily implemented, and in fact significantly reduces a substantial risk of severe pain." *See Nance*, 169 F.4th at 1318 (quoting *Barber*, 73 F.4th at

1318). Even without a showing of physical pain, Lee may succeed if the Protocol "induces psychological terror or pain that is severe enough to support an Eighth Amendment claim." *Grayson*, 121 F.4th at 900 n.3. But "[p]sychological pain or mental suffering is a likely result of being sentenced to death and anticipating the execution." *In re Ohio Execution Protocol Litig.*, 881 F.3d 447, 450 (6th Cir. 2018) (citation omitted). The Protocol does not implicate the Eighth Amendment unless it very likely causes "*needless* suffering," *Baze*, 553 U.S. at 50 (emphasis added), or "cruelly *superadds* pain to the death sentence," *Bucklew*, 587 U.S. at 134 (emphasis added).

After careful consideration, the Court finds that Lee has failed to show that the ADOC's nitrogen hypoxia execution protocol causes severe pain or suffering "well beyond what's needed to effectuate a death sentence." *See id.* at 136–37. Because Lee has failed to show that the Protocol poses a substantial risk of severe pain, the Court pretermits discussion of his proposed alternative method of firing squad.

As discussed above, the evidence shows that the Protocol likely causes severe air hunger—the most severe form of breathing discomfort—for one to three minutes. As Dr. Schwartzstein and Dr. Bastarache explain, air hunger results in profound physiological discomfort and distress, as well as anxiety, fear, and dread. In evaluating whether the air hunger induced by the Protocol cruelly superadds pain beyond that required to extinguish life, *see Resweber*, 329 U.S. at 464, the Court is mindful of the clinical context from which Dr. Schwartzstein's and Dr. Bastarache's opinions arise. When treating patients in a clinical setting, the goal is to minimize pain, alleviate discomfort, and prevent death. But in an execution, the goal is to *cause* death—and because the Constitution does not

guarantee inmates a painless death, *Bucklew*, 587 U.S. at 132, all executions presume a risk of some pain, *see Resweber*, 329 U.S. at 464; *Boyd*, 2025 WL 2884410, at *20 (citing *Bucklew*, 587 U.S. at 132). The Court acknowledges that patients have described air hunger as "the worst thing that could ever happen to you" and "worse than pain." (Doc. 146 at 28:2–9; doc. 173-51 at 1). But air hunger is "the worst thing" and "worse than pain" because it is associated with the fear of death, which doctors can take steps to avoid for their patients but which is the very goal of an execution. (*See* 173-51 at 1 at 2–3 (patients describing air hunger: "*Scared. I thought the world was going to end, like in a box . . . . I'm going to die. I might not make it*" and "[*W*]*hen the shortness of breath was at its extreme, I thought I was going to die and saw a coffin beside me.*" (emphases in original))). Although physicians might find the air hunger induced by the Protocol problematic if reported by one of their patients, it does not necessarily follow that it is unconstitutionally cruel pain in the execution context.

Yes, the Protocol causes air hunger and corresponding emotional pain, anxiety, and dread. Inmates executed under the Protocol will know they are going to die, and their body's survival instincts will kick in, attempting to take in more oxygen while knowing they are unable to do so. The Court also acknowledges Dr. Schwartzstein's testimony that the anxiety caused by the Protocol is evoked by the underlying problem—air hunger—and thus is unique and separate from the baseline anxiety associated with an imminent execution. (Doc. 146:15–47:16). But the anxiety evoked by air hunger remains inextricably intertwined with the fear of dying—and in the execution setting, the *fact* of dying and the inmate's conscious awareness that he *is* dying. Again, this view is

underscored by some of the patients' descriptions of air hunger summarized in the medical literature, discussed *supra*. For Eighth Amendment purposes, the anxiety evoked by air hunger—lasting not significantly more than one to three minutes—is more an "inescapable consequence of death," *Baze*, 553 U.S. at 50, than "'superadd[ed]' pain well beyond what's needed to effectuate a death sentence," *Bucklew*, 587 U.S. at 136–37.[35] As the Court stated previously:

> Every person condemned to die likely experiences feelings of angst, anxiety, stress, or panic. For hundreds of years, condemned inmates—regardless of the execution method—have been placed in the unenviable position of confronting their final moments. On death row, a condemned inmate arguably endures psychological pain from the date his sentence is imposed until the moment of his execution. Every method of execution also inevitably includes several steps signaling that death is imminent. The condemned inmate eats a last meal, says goodbye to loved ones, is escorted to the execution chamber, and utters his final words. It is no accident that the Protocol refers to these actions as "last" and "final." The condemned inmate's psychological and emotional pain likely increase as each step is complete . . . .
>
> Psychological and emotional pain are thus unavoidable consequences of capital punishment under any method of execution, past or present. Walking to the gallows, feeling the electric chair's straps tighten, having a target affixed to one's chest, or being secured to a gurney each evokes strong feelings that death is imminent and results in corresponding psychological and emotional pain.

Boyd, 2025 WL 2884410, at *20–21 (citations omitted).

[35] The Court's conclusion is the same when accounting for the several minutes of unconscious respiratory-related brain suffering identified by Dr. Schwartzstein. *See also* discussion *supra* note 32.

True, the Protocol also causes profound and holistic physiological discomfort—although Lee does not claim that it causes physical pain like a broken bone. The physiological discomfort may feel "like an elephant on your chest," "like a boa constrictor," "like running in a race when you had to stop suddenly and feel like you are going to collapse," or even like "suffocation." (*See* doc. 146 at 19:7–12, 32:11–20, 63:1–5). But on this record, this experience, lasting one to three minutes, is similar to that associated with hanging, which has been considered constitutional for over a century. *See In re Ohio Execution Protocol Litig.*, 946 F.3d at 290 (reaching a similar conclusion in a challenge to Ohio's lethal injection protocol); *see also Bucklew*, 587 U.S. at 132 (explaining that hanging often caused death by suffocation, "which would take several minutes," but its use "was virtually never questioned" (citing and quoting STUART BANNER, THE DEATH PENALTY: AN AMERICAN HISTORY 46–47, 170)). Thus, the Court concludes that the physiological discomfort caused by the Protocol does not violate the Constitution.

It bears repeating that "[t]he Eighth Amendment 'does not demand the avoidance of all risk of pain in carrying out executions.'" *Bucklew*, 587 U.S. at 134 (quoting *Baze*, 553 U.S. at 47). On this record, nitrogen hypoxia does not superadd "terror, pain, or disgrace" to the death sentence. *Wilkerson*, 99 U.S. at 135. It is not like drawing and quartering, public dissection, burning at the stake, crucifixion, breaking on the wheel, flaying alive, scourging, starving, gibbeting, rending asunder with horses, or execution in installments—methods that involve severe pain or suffering "well beyond what's needed to effectuate a death sentence." *See Bucklew*, 587 U.S. at 136–37. Instead, it is like hanging, firing squad,

electrocution, and lethal injection, involving only the "necessary suffering involved in any method employed to extinguish life humanely." *See Resweber*, 329 U.S. at 464.

The Court grants that Lee has shown by a preponderance of the evidence that the ADOC's nitrogen hypoxia execution protocol causes air hunger and corresponding anxiety and physiological distress. Physicians likely would be troubled by this outcome in a clinical setting. But this Court is evaluating the constitutionality of a method of execution, where the relevant legal question is whether the Protocol presents "the sort of 'objectively intolerable risk of harm' that qualifies as cruel and unusual" in violation of the Eighth Amendment under the standard articulated by the Supreme Court. *See Baze*, 553 U.S. at 50. On this record, Lee has failed to clear this high bar. Because he has failed to show that the Protocol cruelly superadds pain, Lee has not established that the Protocol violates the Eighth Amendment.

VI. FINDINGS OF FACT AND CONCLUSIONS OF LAW[36]

A. Findings of Fact

In an execution under the Protocol, approximately twenty-five seconds after the breathing air supply is cut off and nitrogen is turned on, the oxygen concentration in the mask is less than 6%. An oxygen concentration of 6.2% is "just sufficient to maintain consciousness." (Doc. 173-141 at 22, para. 40). An oxygen concentration of less than 5% is "where you start to get critically low oxygen levels of inspired gas." (Doc. 146 at 132:15–18).

[36] To the extent that any findings of fact may constitute conclusions of law, they are adopted as such, and to the extent that any conclusions of law may constitute findings of fact, they are adopted as such.

Approximately thirty to thirty-three seconds after the nitrogen gas is turned on, the oxygen concentration in the mask is less than 3%. And thirty-five to forty seconds in, the concentration is less than 2%. An oxygen concentration of 2.1% would rapidly cause death.

Dyspnea is a medical term for breathing difficulty or breathing discomfort. "With few exceptions, dyspnea will provoke increases in respiratory rate (breathing faster) and tidal volume (the size of the breath) in healthy individuals." (Doc. 173-43 at 7, para. 20). Although dyspnea shares similar features with pain, dyspnea is not physical pain like a broken bone; instead, it is a "more holistic discomfort sensation" without a specific source, whereas pain is associated with a particular injury to a part of the body. (Doc. 146 at 11:1–19).

The experience of dyspnea can range from minor to very severe. The most severe form of dyspnea is "air hunger," the sensation of needing to take in more air. For many people, air hunger causes extreme emotional distress, panic, anxiety, and fear because breathing is essential to human life. "Patients often describe air hunger as akin to suffocation or drowning." (Doc. 173-82 at 6). Air hunger "involves activation of brain regions dedicated to basic survival instincts, which include the need to breathe adequately. When breathing is insufficient, severe distress, anxiety and panic are normal and expected human sensations that, under typical circumstances, highly motivate an individual to improve their breathing immediately or face imminent death." (Doc. 173-43 at 7, para. 22) (emphasis omitted). Many people find air hunger "worse than pain" because it is associated with the fear of dying. (*See* doc. 146 at 28:10–18; *see also* doc. 173-57 at 2 ("Although it

shares many similarities with pain, dyspnea can be far worse than pain in that it summons a primal fear response.")).

Several factors cause or exacerbate air hunger, including hypercapnia (too much carbon dioxide), hypoxia (too little oxygen), and restrictions on the size of one's breath. Anxiety can also exacerbate air hunger. Oxygen deprivation alone, while carbon dioxide levels are normal, can cause air hunger. The chest restraints used in executions under the Protocol do not restrict an inmate's ability to breathe deeply and, therefore, do not contribute to or exacerbate any air hunger the inmate experiences.

Several factors can alleviate air hunger, including taking larger breaths and reducing anxiety. In the clinical and research settings, mitigating the dyspneic subject's anxiety is possible. In the research setting, for example, researchers can reassure the subjects that the air hunger is merely part of the experiment, and this reassurance helps the subjects tolerate the discomfort of air hunger. And in the clinical setting, doctors can reassure many patients that the patients' dyspnea is a consequence of their condition and that it does not mean they are going to die. In an execution setting, such reassurance is not possible because the goal is to cause the inmate's death.

Once PO_2 in the blood dips below 60 mm Hg, which corresponds to a blood oxygen saturation level of 90% on a pulse oximeter, the drive to breathe "takes off" and there is a "very strong stimulus" to breathe, making the person "desperate to try to do something to correct the hypoxemia." (Doc. 146 at 43:17–44:6). Because the goal to take the inmate's PO_2 all the way down to 0 mm Hg, the Protocol will evoke an "incredibly strong stimulus"

to breathe. (*Id.* at 44:20–23). In terms of the concentration of oxygen in the air, dyspnea and air hunger begin when the oxygen concentration is below 15%.

An inmate who is executed under the Protocol experiences severe air hunger and corresponding emotional distress, anxiety, physiological stress, and physical discomfort. An inmate executed under the Protocol consciously experiences air hunger and associated distress for not significantly more than one to three minutes. Even if consciousness may persist for slightly longer than three minutes in some instances, the record does not support a finding that consciousness persists for five, six, or seven minutes.

B. Conclusions of Law

While a person's brain may continue to process dyspnea for three to five minutes while the person is unconscious, on this record, this unconscious brain processing is not cognizable under the Eighth Amendment because it is merely an "inescapable consequence of death." *See Baze*, 553 U.S. at 50.

Lee has failed to show by a preponderance of the evidence that the ADOC's nitrogen hypoxia execution protocol causes severe pain or suffering "well beyond what's needed to effectuate a death sentence." *See Bucklew*, 587 U.S. at 136–37. Because Lee has failed to show that the Protocol cruelly superadds pain, the Court need not consider Lee's proposed alternative method of firing squad. It also follows that, on this record, Lee has failed to show by a preponderance of the evidence that the ADOC's nitrogen hypoxia protocol violates the Eighth Amendment.

VII. CONCLUSION

The extinguishment of human life results in suffering. Murder victims often endure a brutal end while their families suffer unimaginable loss. As a result, the people, through their representatives, permit the State of Alabama to impose the ultimate punishment for capital crimes. Americans continue to passionately advocate for and against the death penalty. If history is any guide, these hotly contested debates will continue regardless of a State's chosen method of execution. Although hotly contested in the public square, the "question of capital punishment belongs to the people and their representatives, not the courts, to resolve." *Bucklew*, 587 U.S. at 150. Thus, the Court's inquiry is a limited one: whether Lee has shown by a preponderance of the evidence that the Protocol "presents a risk that is 'sure or very likely to cause serious illness and needless suffering,' and gives rise to sufficiently imminent dangers.'" *Glossip*, 576 U.S. at 877 (emphases omitted) (quoting *Baze*, 553 U.S. at 50).

Although this Court held the first bench trial in the entire country examining the constitutionality of nitrogen hypoxia, the Court does not write on a clean slate. The United States Supreme Court "has never invalidated a State's chosen procedure for carrying out a sentence of death as the infliction of cruel and unusual punishment." *Baze*, 553 U.S. at 48. Time and time again, the Supreme Court "tells us that the Eighth Amendment does not guarantee a prisoner a painless death." *See Bucklew*, 587 U.S. at 132. While Lee establishes that death by nitrogen hypoxia involves some suffering, he fails to show that the Protocol is cruel and unusual in violation of the Eighth Amendment.

Accordingly, the Court DECLARES and ORDERS as follows:

1. Lee has not shown by a preponderance of the evidence that the ADOC's nitrogen hypoxia execution protocol violates the Eighth Amendment;

2. Judgment is entered in favor of the State and against Lee;

3. Costs are taxed as paid.

A separate Final Judgment will be entered.

DONE this 28th day of May, 2026.

/s/ Emily C. Marks
EMILY C. MARKS
UNITED STATES DISTRICT JUDGE

Exhibit F

IN THE UNITED STATES DISTRICT COURT

FOR THE MIDDLE DISTRICT OF ALABAMA

NORTHERN DIVISION

JEFFERY LEE,

Plaintiff,

Vs. CASE NO.: 2:25cv680-ECM

JOHN Q. HAMM, et al.,

Defendants.

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BENCH TRIAL

VOLUME I

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BEFORE THE HONORABLE EMILY C. MARKS, UNITED STATES DISTRICT JUDGE, at Montgomery, Alabama, on Monday, April 27, 2026, commencing at 8:36 a.m.

APPEARANCES

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Proceedings reported stenographically;

transcript produced by computer

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(The following proceedings were heard before the Honorable Emily C. Marks, United States District Judge, at Montgomery, Alabama, on Monday, April 27, 2026, commencing at 8:36 a.m.:)

THE COURT: I did want to check in with you before we get started at 9:00. Just as a reminder, the rule has been invoked. I don't know who your witnesses are, so you'll need to check and make sure that your witnesses are not in the courtroom during the testimony.

I also wanted to let you-all know, I am reversing myself on the admissibility of Defense Exhibits 11 and 13. I am going to -- to a degree. I do believe they constitute inadmissible hearsay if they're being offered for the truth of the matter asserted, but I am going to admit them for the limited purpose of showing that Dr. Antognini's opinion does have support. So it's admissible for that reason and that reason alone, unless something else comes up during the trial proceeding.

MS. KENNY: Your Honor, we will need to renumber those, because we renumbered after your ruling. So they won't be 11 and 13 anymore.

THE COURT: That's fine.

MS. SIMPSON: Would Your Honor prefer that we just pull them from the binders now or leave them in the binders? In the defendants' binders.

THE COURT: I had ruled that they were not to be admitted. And actually, you-all had withdrawn one of those exhibits. I presume you withdrew the exhibit in response to my ruling.

MS. SIMPSON: Yes, Your Honor.

THE COURT: So I will give you -- obviously, you can continue with your decision to withdraw it, or you can alter your opinion about that.

MS. SIMPSON: I am so sorry. Because we changed the number, would you just clarify for the record which exhibits you're on right now?

THE COURT: Yes. Those are Dr. Nitschke's tweet and deposition.

MS. SIMPSON: Thank you, Your Honor.

THE COURT: And then I just wanted to check in with you if you had had an opportunity to confer about the pulse oximeter data and how that will affect how the trial is proceeding. Is there still the expectation that we will hear testimony today, potentially tomorrow, and then reconvene at a later date?

MS. SHARPE: Yes, Your Honor.

MS. SIMPSON: Yes.

THE COURT: All right. Are there any issues that have arisen since the pretrial conference that we need to discuss before we get the trial started?

MS. SIMPSON: We've agreed to their demonstratives,

Your Honor, so --

THE COURT: All right. Very good.

MS. KENNY: And we will add -- tomorrow morning we will add the two Nitschke exhibits as 58 and 59, and we will have them printed and put them in the binders before we use them tomorrow.

THE COURT: All right. Anything else? All right. Very good. You have 20 minutes. We'll get started.

(Recess from at 8:40 a.m. until 9:08 a.m., at which time the proceedings reconvened, as follows:)

THE COURT: Good morning. We're here for the trial in the case of Lee versus Hamm, case number 25cv680.

I'll take appearance for the plaintiff.

MS. SHARPE: Good morning, Your Honor. Paige Sharpe from Arnold & Porter on behalf of Jeffery Lee.

THE COURT: Good morning.

MS. WIESNER: Good morning, Your Honor. Jocelyn Wiesner, also from Arnold & Porter, and also on behalf of the plaintiff, Mr. Lee.

THE COURT: Good morning.

MR. CLINE: Good morning, Your Honor. Kevin Cline, also from Arnold & Porter, on behalf of Mr. Jeffery Lee.

THE COURT: Good morning.

MS. THOMPSON: And Anna Thompson, Arnold & Porter, on behalf of Plaintiff Lee.

THE COURT: Good morning. And good morning, Mr. Lee.

MR. LEE: Good morning.

THE COURT: And who do we have here for the defendants?

MS. SIMPSON: Good morning, Your Honor. Lauren Simpson for the defendants.

MS. KENNY: Polly Kenny for the defendants.

MR. THOMPSON: Brenton Thompson for the defendants.

MR. BUTTS: Talmadge Butts for the defendants.

THE COURT: Good morning. I understand we are waiving opening statements. Is that still the plan?

MS. SHARPE: Yes, Your Honor.

MS. SIMPSON: Yes, Your Honor.

THE COURT: All right. Then just as a reminder, the rule has been invoked, and the plaintiff will call its first witness.

MS. SHARPE: Thank you, Your Honor. Mr. Cline will be calling our first witness to the stand.

MR. CLINE: Your Honor, Mr. Lee calls Dr. Richard Schwartzstein to the stand.

Your Honor, as discussed at Thursday's pretrial conference, we have some witness binders with the specific exhibits that we intend to use with Dr. Schwartzstein. May I approach the bench and hand those out?

THE COURT: Please.

MR. CLINE: May I proceed, Your Honor?

THE COURT: Go right ahead.

RICHARD SCHWARTZSTEIN

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MR. CLINE:

Q. Good morning, Dr. Schwartzstein. Can you please state your full name for the record.

A. Richard M. Schwartzstein, MD.

Q. And what do you do for a living?

A. I'm an academic physician at Beth Israel Deaconess Medical Center and Harvard Medical School in Boston. I'm a pulmonary and critical care physician by specialty.

Q. And what does it mean to be a pulmonary and critical care physician?

A. As a pulmonary and critical care physician, I take care of patients with a range of lung and cardiovascular problems in particular that elicit symptoms that impair their ability to work and live. And as a critical care physician, I take care of some of the most ill patients, severely ill patients, in an intensive care unit.

Q. I understand, Dr. Schwartzstein, that you were the medical director of the asthma and dyspnea center at Beth Israel. What can you tell us about that?

A. Yes. This is a center that I started in the early nineties. At the time, I was doing research on shortness of breath. And I was also director of the pulmonary rehabilitation program where patients are sent often after hospitalizations or because of their illness and have difficulty ambulating and doing activities. And so I created this asthma and dyspnea center as a way of providing extra help for patients with asthma, which is a common respiratory problem, but for general patients who have shortness of breath as well.

Q. And, Doctor, we'll get into more details in a minute, but at a high level, what is dyspnea?

A. Dyspnea is an -- it's a sensation of difficulty with your breathing. Discomfort associated with breathing is the most generic definition that is typically used.

Q. And approximately how many patients with dyspnea have you seen and treated over the years?

A. I've been a doctor for a long time, so probably about 15 to 20,000 patients with shortness of breath.

Q. Doctor, we're going to be talking about hypoxia and hypoxemia today. What is hypoxia and hypoxemia?

A. Hypoxia is a term for low oxygen levels. Hypoxemia is a very specific term for low oxygen levels in the blood. So hypoxia might be used to think about tissue in the body with a low oxygen level, whereas hypoxemia typically is used just for the blood. The emia part, it means blood.

Q. Doctor, are those terms sometimes used interchangeably?
A. They often are by people. Yes.
Q. And is it okay if we do that today?
A. Yes.
Q. Doctor, are those conditions, hypoxia and hypoxemia, conditions you treat as a practicing pulmonologist?
A. Yes, on a daily basis.
Q. Doctor, in addition to the treatment that you give to patients, do you also do clinical research?
A. That's correct. I do clinical research focused on physiology with specific attention to the physiology of dyspnea.
Q. And, Doctor, has your expertise in dyspnea been recognized by hospitals and other institutions around the world?
A. Yes. I've been invited to participate in a number of international convocations, if you will, to opine about dyspnea, to review the literature on it, and I've been asked to be a visiting professor at universities around the world, give many talks in continuing medical education programs, things like that.
Q. And, Doctor, just a few more questions on your background. You mentioned that Beth Israel is affiliated with Harvard Medical School; right?
A. That's correct. It's one of the major teaching hospitals for the medical school.
Q. Do you teach at Harvard?

A. I do. I teach in a mandatory first-year course on physiology of the cardiorespiratory system, as well as clinical students in all years of the curriculum.
Q. And lastly, Doctor, are you a member of any professional medical societies?
A. Yes. I'm a master of the American College of Physicians, a fellow of the American Thoracic Society, and a fellow of the American College of Chest Physicians.
Q. Now, when you say you're a master of the American College of Physicians, what is that?
A. There are different levels of membership. You join as a member. Depending on your credentials and things that you've accomplished over time, you can apply to be a fellow in the organization. And then with additional activities that you do, different additional credits to your record, so to speak, you can become a master.

MR. CLINE: Your Honor, Dr. Schwartzstein is an expert in pulmonology and critical care medicine, physiology, hypoxia, dyspnea, and air hunger, and defendants have stipulated to his qualifications.

THE COURT: All right. He's accepted.

Q. (Mr. Cline, continuing:) Doctor, we're going to be talking about a number of your opinions today. Are all of your opinions given to a reasonable degree of medical certainty?
A. Yes, they are.

Q. Now, earlier you gave a high-level definition of dyspnea as breathing discomfort. Let me ask you straight up. Doctor, is dyspnea pain?
A. Dyspnea has features that are similar to pain, but it is different than pain. Pain is associated with often a particular injury to a portion of the body, whether it's an internal organ or external limbs, and dyspnea is a more holistic discomfort sensation that you can't point to and say, this is where my dyspnea or shortness of breath is. So it has a very different quality to it in that sense. It is similar to pain in that it can be rated. It is similar in that it can be minor to very severe, but it is qualitatively really quite distinct from pain.
Q. And qualitatively, how does dyspnea compare to physical pain?
A. There are many descriptors for dyspnea, as there are different descriptors for different types of pain, but it gives you a sense in the most severe forms of threat to your very existence. It's a holistic discomfort, again, something that can't be localized to one part of the body.
And it's very difficult to distract somebody from their shortness of breath. Whereas you can often distract somebody with music or watching television or doing an activity, and people kind of forget about their pain, you can't do that with people who have significant shortness of breath.
Q. Doctor, I think you mentioned that physical pain can range

from mild to severe. Is the same true for dyspnea?
A. That's correct. It can be mild, and it can be incredibly intense.
Q. And is there a term the medical uses to describe this incredible intense level of dyspnea?
A. Generally the most severe forms of dyspnea are characterized by phrases that have become lumped together under the term air hunger: I need more air. I can't get a breath. I can't get air in. So a number of these phrases that, again, collectively we refer to as air hunger, and that is the most severe form of discomfort.
Q. Doctor, is there a way to rate the level or type of dyspnea someone is experiencing?
A. We tend to use what are called ordinal scales, 11 point scales from zero to ten, similar in many ways to what people do with pain. So the intensity is generally rated in that way. What is a little bit different in some of the instruments that we've developed for assessing dyspnea is that there are also qualitative aspects -- again, what does it actually feel like -- which helps distinguish sometimes what the cause of the dyspnea is. So that's important.
And then what's really different about dyspnea compared to pain is this affective or emotional consequence. And so we've developed instruments that allow us to determine that. And there are some kinds of shortness of breath that don't evoke

much in the way of emotional things, whereas others make people anxious and fearful and threatened in ways that other types aren't. So those are ways for us to get a better handle on this situation.

Q. Doctor, are you familiar with the multidimensional dyspnea profile?

A. Yes. That's exactly the instrument that we developed in our laboratory to parse out these different elements. There's intensity. Is it unpleasant, what is the quality of it, does it feel like tightness, which is characteristic of asthma, for example, is it air hunger, which is much more characteristic of things like hypoxemia. So we have that qualitative aspect.

And then, what are the things that are evoked by it? So somebody who might have just increased effort of breathing, some patients with COPD, will talk about that. That doesn't -- generally doesn't evoke a lot of these emotional kind of consequences. But air hunger can really cause this anxiety, fear, fear for your life almost, as part of it. So this is the multi dimensions that we're talking about and we've now used to assess our patients.

Q. And you've said we a few times. I just want to make sure. How are you personally, Dr. Schwartzstein, familiar with the multidimensional dyspnea profile?

A. So I and colleagues that I work with in our laboratory developed this instrument through the studies we were doing,

both on normal individuals whom we made short of breath in the laboratory, as well as patients. And when I was in the asthma and dyspnea center, I actually began this by literally giving people sort of questionnaires, if you will, and saying, tell us what your shortness of breath actually feels like.

What's interesting is historically, we don't ask that question about shortness of breath. I wasn't taught that in medical school. This wasn't a thing then. And during my fellowship, there was something called the McGill Pain Questionnaire that was developed for headaches from Canada where they said, gee, a tension headache is different than a migraine headache is different from other kinds of headaches. And that was the beginning of really thinking about how the qualities of discomfort can tell us about the actual causes of the discomfort. And with that insight, I began doing this work on trying to determine the qualities and the nature of dyspnea, which led to further and further research into this area.

Q. Doctor, can you just give the Court some examples of the types of phrases included in that questionnaire that you helped develop?

A. Again, everything from, it's hard to get a breath, to, I just can't get any air into my lungs. It doesn't go deeply into my lungs. There's a sense of not going in. I just can't get a big enough breath. I have to pay more attention to my breathing. I mean, there's a range of descriptors.

The questionnaire we gave them probably had about 20, and what we would tell patients is put a check mark next to each of the ones that might apply. They would say, now, look at those, and tell me the three that are most characteristic of your dyspnea. And from those three I would then ask, tell me the one that is the best descriptor.

And so, again, for many of these patients, particularly with the more severe dyspnea, they would land on things that we now subsume under this concept of air hunger.

Q. And, again, can you just give us some examples of those specific things that you say they land on when it's at the extreme end of the air hunger.

A. Yes. Mostly comes up to things like, I can't get enough air. It's the worst feeling I've ever had. When this happens to me, I feel threatened for my life. It's quite dramatic in some cases.

Q. Doctor, have you and other scientists published research papers on what patients have said about what it's like to experience severe dyspnea?

A. Yes, we have. Both patients who come to us in an outpatient setting, as well as patients who are admitted to the hospital.

Q. Let's look at a few of those articles.

MR. CLINE: If we could pull up Exhibit P0049.

Your Honor, these -- that exhibit has been preadmitted and, in fact, all the exhibits that I intend to use with

Dr. Schwartzstein today have been preadmitted.

THE COURT: All right. We have talked about preadmission, but we haven't actually gone through doing that. So do you want to go ahead and put on the record which specific exhibits you have agreement that can be preadmitted?

MR. CLINE: Yes, ma'am. We can do that. I believe the agreement is for all the exhibits on the plaintiff's exhibit list?

MS. SIMPSON: Yes, Your Honor. The agreement is for all of the plaintiff's exhibits.

MR. CLINE: But I'm happy to specify if you want.

THE COURT: That's fine. We just need to put it on the record. So all of the plaintiff's exhibits are being preadmitted?

MS. SIMPSON: Correct, Your Honor.

THE COURT: All right. They are admitted.

MR. CLINE: Thank you.

THE COURT: Go ahead.

Q. (Mr. Cline, continuing:) Doctor, in your binder, if you could turn to the exhibit marked P0049.

MR. CLINE: And Your Honor, it should be in your binder as well.

Q. Dr. Schwartzstein, is this a paper that you're familiar with?

A. Yes, it is.

Q. And how are you familiar with it?
A. This paper was done by members of my research group and members of my division that I've worked with on a number of other studies. I was not part of this in terms of getting authorships on it, but it is a group that I've worked with.
Q. Doctor, if we turn quickly to the last page of this study, are you the Richard Schwartzstein that the authors acknowledge there in the acknowledgment section?
A. Yes, I am.
Q. And, Doctor, what is the title of this article?
A. The title is Scared to Death: Dyspnea From the Hospitalized Patient's Perspective.
Q. And where was this published?
A. This was published in one of the British medical journals, related journals, called BMJ Open Respiratory Research.
Q. Is this research article peer reviewed?
A. Yes, it is.
Q. Can you explain what your research colleagues did in this study.
A. In this study they went to patients throughout the hospital.
And I would just note one of the authors is actually a nurse who is often involved with our group as well.
We went to patients throughout the hospital. They were not necessarily admitted because of breathing problems but often had multiple diseases. And we asked them if they were short of

breath, and we found that -- we in the colloquial way, that these were people that I have worked with -- 156 hospitalized patients completed this questionnaire, and a significant number of these individuals were experiencing dyspnea.

I would just note that the results from a study like this led to us mandating in our hospital that like pain, where the accrediting bodies for hospitals that nurses ask about pain on every shift, we mandated that nurses ask about dyspnea on every shift because it was going unnoticed and unappreciated in the hospital.

Q. And what did your research colleagues find when they surveyed patients with dyspnea?

A. They found that, again, patients were experiencing dyspnea, and it was unknown, frankly, to some of the caregivers at the time.

Q. Doctor, if you could turn with me to the second page on the left-hand column in the section titled Emotion Related to Dyspnea. What were some of the ways patients in this research study described the experience of dyspnea?

A. So there are a number of quotes that we put in because it was -- that they put in doing this because it gives you the real sense of the experience for the patients. Breathing discomfort gets to a point where it feels like, I can't take another breath. Feels very stressful and anxious. Another phrase, panicking. Couldn't get any air in. Excuse the language, but,

scared the shit out of me. Another one says, scary. Not getting the air in. Another one, scared. I thought the world was going to end. Like in a box. I'm going to die. I might not make it.

Q. And, Doctor, if you look at the bottom of this page and the second column, right-hand column, under metaphors for dyspnea, what were some of the metaphors patients used to describe how their dyspnea felt to them?

A. One patient noted, it's like an elephant on your chest in the commercial. Or another one, like I was running in a race when you had to stop suddenly and feel like you are going to collapse. Or, it feels like a boa constrictor. It felt like there was not enough air in the room.

Q. Doctor, are these descriptions consistent or inconsistent with what patients have told you in your research and clinical practice?

A. Very much consistent with what I've heard over many years.

Q. Doctor, if you can go back to the first page of this article near the bottom of the first column. What, if anything, do these authors write about dyspnea and suffering?

A. Dyspnea causes suffering and predicts substantially increased mortality. And here we go: Dyspnea -- as I just mentioned, increased mortality. That's been shown in other studies as well with dyspnea.

Q. Let me ask you, Doctor, as someone who has researched and

treated patients. Can you explain what the authors mean by dyspnea causes suffering?
A. So dyspnea in this -- in the phrases that I've just read from here that were given by the patients, you get that sense of this is really an incredible, tortuous experience they're going through. It is scary. It provides a sense of doom, of catastrophe almost for some of them, particularly when it occurs for them at rest. I mean, it's one thing to have experience with this when you're exercising. I can stop exercising, and maybe the experience goes away. But when I have this at rest, and there is nothing I can do about it, it is incredibly scary. It is a sense of suffering, because they're not given any treatment for it that seems to work. And so it's a really incredibly disturbing symptom for them.
Q. Thank you, Doctor. We can take that down.
Let's now take a look at Plaintiff's Exhibit 56. And that is also in your binder as well. Is this another study that you rely on for your opinions in this case?
A. Yes, it is.
Q. And what is the title of this study?
A. This study is titled Prevalence, Intensity, and Clinical Impact of Dyspnea in Critically Ill Patients Receiving Invasive Ventilation.
Q. And what journal was this study published in?
A. This is the American Journal of Respiratory and Critical

Care Medicine, which is another peer-reviewed journal.
Q. Anything else you can tell us about the American Journal of Respiratory and Critical Care Medicine?
A. This is the leading journal of the American Thoracic Society, which is the leading organization for academic respiratory and critical care physicians. Many anesthesiologists and surgical critical care people also belong to this. Many international physicians also belong to the American Thoracic Society. So it is -- I would argue it is probably the leading journal for respiratory physicians in the country.
Q. Doctor, if you can turn to page 922 of this article, there's a section titled Dyspnea and Patient Important Outcomes. Do you see that?
A. Yes.
Q. And in the last sentence on that page at the bottom that carries on to the next page, can you read what the authors say about air hunger?
A. "Air hunger is known to be the most disturbing sensation of dyspnea, characterized by its capacity to evoke anxiety, panic, frustration, and fear."
Q. And do the authors provide any citations in support of those statements?
A. Yes. Citations 29 and 30.
Q. Doctor, if you would just quickly look with me to reference

29 and 30 at the end of this article. Do you recognize those references?
A. Yes. They are both from members of my research group. The first one, Banzett, Pedersen, Schwartzstein, Lansing, The Affective Dimension of Laboratory Dyspnea. Air hunger is more unpleasant than work and effort. This was one of the studies in which I was engaged, showing that some of these qualitative aspects of dyspnea are worse, cause more suffering, if you will, than others do. Just having increased work of breathing, which can be bad, doesn't evoke the same kind of discomfort and fear that it does in people with air hunger.
The second one by Banzett, Lansing, and Binks -- again, these are people with whom I've worked -- this is an article called Air Hunger, A Primal Sensation and Primary Element of Dyspnea.
Q. So these authors cited your own research to support their statements about dyspnea?
A. Yes, that's true.
Q. What can you tell us from your own research about the anxiety, panic, and fear provoked by air hunger?
A. This goes back to this questionnaire that we use, this notion of multi dimensions to shortness of breath. Yes, there is a sensation, and yes, it has a qualitative aspect to it, but it also evokes these emotional reactions; these -- this sense of dread, of suffocation, of things that are -- of air hunger that

are just very horrendous for the patient and cause incredible dread on their part.

MR. CLINE: We can take that down. Let's look at another article. If we can put up Plaintiff's Exhibit 55.

Q. Doctor, is this an article that you reviewed and rely on for your opinions in this case?

A. Yes, it is.

Q. And what is this paper?

A. This paper is entitled Dyspnea in a Acutely Ill Mechanically Ventilated Adult Patients. It's a statement of the European Respiratory Society and the European Society for Intensive Care Medicine.

Q. And who are the European Respiratory Society and the European Society of Intensive Care Medicine?

A. European Respiratory Society is analogous to the American Thoracic Society. It's the major academic organization for academic research-oriented pulmonary people in Europe. The European Society for Intensive Care Medicine is, again, a professional organization, primarily for academic, although nonacademic people can certainly join, people who are doing intensive care medicine and, again, might involve both pulmonary people as well as surgical critical care, anesthesia critical care, emergency medicine critical care as well.

Q. Dr. Schwartzstein, did you have any involvement in this ERS statement?

A. Yes, I did.
Q. Is that your name among the list of coauthors there?
A. That's correct. Yes.
Q. Were there any other physicians from this country, the United States, on the committee that authored this European respiratory society consensus statement?
A. No. I was the only American that participated in this process.
Q. And, Doctor, are you familiar with the methodology of how a statement like this is put together?
A. Yes, I am, because we've also done two of these for the American Thoracic Society related to this sort of work. Not mechanically ventilated patients, but this notion of bringing together experts. And what we do is we review the literature on the topic that we're trying to address. We then meet together among the experts and discuss different elements and what do we learn from this and how do we think about it; how will this lead to recommendations for the greater community. And this is in a sense a service that academics provide for the greater community of doctors taking care of patients to help guide them. We then come up with recommendations as well, evidence-based, based on the best research that we have on the topic area.
Q. And, Doctor, what journal was this article published in?
A. So this was published in the European Respiratory Journal, which is the leading journal, also peer reviewed, in Europe for

pulmonary doctors.
Q. Now, Doctor, you had told us and mentioned that the title of this consensus statement is Dyspnea in Acutely Ill Mechanically Ventilated Adult Patients, an ERS/ESICM statement.
What is mechanical ventilation?
A. When a patient develops what's called acute respiratory failure, meaning that whatever their disease process is, they are about to die because they can't get enough oxygen into their blood because they're just not able to sustain themselves, we have to save them, and we do that by putting a tube, an endotracheal tube, into their mouth, down into their windpipe, and then connecting them to what's called a mechanical ventilator. So this is a device that pushes air into the lungs. We can add up to 100 percent oxygen as well to take care of any hypoxia that's going on. And we can control their breathing in a sense by taking over, sustaining them while we're trying to treat the underlying disease or problem that is causing the acute respiratory failure.
Q. So, Doctor, can you explain to the Court how the experience of patients on mechanical ventilation informs your opinions about inmates executed by nitrogen gas?
A. So one of the things that we talked about in this report is that the data has emerged that suggests that people are going to be more short of breath if you have restrained breathing. So one of the problems that we have with mechanical ventilation is

that data has shown if we give people too big a breath with a ventilator, given the disease in their lung, we can overstretch the gas sacs that are called alveoli. And repetitive overstretching of the gas sacs will lead to lung injury. It's called volume-induced lung injury or VILI. So we have to constrain the tidal volume. The tidal volume is the word for the size of your breath. We all take normally about 400 milliliter breaths, little bit less than half a liter.

If we give people bigger breaths with the ventilator and they have injured lungs, we can further injure the lung. So we have to give them relatively smaller breaths. And that makes their shortness of breath worse.

When you are short of breath, you want to take bigger breaths. It's just the reaction of the body to try to compensate for it. And by keeping people with smaller breaths, we are making them more short of breath.

Q. And so how does that relate to -- how does restrained breathing relate to what's happening during a nitrogen hypoxia execution?

A. So based on pictures that I've seen of people who are going through this process of nitrogen asphyxiation, they are placed on a gurney and they have straps that are placed around them from their shoulders, down to their upper abdomen, and they're tight enough that people can't really sit up or move very much from there, and that they are likely to be restraining the

motion of the chest wall and the upper abdomen.

And I mention the upper abdomen in part because when your diaphragm moves, it has to push the abdominal contents out of the way. And if you actually looked at somebody breathing, their abdomen moves out. So if your abdomen and chest wall can't move out, then we are restricting the tidal volume, the size of the breath. And if somebody has an urge to breathe, air hunger, wants to get a deep breath, feels like they can't get enough air, that's all made worse by the inability to get that deeper breath.

Q. Now, Doctor, you used the term nitrogen asphyxiation instead of nitrogen hypoxia. Why do you use that term?

A. Well, the process that's used in this protocol is essentially smothering somebody. So asphyxiation I would argue is the medical term, really, for smothering someone. It's the way that physicians refer to what's happening with this type of protocol.

Q. Thank you, Doctor. Back to Exhibit P55, if you could turn to page 2. In the first sentence of the introduction there, can you read what you and your coauthors wrote about the experience of dyspnea.

A. "Lacking air, having to breathe forcefully, experiencing chest constriction, or more generally the feeling that breathing is abnormal constitute experiences that are among the worst suffering that a human being can experience."

Q. And what did you mean by that?
A. That this type of dyspnea, this air hunger that is associated with these people who are going through this really is an intense experience that is really terrible. It is worse than pain. It is the most unimaginable thing or most -- you can't imagine it. It's just a horrendous experience for people. This is what our patients are telling us, and this is what we are worried about for patients who can't tell us, which is what this paper was about, for people on mechanical ventilation.
Q. Well, Doctor, in fact, in the next sentence, can you explain what you and your colleagues said about dyspnea in relation to pain.
A. "Although it shares many similarities with pain, dyspnea can be worse than pain in that it is consistently associated with the fear of dying."
Q. And can you explain that a little bit more for the Court.
A. It evokes this sense of doom that I just can't do anything about it. I'm going to die. And again, it's distinguished from --
And I'll just use a personal experience. I broke my elbow three years ago in a jogging accident. I got hardware in there with a plate and six screws. And I had terrible pain afterwards, but I could distract myself from it. I wasn't worried I was going to die from that.
And when we've done some of these experiments on healthy

individuals in the laboratory, I've also been a subject for some. I tried it out on myself before we do it with our subjects. And when I've been subjected to this same kind of air hunger that we're talking about, it is totally different, and it is worse than that fractured elbow that I had. I mean, it just -- it's associated with a sense of I've got to escape this, I've got to make this better, that's just different than even really bad pain is.

Q. And, Doctor, is dyspnea associated in any way with physical suffering?

A. I mean, it is a physical suffering that they're going through. This is a part of my body, so it's physical, you know, in that sense, but it has, again, this emotional and affective response to it that just really isn't part of most pain experiences.

Q. Thank you, Doctor. We can put that exhibit down.

You mentioned earlier that you've been involved in other expert consensus documents relating to dyspnea; correct?

A. Yes, that's correct, for the American Thoracic Society as well. Two occasions, yes.

Q. Let's take a look at Exhibit P-74. Can you tell us what this is.

A. I'm having a problem finding it in my binder, but this is the official American Thoracic Society statement, Update on the Mechanisms, Assessment, and Management of Dyspnea.

Q. Doctor, if you need a second to locate it --
A. What was the number again for that one?
Q. P0074.
A. Okay. Got it now.
Q. You've got it, Doctor? Okay. And I think you said this is the -- well, can you tell us what the title of this document is again, please --
A. So this is an official American Thoracic Society statement. Update on the Mechanisms, Assessment, and Management of Dyspnea.

And I just want to explain for a moment, when it says official American Thoracic Society statement. So, yes, we have a group of experts who have, again, come together. This included nurse researchers as well as physicians and physiologists coming together. Again, although it's the American Thoracic Society, there are international people that have been involved in this as well, because they're often members of the ATS.

But once they've come with their conclusion, once we have written a draft of this, it then is reviewed by the leadership of the American Thoracic Society, and they have to acknowledge that it's well done; it meets all the expectations in terms of review of articles and the way this was put together with groups, again, debating various things and so on. So that's how it becomes an official statement. It's quite an elaborate process. I would say it probably took about 18 months. This is

not something that's done overnight. This is a really deliberative process to write something like this.
Q. And can you explain your personal involvement and role in the ATS consensus?
A. Yes. I along with Mark Parshall, who's a nurse researcher, we were the codirectors of this group.
Q. And is P74 the most recent consensus statement from the ATS on dyspnea?
A. This one is from 2012. Yes. We also did one in 1999.
Q. And when you say we, were you involved in that earlier statement --
A. I was also the co-chair -- co --
Q. Sorry, Doctor. Let me finish.
A. Oh, I'm sorry.
Q. For the benefit of the court reporter.
A. Yes.
Q. Let me finish my question, make it a little easier.
Were you also involved in that earlier consensus statement?
A. Yes. I and Dr. Parshall were also the co-chairs of the committee in 1999.
Q. Okay. And, Doctor, what journal is the American Thoracic Society consensus statement published in?
A. As I noted earlier, this is also the American Journal of Respiratory and Critical Care Medicine, again, the leading journal of the American Thoracic Society, also a peer-reviewed

journal.
Q. Thank you, Doctor. If you could turn to page 439 of this document.
A. Yes.
Q. In the top right corner, can you explain what table three is.
A. Table three is titled Descriptors For Air Hunger Commonly Chosen From Lists. And so I had mentioned early on about how we give patients these lists or questionnaires, so to speak, of phrases that other people have used at times for their shortness of breath; which one is commonly chosen by people. So these are descriptors that have been associated with this category of air hunger. And you can see, urge to breathe. Starved for air. Breaths feel too small. Again, that sense, I want to get bigger breaths than I can. Cannot get enough air. I need more air, and I'm feeling a feeling of suffocation.

Again, these are the phrases they use, and you can get the sense of that emotional or affective quality that's associated with it. It's not just a little bit of shortness of breath. I'm starved for air. I'm feeling like I'm suffocating.
Q. Doctor, as part of your research and clinical experience, have your patients described air hunger as a feeling of suffocation?
A. At times, yes.
Q. How about a feeling of being starved for air?

A. Yes. These are among the phrases that I have heard personally.
Q. How about being hungry for air?
A. Yes.
Q. Doctor, we can turn to page 436. In the left side column, top left corner, can you explain what you and your co-authors wrote in this first bullet.
A. "Data from investigations using three-dimensional brain imaging technology demonstrate that dyspnea activates corticolimbic structures." Again, what we're saying now is you have this sensation, and it's actually triggering very specific areas of the brain. It's being processed there in the brain. And being able to make this correlation between I feel this way and, wow, it lights up in the brain at the same time, and it's a part of the brain associated with unpleasant experiences that people have. So this is a nice way of linking what the subject is saying, what the patient is saying, with a neurological correlate that demonstrates how this is being processed neurologically.
Q. And what, if anything, does this data tell us about how dyspnea and pain are related?
A. Well, when you give someone a painful stimulus, you can also find areas of the brain, very similar areas, light up there. And we tend to then think of these things -- again, there are similarities between pain and dyspnea, although there are also

differences. One of the similarities is we can treat them with similar drugs, which are the opioids. That's also mentioned in this paragraph that both endogenous, which are endorphins -- it's a type of endogenous opiate that's released when you're distressed, as well as exogenous medications like morphine or dilaudid that we can use to treat shortness of breath.

Q. Doctor, if you could turn to page 439 of the ATS document.

A. Yes.

Q. In the paragraph that starts with air hunger/unsatisfied inspiration, does the ATS discuss some of the causes or stimuli of dyspnea?

A. They do here. And just to read this first sentence here: "Hunger or unsatisfied inspiration" -- again, another term for air hunger, another phrase for that -- "is intensified by stimuli that increase spontaneous ventilatory drive." So we have a part of our brain that I typically call for my students the controller. The part of the brain that says, breathe this rate. Breathe with this depth of breathing; the size of your breath. So that's ventilatory drive. And the things that provoke that are things like hypoxia, hypercapnia, acidosis, building up of acid in the blood, and signals arising from exercise-related drive. So these are just some of the stimuli that we're talking here.

The last phrase, "Especially if ventilatory response is constrained in some way." So the brain works by saying, I want

to take a breath that, say, is one liter big or one-and-a-half liters big, and I don't let that happen. Well, how does the brain know that? The brain has -- we have receptors all through our body in the muscles, in the joints, in the lungs. And when they do things, when they move, they send information back to the brain saying, this is what you got. You wanted a one-liter breath? Sorry. Half a liter is all you got. And when the brain says, wait a second, I asked for this and I got back this, alarm bells go off. It's not happening the way it should be. And the alarm bell is shortness of breath. Something needs to change. Something has to happen here. Your life is under threat.

Q. Thank you, Doctor. Let's break some of that down.

First, the ATS document mentions hypercapnia. What is hypercapnia?

A. Hypercapnia is elevated carbon dioxide.

Q. Can you give us examples of when hypercapnia would cause dyspnea?

A. So hypercapnia tends to be associated with things where you can't get enough air in and out of the lung. Probably the most common disease that causes that is emphysema where people, because of destruction of lung tissue, are not able to get enough air in and out of areas of the lung that are receiving blood flow and so forth, and they get elevated CO2 levels.

But anything that reduces ventilation. The amount of air

going in and out of the lung per minute, we call that minute ventilation. Anything that reduces that below the level of carbon dioxide that you're producing will lead to elevated levels of carbon dioxide.

Q. Now, Doctor, does a person need to have elevations in carbon dioxide to feel short of breath?

A. No. In fact, the vast majority of patients who are short of breath have normal or low levels of carbon dioxide.

Q. And can you explain that a little more.

A. Well, there are many precipitants for shortness of breath based on which receptors in the lung and other parts of the body are being stimulated. And hypercapnia, again, is relatively uncommon. Hypoxemia, I would say, is much more common than hypercapnia is as well.

Q. And, Doctor, can hypoxemia alone without an elevation in carbon dioxide cause dyspnea and air hunger?

A. It absolutely can. It's relatively appreciated for that now. Historically people didn't really understand how that worked, and so, frankly, even, again, when I was in med school, I wasn't taught about that. But I'm telling you that now as a professor at Harvard med school, I am definitely teaching my students about this and have been for a number of years.

But the literature, particularly from the last 40 years, although a lot of this predates that, it just wasn't in the clinical arena, demonstrates how hypoxemia can cause ventilation

to go up, cause our breathing to go up, and is a strong stimulus for that.
Q. Doctor, you mentioned the literature. Are there studies that looked at whether hypoxemia alone, without hypercapnia, can cause air hunger?
A. Yes. Studies that were performed, again, by members of my research group.
Q. Well, let's take down the ATS document and turn to Plaintiff's Exhibit 72. Tell me when you're there, Doctor.
A. Okay.
Q. Are you familiar with this study, Dr. Schwartzstein?
A. Yes. This is a study by Shakeeb Moosavi, who is actually a British researcher who spent time in our lab doing a postdoctoral fellowship; Dr. Binks, another British researcher with whom I've worked for a number of years; Dr. Lancing from Arizona, a Ph.D. psychologist who was a very big contributor of our work; Dr. Brown from our VA hospital, an expert physiologist and pulmonary physician; and Dr. Banzett is a Ph.D. physiologist as well with whom I've worked.
Q. What is the title of this study?
A. Hypoxic and Hypercapnic Drives to Breathe Generate Equivalent Levels of Air Hunger in Humans.
Q. And what journal was this study published in?
A. This is in the Journal of Applied Physiology, which is arguably the leading journal for physiologists in the world.

Q. Is it also peer reviewed?
A. And is also peer reviewed, yes.
Q. And so what were the authors studying here in this research study?
A. So in a well done, controlled study of healthy individuals who were made hypoxemic by giving them concentrations of gas that had low oxygen levels in it, versus making them hypercapnic, they found equivalent levels of shortness of breath in these subjects. They also found that if I restrained the size of the breath, if I didn't let them take as big a breath as they wanted, as the brain was telling them, that that further exacerbated the shortness of breath that they were experiencing.
Q. And, Doctor, why did your research colleagues look into this issue? In other words, what was the commonly held view about hypoxia as a cause of dyspnea at the time they studied this?
A. The notion for years has been that hypoxia just isn't that bad. We don't see it so much. You know, we see patients who are hypoxemic in the hospital, and they don't seem to be breathing that much or that short of breath. And it comes from a fundamental misunderstanding of the physiology of dyspnea and the way that we have evolved as human beings to do this.
Q. And, Doctor, did you help us create a demonstrative to help explain this point and this point about how we evolved?
A. Yes, I did. It's actually one that I put into my textbook on this and that I use in my teaching on a regular basis.

MR. CLINE: Your Honor, with your permission, I would like to use a demonstrative that depicts Plaintiff's 97. We've showed this to opposing counsel who does not object.

MS. SIMPSON: Correct.

MR. CLINE: May I approach and turn the demonstrative?

THE COURT: You may.

MR. CLINE: Your Honor, I'd also like to ask Dr. Schwartzstein to come down so he can better explain it. May we proceed?

THE COURT: You may.

Q. Dr. Schwartzstein, I think you said these figures were reproduced from your textbook. What can you tell us about your textbook?

A. Yes. So I authored a textbook on respiratory physiology called Clinical Physiology -- Respiratory Physiology: A Clinical Approach because I wanted to make this available to clinicians and to medical students. And this is a required textbook in my first year course as well, and it's used by, frankly, medical schools in the U.S. and internationally. And I've gotten e-mails from people internationally, Imperial College of Medicine in London, as well as people in the Middle East who are using this as well.

So I tried to tie the physiology with clinical medicine because the problem that we had in the past was the

physiologists knew about this and the clinicians didn't. So I'm trying to bring together what we know about physiology, make it available to clinicians from the first year of medical school so they can take better care of the patients and avoid some of the discomforts and things that we know are experienced by patients.
Q. Okay. Doctor, before I ask you to explain what we're looking at here --
MR. CLINE: Just for the record, Your Honor, these figures are on pages 109 and 138 of Exhibit P-79.
THE COURT: Thank you.
MS. KENNY: Your Honor, if Dr. Schwartzstein is going to be pointing to the exhibit, can we either move it or can counsel move so we can see what he's doing? Because we can't see the exhibit.
THE COURT: We can probably do both. If you would maybe turn it so that I can see it but that you can also all see it. If the attorneys need to move, you can feel free to do so.
MR. CLINE: Your Honor, you tell me when is a good angle for yourself. Is that still good?
THE COURT: I can still see it. That's great. And if the attorneys want to move so that you can also see how he's referring to the exhibit -- or to the demonstrative, you can.
A. Your Honor, there are two --
Q. Dr. Schwartzstein, let me ask you a question. Can you just explain what we're looking at here.

A. Your Honor, there are two figures here, and I'm going to start with this one on the left, then go to this one on the right, and back to the left.

Whenever we look at a figure, to begin with you have to look at what the axes are. So on this axis, this is the arterial partial pressure of oxygen. Now, oxygen exists in two forms in our blood. It's dissolved in the liquid part of the blood we call plasma. That term may be familiar to you. It's just mostly liquid and proteins and things like that. And it also exists on hemoglobin in our red blood cells.

And far and away most of the oxygen exists on our red blood cells bound to hemoglobin, but it's in equilibrium with this dissolved oxygen in the blood as well. So we refer to the partial pressure of oxygen, which tells us information about how much is on the hemoglobin. That's just what we often measure, getting a sample of blood from the radial artery. And we live around 100.

Now, on this axis, this is minute ventilation, liters per minute -- so, again, how much air is going in and out of your lung. We use liters in terms of the unit as opposed to gallons or something like that. So liters per minute that's going in and out. And a normal individual might be breathing five or six liters per minute, so way down here. Now, what you notice is that we live with a partial pressure of oxygen of about 100, and we're breathing about, again, five or six liters per minute.

The oxygen saturation, which is a common measure of the pulse oximeters that you may have seen during COVID and so on, where they put this thing on your finger and it tells you what the saturation is, that's looking at the hemoglobin.

So if I have a hundred binding sites on my hemoglobin that can pick up a molecule of oxygen, and we say you're 98 percent saturated, that means 98 out of a hundred of those binding sites have an oxygen molecule. That's really good. That means the content of oxygen in your blood is high. It's going to be delivered to your vital organs so that everything works well.

So at a PO2 of 100, partial pressure of 100, you'll be 100 percent saturated. All the binding sites will be fine. And if you go down to 60 -- so that's a pretty significant drop, 100 to 60 -- actually, ventilation doesn't change, but the O2 saturation doesn't change very much at all either, and that's what I'm going to show over here.

So this now is oxygen saturation. Again, how many of those binding sites? What percent of those binding sites in hemoglobin have oxygen on them? Again, that's where most of the oxygen is in your blood. It's on hemoglobin.

Well, at 100, PO2 of 100, you know, it's right up there near -- almost all the sites are bound with oxygen. And look what happens. As I go from 100 to 60, it doesn't change very much.

Well, why have we evolved that way? I mean, I can be --

drop this oxygen level from 100 to 60, and my hemoglobin is still mostly bound, 90 plus percent bound with oxygen.

And think about a time before medicine, you know, prehistoric times, and you've got this person, and they get pneumonia. Well, if they had a linear relationship like they have here in this area, they would be hypoxic and they would die.

So we evolved in this way because this allows us to have problems with our lungs, mild to moderate problems with our lungs, and still have sufficient --

MR. BUTTS: Objection, Your Honor.

THE COURT: What's the objection?

MR. BUTTS: Narrative testimony.

THE COURT: You need to ask a question.

Q. Dr. Schwartzstein, let me ask. What does the solid line -- well, strike that.

Why does the solid red line at the bottom stay relatively flat or straight from 100 partial pressure of oxygen to 60, but then suddenly shoots up after 60? Can you explain that?

A. So this is relatively flat, as I noted before, because why spend energy breathing more when I'm already still 90 percent saturated? It doesn't make sense. It wouldn't be something that would favor evolutionary development. It's wasted energy.

But now when I get below 60, and I'm dropping my oxygen saturation, and I'm at risk now of organ damage because I don't

have enough oxygen in the blood, suddenly now ventilation takes off and becomes almost a vertical line here. So this now goes from my five or six liters a minute up to 50 to 60 liters a minute, just going down to partial pressures of about 35 to 40. So now I'm desperate to try to do something to correct the hypoxemia. This is a very strong stimulus to breathing.

Q. Doctor, just in layman's terms, what is ventilation? What does that mean?

A. Ventilation is the amount of gas, amount of air going in and out of my lungs. How many liters per minute, every breath. So we measure ventilation, calculate it by our tidal volume, the size of a breath, and the rate at which we're breathing, how many breaths per minute. So the multiplication of size of breath and how many breaths gives me how many liters per minute are going in and out of the lungs.

Q. So, Doctor, how does this figure relate to air hunger and hypoxemia?

A. So, again, the notion, you know, before people clinically were thinking about this was that hypoxemia is not much of a stimulus, but the reality is it's a very strong stimulus. And for this case, with thinking about nitrogen asphyxiation, we're operating below PO2 of 60, and this is an incredibly strong stimulus for ventilation.

Q. Thank you, Doctor.

MR. CLINE: Your Honor, may Dr. Schwartzstein return to

his seat?

THE COURT: Yes.

Q. Doctor, I want to turn back to Plaintiff's Exhibit 72, the Moosavi study that we were looking at before you came down and talked to us about the demonstrative. Can you tell us, what did this study show? What did these authors conclude?

A. The conclusion of this study was that hypoxemia with normal CO2 levels, or even on the low side, produces air hunger and produces symptoms quite similar to what people have with elevated carbon dioxide levels as well. And again, they did this model of constraining ventilation, which exacerbated the shortness of breath.

Q. Doctor, based on the Moosavi study and your own research and experience studying dyspnea over the years, do you have an opinion on whether hypoxia in the absence of carbon dioxide elevation causes air hunger?

A. Yes. This study in particular, figure one I think really demonstrates that hypoxemia definitely causes air hunger in a way that's quite similar to what we see with elevated CO2.

Q. And, Doctor, based on this study and your own clinical and research experience, do you have an opinion on whether hypoxia in the absence of carbon dioxide elevation can cause suffering?

A. Yes. This is a very definitive study in that regard.

Q. Doctor, I want to shift gears. Can patients experience dyspnea and dyspnea-related suffering even when not conscious?

A. Yes. I believe that the studies that are emerging now really give us that conclusion, that people can have dyspnea even when they're not awake.

MR. CLINE: If we can pull back up Plaintiff's Exhibit 55, which we looked at earlier this morning.

Q. Let me know when you find that in your binder.

A. Yes, I have that up now.

Q. This is the ERS consensus statement that you co-authored; correct?

A. That's correct.

Q. And if you turn to page 3 of this consensus statement, in the second paragraph, the paragraph right before you get to table one, you and your coauthors refer to signs of respiratory distress that may indicate the presence of dyspnea. Can you explain what that refers to.

A. The term sign in medicine is something that we observe. So it's some action or visible element of the patient that we're observing that gives us information about underlying symptoms that they're having or pathophysiologic processes occurring in the patient.

Q. And, Doctor, further down in the next sentence, what did you and your co-authors mean when you write, "The inability to verbally or physically report a symptom does not mean that its source is not present and does not cause suffering, as clearly acknowledged about pain"?

A. So, again, we look at a patient who is demonstrating various things to us that are equivalent, that we notice when we have patients who can communicate to us, that is associated, for example, with shortness of breath or air hunger. So when we see this in a patient who cannot communicate, we are inferring that they're experiencing the same suffering that a patient who could tell us about it is experiencing.

Q. And, Doctor, in the middle of table one there's a term, respiratory-related brain suffering. What is respiratory-related brain suffering?

A. Well, again, as they define it -- and, again, this was a group consensus -- it's an ensemble of brain responses to abnormal or abnormally interpreted respiratory related messages. So in other words, I'm short of breath. I'm getting this information back from all these receptors in the body that we're referring to. And even though the patient is not awake and can't communicate, the brain is processing this. The brain is experiencing suffering. Our brain -- it's what we all experience, even though the individuals cannot communicate that to a physician.

Q. And can you explain what you and your co-authors meant in the third bullet there under respiratory-related brain suffering.

A. So dyspnea is disassociated from clinical radiologic or physiologic abnormalities. As a result, dyspnea should be the

primary guide of clinical management when it can be evaluated.
So what that means is I could look --
Q. Just hold that thought for a second. I was asking you about the third bullet in that shaded box that starts, "A clinical appearance."
A. Oh, I'm sorry.
Q. That's okay. What did you and your co-authors mean when you wrote that sentence?
A. So an ensemble of brain responses to abnormal -- abnormally -- are you looking at the first bullet in that --
Q. No, the third bullet --
A. Yes.
Q. -- under respiratory-related brain suffering. Starts with "A clinical appearance."
A. "A clinical appearance of unconsciousness cannot exclude respiratory-related brain suffering.
Q. Can you explain that, please.
A. So just because someone is unconscious -- and, again, to me what I referred to there is they're not awake, just because of colloquial ways that people think of consciousness, but if they're not awake, colloquially unconscious -- we cannot exclude respiratory-related brain suffering. You are not awake, you cannot tell me you're short of breath, but I know from other things that are going on with you that you are short of breath.
Q. Do you and your colleagues discuss in this consensus

statement any data that supports your opinion that respiratory-related brain suffering can occur in patients apparently unconscious?
A. Yes. There are studies emerging now of patients who have had acute respiratory failure. They are treated with mechanical ventilators to save their life. We have to use these small breaths for them to manage their shortness -- or manage their respiratory failure without injuring the lung. And these individuals, many of them, will subsequently -- if they survive the episode of acute respiratory failure, will have mental health problems, including post-traumatic stress disorder, which is felt to be attributable to the suffering they experienced during mechanical ventilation.
Q. In your clinical practice treating patients how, if at all, do you incorporate this idea of seemingly unconscious patients being able to experience and process respiratory-related suffering?
A. There are two major things, and I was in the ICU last week and was employing some of these even during that week. One is to ensure that a patient who is being treated with mechanical ventilation gets analgesia. We don't even have a word, frankly, because of misunderstandings about this for drugs that just relieve dyspnea, but it turns out that opiates, which relieve pain, also relieve dyspnea. So we give them analgesics.
Historically patients were primarily given sedation. Not

analgesia, but sedation. They are different. There have been studies now that show that if I give someone sedation, and they look totally fine, they look totally comfortable, and I give them -- studies were done with a painful stimulus on the arm. And they put them in an FMRI scanner to see if the brain does anything when I do this, and they're sedated, they're not showing anything, and those brain areas we refer to before light up. They are processing the pain, even though you look at the patient, and they look totally comfortable with sedation. So we ensure now that we give them analgesia in addition to the sedation. So that's one area that I've changed.

The second area is what I do when I talk to families of their loved one who has had respiratory failure and is placed on a ventilator. Early in my career, before I did the research and others have done research like we've been describing, I would tell the family, don't worry. We will keep your loved one comfortable. And I no longer say that. I say, we will do our best to keep them comfortable, but I cannot guarantee that they will be comfortable. I cannot guarantee that they will not suffer these kind of mental health problems afterwards as a result of being on a ventilator.

We have to do this because of the other data that suggests, you know -- otherwise the lung injury might kill them, but nonetheless, I have to make them aware that I'll do my best to keep the patient comfortable, but I can't guarantee it.

Q. Doctor, do other doctors with experience treating patients with dyspnea take a similar approach to the unawake patient?
A. Many of these articles we've been talking about are relatively recent. Certainly in the history of medicine, they're very recent. And many doctors who trained and don't follow this literature commonly are not aware of these things. So, yes, this is something that I teach about and write about. It's part of why I do all this, because one of my goals as a physician is to alleviate suffering. And so I view this very personally in some ways as well as professionally, that this is something that I have to do at the bedside, but I want my colleagues and I want the people I'm training to do this when they take care of patients as well.
Q. Thank you, Doctor. We can take Plaintiff's 55 down.
Doctor, I want to shift gears again. Now, you've told us about dyspnea, and you've told us today how bad it is and that patients can suffer even while unconscious. Is that what's happening in these executions by nitrogen gas?
A. Well, again, my phrase for it is they're not awake. But because people sometimes say consciousness means I can't appreciate anything going on, and these data show that people who are not awake, in fact, are experiencing things and have sequelae; have complications later. So I refer to it as in the unawake state, these patients still experience these things. And this is part of what the literature is telling us.

Q. But, Doctor, before we even get to that state, I want to put this all together now. We've talked a little bit today about dyspnea, we've talked about how bad that can be, and we've talked about your demonstrative demonstrating air hunger as hypoxemia sets in.

MR. BUTTS: Objection, Your Honor. Leading.

Q. Doctor, is that what's happening --

THE COURT: Why don't you rephrase your question. Sustained. Rephrase your question.

MR. CLINE: Fair enough.

Q. Doctor, can you tell us, in your opinion, what's happening in these executions by nitrogen gas?

A. So for me, there's almost a straight line correlation between all the physiology that I've been talking about here in terms of what we understand about the multidimensional profile, the emotional and affective responses people have to dyspnea, the physiology of the way hypoxemia works when I get below critical values, I stimulate hypoxia, the studies by Banzett, et al., and Moosavi telling us that hypoxemia alone causes shortness of breath, certainly stimulates ventilation, all of these things lead up to this notion that somebody who is asphyxiating with nitrogen inhalation is experiencing air hunger, the worst form of shortness of breath, of dyspnea, and that this is a form of intense suffering, suffocation, that people could have.

Q. But Doctor, what about the fact that there may not be a rise in an inmate's carbon dioxide levels?
A. Again, carbon dioxide -- in the literature that predates a lot of this as well as the more recent literature, it's not necessary for somebody to have shortness of breath. That was a common understanding in earlier years, but that's really been shown, I think, definitively now by the Moosavi study that you do not need CO2 with hypoxia for hypoxia to cause shortness of breath. The hypoxia alone is sufficient to cause shortness of breath equivalent to CO2 and characterized by air hunger, the most severe form of shortness of breath.
Q. Doctor, do you have an opinion on how long it takes for the brain to stop processing respiratory-related suffering in inmates who are executed by nitrogen asphyxiation?
A. It's hard to be totally certain, but I think we're probably talking at least three to five minutes for that to still be aware, even after the patient is unawake.
Q. And, Doctor, referring back to your demonstrative that you walked through with us, as we think about what is happening to these inmates once the nitrogen gas starts flowing, can you explain where they fall in the context of that figure?
A. So they're in the far left-hand part of that figure where the curve of the figure changes -- and, again, we're talking about the left-hand figure there -- when I get below 60 and suddenly that line takes off, ventilation, again, which is on

the Y axis, goes from five liters a minute up to 50, 60 liters a minute, depending on how far down you go on the hypoxia.

Now, they go down to zero ultimately in the protocol, so that -- it's not even shown there because nobody has ever probably taken them down that level in the study, but the ventilation could be 70, 80 liters a minute, perhaps, if they could actually manage that physically.

Q. Doctor, is there anything about the way these nitrogen asphyxiation executions are carried out that exacerbates the sensations provoked by air hunger?

A. So I've been referring periodically to this notion of constraining or restraining chest wall motion, upper abdominal motion. Again, when the brain says, I want a breath of this size, and I don't allow you to do that, whatever air hunger I would have had with the larger breath becomes more intense when I constrain the ventilation.

Q. Now, Doctor, as part of your involvement in this case, have you seen photos of the gurney and the restraints used by Alabama?

A. Yes, I have seen some photos.

Q. And if you could look in your binder -- if you look briefly at your binder, Exhibits P-100 -- we don't need to pull these up. These have been marked as highly confidential: P-100, P-101, 103, 108, and 110. Just want to confirm that you have those in front of you.

A. Yes.
Q. Are these the photos of the gurney that you've seen?
A. Yes.
Q. Doctor, in your opinion, do the restraints used in nitrogen asphyxiation executions pose a unique problem in nitrogen executions that they would not pose in other methods of execution?
MR. BUTTS: Objection, Your Honor.
THE COURT: What's your basis?
MR. BUTTS: Speculation. He has no basis to know how tight the strap he's viewing in the picture is, and there's been no foundation laid for that basis.
THE COURT: You can cover that on cross-examination. Overruled. Go ahead.
Q. Would you like me to repeat the question, Doctor, or do you have it?
A. I have the pictures here.
Q. Do you have my question? Let me reask it.
A. Yes. Rephrase again. Yes. Thank you.
Q. Based on your review of the pictures and your understanding of constraining breathing, do the restraints used in nitrogen asphyxiation executions pose a unique problem in nitrogen executions that they would not pose in other methods?
A. Yes. It's my understanding that these are placed in order to keep the patients supine or lying flat on the gurney, and

that the inverted triangle over the chest would restrict anterior/posterior motion of the thorax, which would restrain tidal volume. And possibly the bottom level of that with the two other cords coming from the sides just above the umbilicus might restrain the abdominal expansion. So, again, when your diaphragm moves down, your abdomen has to move up. Obese patients, as an example, compress their abdomen as part of the shortness of breath that patients with central obesity have, and this looks like that might well mimic that by restraining the abdominal motion.

Q. Doctor, a condemned inmate facing execution by any method is going to experience some fear and anxiety. Can we agree on that?

A. Yes.

Q. Is the primal fear and panic that you've described as associated with air hunger, is that any different from that generalized fear that an inmate might have facing execution?

THE COURT: What's the basis of your objection?

MR. BUTTS: Leading.

THE COURT: Overruled. You can continue.

A. We all have anticipatory anxiety of something challenging ahead of us, something bad might happen. We have that kind of anxiety. The anxiety we talk about in the multidimensional dyspnea profile is different. It's anxiety evoked by the underlying problem, the shortness of breath, the air hunger that

they have.

And I know that this is different because if you're anxious about something you're going to do tomorrow, I can give you benzodiazepines, Valium-type drugs, Ativan. That reduces anxiety that we all sort of experience in anticipating something bad. Benzodiazepines have been studied extensively as a treatment for dyspnea. They do not work. They do not work.

So to the extent that anxiety is described as an associated part of what's evoked by the shortness of breath in the multidimensional dyspnea profile studies, this is a different anxiety, I believe, than what is experienced by all of us at times when we anticipate something that might be challenging or difficult for us. So it's based on those kinds of studies that I feel this is a very characteristic -- specific characteristic of the dyspnea itself, not the traditional anxiety that we have on a day-to-day basis potentially.

Q. Doctor, before we go any further, I wanted to ask, do you have a personal view one way or the other about the death penalty generally?

A. I have mixed feelings about the death penalty. On the one hand, as good as our justice system is, we sometimes make mistakes. And if someone's been executed, there's no way to rectify that if it turns out they were not guilty of whatever they were charged with and convicted of. On the other hand, I know that people who are sentenced to life in prison without

chance of parole, at least by some things I've read, can be very challenging for the correctional system to deal with. So I, frankly, don't have a specific opinion about the death penalty. I continue to go back and forth in terms of these different elements.

Q. Doctor, to what extent does your mixed feelings about the death penalty in general impact your opinions about using nitrogen gas as a form of execution?

A. It really hasn't been relevant at all. As I alluded to earlier, as a physician whose job it is to alleviate suffering, I feel -- and all this research and clinical work I've done on dyspnea, I think this is an incredibly significant issue, not well appreciated by many physicians. And it is part of my job I believe as a physician in order to alleviate suffering to make this better known, and my participation in this was really largely geared around that construct.

Q. Doctor, I want to switch gears again. There have been studies published in the literature on aviation pilots that suggests hypoxia results in rapid loss of consciousness without any suffering. How do you square those studies in pilots with your opinions about execution by nitrogen asphyxiation?

A. So in those studies, which are usually done at high altitude or pressure chambers that mimic that, the pressure in the alveoli, those gas sacs, is actually less than the pressure in the blood -- of the oxygen in the blood. So the oxygen isn't

just being consumed by the metabolism of the body to cause hypoxemia. It's actually leaving the blood as it perfuses or goes past the alveoli, the air sacs, moving in the opposite direction to what it normally does. So even faster development of hypoxia than you would have. And again, these are pilots, well-trained individuals, young, healthy otherwise. So correlating that with some of the things that might happen to patients, of course, is different, and depending on the individual convict, might be different as well.

But the main thing is that these are -- it's a system -- low-pressure scenario where oxygen is actually leaving the blood at the level of the air sac, which is different than what we're really talking about here.

Q. Doctor, there have also been published case reports describing helium and nitrogen gas suicides that suggests consciousness is, again, rapidly lost. How do you square those suicide reports with your opinions about nitrogen executions?

A. Suicide is a challenging issue, certainly. Helium as a gas is a lower density than oxygen and nitrogen. Its flow characteristics are different. There's less turbulence in the airways at all the branch points. How that might affect gas mixing and other things, you know, is speculative to some degree. I'm not sure of any studies of that. But we know we use helium and oxygen together for people with airway obstruction because of its characteristics as a low-density gas

that doesn't create turbulent flow. So helium is inherently different from oxygen and nitrogen in that way or from nitrogen in that way specifically.

And then people who want to die, these are usually chronically ill patients who have been suffering from their chronic illness and they want to die. In my experience as a clinician over decades of practicing, when I have a patient who tells me they want to die, it scares me incredibly because it's like no matter what I do, they will die. It is some kind of interaction between the brain and the body that I can't characterize more specifically in terms of physiology. I've never seen anything on it. But people who have made up their mind that they're going to die, they will die. And so I think that some of these stories about assisted suicide are a little bit different than what we're talking about with somebody who's not intent on dying.

Q. Finally, Dr. Schwartzstein, there are OSHA occupational and safety incident reports relating to workplace fatalities due to nitrogen exposure. How do you square those reports with your opinions about nitrogen asphyxiation executions?

A. So the reports that I've seen on this, no one has observed what's going on. Someone connected themselves to the wrong gas line, and we don't know, really, what happened to them. We don't know at what point their thinking was clouded in some way so that they couldn't get themselves out of this situation or

take their mask off or whatever.

So they're interesting reports. It's unfortunate, of course, that these things happen. I'm not sure that it really informs me at all about comparing this, say, to a nitrogen asphyxiation scenario.

Q. Doctor, is your opinion on nitrogen asphyxiation executions that you've provided today one that you formed before or after you agreed to be an expert in this case?

A. Well, I agreed to co-author a paper about this before I was ever approached about participating in this proceeding.

Q. And can we -- what can you tell us about that paper?

A. So this was a paper put together largely by European physiologists and respirologists. They knew about my work on dyspnea and asked me to contribute to the publication about this notion of basically smothering somebody as a way of executing them.

Q. Let's put up Exhibit P-45. That should also be in your binders.

A. Yes, I have that.

Q. Is this the article that you mentioned that you co-wrote with other colleagues?

A. Yes, it is.

Q. What's the title of this article?

A. The title is Breath to Death: Nitrogen Asphyxiation For Execution and Assisted Suicide.

Q. And where was this article published?
A. This was also published in the Journal of Applied Physiology, which I mentioned before is peer reviewed and probably the leading journal for physiologists in the world.
Q. Was your article peer reviewed?
A. Yes, it was.
Q. Doctor, if you would turn with me to the last paragraph. Can you read what you and your co-authors concluded about nitrogen asphyxiation.
A. The last paragraph reads, "Ultimately the use of nitrogen asphyxiation for execution or assisted suicide rests on a profound misrepresentation of human physiology. Far from being humane, painless, or peaceful, it provokes dyspnea, panic, suffering, and an unnecessarily violent death."
And I would note that this notion of profound misrepresentation, to me that gets back to this issue that I alluded to earlier about the misunderstanding and hence misrepresentation about what hypoxia can do, both to stimulate the drive to breathe as well as causing shortness of breath or air hunger.
Q. Doctor, based on your knowledge of the literature and your clinical and research experience, do you have an opinion on whether there is a substantial risk that an inmate executed by nitrogen asphyxiation will experience dyspnea, panic, and suffering?

A. Yes. I think that it is highly likely that individuals succumbing to this protocol will experience severe air hunger, possibly in their unawake state, but they will experience that. The brain will process that, and they will have that intense suffering, smothering feeling akin to drowning, if you will, to something that we often can relate to as individuals who are otherwise healthy before they die.

Q. Thank you, Dr. Schwartzstein.

MR. CLINE: Your Honor, I don't have any further questions at this time.

THE COURT: All right. Cross-examination.

MR. BUTTS: Your Honor, may we take a brief recess?

THE COURT: Yes. Certainly. It's 10:31. We will take a recess until 10:45.

(Recess was taken at 10:31 a.m. until 10:46 a.m., at which time the proceedings reconvened, as follows:)

THE COURT: Cross-examination.

MR. BUTTS: At this time, I do also have some prepared binders I would like to hand out to Your Honor and the witness and plaintiff's counsel.

THE COURT: All right. Go ahead.

MR. BUTTS: There are some of the already stipulated -- prepared -- or preadmitted exhibits from plaintiffs as well as stipulated preadmitted exhibits from defendants. At this time, I would like to proffer that on the record that they're

preadmitted.

MR. CLINE: What are they? Can you identify which ones they are?

MR. BUTTS: They're numbers -- they're Defendants' Exhibits 16, 18, 19, 22, 23, 24, 30, 33 through 38, 40 through 41, and 45.

MR. CLINE: No objection.

THE COURT: They're admitted.

MR. BUTTS: Thank you, Your Honor.

CROSS-EXAMINATION

BY MR. BUTTS:

Q. Good morning, Dr. Schwartzstein.

A. Good morning.

Q. So, Doctor, you stated earlier that you are one of the co-authors of the Breath to Death: Nitrogen Asphyxiation For Execution and Assisted Suicide article; correct?

A. Yes.

Q. Now, plaintiff's counsel walked through that as its own exhibit, but you actually appended that piece to your expert report in this case, correct, as Appendix C?

A. I believe so, yes.

Q. If you'll turn with me to your report, it's that first Exhibit 41 in the binder. If you'll turn to Appendix C, let's look at Breath to Death together.

Now, that article was submitted for publication on September

11th, 2025; correct?
A. Yes.
Q. And it was accepted for publication on October 22nd, 2025; correct?
A. Yes.
Q. So the Boyd execution, which is the execution that you discuss in your report, occurred on October 23rd, 2025; correct?
A. I don't have the exact date in front of me.
Q. Well, you actually do in your expert report. Let's turn here to paragraph 36 on page 11 of your report. Are you with me, Doctor?
A. Yes.
Q. And do you see there the second sentence of that paragraph?
A. Yes.
Q. Could you read that sentence aloud for me.
A. "According to news reports in Alabama's October 23, 2025, execution of Anthony Todd Boyd by nitrogen asphyxiation, there appeared to be a 25-minute period between the initial flow of nitrogen gas and cessation of cardiac activity."
Q. Thank you, Doctor. So Anthony Boyd's execution was on October 23rd, 2025, a day after Breath to Death was accepted for publication; correct?
A. Yes.
Q. So you had not been able to review the Boyd execution accounts at all prior to the acceptance, publication, and the

authorship of Breath to Death.
A. That's correct.
Q. And you were retained to provide expert opinions in this case in late 2025 or early 2026, thereabout?
A. It was early in 2026.
Q. And so the Breath to Death article was completed and accepted before you were retained as an expert in this case?
A. That's correct.
Q. So look with me at that article, if you will. In Breath to Death, the last sentence of the second paragraph on the right column of page 1. Do you see that, Doctor?
A. The sentence beginning with "We vehemently"?
Q. That's correct.
A. Yes.
Q. Will you read that sentence, Doctor.
A. "We vehemently oppose using inhaled nitrogen for these and related purposes, as stated previously, grounding our arguments in well-established physiological rationale and empirical studies as opposed to speculative emotion and unfounded beliefs."
Q. So that was your published position before -- excuse me. Strike that.
You wrote that with your co-authors; correct?
A. Yes.
Q. So that was your published position before you were retained

as an expert in this case?
A. Yes.
Q. And the stated purpose of the article is to offer, quote, Timely and constructive collective opinion, end quote, that you hope will, quote, resonate with policy makers, physicians, bioethicists, and physiologists, end quote. Correct?
A. Yes.
Q. In other words, the primary goal of that article was to influence policy on nitrogen executions as a method; correct?
A. As stated there, yes.
Q. So turn with me, Doctor, to the -- to Defendants' Exhibit 41 in your binder. This is Air Hunger and Psychological Trauma in Ventilated Patients with COVID 19: An Urgent Problem. Do you recognize this?
A. Yes. Did you say tab 41?
Q. Excuse me, Doctor. Yes. Tab 41, the last -- the second tab 41. This is the Defendants' Exhibit 41.
A. Yes.
Q. And this was published in the Annals of the American Thoracic Society 2020; correct?
A. That's correct.
Q. And you are a co-author there with Christopher Worsham and Robert Banzett?
A. That's correct.
Q. And those American Thoracic Society dyspnea consensus

statements that you cite, the 1999 and 2012 statements, I believe you discussed with plaintiff's counsel, you were a co-chair on those committees that produced those reports; correct?
A. That's correct, yes.
Q. And so a significant portion of that scientific support for your opinions in this case trace back to your own research and that of your fellow co-chairs and co-committees and so forth; correct?
A. Yes. The scientific foundations, yes.
Q. So, Doctor, you have expressed that you have mixed feelings about capital punishment; correct?
A. Yes.
Q. And you've said that those mixed feelings are primarily rooted in concerns about wrongful convictions, both on a systemic level and an individual innocence level; correct?
A. Yes.
Q. So you also believe that if capital punishment exists -- and I'm quoting your deposition testimony here -- quote, we should not be torturing people as part of that process, end quote. Did you say that?
A. Again, I don't have the -- right in front of me now, but if you're reading from the deposition, I'm assuming I said that.
Q. Do you agree with that statement here today?
A. Can you read it to me one more time?

Q. As part of -- as part of capital punishment, if it should exist, you would, quote -- you would agree that, quote, we should not be torturing people as part of that process, end quote.
A. Yes. I still believe that.
Q. And torture is not a medical classification or a medical diagnosis, is it, Doctor?
A. No, it's not a term we use in medicine.
Q. And you have never met Jeffery Lee, have you, Doctor?
A. Mr. Lee? No, I've not met him.
Q. And so have you ever spoken with Jeffery Lee?
A. No, I have not.
Q. Have you ever reviewed his medical records?
A. No, I have not.
Q. And at your deposition, you were not aware that Mr. Lee has testified under oath that he would not hold his breath during an execution; correct?
A. I am not specifically aware of that, no.
Q. Okay.
MR. BUTTS: Your Honor, I have a copy here of Dr. Schwartzstein's deposition testimony. May I approach so he can refresh his recollection?
THE COURT: You may.
Q. Doctor, if you'll turn with me here to page 164 of your deposition transcript. It is in the top right quadrant of this

condensed version of the testimony.
A. Okay. 164? Yes.
Q. Can you read the first question there to yourself and your answer.
A. "Are you aware that Jeffery Lee has testified that he would not hold his breath" --
THE COURT: I think he wants you to read it to yourself. Just read it to yourself.
THE WITNESS: I'm sorry. Okay.
MR. BUTTS: Thank you, Your Honor.
Q. Have you refreshed your recollection?
A. Yes.
Q. So are you aware, Doctor, that Jeffery Lee has testified that he would not hold his breath during his execution?
A. Yes.
Q. And every opinion that you offer about how Mr. Lee will experience his execution is based on general physiology, not on any individualized patient-doctor-based relationship or assessment; correct? With Mr. Lee, that is.
A. Not Mr. Lee specifically, but with other patients that I've cared for and extrapolated from their conditions and the physiology.
Q. And no patient of yours has ever been a condemned felon in an execution protocol of any kind, have they, Doctor?
A. No. I have never had a patient who has been condemned to

death.
Q. And you've never had a patient that has been condemned to die via nitrogen hypoxia, have you, Doctor?
A. No, I have not.
Q. So, Doctor, in your field, data are derived from research studies, observations that help formulate hypotheses, which can then be used -- or tested and used. So is there a distinction between those observations and data?
A. I'm not sure I understand the question.
Q. You would agree that there are distinctions between research studied data and lay witness observations; correct, Doctor?
A. Lay witness observations, yes, I think there are differences often between those and the actual data from controlled studies.
Q. And that being said, eye witness accounts of prior nitrogen executions are not data, they're observations; correct?
A. Yes, they're observations, which we may then try to integrate with studies and other things that we observe -- or know from studies.
Q. The Luft 1951 aviation study, is that data?
A. Can you -- I know you have it somewhere in the binder.
Q. In the binder, yes. Yes, Doctor. In the binder before you, it is Defendants' Exhibit 18.
MR. CLINE: Your Honor, I don't mean to interrupt. Does defense counsel have a binder for opposing counsel? Thank you. Thank you, Your Honor.

Q. Are you with me, Doctor, on the 1951 Luft?
A. Yes.
Q. So this is a research study; correct?
A. I'm just reviewing it quickly, if I may have a moment.
What I'm looking for to assess this is a description of the methods, the methods section, which does not exist in the study, nor is there a specific results section. It's describing some experiences that he witnessed, and it's not -- I would not call this a formal research study, no.
Q. In your prior testimony with plaintiff's counsel, you did credit the results of the study, though, didn't you, Doctor? You just distinguished them as being different because, well, this is dealing with partial pressure related to changes in the atmospheric pressure to simulate pilots and so forth, but you credited the time to loss of consciousness that they found in this study; correct?
A. I helped to -- at that time to explain what I thought was being seen here. But your question to me just now is, is this a research study, and I do not classify it as a research study.
Q. And you wouldn't classify layman testimony of reporters viewing an execution as research studies; correct?
A. That's correct.
Q. And the Breath to Death article that you co-authored, it has right at the top in all capital letters, I believe, perspectives. Now, a perspective piece, that is different from

a typical research study, isn't it?
A. That's correct. A perspective is not a research study. It represents views of the authors for an academic journal, like the Journal of Applied Physiology, drawn from other published work -- high-quality published works. That's how you get this sort of thing accepted for peer review through a peer-review process.
Q. So ultimately, Doctor, this is an opinion and advocacy piece that you have included citations in; correct?
A. It's a perspective of -- as an interpretation of the literature, which is viewed as quality literature, and then drawing conclusions from it and making recommendations based upon that. That would be the way I would characterize a perspective.
Q. So you would disagree that it is your opinion?
A. If I wrote a paper that just said, this is my opinion, it would not be published in a peer-reviewed journal. So this, again, is an informed statement of the literature, what the literature is telling us, and making recommendations. Other people could make different recommendations, so in that -- to some extent that reflects the views of myself and the coauthors here. But it is different from just saying, this is my opinion about something.
Q. So in Breath to Death, you and your coauthors discuss thrashing, violent jerking, heaving and retching, gasping, eye

witness testimonies, essentially. And you've agreed that those eye witness testimonies are not data; correct?
A. That's correct. Eye witness testimony is not data from a controlled study.
Q. So you are relying on more in Breath to Death than peer-reviewed, research-studied data; correct?
A. We put in those kind of descriptions because there were other observations claiming people looked comfortable somehow during it. So this was really just to say, well, there are those observations, there are these observations, but ultimately the perspective was based on physiologic data and studies.
Q. So what observations are you referring to there, Doctor, that people testified -- I'm not sure where that's coming from. Did you cite where people said they felt comfortable in Breath to Death somewhere?
A. I think there were -- again, I'd have to go back and look specifically at the paper if you would give me a moment. Again, if you could just refresh my memory on where that reference is in your binder. Do you have the tab number for Breath to Death?
Q. In your binder, it is Plaintiff's Exhibit 41 there at the front, Appendix C. It is the piece that you appended to your expert report in this case.
A. Okay. All right. 41 is the Worsham article.
Q. It will be the first 41 in your binder.
A. So 41 is my deposition in the binder you've just given me.

Q. It's the large binder, Doctor. Yes, sir.
A. So 41 -- the first 41 is my deposition. The second 41 --
Q. The first 41 should be your expert report.
A. Yeah.
Q. And then if you turn all the way towards the back, at Appendix C, this is the version --
A. Okay. I have it now. Thank you.
Q. -- that is appended to your expert report.
And so there's nowhere cited in this piece that relates to any testimony or assertion that it is comfortable, but you've testified here that the eye witness reports in this piece were in response to assertions that nitrogen asphyxiation is comfortable; correct?
A. Right. We make this statement about contrary to claims, but didn't provide citation for that.
Q. So, then, you are discrediting other potential eye witness reports in favor of eye witness reports that align with your opinion; correct?
A. No. The basis for this paper was from, again, our understanding of the physiology. The inclusion of that was merely as a counter to somebody saying, well, but there are these reports that patients looked comfortable. So we put that in really to counter those reports, but the ultimate basis for this was about the underlying physiology.
Q. So there in paragraph two, will you read the last sentence

of paragraph two for me there on the left column of the first page.
A. First sentence or the last sentence --
Q. Last sentence of the second paragraph.
A. "The misinformed notion that nitrogen asphyxiation is peaceful or humane continues to circulate in public debate, policy discussions, and even legal frameworks, necessitating a concerted scientific and ethical response."
Q. And so the Breath to Death piece, none of it reckons with any of the research or support or bases that people may have for what you claim to be a misinformed notion; correct?
A. Again, I'm not sure I totally understand the question.
Q. In the Breath to Death opinion piece, you have only cited research that aligns with your opinion that nitrogen asphyxiation is painful; correct?
A. I'm not aware of any research that shows that it's not associated with suffering.
Q. Okay, Doctor. The Moosavi study, you have said that that is the primary study for your opinion that dyspnea is caused by hypoxia alone; correct?
A. That is the best study that I know of recently that specifically looks at hypoxemia in a very controlled way to analyze whether it is producing shortness of breath or dyspnea.
Q. And the subjects in the Moosavi study were healthy volunteers; correct? If you would like to turn with me, it

is Exhibit 37 in the binder in front of you, Defendants' Exhibit 37.
A. Yes. Thank you. These were healthy subjects. Yes.
Q. None of the subjects were prisoners or restrained physically or facing an execution; correct?
A. They were not prisoners. They did a piece of the experiment where their ventilation or the size of their breath, rather, was restrained.
Q. And that part of the experiment, their breath was restrained via intubation and a mechanical ventilator; correct?
A. No. They were restrained by breathing from a bag, an anesthesia bag, that was limited in its volume.
Q. Okay. So they had an external bag that was simulating a lung with a limited volume of air; correct?
A. Right. It was looking at this notion of if I don't get the breath size that I want, that my brain is telling me I need, what will that do to the shortness of breath intensity? And it showed that it markedly increased the intensity of the dyspnea.
Q. And those subjects, they could communicate verbally at any time; correct?
A. They were breathing on mouth pieces and things, but they could take it out and communicate, yes.
Q. And so by virtue of being a subject in this type of study, they could stop at any time if they wanted to?
A. Yes.

Q. And none of the subjects ever reached unconsciousness; correct?
A. That's correct. They were all awake during this study.
Q. So in the Moosavi study, CO2 was carefully maintained at hypocapnic artificially low levels; is that correct, Doctor?
A. In the Moosavi study, they were in the low thirties, I believe. Yes.
Q. So the Moosavi study just has no data at all on what subjects would have experienced once they became unconscious if they had; correct?
A. No. This study does not address experiences when not awake. We rely on other studies for that conclusion.
Q. So the Moosavi study does not directly address the unconscious phase of nitrogen asphyxiation at all; correct?
A. No. I think the studies of mechanically ventilated patients provides us with information related to experience of dyspnea when unawake.
Q. The other studies you're referring to; correct?
A. The Demoule study. Yes.
And I would add to that the study of -- the FMRI study of somebody who is made uncomfortable with a stimulus while they were sedated as well and unawake and that their brain imaging lit up. So that's another example of how one can perceive noxious experiences even when not awake.
Q. What MRI study are you referring to?

A. This is the FMRI study that looked at people sedated with propofol and given a noxious stimulus and put in the FMRI scan to look at whether the brain was activated during that time that they were sedated.
Q. Did you cite that study in your expert report or rebuttal?
A. I don't specifically recall that now.
Q. Do you know the name or who authored that study?
A. I'm sorry. I don't recall the author's name at this moment.
Q. Do you recall the title of the study?
A. No, not at the moment.
Q. Do you recall the year the article was published?
A. It was relatively recent, in the last ten years, but I don't remember the exact year.
Q. So you have your expert report there in front of you.
MR. BUTTS: Your Honor, may I have a moment to confer?
THE COURT: You may.
(Brief pause in the proceedings.)
MR. BUTTS: Thank you, Your Honor.
Q. Doctor, if you will turn with me on paragraph 32 -- I believe I know where you're referring to in your report. Can you read paragraph 32 of your expert report for me. Again, that's at the front of the binder, Plaintiff's Exhibit 41. It's page 9 of your report.
A. Paragraph 32 did you say?
Q. Yes, Doctor, if you'll read it.

A. "Healthy patients sedated in an experimental setting with the drug propofol, for example, have been shown to have functional magnetic resonance imaging, FMRI, patterns of conscious activity in the areas of the brain that process noxious stimuli and control adverse emotions such as fear, despite being rendered completely unconscious by propofol." Huang, 2018.
Q. And that Huang 2018, is that the source that you're thinking of?
A. Yes. That was the one in addition to the ventilator studies. Yes.
Q. And you don't recall the title of that source, do you, Doctor?
A. No, not off the top of my head right now. No.
Q. Is it in the materials you relied upon in your report?
A. Well, this is in the report, so it's one of the things that informed me about this and influenced my writing of the report.
Q. Well, that's -- Doctor, I'm asking, is the specific title, the publisher, the full name of the authorship, are those included in your report anywhere? I'm trying to find it here myself. If you want to turn with me to Appendix B, we've got your materials considered list.
A. I mean, it's referenced there with the name and the author's name and the -- the year, so I'm assuming it's in the reference list that went along with the report. What you've given me here

doesn't include the reference list, the citation list.
Q. Are you at Appendix B of your report?
A. Appendix B is my curriculum vita, I think. Is that not -- no. Here it is. 18. I'm sorry. Huang.
Q. Let's go page by page, Doctor. Do you see it there on the first page, items one through nine of your materials considered?
A. It looks like it was somehow left out of the reference list.
Q. So you confirm you do not have a full citation to the Huang 2018 study anywhere in your expert reports?
A. I do not see it in this expert report that's in this binder, no.

MR. BUTTS: Your Honor, at this time, I'd like to move to strike all testimony related to any of the FMRI imaging that the Doctor has been referencing, because he has not provided a source.

THE COURT: What's your response?

MR. CLINE: Your Honor, we would object. We went through a number of articles with Dr. Schwartzstein earlier today, including the consensus statement by the European Respiratory Society, which he was a co-author on, and we looked at specific quotes and sections in that article that talked about MRI imaging studies. Dr. Schwartzstein provided testimony about those imaging studies and how he was aware of them in the context of how you put a consensus statement like that together. And there are citations in the ERS consensus statement about

these very MRI imaging tests that he's now being questioned about. So I think it's clear from his testimony earlier today, being a co-author on this article, which he relied on and which is on his reliance materials, that he's familiar with those studies, he's familiar with that data, and he should be competent enough and is competent enough to testify about them.

THE COURT: What's your response?

MR. BUTTS: Well, Your Honor, it is one thing if he did actually cite it in one of the studies, but I would like the citation. So if it's kind of -- kind of hidden under some bolstering, then we need to know that citation to be able to have confidence that he's an appropriate expert on this.

MR. CLINE: I can make a representation to you, proffer to you what the citation is, or I can do it on redirect, however you want to proceed --

MR. BUTTS: If you'll proffer --

MR. CLINE: -- or however the Court wants to proceed.

MR. BUTTS: Deference to the Court, of course, Your Honor, but if --

THE COURT: If you can proffer the citation, why don't you do so on the record now.

MR. CLINE: Yes, Your Honor. And just so the record is clear, in Plaintiff's Exhibit 55, the ERS statement of which Dr. Schwartzstein is a co-author, reference 26 in that paper is a study by -- I'm going to butcher this -- first name Hofbauer,

et al., Dose-Dependent Effects of Propofol on the Central Processing of Thermal Pain. And that's in Anesthesiology, Journal of Anesthesiology, 2004, volume 100, page 386 to 394.

MR. BUTTS: Is that the only source?

MR. CLINE: I would submit there are multiple citations in the ERS statement which he co-authored and relies on related to that very same topic.

MR. BUTTS: Okay.

MR. CLINE: Would you like me to continue?

MR. BUTTS: Well, I will state for the record that the Hofbauer, R.K., Plourde, G., Dose-Dependent Effects of Propofol that plaintiff's counsel is referring to, it's published in 2004. I do not see Huang or a publication date of 2018. So for the record, that is not cited specifically in his expert report.

MR. CLINE: Your Honor, they've stipulated to his qualifications as we went through today. Dr. Schwartzstein has extensive qualifications. He's a co-author of not only this statement, but the ATS statement, which I believe also talks about how regions in the brain -- the same regions in the brain are stimulated by both dyspnea and pain and discussion about that statement and also --

THE COURT: Well, let me stop you. He's moving to strike the testimony based on the fact that the defense doesn't have any reference to that study. Do you have authority for the fact that absent having the underlying study, he can testify

about the study?

MR. CLINE: No, Your Honor. Not specifically about that study. But as we mentioned, he did rely on articles that discuss that and other studies as part of his work on these -- the ERS consensus statements.

MR. BUTTS: And, Your Honor, we would state for the record that we have not stipulated to Dr. Schwartzstein's qualifications as an expert in MRI imaging. That's not part of the stipulation to his expert qualifications.

THE COURT: All right. In the absence of them being able to have the study, and he is not being offered as an expert on MRIs, I'm going to strike his testimony as to that aspect of the FMRI imaging, unless you can rehabilitate him with respect to that on redirect.

MR. CLINE: Understood, Your Honor.

THE COURT: All right. Go ahead.

MR. BUTTS: Thank you, Your Honor.

Q. While we're still working through your expert report, Doctor, if you'll turn with me to page 27 of your expert report. You wrote that a prisoner's conscious knowledge that he cannot take steps to rectify the underlying cause of his shortness of breath, end quote, that that is an independent factor that amplifies the alleged suffering. You wrote that; correct?

A. You're referring to my report now, which only goes 14 pages. You said page 27?

Q. Paragraph 27, Doctor, that first sentence: "The first factor exacerbating dyspnea is the conscious knowledge that he cannot, the prisoner, take steps to rectify the underlying cause of his shortness of breath."
A. Yes.
Q. You wrote that?
A. Yes.
Q. And so your theory is that this conscious knowledge that you're referring to in your report, that that causes increased anxiety; correct?
A. Yes.
Q. And that increased anxiety feeds back and worsens the dyspnea almost cyclically; correct?
A. Yes.
Q. So that feedback loop, the anxiety-amplifying dyspnea, the dyspnea-amplifying anxiety, that requires the prisoner to be consciously aware of that situation; correct?
A. This is a first factor exacerbating dyspnea. It's not the only thing that's contributing. If I'm fearful about something about to happen, it may well further the intensity of the actual experience that they're doing.
Q. Yes, Doctor. So for this factor, conscious awareness is necessary?
A. Not necessary for them to be short of breath. It's just going to further exacerbate the intensity of the dyspnea.

Q. So the sentence reads: "The first factor exacerbating dyspnea is the conscious knowledge." So, Doctor, the factors we're talking about here are those which exacerbate dyspnea; correct?
A. Yes. But I might have a dyspnea level of ten, and with the anxiety it's 11. So, you know, it's already intense, and it may be even more intense based on an anxiety of knowing that I'm about to suffer from this and die.
Q. And that anxiety is conscious knowledge; correct?
A. Yes.
Q. But if the prisoner was fully unconscious, they would have no conscious ability -- no conscious knowledge of that inability to breathe; correct?
A. Yes. But that's, again -- it's a small factor that may make that sensation worse, but it doesn't mean that in the absence of that, I'm not going to have dyspnea, which seems to be an implication of the question. So I just want to be clear that this is a minor issue. It is an exacerbating factor, but the underlying protocol is what's causing somebody to be extremely short of breath and suffering from this.
Q. So there in that part four of your expert report in paragraph 27, we've been discussing the first factor of conscious knowledge, which exacerbates dyspnea. In 28 you have the second exacerbating factor, the presence of physical restraints. Those are the only two factors that you give in

your report of exacerbations of dyspnea; correct?
A. Of exacerbation of the dyspnea. Yes.
Q. And so would you say, one, 50 percent of the two exacerbating factors is small? Would you agree with what you've just stated?
A. Well, the conscious knowledge part is small. I think the restricted tidal volume is significant -- is very significant.
Q. And so if the prisoner just has no conscious knowledge, that amplification situation you're talking about in paragraph 27, one of the exacerbating factors, that's not going to happen while they're unconscious; correct?
A. I mean, in general, an unawake person is not predicting what's going to happen to them. But this is -- they don't lose their consciousness -- their wakefulness at the early part of the protocol. So this is relating to the fact that in the early part of the protocol, it hasn't been started yet. I know that they're going to do this thing that's going to make me intensely short of breath. And, yes, that preconceived notion, that anxiety associated with that, will contribute to it. And so that's the part of the protocol that we're referring to here -- that I'm referring to here.
Q. And the prisoner also is going to reasonably have anxiety about their impending death; correct?
A. Yes. But as I noted, that's an exacerbating factor, but it's different from the anxiety that's associated with the

actual dyspnea itself.
Q. And the fact of the matter is you actually -- you have no basis with which to extricate those two components, though.
A. I do have a basis, based on what I noted in my testimony about benzodiazepines and their effect on anxiety and the way we typically think about it for predicting some activity we're engaged in or something that's going to happen to us versus the anxiety associated with dyspnea. One is responsive to benzodiazepines, the anticipatory anxiety; one is not responsive to benzodiazepines, the anxiety associated with shortness of breath.
Q. And in those studies you're referring to, they were conscious patients?
A. Yes.
Q. And they were not subject to impending execution?
A. No, they were not.
Q. So, Doctor, we talked a lot about this in your deposition. You have this theory of unwakefulness. So you have testified that even though someone may have no conscious knowledge while they are totally unconscious, that they nevertheless suffer dyspnea while not awake; is that correct?
A. That's correct. And it isn't just my theory. Again, we reviewed this earlier this morning. The statement from the European Respiratory Society and the European intensive care medicine -- European Society of Intensive Care Medicine, this

notion of brain suffering where they also delineate throughout that paper this notion of going from wakefulness to unwakefulness and still having activity and processing and experience of the brain that leads to brain suffering.
Q. And so what source are you speaking to there, Doctor?
A. That was one of the other sources we mentioned -- came up within our -- and I'll try to look for it if you want. It will take a few minutes to try to find it.
Q. What are the kinds of studies that are used in the piece you're talking about?
A. So just to get back to your first point, the discussion about brain suffering is in Dyspnea in Acutely Ill Mechanically Ventilated Adult Patients, the ERS/ESICM statement.
Q. Okay. I've got it here.
THE COURT: Can you state for the record what exhibit number that is?
MR. BUTTS: That is Plaintiff's Exhibit 55.
A. And in table one, they describe respiratory-related brain suffering. An ensemble of brain responses to abnormal or abnormally interpreted respiratory-related messages. And go on to describe other elements of respiratory-related brain suffering.
Q. I see where you're at there on page 3, Table 1.
A. Yes.
Q. I believe the citation there is pointing to end note 12; is

that correct?
A. Yes, that is the citation that they're using in the paragraph above. "The nature and the very existence of dyspnea as a symptom depend on a complex series of processes linking its expression to the underlying phenomena, including past experiences and the associated expectations." And they reference number 12 as you just noted.
Q. And number 12 there on page 19 looks to be by Marlow, Faull, and Finnegan, titled Breathlessness and the Brain: The Role of Expectation, published in Current Opinion Support Palliative Care in 2019; is that correct?
A. Yes.
Q. And you were not a co-author on that study; correct?
A. No.
Q. And you did not participate in that study in any capacity; correct?
A. That's correct.
Q. And so part of your basis there of the PTSD studies, those do include the Worsham, the Banzett, and your own Breath to Death paper; correct?
A. Yes.
Q. Excuse me. I'm referring to, actually, Defendants' Exhibit 41, the Air Hunger and Psychological Trauma in Ventilated Patients with COVID 19, which Dr. Schwartzstein was the co-author of.

A. We're also talking about the Demoule paper which was referenced earlier today as well. Yes.
Q. That would be the 2024 Demoule paper?
A. I can't swear to the year, but let me try to find it.
Q. It should be at the front of your binder, Plaintiff's Exhibit 55.
A. Yes. Yes. Well, no, there's another study -- I'm sorry. There's another study that was done by Demoule that is the actual study that collected the data on which the statement was partly based.
Q. Focusing on the Demoule study --
A. Well --
Q. -- you've relied on that for that proposition that dyspnea causes suffering, even in this unwakeful state and/or apparent unconsciousness; correct?
A. Just to be sure we're in the same place here, this is a study, Prevalence, Intensity, and Clinical Impact of Dyspnea in Critically Ill Patients Receiving Invasive Ventilation. That's Alex Demoule. He's a European, well-respected pulmonary critical care doctor. This was published in the American Journal of Respiratory and Critical Care Medicine, 2022. April 15th, 2022.
Q. So I'm looking at Plaintiff's Exhibit 55, the 2024 published Demoule, Dyspnea in Acutely Ill Mechanically Ventilated Adult Patients in ERS/ESICM statement. It is tabbed 55 at the front

of your binder.
A. I'm sorry. Yes. Sorry. Lots of studies here.
Q. But you did rely on this study; correct, Doctor?
A. Yes. Where they demonstrated increased mental health issues and PTSD following intubation for acute respiratory failure.
Q. And so all of the patients and subjects considered in that study, they were mechanically ventilated ICU patients; correct?
A. I believe so, yes.
Q. And they were not prisoners experiencing nitrogen hypoxia; correct?
A. That's correct. But they were, again, experiencing intense shortness of breath with appearance of being unawake, and yet experienced -- processed this experience in a way that led to mental health issues, including post-traumatic stress disorder. So when you asked me originally why I believed that people who are unawake may be, in fact, experiencing distress, this was some of the information that I rely upon for making that conclusion.
Q. Okay. So every person in those PTSD studies that you rely on, they necessarily subsequently regained consciousness, and they were then able to communicate their experience; correct?
A. Yes. They were able to communicate the experience and give us insight into what was happening to them when they were unable to communicate their experience.
Q. And there's no way to diagnosis PTSD or confirm suffering

from dyspnea until after somebody is awake and conscious and able to communicate, is there?
A. That's correct. But if we know those experiences that are associated with PTSD and someone goes through those experiences, I think we can make a prediction that there's a high probability that they will also experience this kind of a consequence.
Q. But that kind of experience is necessarily different from a nitrogen hypoxia execution where unconsciousness is rendered, brain death follows, and subsequently the death of the person; correct?
A. I'm sorry. Could you repeat the question?
Q. These PTS studies of mechanically ventilated adult patients that wake up after their period of being mechanically ventilated, that is necessarily different from someone who is rendered unconscious as fast as possible by objective, leading to brain death and ultimate death of the person; correct?
A. No. With respect to the comparison that I'm making, which is, are they experiencing potentially severe air hunger and suffering from that in the unawake state, I think they are comparable.
Q. And you have never talked with anyone that has experienced a nitrogen hypoxia execution, have you?
A. That is correct.
Q. And you've never talked with anyone that has survived nitrogen hypoxia?

A. That is correct. I believe there are no survivors of it. Are you aware of any? I'd love to talk to them.
Q. Mr. Jeffery Lee will not regain consciousness after his nitrogen execution to report anything, will he?
A. I believe that's correct.
Q. And you do not know and cannot state with any medical certainty that he experiences any pain; correct?
A. I believe we have sufficient data here to indicate that there will be brain suffering here and that there is intense dyspnea, even when he is in the unawake state.
Q. So that entire evidentiary bridge between brain activity during sedation or unwakefulness or unconsciousness and reportable suffering in all of the PTS studies, it nevertheless depends on the patient surviving to describe it; correct?
A. It depends on a patient's surviving to tell me that they had the experience. It doesn't require them to survive it to have the experience. If you fell off a mountain and got crushed and died, you had this experience, and you may not be able to tell anyone about it.
Q. So, Doctor, this is not falling off a mountain; correct?
A. Correct.
Q. And all of the patients in these PTS studies, they did not undergo precipitous hypoxia; correct?
A. I'm sorry. In which studies, now, that you're referring to?
Q. The Demoule 2024 and those akin to it that you have relied

on for your PTSD position.
A. They may have been hypoxemic before they were intubated and placed on mechanical ventilation. We certainly try to prevent severe hypoxemia during mechanic ventilation.
Q. But they were all conscious when they were mechanically ventilated?
A. No. Well, they were not awake. Again, I -- I'm sorry about parsing out a little bit about the term consciousness, because it's used by many lay people to just say you're not awake, and so you're unconscious. But I believe that they can be asleep or not awake and still have their brain functioning and experiencing stimuli.
Q. So your expert report simultaneously argues that conscious knowledge amplifies suffering, like we looked at paragraph 27, and that suffering occurs without consciousness in paragraph 33; correct?
A. What I'm saying in paragraph 27 is that with anticipatory anxiety about the event, that that will be an exacerbating factor for dyspnea.
Q. And that anticipatory anxiety is necessarily a conscious experience; correct?
A. I believe so, yes.
Q. And then in paragraph 33, you make reference to, quote, patients who survive episodes of acute respiratory failure treated with mechanical ventilation who appear comfortable with

sedation and analgesia, nevertheless frequently suffer from mental health issues, including PTSD, attributed to the dyspnea experienced during mechanical ventilation." Citing to Worsham, et al., Demoule, et al., 2022, Demoule, et al., 2024. This is evidence that individuals can experience distress from dyspnea even in a state of apparent unconsciousness.

Those are both of your opinions; correct?

A. Yes.

Q. And the character of the unconsciousness of all of those subjects and patients in those studies was such that they could wake up; correct?

A. To the extent that they survived their acute respiratory failure, yes, they could wake up.

Q. And so they had not suffered brain damage to the point where they were incapacitated from relaying that conscious experience retrospective; correct?

A. We don't really know that because they died is what you're saying. They didn't wake up.

Q. The PTS study subjects all died?

A. Sorry. You're -- repeat your question. I may have misunderstood.

Q. Doctor, I'm talking about the PTSD studies --

A. Yes.

Q. -- and those subjects that were studied therein.

A. Yes.

Q. They all necessarily woke up; correct?
A. Yes.
Q. And they all necessarily had not suffered a state of unconsciousness which resulted in any brain damage; correct?
A. I don't know whether every one of those patients survived without having some brain dysfunction --
Q. So all of those patients were able to convey consciously, in a coherent fashion, to the authorship of those studies; correct?
A. Yes. They were able to communicate after being extubated.
Q. And so the -- once Jeffery Lee is fully unconscious, the only empirical basis that you have for claiming suffering continues is a PTSD analogy to patients who have survived and not suffered hypoxic brain death, so it is unlike Mr. Lee; correct?
A. Right. I am extrapolating that in the unawake state, as these patients were --
Q. Thank you, Doctor.
A. -- they have experiencing dyspnea --
THE COURT: Let him finish his answer. Go ahead.
A. That being unawake does not prevent you from experiencing dyspnea and the associated suffering.
Q. In your expert report, paragraph 28, we've got the second exacerbating factor of dyspnea as you've alleged, which is the presence of physical restraints; correct?
A. Yes.

Q. And the primary study that you've cited for that proposition is your 1995 paper you co-authored with Manning that is Plaintiff's Exhibit 70; correct?
A. Yes.
Q. That is The Pathophysiology of Dyspnea, Plaintiff's Exhibit 70.
A. Yes.
Q. And in that study, the subjects were quadriplegic patients on mechanical ventilators; correct?
A. Yes.
Q. And their tidal volume was constrained externally by the ventilator settings; correct?
A. Yes.
Q. So the machine was programmed to limit how much air it delivered; correct?
A. Yes.
Q. That is a different physiological mechanism from a seat belt, isn't it, Doctor?
A. It's a different physiological mechanism? Is that what you asked?
Q. Yes, Doctor.
A. No, it's a similar physiological consequence.
Q. So a strap that you're wearing normally akin to a seat belt in a vehicle, is your breathing restricted when you drive?
A. It depends on where the seat belt is and what the nature of

your abdomen is.
Q. And the nature of the abdomen, that refers to your comparison to obese subjects; correct?
A. Yes.
Q. And how they may or may not fit well to a strap?
A. Yes.
Q. Have you ever seen the straps that are used in Alabama's protocol, Doctor?
A. I've seen the pictures of them. I have not seen them directly.
Q. So you have not seen the straps in person?
A. No.
Q. And you have never worn the straps; correct, Doctor?
A. That's correct.
Q. So you have no basis to opine on how tight the straps may or may not be; correct?
A. I have no primary knowledge of that.
Q. And you have no primary knowledge if the straps impede the tidal volume of the condemned on the gurney in any way; correct?
A. No.
Q. So you've asserted that physical restraints can mechanically drive increased respiratory distress independent of consciousness; is that correct?
A. Yes.
Q. So your assertion is that, well, it doesn't matter if

they're unconscious, the straps could still be limiting tidal volume and thus increasing suffering; correct?
A. Yes. We believe that's a key part of the study by Demoule with mechanical ventilation.
Q. So the key part of your theory that unconscious people would suffer is the chest restraint, correct, because it's limiting that mechanical ventilation, even though they're unconscious?
A. You're talking about in the nitrogen asphyxiation --
Q. Yes, Doctor.
A. -- protocol? Yes, it appears that that may be restricting tidal volume at a time when their drive to breathe is exceedingly high from the hypoxia.
Q. And so would it be your opinion that some of the same observable symptoms of increased respiratory rate, heaving and gasping, that even if the person is unconscious, that it could be the restraints causing that?
A. I think the restraints would exacerbate it, not be the direct cause, but would make things worse. So you need to have something that's stimulating your respiratory centers, control centers, telling you to take larger breaths.
Q. So, Doctor, in your rebuttal report, paragraph four, you argue that "Coordinated, purposeful movements observed across nitrogen executions, such as the pulling against restraints, coordinated extremity movements, repositioning, hand gestures, et cetera, are qualitatively different from the tremors and

extensions in the Ogden helium reports."
A. I'm sorry. Can you tell me which paragraph in the rebuttal that you're looking at?
Q. We're looking at paragraph four of your rebuttal.
A. Okay. Yes. Redirect me to exactly what you were asking about. I'm sorry.
Q. So you argued that alleged coordinated, purposeful movements observed across the executions, that those are different from the Ogden movements; correct?
A. Yes. That's what I've written here. Yes.
Q. And so to make that conclusion categorically in a reliable fashion, you would have to rule out any involuntary neurological symptoms; correct?
A. I'm sorry. I would have to rule out any -- I'm not sure I'm understanding the question.
Q. You have ruled out categorically the movements of the Ogden studies, correct, as being dissimilar?
A. As a physician, I tend not to do categorical things. But I said here, to read what I said, "are not consistent with the movements observed in the dissimilar studies." Is that what you're referring to?
Q. Yes, Doctor. And then you go on to state, "For example, Ogden and others describe tremors and leg/arm extensions in the case reports of helium suicides. These are very different from the coordinated and purposeful movements, e.g., pulling against

the restraints, coordinated movements of the extremities, repositioning of the body, hand gestures, et cetera, observed in prior nitrogen executions."
A. Yes.
Q. You go on to state, "As stated in my expert report, coordinated muscle movement as described in the accounts of prior nitrogen executions is indicative of some degree of consciousness and consistent with attempts to relieve air hunger."
A. Yes.
Q. And you said that?
A. Yes.
Q. So that's -- to make that statement, you would have to categorically rule out any neurological symptoms; correct?
A. I'd have to categorically rule out any neurological symptoms. What type of neurological symptoms?
Q. To make that opinion in paragraph four of your rebuttal report, you had to have ruled out any postural reflexing, any other neurological symptoms that come from brain damage and brain death; correct?
A. Certainly there are people who, in the process of dying, may make movements, but these look like coordinated movements. And so to me that indicated that there was enough working, functioning brain activity to do that. Was there some part of the brain that may have been damaged before that? I can't

categorically exclude that. But what I'm saying is I'm observing something that looks like there was sufficient brain activity to do coordinated movements.
Q. But you would not know what kind of brain activity or to what degree; correct?
A. No, I wouldn't be able to tell the totality of brain activity at that point.
Q. So, Doctor, are you familiar with hypoxic myoclonus?
A. Yes.
Q. Can you explain the specific mechanism of that? Because in your deposition you were not familiar, if I recall.
A. I think they're spasmodic movements. I'm not particularly -- I can't tell you a lot more about them in terms of the neurological processing.
Q. So with the degree of understanding that you do have of it, hypoxic myoclonus is characterized by sudden muscle spasms and jerks caused by lack of oxygen to the brain; correct?
A. Yes.
Q. And so these movements can appear coordinated or purposeful, even though they are involuntary; correct?
A. Myoclonus generally does not look like purposeful movement. I'm using this in terms of general activities of myoclonus.
Q. Did you rule out hypoxic myoclonus as explanation for the movements across the execution accounts before forming your categorical conclusion that these weren't indicative of brain

damage?
A. I'm not sure I would phrase it the way that you're talking about. What I'm saying is the reports were evidence of coordinated movements, which meant that there was still functioning brain activity to lead to those movements. If I want to try to get these restraints off, I want to do something to get me out of this. I talked about the anxiety associated with severe air hunger. I must do something to change the environment, or I will die. And so this is the kind of activity I think that would be associated with what these patients are telling us on a regular basis when we inquire about their dyspnea.
Q. So that's all conscious experience; correct?
A. I think they're doing it -- the people are doing this -- conscious implies to me a little bit, the way you're using it, as I'm specifically thinking I need to do it. This is what the body reaction is to it and response to, I have to change this because I am suffering. I am dying. Those words that I used this morning from the patient reports. So this is the body's response to that awareness of suffering.
Q. So if it's the body's response without any conscious thought, it would be involuntary; correct?
A. I'm making a distinction here, just because these -- we're using words here that have different meanings to different people. Conscious is, I have this thing, I need to do this, I'm

moving my arm now to do that. A coordinated conscious activity. I think the reactions that people make when they're under incredible duress are not quite that planned out. I'm doing something to change this situation that I'm in; to relieve this horrendous suffering that I have. So is that conscious in the sense of I'm picking here to do this? That? I'm not sure it's that kind of conscious. We're using it in the sense that this is my response to my life being in endangered by this intense suffering. Yes, that's conscious if you want to use it that way.

Q. So is it your opinion -- are you referring to subconscious movement? What exactly are you referring to, Doctor, between consciousness -- you're using possessive pronouns, my response to being strapped down, things of that nature. So is it your opinion that there is wakefulness or not in nitrogen hypoxia?

A. I think there is wakefulness until there isn't. They're not awake the entire time, but they're awake for part of the time and then not awake.

Q. And any inmate would be awake for part of the time of any execution method; correct?

A. Yes. They're awake for part of the time of the execution. Yes.

Q. Are you familiar with the Lazarus reflex, Doctor?

A. Somewhat.

Q. I remember we discussed it in your deposition, and you were

not familiar with it then. It's a phenomenon where patients have brain stem only function, correct, based on your understanding of it? And so they have no cortical activity; correct?
A. Yes.
Q. They produce coordinated appearing arms crossed and raising upward type of movements; correct?
A. Yes.
Q. Like Lazarus rising up; correct?
A. Yes.
Q. And you weren't familiar with that reflex when I asked you about it at your deposition, were you?
A. No. I looked it up after the deposition.
Q. And so you did not rule out that class of brain stem only reflexes as an explanation of coordinated movements in the execution accounts either, did you?
A. No. But in retrospect, I don't think that's what's being described with them.
Q. Lifting up against the straps?
A. Not with your arms crossed like that, no. I'm trying to get a deep breath, and that's -- my response to it is very similar to that. So I think that's more likely what we were seeing.
Q. And their arms are strapped down in the protocol; correct?
A. Right.
Q. So the lifting of the arms could be the arms attempting to

cross; correct?
A. I suppose it's possible.
Q. So, Doctor, you've mentioned subconscious and -- subconscious movements. Those types of subconscious movements, they would -- they could not have occurred without the prisoner being consciously aware; correct? If the prisoner is experiencing a subconscious movement, that necessarily means that it was not a conscious movement; correct?
A. Again, I'm making the distinction between awake and not awake. We do a lot of movement around when we are sleep, for example, to relieve pressure areas in our body. These are not things you remember in the morning. These are not things that are conscious in the sense of I'm awake and I'm deciding to roll over. We do this all the time in unawake states.
Q. So looking at paragraph 37 of your expert report, you stated, quote, "While other physiological processes may explain some of these movements, all of these listed movements are consistent with movements taken either consciously or subconsciously in an effort to relieve sensations of dyspnea or air hunger." Those are your words; correct?
A. Yes.
Q. So you categorically discredited any potential neurological symptom of movement in that opinion; correct?
A. Again, I did not use the term categorically here. I'm describing what are most consistent movements or consistent with

movements taken consciously or subconsciously in an effort to relieve sensations of dyspnea or air hunger.
Q. So, Doctor, the raising of the arms appears coordinated and purposeful, does it not?
A. Yes.
Q. And the crossing of the arms over the chest would appear coordinated and purposeful, doesn't it?
A. It may, yes.
Q. And the lifting up with the arms crossed across the chest would appear purposeful and coordinated; correct?
A. Yes.
Q. And all of those symptoms are part of the Lazarus reflex; correct?
A. Yes.
Q. And the Lazarus reflex is strictly a symptom of brain stem only neurological functioning; correct?
A. Yes.
Q. Which is to say the cortical part of the brain that is responsible for conscious experience has died; correct?
A. Yes, if you're talking specifically about that reflex. Again, I think there are other explanations for this, as I outline here.
Q. So, Doctor, you also opine that Grayson lifting both legs to 45 to 50 degrees indicated consciousness and consistent -- was consistent with attempts to relieve air hunger; correct?

A. Yes. Consistent with that.
Q. And you base that primarily on Dr. McAlary's declaration; correct?
A. Can you refer me to the paragraph you're looking at right now?
Q. We're looking at paragraph 38 of your report.
A. Yes.
Q. And you cite there to the declaration of Dr. Brian McAlary, Exhibit 4 in the Boyd case, which has been preadmitted in this case as Defendants' Exhibit 16.
And so, Doctor, I remember from the deposition, you are familiar with decorticate and decerebrate posturing; correct?
A. Yes.
Q. And those are known as postural reflexes that are brought on by brain damage; correct?
A. Yes.
Q. And just like the Lazarus raise, the Lazarus cross, that can appear coordinated as well; correct?
A. It can. I would say many of them are quite distinctive and are not typically associated, obviously, with conscious efforts.
Q. Brain damage likely -- strike that. Brain damage begins at minimum at approximately three to four minutes of pure nitrogen inhalation; correct?
A. Yes. That's probably a reasonable time interval for it.
Q. And you testified to that in your deposition; correct?

A. Yes.
Q. The Grayson leg raise occurred at approximately three to five minutes after nitrogen flow began, precisely when brain damage was beginning by your own assessment; correct?
A. Yes.
Q. And you acknowledged in your deposition that a postural reflex explanation for the leg raise was possible; correct?
A. Yes.
Q. And you couldn't rule it out; correct?
A. Yes.
Q. If it's possible that the leg raise was a postural reflex caused by brain damage -- if it is possible -- scratch that. If it is possible that the leg raise was a postural reflex caused by brain damage, then it's not reliable evidence of consciousness; correct?
A. So my testimony is built on the combination of what we understand about the physiology of these processes as well as some of these observations. So while, yes, I can't say with 100 percent certainty about some of the things you're raising now as to what the cause is, when I look at the totality of what's going on, I think that the descriptions -- most of the descriptions that we've seen, certainly in those first three to four minutes, are likely responses to the severe distress that these patients are experiencing, and that was what the basis of the testimony was in the report.

Q. But here today, you cannot state one way or the other that Grayson's leg raise was a conscious movement or an involuntary postural reflex brought on by brain damage?
A. My testimony is about probabilities and things that are consistent with what we understand physiologically. I try not to deal with absolutes. I think those are very challenging in medicine.
Q. So your characterization in paragraph 39 of your report of Boyd rolling to his side and shifting as a, quote, conscious, coordinated effort to relieve air hunger, end quote, that is based on Sarah Clifton's news articles in the Montgomery Advertiser cited in footnote 11 of your report; correct?
A. That's correct.
Q. First sentence of paragraph 39; is that correct?
A. Yes.
Q. And Ms. Clifton is a journalist, not a clinician or a medical observer; correct?
A. Yes, I believe so.
Q. And she was observing from the viewing chamber, not at Boyd's bedside; correct?
A. Yes.
Q. And you testified in your deposition that you would be, quote, even more suspect, end quote, making a clinical claim based solely on a lay person's description; correct?
A. I believe I said that, yes, and I'm sure you're reading from

the deposition.
Q. Would you like to refresh your recollection?
A. Sure, if you can direct me to that.
Q. Okay. That is page 156 of your deposition, if you will turn there with me.
A. Which tab is the deposition?
Q. The deposition is the small notebook.
A. I'm sorry. And the page again?
Q. It's page 156, which is the upper right quadrant. And while you turn there -- well, strike that. Let me know when you have it.
A. So I'm looking at page 156.
Q. Right there on the first question --
A. Yes.
Q. -- in the middle of the quadrant, can you read that question and that answer silently to yourself.
A. Are you referring to the issue of a resident meeting the bar -- I mean a lay person off the street? I'm sorry. I may not be in the same place you are.
THE COURT: Could you speak a little more directly into the microphone? Thank you.
A. I'm sorry. I'm looking at page 156. There is a question: Okay. So a resident would meet the bar, but I mean a lay person off the street --
Q. Doctor, excuse me. Don't read the deposition.

A. I'm not sure I'm in the same place --

THE COURT: Give him the line number -- page and line number.

MR. BUTTS: Thank you, Your Honor.

Q. Line number 16 through 19 is your answer. Can you read that silently to yourself.

A. Yes. So I've read that.

Q. Having read your answer there, I will repeat my question. You testified that you would -- that you would be, quote, even more suspect, end quote, making a clinical claim based solely on a lay person's testimony. Does that answer from the deposition comport with that question request?

A. Yes. This was in the midst of a large discussion we were having during the deposition about observations and how doctors interpret observations in terms of associating the observations with underlying pathophysiologic processes. So it was in that context where I made the comment that a lay person off the street, I would be, you know, potentially suspect about conclusions that they drew necessarily, as opposed to what I may conclude or interpret based on the actual description of what was going on.

Q. Okay. And Ms. Clifton's account is a lay person's account; correct?

A. Yes.

Q. And you offered your opinion about Boyd's conscious state to

a reasonable degree of medical certainty based on that lay person's account; correct?
A. That's correct.
Q. All right, Doctor. So at a strictly brain stem only functioning, where the cerebral cortex is no longer operating, there is absolutely no consciousness whatsoever; correct?
A. If we're talking about purely brain stem function, yes, there's no processing probably going on in the cortex.
Q. Okay, Doctor. So in hypoxic brain damage, it is the conventional medical understanding that the cerebral cortex suffers damage before the amygdala and the brain stem; correct?
A. That's correct.
Q. It is the first to fail; correct?
A. Death is not the first effect. Disorientation, other things go on before the --
Q. Excuse me, Doctor. It is the first to fail? The cortical cortex fails first?
A. The location of the first effect is on the cortex, yes.
Q. So in order for people to have a conscious experiential perception of noxious stimuli, you cannot confirm as a fact the amygdala can produce that perception without communicating with the cerebral cortex, can you?
A. There has to be interactions, yes, between different parts of the brain. Yes.
Q. And whether the cerebral cortex is the part of the brain

that allows for conscious experience, has that been firmly established to your satisfaction?
A. I'm sorry. Has the -- repeat the question again.
Q. Whether the cerebral cortex is the part of the brain that allows for conscious experience, has that or has that not been firmly established to your satisfaction?
A. I think that our experiences are interaction between different parts of the brain, and that includes the cortex.
Q. And you have done no brain imaging studies, have you, Doctor?
A. Personally, no.
Q. And you have never been a co-author of any brain study, have you, Doctor?
A. No.
Q. So putting those together, the cortex fails first in hypoxia. The cortical failure ends consciousness. Brain stem only function means no consciousness at all. You've agreed with each of those, haven't you, Doctor?
A. Other than the fact that the way you're stating it is an all-or-none sort of thing. So people go through stages before death occurs, so to speak, in any particular tissue.
Q. And so you have testified that you can't confirm that amygdala activity alone produces any conscious awareness without the cortex; correct?
A. I'm not aware of any specific studies on that, no.

Q. And so in your rebuttal report, paragraph six, you invoked the International Association for the Study of Pain's definition of pain. That's the rebuttal report, Plaintiff's Exhibit 41, paragraph six.
A. Is that the second 41 tab?
Q. Excuse me. Plaintiff's Exhibit 42, the first 42 tab.
A. Okay. And which paragraph are we in?
Q. And please look to paragraph 67 on page 3 of your rebuttal.
A. Okay.
Q. And the International Association for the Study of Pain defined pain -- or defines pain as, quote, An unpleasant sensory and emotional experience associated with or resembling that associated with actual or potential tissue damage, end quote; correct?
A. Yes.
Q. So the experience in the clinical sense that that definition is using implies some form of subjective awareness; correct?
A. That's not defined in that terminology, no.
Q. So it's not defined one way or the other. Is that fair?
A. Yes.
Q. And a fully unconscious person with no cortical functioning under that definition is not having a sensory and emotional experience in the way contemplated by the definition; correct?
A. So your question is if a brain is not functioning at all, can you have this experience? No. If we're saying, again, if

you're not awake, can you have this experience? I don't think this definition addresses that.
Q. Well, in the definition, it is a tool that's designed for use with patients who can report their experience; correct?
A. To measure a symptom, one has to have a report from the patient. To measure the impact of experiences as was represented in the studies of the patients on ventilators, they had that experience even during times when they can't tell you about it.
Q. And so the definition is not contemplating what a dying, unconscious person is experiencing; correct?
A. Again, depends on your use of the term unconscious. Again, I prefer unawake, and I think this doesn't address that. But, again, this was in response to something in the other expert's report, Dr. Antognini's report, so I just really was making the point here that by the -- he indicated that dyspnea is not pain, and by this definition of pain, dyspnea would be considered pain. You're extrapolating this from other issues. That was intended here specifically in response to one of the claims by Dr. Antognini.
Q. But the IASP definition, it's not designed to be asked of someone who has been rendered unconscious and subsequently passes away before ever regaining consciousness; correct?
A. I think this -- let me just check on this one second. I don't have the reference here. It's 2020, so this is before the

studies that we were talking about this morning, earlier this morning, on the ventilated patients. So it's a definition that comes before other data that inform us differently. And if one were making a definition now, it might be written in a different way. Medicine evolves.

Q. Would you make a definition to ask someone who has perished from unconscious --

A. The question is not whether someone who is dead can tell you about whether they had pain. The question is when somebody is in a dying process, are they experiencing suffering? And that's what we were -- I've been trying to address.

Q. So your opinion is that unilaterally the dying process for someone that wakes up -- that is -- that wakes up from this kind of experience is necessarily the same as someone who perishes as a result?

A. The experience -- while that -- for the person who died, the experience they had before they finally died may, yes, be very similar to the person who somehow survives and wakes up. Yes.

Q. And you have no way to know what that experience was prior to their death?

A. I don't need -- I don't have a way to know of that specifically for a given individual; but extrapolating, again, from the information we have from these ventilator studies, I think we can project that these patients would have experienced -- or these individuals would have experienced this

prior to their death.
Q. But you would agree with me, though, Doctor, that the extrapolation is necessarily different where it does not result in death versus a precipitous hypoxic situation that does result in death; correct?
A. I don't know that I'm making -- no. I'm not sure I would make that distinction.
Q. So they're the same in your expert opinion?
A. I think that someone who's going through a stage -- stages of an event and are suffering, and that ultimately leads to death for one person, but the other person for whatever reason is saved, that the experiences prior to that final event may well be the same. Yes.
Q. And you've cited studies in your rebuttal report that show dyspnea activities activate similar regions as pain; correct?
A. Yes.
Q. But you've never conducted such studies yourself; correct?
A. No. That's correct.
Q. And you've never co-authored any papers reporting the --
A. No. This is based on review of the literature. Yes.
Q. And you're not a neurologist?
A. No, I'm not.
Q. And you're not a neuroanatomist -- anatomist?
A. No.
Q. And you cannot give us the specific neural pathways that

would be involved in postural reflexing of the decorticate or decerebrate posturing; correct?
A. No.
Q. And you wouldn't be able to interpret EEG readings to distinguish between cortical and brain stem only functioning; correct?
A. No.
Q. And has the question of whether the cerebral cortex is required for conscious experience, has that been firmly established to your satisfaction?
A. There are a number of studies coming out now that are raising questions about that issue. I think that has been the historical view, though.
Q. And in your deposition, you actually testified that that question had not been firmly established.
A. And it hasn't been, but I've been seeing since the deposition additional articles that have come out that are talking about a more complex understanding of this process. And it is unsettled at this point, I would agree, but there is certainly interest in this issue with studies being done.
Q. And you've never observed any nitrogen hypoxia in any human subject; correct?
A. No, I have not.
Q. You've never observed a nitrogen hypoxia execution; correct?
A. That's correct.

Q. Have you observed any inert gas asphyxiation at all?
A. No, I have not.
Q. And in your clinical practice, you've actually never seen a patient arrive at the hospital with an oxygen saturation below around 80 percent; correct?
A. Other than in cardiac arrest patients.
Q. And your only publication directly addressing nitrogen asphyxiation as an execution method is the Breath to Death prospectus piece?
A. That is correct.
Q. Which is an advocacy piece; correct?
A. It was a piece designed to inform the public about the physiology -- the public -- the medical community about the physiology underlying these processes and what we believed to be the suffering experienced by people subjected to this process.
MR. BUTTS: Your Honor, may I have a brief moment to confer?
THE COURT: You may.
MR. BUTTS: Thank you, Your Honor.
(Brief pause in the proceedings.)
THE COURT: Thank you. Is now -- are you continuing?
MR. BUTTS: I just have a brief close, and then I'll --
THE COURT: Sorry. I thought you were finished. Go ahead.
Q. (Mr. Butts, continuing:) So, Doctor, just to clarify, your

best study is the Moosavi study; correct?
A. The best study demonstrating that hypoxia causes increase in ventilation and dyspnea, that is I think the best study that's been done, yes.
Q. And the Moosavi study contains no data on the unconscious phase of nitrogen asphyxiation; correct?
A. That is correct.
Q. And every PTSD study you rely on involved patients who survived and woke up to report the experience; correct?
A. That's correct.
Q. Which is necessarily unlike Mr. Lee after undergoing an execution.
A. It's unlike the fact that a person who's executed can't report it. It doesn't mean that the experience is dissimilar.
Q. And brain stem only functioning, there's no consciousness whatsoever; correct?
A. Brain stem only, yes, I would say that that's an appropriate way to describe it.
Q. And so in your own report, paragraph 37, you wrote that those movements, they could have occurred subconsciously or consciously; correct?
A. They could be consciously or unconsciously, yes.
Q. And you published your, quote, vehement opposition, end quote, to using inhaled nitrogen for execution, Defendants' Exhibit 29, before you were retained as an expert in this case;

correct?
A. That's correct, yes.
Q. And you have never met, examined, or reviewed any of Jeffery Lee's records individually; correct?
A. No, I have not.
MR. CLINE: Objection. This has been answered. He's going back over questions.
THE COURT: Yes. This feels like wrap up.
MR. BUTTS: Nothing further, Your Honor.
THE COURT: I want to give you an opportunity to redirect, but it is after 12:30, and we've been going for over an hour and a half. I feel like now is a good time to stop for a lunch break.
Is there any objection to stopping for a lunch break?
MR. CLINE: No objections, but just so you understand, I have one or two questions.
THE COURT: All right. Well, let's finish up with this witness, then.
MR. CLINE: Thank you.

REDIRECT EXAMINATION

BY MR. CLINE:
Q. Dr. Schwartzstein, you were asked some questions about what I believe was the Huang study. Do you remember those questions?
A. Could you refresh my memory? I'm sorry.
Q. Yes. I believe the Huang study was an MRI study --

A. Yes.
Q. -- that you were asked some questions by Mr. Butts about.
A. Yes.
Q. For your opinion on the experience of the unawake patients and what they can suffer, were you relying on that one study, the Huang study, or other studies?
A. I was relying on multiple studies. This was just one of them that had an interesting approach to demonstrate the neurological processing. But it's certainly not the only study that forms my opinions.
Q. And as part of your work on the European Respiratory Society consensus document, were you involved in this extensive literature review that you described earlier today?
A. Yes. Literature review and the ensuing discussions that occurred that were quite involved afterwards.
Q. And in the ERS consensus document that you were a co-author of, did that document discuss brain imaging studies and other data related to the unawake patient?
A. Yes, it did.
Q. And did you cite the ERS study in your expert report?
A. Yes.
MR. CLINE: No further questions, Your Honor.
THE COURT: Any recross?
MR. BUTTS: No further recross, Your Honor.
THE COURT: You can step down. Thank you, Doctor.

It is 12:35. I want to give everybody an opportunity to get something to eat and return. Is an hour enough time, or do you propose a different amount of time?

MS. SIMPSON: That's fine with us, Your Honor.

MS. SHARPE: That's fine, Your Honor.

THE COURT: All right. So we will start back at 1:35. All right. Have a good lunch. And just for your information, if you go down to the basement, there is a deli. You can get lunch there. If you don't want to leave the building and have the delay of coming in and out, that's an option for you. So have a good lunch.

(Recess was taken at 12:35 p.m. until 1:42 p.m., at which time the proceedings reconvened, as follows:)

THE COURT: All right. Welcome back.

I want to clarify my earlier ruling that -- on the motion to strike, I want to make sure my ruling was clear. I am striking any reference to the Huang study from 2018 and any specific testimony related to that specific study. So it's a narrow ruling, but it is specific to the study itself that was not provided. Is that clear?

MR. CLINE: Thank you, Your Honor.

THE COURT: Very good. The plaintiff will call its next witness.

MS. SHARPE: Thank you, Your Honor. I just wanted to introduce a colleague who's joined us at counsel's table, Tommy

Huynh, who has been admitted.

THE COURT: Good afternoon.

MS. SHARPE: And Plaintiff Jeffery Lee calls Dr. Julie Bastarache to the stand.

Your Honor, once again, we have witness binders for both the Court and opposing counsel, so may I approach?

THE COURT: Yes. Please. Thank you.

MS. SHARPE: Your Honor, I would just note that the witness binder contains one demonstrative that we previewed with opposing counsel and that they do not oppose, and the other exhibits are all plaintiff's exhibits which have been preadmitted.

JULIE BASTARACHE

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. SHARPE:

Q. Good afternoon. Could you please introduce yourself to the court.

A. Sure. Hi. I'm Julie Bastarache.

Q. And where are you employed, Dr. Bastarache?

A. I live in Nashville, Tennessee, and I work at Vanderbilt University Medical Center and also at the VA hospital in Nashville.

Q. What are your roles at Vanderbilt and at the VA?
A. Sure. So I'm a physician scientist, which means I'm a physician. I went to medical school. I see patients. But I also have a research laboratory where I study critical illness and lung issues. So I do both jobs.
Q. And do you also work in ICU?
A. Yes, ma'am.
Q. And with respect to your clinical work, in what areas of medicine do you practice?
A. I practice in pulmonary and critical care medicine.
Q. And can you describe what your medical practice actually involves.
A. Sure. So I spend about 25 percent of my time seeing patients, and that equates to about six weeks a year at our VA hospital right next to Vanderbilt. The bulk of that work is in the intensive care unit, but I do see some consult patients that have pulmonary issues and an occasional outpatient with pulmonary issues.
Q. And how do you spend the other 75 percent of your time?
A. Sure. So that's the scientist role. So I have a large research lab at Vanderbilt, and I study critical illness and sepsis and how that affects organs, like causing lung failure, brain failure, kidney failure, and then I also have some leadership roles at Vanderbilt. So that accounts for the other 75 percent of the time.

Q. And can you describe your experience in the field of pathology.
A. Sure. So I do have an appointment. I'm also a professor of pathology. And that really -- I'm not a clinical pathologist, but my -- I do have clinical experience with pathology.
So I'll explain it a little bit. So my appointment as a professor in pathology is primarily related to my research role. Since I study lung injury and lung disease, that relates to pathology, so I have a lot of experience looking at mouse and human lung tissue from a research perspective.
Then from a clinical perspective, I have been to dozens of autopsies, I've read hundreds of autopsy reports, so I'm very familiar as a critical care physician in reviewing autopsy reports.
Q. And Dr. Bastarache, I am just going to, for the comfort of the court reporter, ask that you slow down a little bit. I know you naturally speak quickly from spending time with you.
A. My apologies.
Q. No, not at all.
In your treatment of patients, do you use the observation of lay witnesses such as friends and family members to inform your diagnoses and treatment?
A. Absolutely. That's actually central to being a physician, and particularly in the ICU where we can't talk to many of our patients. All doctors are trained to get information from

family, friends, the patient him or herself, take those observations, take those statements, and then make medical interpretations on those. So that's part of everyday practice. Most of my patients are not medically trained, so every day I'm interpreting lay witness observations about patients.

Q. And since you obtained your medical degree, can you estimate about how many patients you've treated with pulmonary issues?

A. Sure. So I've seen thousands of patients. I've been practicing pulmonary critical care for over 20 years, so thousands of patients.

Q. And in your clinical practice, do you regularly treat patients with dyspnea caused by hypoxia?

A. Yes. That's a very common thing that I treat as a pulmonary critical care physician.

MS. SHARPE: Your Honor, Dr. Bastarache is an expert in the field of pulmonology, critical care medicine, and pathology, and defendants have stipulated to her expertise.

THE COURT: She's accepted.

Q. Dr. Bastarache, what were you asked to do in this case?

A. Yes. So I was asked to review the eye witness reports of the nitrogen hypoxia executions, review the protocol that was used and also some testimony from prior hearings, and give my expert opinion as to the physiologic effects of hypoxia on the body. And by physiologic, I mean physical effects of hypoxia on the body that would be induced by this method. Also to make

some comments about time to loss of consciousness in these particular cases.
Q. And are all the opinions that you will be providing today be given to a reasonable degree of medical certainty?
A. Yes, ma'am, they are.
Q. And on what are you basing your opinions?
A. So primarily my education, training, and experience as a practicing pulmonary critical care physician. Learning about respiratory physiology is part of our education. I also have a few articles I've cited in my expert reports.
Q. And have you formed opinions in your review of this case about the physiological steps that lead to loss of consciousness during an execution by nitrogen gas?
A. Yes, ma'am, I have.
Q. And what are those physiologic steps?
A. Sure. So there are three main steps involved. The first is the amount of time that it takes from when the nitrogen starts flowing until the mask that is placed on the inmate's face is completely devoid of oxygen. So all the oxygen has been washed out. That's step one. The second step is the amount of time that it takes for the inmate to exchange all of the air in his lungs with the 100 percent nitrogen that's being breathed in. And then the third step is the amount of time it takes the blood to circulate and deliver oxygen throughout the body.
Q. You mentioned 100 percent oxygen. Is it your opinion that

the oxygen in the mask gets down to 100 percent?
A. It's the nitrogen.
Q. Thank you. I'm sorry.
A. I've done that myself.
So no. The lowest it came -- got down in Dr. Antognini's experiment was 2 percent. So it never got down to zero percent.
Q. And I want to walk through those steps with you in a little more detail. As we were just alluding to, the first step is the filling of the mask with nitrogen gas. Do you have an opinion about how long that takes?
A. Yes, ma'am. My opinion is that it takes about 33 seconds for the mask to fill with mostly nitrogen.
Q. And on what are you basing that opinion?
A. That was on Dr. Antognini's test where he tested the mask and how long it took to wash out all the oxygen.
Q. And what is your understanding of the test that Dr. Antognini conducted?
A. So based on the description from his expert report, what Dr. Antognini did was use the system that's used by the Department of Corrections. He placed a towel around the mask to simulate a seal as it would be around an inmate's face and then put an oxygen probe inside the mask to measure the oxygen concentration in the mask and then set a timer from when the nitrogen gas was turned on to calculate how long it took for the oxygen levels in the mask to drop.

Q. So the demonstrative that we have is actually an excerpt from Dr. Antognini's report. If we could pull that up. And that should be in your binder under a tab labeled demonstrative.

Dr. Bastarache, can you describe what is being displayed here.

A. Sure. So this is a simple table showing two things. It's showing the oxygen concentration on the top row -- that's the O2 C-O-N-C, concentration -- and then the bottom row is time measured in seconds. So this is relating the concentration of oxygen measured in the mask from the time when the nitrogen gas was turned on.

Q. And to be clear, which oxygen reading are you relying on your opinion for the time that it takes for the mask to fill sufficiently with nitrogen?

A. Sure. So less than 5 percent oxygen is really where you start to get to critically low oxygen levels of inspired gas, and so I looked for the oxygen concentration to get below 5 percent. The next reading is 3 percent, and that's 33-and-a-half seconds, so that's where the 33 seconds came from.

Q. And are the lungs depleted of oxygen during the 33-and-a-half seconds that the mask is filling with nitrogen?

A. They are -- they're slowly starting to deplete with oxygen during that time, but they are not able to fully deplete with oxygen until the oxygen concentration reaches 3 percent in that mask.

Q. And why is that?
A. It's because of the second step of the air going in and out of the lungs.
Q. And before we get to that second step, does this chart from Dr. Antognini's report inform your opinions in any other way?
A. Yes. So the other thing I looked at in this chart is at what point did the oxygen level get below 15 percent, which is right about the level of oxygen that -- when someone's breathing in that they start to feel dyspneic or air hunger.
So at 10 seconds, the oxygen is about 15 percent, and then at 14 seconds it's 10 percent. So somewhere between 10 and 12 seconds after the nitrogen gas is turned on, the inmate will first start to experience that dyspnea or air hunger.
Q. And in your clinical experience, what is air hunger?
A. Air hunger is the primal urge to get more air. As we heard early this morning, the body has to have oxygen to survive, so when oxygen is not available for whatever reason, the body sends intense alarm signals and gives the sensation that the patient has to get a breath. So that extreme physiologic need to get more oxygen is what we call air hunger.
Q. So moving on to the second step, how does the oxygen in the lungs get replaced with nitrogen?
A. Sure. So the lungs have a lot of air in them, but each time we breathe in and out, we just breathe a small amount. So that's called the tidal volume, which we heard this morning. So

in order to replace all of that gas in the lungs with a different gas, a person has to breathe several times to exchange all of the air that's in the lungs with new air that is being breathed in.

Q. And are you able to estimate how many breaths that would require?

A. Yes. It does vary by age. So in younger men aged 20 to 30, that would be about six to nine breaths, which would take roughly 35 seconds. Older people, 50, 60, 70, takes a little bit longer, so nine to 11 breaths, about 45 seconds.

Q. And is there medical literature on which you rely for your opinion about the number of breaths it takes to replace the oxygen in the lungs with nitrogen?

A. Yes, ma'am, there is.

Q. And can you identify what that literature is.

A. Yes, ma'am. That was the study by Fowler in 1951.

Q. And how does that article support your opinion about the length of time that this oxygen to nitrogen replacement takes?

A. So the reason that this article helps me is because the article was answering this exact question: How long does it take a young, healthy -- and I'm still saying that 60 and 70 is young -- but a young healthy person to exchange all of the air?

So what the scientists did, they took ten healthy volunteers, all men in this age range, and had them breathe 100 percent oxygen in this case, because you can't have someone

breathe 100 percent nitrogen. Had them breathe 100 percent oxygen and measured how long it took to completely get all of the nitrogen out of the lungs. So this study established that range of six to nine breaths for younger men and nine to 11 breaths for older men.

Q. And was the Fowler article on which you're relying, was that published in the peer-reviewed medical literature?

A. Yes, ma'am, it was.

Q. Now, how does the time that it takes for the mask to fill with nitrogen correlate with the time that it takes to replace the oxygen in the lungs with nitrogen?

A. So those things are happening simultaneously; but as you note here, even at 23-and-a-half seconds, there's still 5 percent oxygen in the mask. And even at these very low oxygen levels, hemoglobin, like we heard about this morning, is able to extract more and more oxygen from the limited oxygen supply in the lungs.

This is sort of analogous to mountain climbing. People who climb mountains are routinely exposed to oxygen in the single-digit percent, and hemoglobin has evolved to hold on to oxygen more tightly in those oxygen-poor environments. So while these two things are happening simultaneously -- the mask is getting depleted of oxygen and the air is getting exchanged in the lungs -- there's still very little overlap in those two time intervals because the oxygen really needs to get to 3 percent in

the mask and be fully exchanged in the lungs before there's critically low oxygen levels in the lungs themselves.

Q. So are these times additive?

A. Yes, they are additive.

Q. And then you testified previously that there is a third step, an additional step in the process. Can you explain in more detail what that third step involves.

A. Sure. So that third step is the way that the oxygen gets delivered to the body, and that's through blood flow; blood circulation on red blood cells. So the blood has to move through the lungs and then through the whole circulatory system to first pick up oxygen and then deliver oxygen, and that cycle takes time. So it takes up to 60 seconds for a red blood cell to circulate in the body and return back to the lungs and then takes an additional eight to 10 to 12 seconds to transit through the lungs themselves.

And importantly, when the first round -- let's say you go around one time. When the blood comes back to the lungs to get more oxygen put on, it still has 70 percent oxygen, so it still has a high level of oxygen. So the blood coming back to the lungs in a normal circumstance, someone breathing room air and not hypoxic, the hemoglobin just sort of gets topped up from 70 percent to 100 percent. So it's going to take several cycles of the blood cycling through a nonoxygenated or low-oxygen environment in the lungs, delivering oxygen to the body, for the

hemoglobin in the red blood cells to get critically depleted of oxygen.
Q. And on what are you basing your opinions for the time period that it takes for the red blood cells to circulate through the body?
A. Yes. So this is fundamental physiology that I learned in medical school, residency, fellowship. So this is fundamental cardiopulmonary physiology about the transit time of red blood cells.
Q. And with respect to the time periods that we've been talking about, how does this third step correlate to the first two steps which you have testified are additive?
A. Again, this step is also additive because, like I said, the unique property of hemoglobin is that as the oxygen in the lungs gets scarcer and scarcer, the blood wants to hold on to oxygen, so binding gets tighter. So it really, again, takes getting to those very critical levels of oxygen in the air space before the blood is critically depleted, so the circulation time is also additive to the other two phases.
Q. And at what point in relationship to these three steps that you've outlined would a person then lose consciousness?
A. So those three steps would result in the blood being delivered to the brain having a critically low oxygen to the point where a person would lose consciousness.
Q. And based on these times, have you calculated as a

theoretical matter what would be an average time to loss of consciousness based on these three steps?
A. Yes. And it's important to note that these numbers are derived from idealized experiments -- experiments done in idealized conditions, so the real world condition is a little bit different. This really provides a theoretical framework for the length of time. So the length of time, adding those intervals together, is about two minutes and 18 seconds.
Q. And with respect to this estimate of two minutes and 18 seconds under idealized conditions, would that time period be the same for every person in the same conditions?
A. No. So that really -- so that's really just an idealized, theoretical calculation based on the existing evidence and knowledge of physiology. Each patient is going to have a different experience in time to loss of consciousness. People vary in their sensitivity to hypoxia, their sensitivity to hypercarbia, the time it takes for them to pass out after getting hypoxic. So there's a lot of individual variability. So, again, that 02:18 is really just a theoretical time frame, illustrating those three critical pieces that need to happen, each of which takes time.
Q. And just based on this theoretical framework, in your opinion, what is the likelihood that it will actually take longer for this loss of consciousness in an execution setting?

A. Sure. So this theoretical framework is really getting close to the lower limit. This is never going to be zero, just because each of these things take time. So the best estimate to kind of the floor on how fast this can happen is probably about two minutes, so a few seconds shorter than the 02:18. But again, for a variety of reasons, the -- so some people will be in that two-minute range, but there's going to be a long tail of people that are going to have variable and lengthy -- longer times to loss of consciousness in the same scenario.

Q. Are your opinions about the time to loss of consciousness and the body is depleted of oxygen informed at all by your experience in the ICU?

A. Oh, absolutely. Yes, ma'am.

Q. And can you explain to the Court how your experience with intubation figures in.

A. Yes, ma'am. I'd be happy to. We heard a little about intubation earlier, and that's a situation where someone can't breathe, and they're about to die, and so we need to take over breathing.

What we do during the process of intubation -- and intubation is just that procedure of putting the breathing tube into the lungs. What we have to do in order to make that happen is we do something called rapid sequence intubation, which is we rapidly give the patient a high-dose sedative and a paralytic to make them calm and stop breathing and relax their muscles so we

can get that endotracheal tube into the wind pipe. During that period we -- there are several physicians and nurses in the room. The patient is hooked up to monitors, including pulse oximetry.

So I have lots of experience watching people who are not breathing at all; not getting any oxygen. And we watch -- we can see how fast the oxygen is going down by the pulse oximetry, similar to what the inmates are wearing. And it can take up to minutes for the oxygen levels to go down to really critically low levels. So it actually does take quite some time in the real world for oxygen levels to go down, even when someone's not breathing.

Q. The steps that we walked through in this theoretical two minutes and 18 seconds, do they tell you when inmates executed by nitrogen gas actually lost consciousness?

A. No. No, they don't. As I mentioned, that's really the theoretical framework for these time intervals. Determining loss of consciousness is a visual clinical determination, so the only way to determine when someone loses consciousness is to observe them or read a report of someone who has observed them and described what's going on. So the two minutes and 18 seconds really doesn't have -- doesn't dictate when someone loses consciousness. It's more of a theory.

Q. And did you rely on eye witness accounts of executions by nitrogen gas to form your opinions in this case?

A. Yes, ma'am, I did.
Q. And what were you looking for specifically in those witness observations with respect to loss of consciousness?
A. So, again, we heard a little about it this morning, but there's -- I'm looking specifically for movements that the inmates are making. We classify movements into two different categories.
So the first is purposeful movements -- I know what I'm doing; I'm rolling over; I'm trying to sit up and breathe, so movements that have purpose -- versus unpurposeful movements like a seizure or that myoclonic jerking we heard about. So purposeful movements indicate consciousness, whereas nonpurposeful movements indicate loss of consciousness. So that's what I was looking for as I was reading these.
Q. Now, to the extent any of these eye witnesses provided their own assessment of when an inmate lost consciousness, are you relying on that eye witness's account of that?
A. No, not to the determination of loss of consciousness. So the purposes of what I was doing -- the determination of loss of consciousness really requires some clinical assessment and clinical judgment. And as we heard this morning, often people use that term, and it might mean that someone looks like they're asleep or they passed out. So the loss of consciousness determination is really my determination based on the movements I'm seeing, not relying on a witness to say, oh, that person

lost consciousness.
Q. And based on the eye witness accounts that you have reviewed, were you able to form an opinion as to the time to loss of consciousness in each of the executions that Alabama has conducted by nitrogen gas?
A. Not all of them. A few of them, I think two or three, I believe, just didn't have enough information in the description, and so I was not able to make an assessment as to time to loss of consciousness.
Q. Conversely, were there executions where you reviewed eye witness accounts and felt that you were able to render an opinion as to roughly when loss of consciousness occurred?
A. Yes, ma'am.
Q. Were you also able to form opinions based on these eye witness accounts as to what the inmates experienced during the executions by nitrogen gas?
A. Yes. So I was looking for signs of respiratory distress, dyspnea or air hunger, and so I was looking for those signs also in the descriptions of what the eye witnesses reported.
Q. And are there physical signs associated with air hunger that are observable?
A. Oh, absolutely. And as I mentioned, this is what I assess daily in the ICU. So there are physical signs, and those would include rapid breathing, trying to take a deep breath, being very fidgety in bed, trying to reposition, struggling, trying to

sit up to get more breath, shaking, sweating. So there are lots of signs that could reflect underlying air hunger from hypoxia.
Q. And in your opinion, have all of the inmates who have been executed to date by nitrogen gas, have they all shown signs of air hunger?
A. Yes, ma'am, they have.
Q. And have those signs been consistent?
A. No. Not everyone has to have every sign to display air hunger. People can vary in their outward display, so they're not all the same. But each of them had some of those -- at least some of those features of air hunger.
Q. And are your opinions as to the air hunger that these inmates suffered, are they based on any individual sign, or are they based on the constellation of circumstances and signs that you were observing from the reports?
A. Sure. So any sign or symptom, pretty much regardless, has to be taken in context of everything else that's going on. So it's really -- you know, it's really contextualizing these descriptions in what the actual circumstances are at the moment.
MS. SHARPE: Let's pull up Plaintiff's Exhibit 29, please.
Q. And that should be in your binder as well, Dr. Bastarache.
A. Yes, ma'am. I have it.
Q. I think we're waiting for it to come up on the screen.
Dr. Bastarache, can you identify this article for the Court.

A. Yes, ma'am. This is Nitrogen Gas Execution. Kenny Smith -- Kenneth Smith Convulses for Four Minutes in Alabama Death Chamber.

Q. And who is the author of this article?

A. This was written by Marty Roney.

Q. And do you have an understanding of whether Marty Roney was a witness to Mr. Smith's execution?

A. It's my understanding that he was there during the execution.

Q. And how does Mr. Roney's account of Mr. Smith's execution support your opinions in this case with respect to loss of consciousness during this execution?

A. Yes, ma'am. So we can walk through this.

So the first thing I'm looking for to start the clock, so to speak, is the time that the nitrogen began flowing. And in this case, Mr. Roney says at 7:57 the nitrogen apparently began flowing.

And then in terms of assessing for consciousness, I'm looking for purposeful movements as we've discussed as I'm reading through this. And so the next time period, 7:57 to 8:01, I noted several movements that were in my assessment purposeful movements. So writhing and convulsing on the gurney, his body shaking, his eyes rolling back, clenching his fists and legs, shaking under the sheet, are all evidence of conscious -- purposeful movements in the effort to try to get more air.

Q. And based on Mr. Roney's observations and your interpretations of them, how long did it take for Mr. Smith to lose consciousness?
A. So in order to determine that, I looked for the last time that I saw a movement that I considered to be purposeful. And the next time frame here is 8:02, and after that I did not see any evidence of purposeful movements. So my time interval was 7:57 to 8:01.
Q. And did any of the descriptions in this article indicate to you whether Mr. Smith was experiencing air hunger?
A. Yes, ma'am, they did. And there was some overlap between the two. Those would be taking deep breaths, body shaking, eyes rolling, gasping for air.
Q. Thank you, Doctor.
MS. SHARPE: Let's pull up Plaintiff's Exhibit 126.
Q. Dr. Bastarache, can you identify this article for the Court.
A. I'd be happy to. This is Witnessing Alan Miller's Execution: A Firsthand Account From Alabama's Death Chamber.
Q. And who is the author of this article?
A. This was written by Gladys Bautista.
Q. Do you have an understanding of whether Gladys Bautista was a witness to Mr. Miller's execution?
A. Yes, ma'am, it's my understanding that she was.
Q. And how does Ms. Bautista's account of Mr. Miller's execution support your opinions in this case with respect to

loss of consciousness during this execution?
A. Yes. So I went through a similar exercise. So in this report, at 6:18, it was noted that the gas started to flow. Then I looked for evidence of purposeful movements. And so at 6:18, I noted purposeful movements, specifically lifting his head off the gurney; struggling against restraints. And those were described as continuing for two minutes. And then at 6:19, again, movements continued. And then the next conscious movement that I noted was at the 6:22 time period, head lifting -- lifting his head from the gurney. That is a conscious movement in my opinion.
Q. And that time period in which the head continued to lift from the gurney was what time period?
A. So the exact end of that is not clear. So starting at 6:22, it says the next two to three minutes, so up to 6:23, 24, 25.
Q. And based on Ms. Bautista's observations and your interpretation of them, about how long did it take for Mr. Miller to lose consciousness?
A. About seven minutes.
Q. Now, does Ms. Bautista also indicate that Mr. Miller appeared to lose consciousness earlier than that?
A. Yes, she does make that notation.
Q. Again, why do you disagree with that?
A. Because I see evidence of purposeful movements after that assessment by Ms. Bautista.

Q. Do any of the descriptions in Ms. Bautista's article also indicate to you whether Mr. Miller experienced air hunger during the execution?
A. Yes, ma'am, they do. And those would be taking deep breaths. Also lifting the head off the gurney, struggling against restraints, trembling and shaking. And then at 6:20, 6:21, gasping for air.
MS. SHARPE: Let's pull up Plaintiff's Exhibit 127, please.
Q. And Dr. Bastarache, can you identify this article for the Court, please.
A. Yes, ma'am. This is "Alabama Executes Dale Grayson by Nitrogen Gas for 1994 Murder. Grayson was Convicted with three other men for the brutal slaying and mutilation of 37-year-old Vickie Lynn Deblieux."
Q. And who was the article -- pardon me. Who is the author of this article?
A. That would be Kent Faulk.
Q. And do you have an understanding of whether Kent Faulk was a witness to Mr. Grayson's execution?
A. Yes. It's my understanding that he was.
Q. And how does Mr. Faulk's account of Mr. Grayson's execution support your opinions in this case?
A. So the only thing I was able to get from this particular article was the time that the gas started flowing, and I put

that time at 6:12.

MS. SHARPE: Let's pull up Plaintiff's Exhibit 17, please.

Q. Dr. Bastarache, can you identify this document for the court, please.

A. Yes, ma'am. This is declaration of Dr. Brian McAlary.

Q. And is it your understanding that Dr. McAlary was a witness to the execution of Mr. Grayson?

A. Yes, ma'am. That's my understanding.

Q. And how does Dr. McAlary's account of Mr. Grayson's execution support your opinions?

A. Yes. So this allowed me to put a time interval on the loss of consciousness. So point 13 and point 15 are where I get the most useful information. So Dr. McAlary talks about the patient exhibiting significant anxiety and fear, including rapid eye movements and raising his head off the gurney. And simultaneous with that, in number 15, Mr. Grayson lifted both legs off of the gurney. I interpret those as purposeful movements. And Dr. McAlary says that these movements went on for approximately three to five minutes.

Q. And so based on these observations, do you have an opinion as to how long it took for Mr. Grayson to lose consciousness?

A. Yes, ma'am. Between three and five minutes.

Q. Do any of Dr. McAlary's descriptions indicate to you whether Mr. Grayson experienced air hunger during his execution?

A. Yes, they do, similarly in 13 and 15. So he's described as having an increased depth and rate of breathing, anxiety and fear, raising the head and the feet off the gurney, are all evidence of air hunger.

MS. SHARPE: And let's pull up Plaintiff's Exhibit 86, please.

Q. Can you identify this article for the Court, Dr. Bastarache.

A. Yes, ma'am. This is "Alabama Executes Gregory Hunt by Nitrogen Gas for 1988 Murder of Karen Lane."

Q. And do you have an understanding of whether this reporter was a witness to Mr. Hunt's execution?

A. Yes, ma'am. It's my understanding that this writer was there.

Q. And if you flip to the second page, I'm going to ask you to assume, based on documents that have been produced in this case, that the nitrogen gas began to flow at 5:55. Taking that into account, how does this --

MR. THOMPSON: Objection, Your Honor. There's been no foundation laid that the gas did, in fact, flow at 5:55 p.m., and Dr. Bastarache has no personal knowledge of when that would have begun.

MS. SHARPE: I'm asking the witness to assume at 5:55. Not that it's an actual fact, but asking that as an assumption that she make for purposes of her calculations. If it's later shown that it's different, we can reexamine, but I'm just asking

her to use that time in order to derive an interval, not to take it as an actual fact in the case.

THE COURT: Overruled. You can continue.

A. Thank you. I'm sorry. I'll let you ask the question.

Q. Yes, Dr. Bastarache. I was asking you to assume that the nitrogen gas starts to flow at 5:55. Taking that as an assumption, how does this reporter's account of Mr. Hunt's execution support your opinions in this case with respect to loss of consciousness?

A. Sure. So I noted as 5:57 that Mr. Hunt was lifting his head off the gurney and he jerked his left knee up and his body shook. And then at 5:59, lifting head and feet into the air. And then at 6:01, the left fist was balled tightly. And that was the last conscious movement that I noted at 6:01.

Q. Based on this reporter's observations and your interpretations of them, how long did it take for Mr. Hunt to lose consciousness during this execution?

A. That would be 5:55 to 6:01, which would be approximately six minutes.

Q. And do any of the descriptions in this article indicate to you whether Mr. Hunt experienced air hunger during his execution?

A. Yes, ma'am, they do. So at 5:57, breathing more heavily and lifting his head off the gurney and also his knee. Lifting head and feet off the gurney at 5:59. At 6:01, breathing deeply.

Those are all signs of air hunger.
Q. Dr. Bastarache, can you explain to the Court how it is that you've calculated a theoretical number of two minutes and 18 seconds or so from a physiological standpoint for loss of consciousness to occur and opined that the executions that you've reviewed have taken up to seven minutes? Can you explain how you reconcile those numbers?
A. Sure. Absolutely. So that physiologic basis is really a theoretical basis based on idealized experimental conditions. And as I mentioned, although it's an average of a few people, it sort of represents the floor.

I think there are a couple of factors that could have prolonged this or could have explained a longer time period than that, one of which is that I never saw -- I didn't see evidence that the nitrogen that was being breathed in ever got to 100 percent. So even after 45 seconds, there was still some oxygen going into the lungs. So that would make the time longer.

Also, individuals vary greatly in how they're going to respond. In each of those physiologic steps, there's wide -- there's variation only out to the longer side, again, we talked, not to the shorter side. Just like people can run at different speeds, there's variation.

And then finally, we talked a little this morning about the breathing being restricted. So if the inmates aren't able to breathe deeply, that would also prolong the time.

So I think those factors are what explain the difference between the theoretical calculation based on idealized experiments and what we see in real life.

Q. We saw in some of the articles descriptions that the inmates took deep breaths. Can you explain how that squares with your opinion that you offered with respect to this chest restraint and their ability to breathe deeply.

A. Sure. So taking a deep breath can be really very variable. So as we're all sitting here breathing quietly, we're taking pretty small breaths. But when I see someone take a deep breath or when a person is witnessed to take a deep breath, that breath can be twice the size of our normal breath or five times the size of a normal breath. So there's a wide variation. So while these inmates were able to breathe more deeply, based on the restriction on their chest, they weren't able to maximally take the deepest breath that they could.

Q. Dr. Bastarache, before we move on, can you please share with us, what are your personal views of the death penalty?

A. My personal views are that I'm opposed to the death penalty.

Q. And do those personal views affect the opinions that you're offering in this case whatsoever?

A. No, ma'am, they don't.

Q. I want to switch gears a bit and talk about your opinions in this case with respect to pathology and autopsies. You testified earlier about your experience in those areas, and I

wanted to ask, in forming your opinions in this case, did you review autopsy reports from prior nitrogen hypoxia gas executions to form your opinions?
A. Yes, ma'am. I had the opportunity to review four autopsy reports.
Q. And which autopsy reports were those?
A. Those were Boyd, Grayson, Miller, and Smith.
Q. And what did you observe, if anything, that was notable about these autopsy reports?
A. The thing that most stood out to me was all four autopsies were described -- the lungs were described as having pulmonary edema, and that's an abnormal finding. So that struck me that they all had pulmonary edema.
Q. What is pulmonary edema, Doctor?
A. Pulmonary edema is when the lungs start to fill with fluid. Normally the barrier -- the cell barrier between the blood and the air space, the air sacs, is very, very tight to keep the lungs dry. We need to have dry lungs in order to exchange gas. If that becomes disrupted, the lungs can fill up with fluid, and then oxygen and carbon dioxide can't be exchanged. So pulmonary edema is really the lungs filling up with fluid.
Q. And do you treat patients with pulmonary edema?
A. Yes, ma'am.
Q. And what does the presence of pulmonary edema in the autopsy reports of these inmates indicate to you with respect to

nitrogen asphyxiation as an execution method?
A. Absolutely. So when I saw the pulmonary edema, I went through the exercise of trying to figure out, well, why is there pulmonary edema? Pulmonary edema -- and, again, this is the -- one type of pulmonary edema is the type that I've been studying in my lab for 20 years. That's called acute respiratory distress syndrome. And that type of pulmonary edema, there's actually injury to the cells that line both the blood vessels and the air sacs. That pulmonary edema happens in response to something else. A pneumonia, sepsis. And then over days, the ARDS or acute respiratory distress syndrome can develop. Obviously, that was not what happened here, because this pulmonary edema developed very quickly.

So I ruled out ARDS or what we call noncardiogenic pulmonary edema, and that left the other type of pulmonary edema, which is cardiogenic pulmonary edema. In that type of pulmonary edema, the lung structure remains completely intact, but the pressure in the blood vessels in the lungs gets higher than the pressure of the air in the air sacs. So the plasma from the blood is essentially squeezed or pushed into the air sacs because of pressure changes. When that type of pulmonary edema happens, we call it cardiogenic, because it happens because of heart or circulatory system problems.

One common way that people get noncardiogenic pulmonary edema is acute heart attacks. I ruled out heart attack as a

cause because although heart attacks can cause pulmonary edema, the formation of pulmonary edema would have to occur over several minutes to hours and not seconds to minutes as it did here.

So that really left me with one type of pulmonary edema, and we call that flash pulmonary edema. The reason we call it flash pulmonary edema is because it happens almost instantaneously, and it happens as a result of sudden increase in blood pressure in the circulation. So sudden increase of blood pressure in the body translates back into the lungs and suddenly increases the blood pressure in the lungs, leading to fluid rushing in to the air spaces.

So it's my opinion that more likely than not, flash pulmonary edema is the cause of the pulmonary edema that I saw, that I noted on these autopsies.

Q. And how does the presence of flash pulmonary edema in the autopsies of inmates executed by nitrogen gas correlate at all with dyspnea or air hunger?

A. So as you pointed out, I treat people that have pulmonary edema from both causes. And just having extra fluid in the lungs or pulmonary edema makes it extremely difficult to breathe. Suddenly these light, pliant, spongy lungs are heavy and filled with fluid. So when fluid rushes into the lungs, it becomes very, very hard to breathe. In fact, when we see patients with severe pulmonary edema, that's the situation where

we have to intubate them. So it can cause significant dyspnea. So I think it's additive to the hypoxia that causes dyspnea.
Q. Do you have an opinion as to when during these executions these inmates would have developed flash pulmonary edema?
A. Yes, ma'am, I do. These would have had to happen very early on in the executions, during the time when air hunger was occurring and reaching its peak. The reason for that is because it takes really extreme high levels of blood pressure to get fluid into the lung like this. And by the time an inmate loses consciousness and transitions into agonal breathing, heart rate and blood pressure are very, very low. So these -- the pulmonary edema had to develop early on during the execution.
Q. And is it your opinion that the inmates were likely conscious when the pulmonary edema developed?
A. Yes, ma'am. Based on timing.
Q. To sum up, Dr. Bastarache, what are your conclusions about Alabama's use of nitrogen gas as a method of execution from a physiological perspective?
A. Sure. So from a physiological perspective, this forced nitrogen hypoxia causes extreme air hunger that lasts up to minutes, during minutes of consciousness, and also it's a physiologic stress that's above and beyond just the nervousness and the stress of being executed. So it's this intense physiologic stress that causes intense suffering in the moments before death.

Q. Thank you, Dr. Bastarache.

MS. SHARPE: I'll pass the witness.

THE COURT: Cross-examination.

MR. THOMPSON: Your Honor, permission to approach to hand the witness a binder?

THE COURT: Yes, you may.

MR. THOMPSON: We have one for you as well.

Your Honor, there are two tab 34s that represent Defendants' Exhibits 34 and 35, but I'll make sure that everyone is clear where we're at if that distinction becomes relevant. And we apologize for the error.

MS. SHARPE: Can I just ask, do the tabs correlate with your --

MR. THOMPSON: Yes, they do.

MS. SHARPE: Your Honor, for the Court's benefit, I will just note that we don't have objections to the preadmission of the exhibits that have been designated for Dr. Bastarache's cross-examination.

THE COURT: All right. So those are Defense Exhibits 21 through 32, 34, 35, 41, 43, and 45?

MR. THOMPSON: Yes, Your Honor.

THE COURT: All right. Those are admitted.

CROSS-EXAMINATION

BY MR. THOMPSON:

Q. Dr. Bastarache, there was some discussion on direct about

this two minute and 18 second time estimate that you've come up with, and it started with the 33 seconds estimate to get the oxygen saturation level in the mask environment to approximately 3 percent; is that correct?
A. Yes, sir.
Q. And then you had the second step, which was 35 seconds for a patient or a person in their twenties and thirties for the lungs to completely -- for nitrogen to completely displace the oxygen in the lungs, and then anywhere from 30 to 60 seconds from that point when oxygen saturation in the lungs had reached zero or approximately zero for loss of consciousness for a total of two minutes and 18 seconds. Is that a fair summary?
A. Yes. And one other point was for older people, it's 45 seconds to exchange gas. But, yes, that's where I get those intervals.
Q. So for someone in their twenties and thirties, your estimate would be two minutes and 18 seconds. For someone in their fifties and sixties, that time frame jumps up to two minutes and 18 seconds. Is that a correct distinction?
A. It's whatever those add up to. I'd need a calculator to add those up. I can't do that in my head.
Q. Sure. I won't make you do math. But there's a ten-second difference at step two, based on the age of the person that we're talking about. Is that fair?
A. Yeah, that's fair. And, again, these are theoretical

numbers based on idealized conditions.
Q. Sure. On that point, you said that this was, as you just said, the lower bound of your theoretical estimate; is that correct?
A. Close to the lower bound, yes.
Q. How does that statement account for the fact that you are describing these time estimates as additive as opposed to overlapping in some significant way?
A. I guess I'm not sure I'm understanding the question.
Q. In other words, as I understand that two minute and 18 second estimate, you are taking as a given that there is either no displacement going on as the mask is filling with nitrogen or a negligible amount.
A. I think what I said was a little bit different. So these things are happening, but they have to -- the -- in terms of the concentration of oxygen in the mask and exchanging it in the lungs, the oxygen in the mask has to reach that critical level before it can exchange. So there's a slight amount of overlap, but the overlap in the time intervals is negligible.
Q. But this is -- I understand it's a theoretical baseline, but it is drawn from cardiovascular pulmonology first principles. Is that fair?
A. Yes. From knowledge of cardiopulmonary physiology and from some experimental studies, yes, sir.
Q. So what we're talking about is an opinion that you have

offered that in this setting, a nitrogen hypoxia execution, there will invariably be an upward departure from that theoretical estimate; is that correct?
A. No, I don't think so. I didn't say invariably. I think two minutes is kind of the lower limit, and the four I reviewed were longer than that.
Q. But do you think that that upward deviation would apply in this case?
A. There's no way in any one particular person to predict the time to loss of consciousness in this scenario.
Q. So, then, in what way -- how do we make effective use, then, of the clinical experience that you have discussed, the lay witness accounts that you have discussed, as a deviation from this two minute and 18 second hypothetical time frame?
A. Again, I don't see it as a deviation. They're two separate issues. So the two minutes and 18 seconds, like I said, is theory in young healthy people in idealized circumstances, breathing 100 percent nitrogen, not having restricted chests. And even within the subjects in that study, there's a few seconds of variation in those measurements. So I don't see it as a deviation.
Q. How would you describe it, then?
A. I would describe it as the two minutes and 18 seconds is the theoretical time frame based on the studies and cardiopulmonary physiology. What happens in real life and not in these

idealized circumstances is what we witnessed in the four executions that I reviewed.
Q. So staying on that track, you said you reviewed, among others, the autopsy of Kenny Smith; is that correct?
A. Yes, sir.
Q. And you said, I think -- and please correct me if your understanding is different -- that there was a finding of pulmonary edema in those four cases; is that correct?
A. Yes, sir, there was.
Q. Did the medical examiner make a specific finding of pulmonary edema, or are you taking the findings that were made and applying your own, I guess, view on it to come to a conclusion that those subsidiary findings support your ultimate conclusion that there was pulmonary edema?
A. I can't remember word for word all the autopsies. I know some of them specifically said pulmonary edema. Some described the lungs as being heavy, and the lungs get weighed during an autopsy. So either one of those is sufficient for me to make the assessment as to whether or not there's pulmonary edema. So I don't recall specifically which autopsies said the words pulmonary edema or which just had heavy lungs, but both are the same to me.
Q. So what would you expect lungs to weigh if they were heavy in such a way that would suggest there was pulmonary edema?
A. So they would be a few hundred grams more than what a normal

lung -- a nonpulmonary edematous lung would weigh.
Q. And how do you determine what a normal lung should weigh in a particular case?
A. You know, I'd have to look it up. There have been autopsy studies historically that report normal lung weights for people of different heights. I don't recall off the top of my head what a normal lung weight would be for men in this age group.
Q. But your opinion is that these lungs were heavy, though; is that correct?
A. Again, without reviewing the four statements, I can't remember exactly if they all four said specifically pulmonary edema, or if some just said heavy lungs with lung weight. But, again, they would be equivalent to me.
Q. Do you recall if any of the autopsies you reviewed made a finding of flash pulmonary edema?
A. No, they didn't, and I wouldn't expect that. Flash pulmonary edema is a clinical diagnosis, so that's something that requires clinical -- it's a clinical diagnosis, not a pathologic diagnosis. The pathologic diagnosis is pulmonary edema, and then the clinical diagnosis would be flash pulmonary edema or one of the other causes of pulmonary edema. So I wouldn't expect a pathologist to note flash pulmonary edema on autopsy.
Q. Is there any way to make a determination of whether flash pulmonary edema existed in that context, a forensic postmortem

examination?
A. Without any knowledge of the situation preceding that, if you just had the postmortem exam, there's no way to determine that. The only thing that could be determined is the presence of pulmonary edema, and it requires understanding of what preceded the autopsy to determine what caused the pulmonary edema.
Q. So what sort of information would you need to know in addition to what you had in front of you to make that determination in a clinical setting?
A. In these circumstances, I don't need any additional information. I walked through my reasoning to getting to flash pulmonary edema. That's really only -- really the only likely cause in this particular circumstance.
Q. Talking a little bit about the lay witness accounts that you relied on in forming your opinion, and I just want to make sure that I'm clear on what your testimony is. You said that you did rely on the eye witness accounts, but that you weren't -- that you were also relying on what you saw. Can you clarify the distinction there for me, and what it is you are relying on and what you meant by both of those?
A. I'm sorry if I was confusing.
The eye witness reports, I was looking for their description -- the eye witness description of what was going on with the inmate during the execution. So their movements and

breathing patterns, et cetera. If I said -- if I used the word saw, that -- I didn't see anything. I'm reading what they're reporting.

Q. So you did not witness any of the past nitrogen hypoxia executions in Alabama that you've mentioned in your report?

A. No, sir. I did not personally witness them.

MR. THOMPSON: Your Honor, may I have just a moment to get the plaintiff's exhibits binders?

THE COURT: You may.

Q. Doctor, do you still have the black binder in front of you?

A. Yes, sir, I do.

Q. Could you turn, please, to Plaintiff's Exhibit 29.

A. Yes, sir. I'm at 29.

Q. So this is the Montgomery Advertiser article written by Mr. Roney about Kenneth Smith's execution. Can you tell --

You testified, I believe, on direct that you saw purposeful movement up until I believe it was 8:01; is that correct?

A. Yes, sir.

Q. So which -- in the -- if you turn to page 2 of 4.

A. Okay. I'm here.

Q. The second heading, 7:57 to 8:01 p.m. Can you identify for me in that paragraph the last purposeful movement that you believe is reflected there.

A. Well, all of these are described together, and the time frame is 7:57 to 8:01. So I can't make an assessment -- the way

I'm reading this, these were all occurring during that time window. So I don't know if by last you mean last in time. I can't make that assessment with this description.
Q. Chronologically in the paragraph.
A. Oh, in the paragraph -- not chronologically in time but in the paragraph?
Q. Certainly. Yes.
A. Okay. I got it. Clenching his fists.
Q. That was the last purposeful movement in your opinion?
A. As it's written in this paragraph. But, again, there were other purposeful movements described in the paragraph in that time window.
Q. So contextually, what about the other information provided in this article informs your opinion that clenching fists between 7:57 and 8:01 p.m. was a purposeful movement indicating consciousness?
A. Because fist clenching is a conscious movement.
Q. Categorically?
A. No, I would not saying anything categorically. As I mentioned earlier, we take all signs and symptoms in context. So in this context, fist clenching, in my opinion, is a conscious movement.
Q. So I guess consciousness is a holistic assessment?
A. I guess in the sense that it requires understanding of the context and using all available information.

Q. Are you aware that there are ADOC witnesses who have spoken to their observations about each of these executions and what they observed relating to consciousness and movements of the condemned?
A. I might have seen those in some trial testimony, but I don't -- I'd have to look at them again to refresh my memory.
Q. Did you take any of those accounts into account in forming your own opinion about which of these were purposeful movements and when your best guess is as to when Mr. Smith and the other past condemned lost consciousness?
A. No. I relied on the media reports, the eye witness reports for those.
Q. Do you know if any of those media witnesses knew the precise moment when the gas started flowing?
A. I don't know if they knew or not.
Q. Do any of these time stamps in the Montgomery Advertiser article about Kenneth Smith's execution denote what second in the minute the -- I guess the time frame is referring to?
A. No, sir, they don't. It's just the minute.
Q. So it could be 7:57:59 to 8:01:01?
A. Yes, it could be.
Q. So on that front, it is nonspecific?
A. Well, it has a range of one minute -- I mean, there's a 60-second range within each one-minute interval.
Q. Sure. But your estimate of four minutes assumes that the

nitrogen started flowing at 7:57:00, and that loss of consciousness occurred at 8:01:00. You know, it could be as short as three minutes, based solely on the facts that you have presented -- or the facts that you have testified to on direct.
A. That's why I called it an estimate, because there -- as you pointed out, there's not enough precision to get more than an estimate.
Q. Do you know if any of these media witnesses, these lay witnesses, have medical training?
A. I don't know that.
Q. Does that factor into your assessment of their accounts of these executions?
A. No, not at all.
Q. So the -- you don't adjust your interpretation of facts reported by a lay observer versus somebody with some level of medical training?
A. No, not for observable characteristics. As I mentioned, this is what I do every single day in the ICU. We have a patient come in that can't speak to us, and I have to talk to the family members, and they report to me what the -- what's going on with the patient, and then I make a medical assessment. So a medical resident or a mother are equally capable of providing an assessment of what they're observing, and then I make the medical assessment based on what the witness is telling me.

Q. Is that an active dialogue between you and the person reporting the facts?
A. Sometimes it is and sometimes it's not. It really just depends on the situation.
Q. Were you able to have any sort of follow-up discussion with any of these lay witnesses about what they saw?
A. No, sir, not in these cases.
Q. To clarify something like -- actually, would you please turn to Plaintiff's Exhibit 126.
A. Okay. I am at 126.
Q. And I apologize, Doctor. I am leading you on a goose chase. Can we go back to 29?
A. Yes, sir. I'm at 29.
Q. So when you say that -- when you see it in the paragraph under 7:57 to 8:01 p.m., quote, he took deep breaths, you were interpreting that as purposeful movement?
A. No, sir. The deep breaths is a sign of air hunger. That is not a sign of -- what I use as a sign for purposeful movement. The way that breathing is occurring is not -- I'm not able to use that to assess level of consciousness.
Q. Body shaking violently.
A. Yes, that could be a conscious movement.
Q. Could be? Does that mean it could also not be?
A. In this circumstance, because he's at the same time displaying other conscious movements, I interpreted that

movement as a purposeful movement.
Q. So would you interpret the word -- or would you accord the same weight to a lay person's description of the condemned as moving violently, versus they raised their legs, you know, quickly in a ten-second period? I mean, I guess what I'm asking is, how do you account for the natural editorializing that goes with this sort of account?
A. So, again, this is how -- this is what I do every day in the ICU. And, yes, I do sometimes get the opportunity to talk to families and patients, but sometimes I'm just provided written information. And it's my job to take all of those pieces of -- all of those data points that I'm given and then interpret them in context and make a clinical assessment. And people have different ways of describing things. So this is just part of my everyday clinical practice, interpreting comments like this.
Q. Do you know how Mr. Roney would naturally describe something like this?
A. I'm guessing he would describe it the way he described it. He wrote this article, so I think it's his description of what was happening.
Q. Sure. Two different people can say violently and mean completely different things; right?
A. Absolutely.
Q. There are inherent restrictions, in other words, on this sort of -- using this sort of basis to make medical

determinations. Is that fair?
A. I would say that that's not fair, because this is -- again, this is everyday medical practice, is using eye witness observations to make assessments about what's going on.
Q. But I guess -- just sort of where I'm going with this is you're not just using eye witness accounts to make medical determinations. You are using eye witness accounts to double your theoretical estimate from the time the nitrogen starts flowing to the time of loss of consciousness.
A. So let me just clarify. So the two minutes and 18 seconds, as I mentioned, is theoretical based on what we've talked about a few times. The actual determination of loss of consciousness really does not have any bearing on the theoretical. You can only make the determination of loss of consciousness in each individual case by looking at the circumstances. So the two minutes and 18 seconds, again, is just a theoretical framework to establish the time intervals, but the actual determination of loss of consciousness is a clinical determination requiring descriptions like this.
Q. Descriptions like what? I'm sorry.
A. Descriptions that we're talking about from the lay witnesses.
Q. So then what benefit, if any, is the theoretical determination if a Montgomery Advertiser article for whom you are not able to go back and forth with Mr. Roney informs your

decision or your opinion, rather, about the time to loss of consciousness?
A. Sure. So I think it is important to -- when I was forming my opinions, I thought it was important to really -- to go through the exercise of what we understand about physiology and the steps that were happening. But, again, for the reasons that we've talked about -- again, the fact that the nitrogen never gets to 100 percent in the mask, individual variability, et cetera -- that time frame can vary, and the two minutes and 18 seconds is just, like I said, a theoretical time frame.
Q. So you just said that oxygen never got to zero percent saturation in the mask?
A. That's correct.
Q. What is the basis for that statement?
A. Dr. Antognini's experiment.
Q. Would you agree or disagree with the statement that as you get closer and closer to zero percent oxygen saturation, that the reliability of instruments that measure oxygen saturation become less and less reliable?
A. I'm not sure what type of instrument was used to measure oxygen here, so I can't comment on the reliability at low levels. There are instruments that can measure down to zero. I don't know what was used here.
Q. Switching gears a little bit, Doctor, is it your opinion that a patient's subjective reporting of any symptoms of dyspnea

are always consistent with their oxygen saturation levels at the time that they're reporting those symptoms?
A. No. There are several factors that can make a person dyspneic, so it's not always related to the oxygen.
Q. What are some of those factors?
A. So if you exercise and you increase the amount of carbon dioxide that your body is producing, that will make you breathe faster. If you get pneumonia and have a fever, your fever makes you breathe faster, and you would feel dyspneic. If you have obstruction in your airways, like you have asthma, that could make you feel dyspneic. If your chest were restricted for some reason and you couldn't take a deep breath, that could make you feel dyspneic. So there are a wide variety of things that could make someone feel dyspneic.
Q. In other words, it's a complicated inquiry. Dyspnea is a complicated, I guess, state that a patient could be in. It's multifaceted.
A. I would say that dyspnea is a symptom, and there are multiple causes of that particular symptom.
Q. What are some of those causes?
A. All of the causes I just listed. Would you like me to list them again or --
Q. Well, I guess my specific question is, can that -- can those circumstances be affected by the patient's underlying cardiovascular or respiratory disease?

A. Yes. So, yes, it could be related to someone's underlying cardiovascular state, and also just individual variability. Just people differ in how sensitive they are to low oxygen and high carbon dioxide just as part of natural human variability.
Q. Is that something you observed in your practice in the ICU?
A. It's not something we measure, but, yes, I've seen patients who are very, very dyspneic, very short of breath, with an O2 sat of 80 percent, and then I've seen other people that are almost blue and have a sat of 30 percent and are able to talk to me. So there's a wide variability in people's response to hypoxia.
Q. So what are some of the common cardiovascular or respiratory diseases that you see in the ICU with the patients that you treat?
A. So common things that we see are pneumonia, sepsis, COPD, asthma, serious bleeding, like bleeding from an ulcer, abdominal infections. A multitude of medical issues. Cancer. Lots of different medical issues.
Q. So I believe that earlier Dr. Schwartzstein mentioned emphysema. And I don't want to misstate his testimony, but he talked about lung damage, that emphysema creates lung damage that reduces the effective surface level of the lungs, the surface area through which gas exchange can occur. Do you agree with that description?
A. Yes, sir, I agree with that.

Q. So that would inherently affect a patient's ability to relieve or avoid in the first instance the feeling of dyspnea?
A. In emphysema specifically, there are several factors that contribute to dyspnea. It really depends on the individual patient.
Q. What about COPD?
A. COPD and emphysema are similar. Emphysema is a subtype of COPD. COPD also includes chronic bronchitis, and those both are under the umbrella of COPD.
Q. What about pneumonia?
A. I forgot what the first part of the question was.
Q. Just that you treat patients who have underlying diseases that can in small or significant ways affect their baseline ability to -- or their lungs' baseline ability to perform gas exchange; their ability to take in oxygen.
A. So emphysema, yes, I would say. Chronic bronchitis, no. The gas exchange area is intact. Pneumonia -- in someone who doesn't have underlying lung disease, pneumonia is an acute illness, so there's nothing really underlying that would predispose them to behave differently. So it kind of depends on the disease you're talking about and then the acuity or chronicity of that problem.
Q. What about ARDS?
A. ARDS is acute respiratory distress syndrome, so that's an acute problem. That happens within seven days of an inciting

insult. That's an acute problem.
Q. So all of these underlying diseases you see in your ICU patients? I apologize for being repetitive, and I have a point, but that's -- you see a varied range of underlying illnesses, underlying diseases in your patients?
A. Yes. Very. Yes.
Q. And so from that experience with those patients with this variable range of underlying issues, you're extrapolating from treating those patients in the ICU setting to making a determination about how nitrogen will affect -- or how nitrogen will create a hypoxic environment for a condemned person under Alabama's nitrogen hypoxia protocol?
A. So the way I'm using my -- so, yes, I am using my clinical experience to inform my opinion. The way I'm using my clinical experience specifically relates to hypoxia, which may or may not be present. Well, in ARDS, hypoxia is always present because that's part of the diagnostic criteria. But I have a lot of experience with treating patients that are hypoxic, either intubated with hypoxia or hypoxic and not intubated. And it's my experience with treating patients with hypoxia that really informs my opinion about the effects of hypoxia and how that might be experienced. It's not tied to any disease. It's more the conserved -- the physiologic response to hypoxia that everyone has when they're exposed to low oxygen levels and become hypoxic.

Q. But in the ICU, that hypoxic reaction is not happening in a vacuum, is it? There are other variables going on, things like mechanical ventilation, intubation, preoxygenation; is that correct?
A. Well, those things are sort of related. Yes, oftentimes there are many things going on in the ICU, but not every patient that I take care of and that I watch experiencing hypoxia or dying with hypoxia is intubated. So the response to hypoxia, the physiologic response, is a conserved response that we all have, regardless of how the hypoxia occurs. And my experience in the ICU I think informs this, because hypoxia is something that I see very, very commonly. Many patients that I have have hypoxia, so I have a lot of experience seeing patients that have hypoxia from a variety of causes.
Q. What percentage of those patients are intubated and mechanically ventilated?
A. In my practice, probably -- of all my patients, probably 15 percent are intubated and mechanically ventilated in the ICU.
Q. What percentage get supplemental oxygen?
A. Probably in the range of maybe 50 percent get supplemental oxygen of some form.
Q. Would it be your expectation that a patient receiving supplemental oxygen would experience a flatter decrease in their oxygen saturation relative to somebody who wasn't receiving oxygenation?

A. I don't think I understand your question. Would you be -- do you think you could restate it possibly?
Q. Sure. So you're making estimates about the rate at which a condemned person receiving nitrogen under the protocol would hit certain benchmarks: The mask filling up, displacing all the oxygen in the lungs, ultimately loss of consciousness. You're making a prediction or you're making an estimate about the rate at which that process will proceed. Is that fair?
A. Yes, that's fair.
Q. And you are at least in some way extrapolating from your experience in the ICU with hypoxic patients; correct?
A. Yes, sir.
Q. So you're extrapolating from a situation where patients are receiving oxygen, which inherently would slow the rate at which their oxygen saturation dropped; correct?
A. It really depends on the underlying illness, but in general, yes. If you're receiving supplemental oxygen and you're hypoxic, the goal of the supplemental oxygen is to raise the oxygen levels in the blood.
Q. So in other words, your goal is fundamentally opposed to the goal of the nitrogen hypoxia protocol.
A. That's fair.
Q. Same thing with mechanical ventilation?
A. Yeah, I'd say that's fair, assuming that the -- that we're not doing like a terminal extubation or someone's at the very

end of life. But assuming we're trying to increase the oxygen, yes, that's fair.

Q. So is there any situation in which a person receiving supplemental oxygen would have their oxygen saturation drop at a rate lower than it would have if they weren't receiving supplemental oxygen?

A. I mean, if the lung -- there are certain situations where the lung damage is so bad that no matter how much oxygen we're giving, the body can't use it. So, yes, there are situations where no matter what we do, the body cannot take up oxygen.

Q. Wasn't quite my question. What I'm asking is if you look at two rates of oxygen saturation dropping, same patient, scenario one, no supplemental oxygen; scenario two, supplemental oxygen. Is there any circumstance in which scenario two's rate of the oxygen saturation dropping would be lower than circumstance one? So is there any situation in which getting oxygen would cause your oxygen saturation to drop at a slower rate than if you didn't get any oxygen at all?

A. Slower? I don't think so. But as I said, giving -- there may be circumstances where the rates of dropping would be the same if the lung damage is so bad that the oxygen is just not working. So it would be, essentially, the oxygen is ineffective.

Q. But it is raising the baseline.

A. If the gas cannot be exchanged in the lungs, you can't raise

the baseline. So there are situations where, for example, severe pulmonary edema where the lungs are completely filled with fluid. You could give someone 100 percent oxygen in their lungs, and they're not going to be able to take up any more in their blood, just because the gas can't get there.

Q. Sure. I understand in that situation, we're talking a little bit more about rearranging deck chairs. But theoretically would supplemental oxygen ever cause oxygen saturation to drop at a lower rate than without it?

A. I can't think of a situation. I've never -- I mean, that -- that's a little bit of an odd question. I can't think of a situation sitting here today.

Q. I'm just distinguishing the circumstances in which your patients are experiencing dyspnea and the circumstances in which, at least sort of in your view, Mr. Lee and other condemned people in Alabama would experience dyspnea under the protocol and saying that those situations -- I mean, they're a bit apples to oranges. Wouldn't you agree?

A. I think the circumstances are different, but the response to hypoxia in terms of the physiologic response, air hunger, is the same.

Q. Can mechanical ventilation cause the sensation of air hunger in ICU patients?

A. It can in certain circumstances. It can cause -- I would use the term ventilator dyssynchrony, but, yes, it can cause

what we would call air hunger.
Q. How would you define that dyssynchronization?
A. So probably one of the more common circumstances where I see something like that is when I'm trying to ventilate someone who has ARDS or acute respiratory distress syndrome. In order to protect the lung, like we heard earlier today, we have to give very small breaths to not overstretch the lungs. And so we're giving less of a breath than the patient actually -- their body is demanding, and in that circumstance the patient struggles because they're not getting the breath that they want. So that is what I would call ventilator dyssynchrony. And we treat that with sedation and narcotics for air hunger.
Q. What is the effect of a sedative and a paralytic on an intubated and mechanically ventilated patient's ability to breathe?
A. If someone is paralyzed, they themselves are not going to be able to initiate any breaths. They won't be able to breathe at all.
Q. Would that depress the respiratory rate?
A. Yes. It depresses it to zero. They can't breathe at all. There's no respiratory rate with paralysis.
Q. So do you have your report in front of you, Doctor, your -- I don't remember if it was amended or supplemental, but the most recent support that you submitted in this case.
A. I don't believe I have that in front of me, unless it's in

your binder.

MR. THOMPSON: Your Honor, could I have just one moment?

THE COURT: You may.

(Brief pause in the proceedings.)

Q. Do you have your screen in front of you, Doctor?

A. I have the screen, but it's blank right now.

MR. THOMPSON: Your Honor, if we were to put Dr. Bastarache's exhibit on the screen, would that be acceptable?

THE COURT: Yes. It's not confidential; correct?

MR. THOMPSON: Perfect. Thank you.

Q. Do you have a preference, Doctor?

A. I like both, if you don't mind.

MR. THOMPSON: Permission to approach, Your Honor?

THE COURT: You may.

Q. So we're bouncing around a little bit. Would you turn to page 3, Doctor, of your report.

A. Yes, sir. I'm on page 3.

Q. About halfway down, do you see the heading under -- or next to number four?

A. Yes, I do.

Q. I'm quoting here: "Hypoxia does not cause rapid or instantaneous loss of consciousness and death." Is that your fourth opinion offered in this case?

A. Yes, it is.
Q. And in that opinion, you have concluded that it would take several minutes after nitrogen -- or after there's full displacement of oxygen in the lungs for loss of consciousness to occur.
A. Yes, sir.
Q. Is that correct?
A. Yes, sir. That's what I said in my report.
Q. So specifically -- and I know that we've talked a little bit about it being a theoretical time estimate that can change based on the circumstances of the case, but how do you square your two minute and 18 second time estimate for loss of consciousness for someone in their fifties and sixties with opinion number four, that once full oxygen displacement occurs in the lungs, loss of consciousness will not occur for several minutes?
A. Well, I think I stated here, it would take several minutes for the inmates to lose consciousness after the flow of nitrogen is turned on. And that squares with my opinions in this case using the physiologic calculation and also the eye witness reports.
Q. But you're making that -- you're offering that opinion categorically; correct?
A. I'm offering the opinion based on the nitrogen hypoxia protocol, the eye witness reports, and the physiology.
Q. Sure. But you testified that whatever the actual number

ends up being, you know, whether it's three minutes, five minutes, seven minutes, the two minutes and 18 seconds is theoretical. The actual number depends on the facts and circumstances of the particular case; correct?
A. Yes, sir. That's what I said.
Q. So what facts and circumstances are you pointing to specifically here in support of that conclusion where you are saying that it will take several minutes, which is above and beyond the two minute and 18 second theoretical time that we've been talking about?
A. Again, this opinion is not just based on the theoretical calculation. It's based on the other things we're talked about, including the eye witness reports.
Q. Can you link those two for me, please?
A. I'm not sure I understand the question.
Q. Are you saying that the eye witness -- I guess -- is this -- is this retrospective or prospective? Are you saying that future executions under the protocol will take several minutes once nitrogen starts flowing, or are you saying that in your opinion, past executions have taken more than two minutes and 18 seconds, and that's the basis for your predictive opinion?
A. Well, I wouldn't really have an opinion based on unknown facts in the future. But both of those statements are true, so based on what we've discussed in this case, including the eye witness reports, they've taken three to seven minutes. And I

would expect similar time frames in the future based on all of this information.
Q. In your experience, do patients experience all forms of air hunger the same?
A. I think the physiologic response, so the brain saying, I need more air, do whatever I can to make air, that's universal. How someone might experience that or describe it could vary.
Q. So no matter whether that's a lack of oxygen, displacement with an inert gas, or a buildup of carbon dioxide, you're saying that those are experienced identically across patients?
A. No, that's -- let me clarify a little bit. So both hypercarbia or high carbon dioxide and low oxygen can cause the symptom of air hunger. Whether those two are exactly identical is --

They're not exactly identical with how the signals are processed. So the initial signal for high carbon dioxide is the body sensing high carbon dioxide, and the initial signal for low oxygen is the body sensing low oxygen, but those signals converge to the same place, and that is, I need to breathe more. I can't get enough air. I'm suffocating. So the input is different, but the end result is the same.
Q. And just to be clear, you said it can, and that sounded a bit less equivocal, so I want to make sure that I'm clear. Are you saying that in all cases, the end result will be the same? Are you carving out some exceptions? Where are you drawing that

line?
A. So each person is going to have some individual variability on the set points for where the symptoms start to occur in terms of levels of oxygen and carbon dioxide, but ultimately the mammalian body's response to sensing those extreme danger signals is the same. So it causes the same response in the brain and body to try to get more air.
Q. So you're saying that the response to dyspnea, no matter what form it takes, is objective or subjective?
A. It's both. It's objective physiologic, physical response of the body that's then experienced by the person living in that body.
Q. And those two things are not always congruent in a particular patient, are they?
A. I am not sure what you mean by congruent.
Q. Physiological markers might suggest that the oxygen saturation levels are acceptable or within normal limits, and yet the patient might still be experiencing dyspnea as sort of a subjective experience?
A. Yes. So dyspnea, as we talked about a few minutes ago, can be caused by several different things, including constriction of the airways. That can cause someone to be dyspneic, but their oxygen level is going to be totally normal. So there are lots of different ways that someone can be dyspneic.
Q. So we've talked about inert gas displacement. We talked

about lack of oxygen. We talked about CO2 buildup. Are there any others that come to mind for you?
A. So asthma or obstruction of the airways, constriction of the chest, you know, inability, pain, exercise, fever. Those all can cause dyspnea.
Q. So you mentioned asthma. And some obstruction of the airway can cause the feeling of dyspnea in a patient, potentially regardless of their oxygen saturation levels. Is that fair?
A. Yes, that's fair.
Q. So would the same be true of a mechanically ventilated and intubated patient in the sense that the foreign object in the trachea is what's causing the distress and the uncomfortable sensation, not the oxygen levels?
A. No. Actually, the tube in the -- surprisingly, just the physical tube doesn't really cause a lot of distress. You bypass all the cough receptors. The distress that patients feel that are intubated is much more related to the underlying lung disease and then how we have to set the ventilator. But again, it depends on the specific circumstance for each patient.
Q. So what's the point of the sedative?
A. The sedative is to really relieve the air hunger that is associated with the underlying lung problem, and also to help treat the ventilator dyssynchrony that we talked about.
Q. So I guess that sounds to me like a roundabout way of saying that in that context, it's the procedure that's causing the

distress, you know, instead of or at least as much as any underlying drop in oxygen saturation, carbon dioxide buildup, what have you.
A. I disagree with that. I think it's completely -- I mean, there are scenarios where it's -- you know, ventilator dyssynchrony is a big driver of why someone's uncomfortable, and then there are other scenarios where it's severe underlying lung disease and hypoxia that we can't treat even with the ventilator. So I can't make an overarching statement that covers all patients. It's very variable, depending on the circumstances.
Q. Have you reviewed any of Mr. Lee's medical records in this case?
A. No, sir, I have not.
Q. Have you examined him in any way?
A. No, sir, I have not.
Q. Have you spoken to him?
A. No, sir, I have not.
Q. Are you aware of his medical history?
A. No, sir, I'm not.
Q. So in that situation, how would you expect to predict how a patient would respond to a hypoxic event or state of being?
A. So in this circumstance, I would not call Mr. Lee a patient. From what I understand, he's a young, healthy man that is going to be exposed to high levels of nitrogen to force him to be

hypoxic so that he suffocates. So I would not consider him -- I don't think of this as a patient. This is someone that's being forced to suffocate from hypoxia.
Q. So you described him as a young, healthy man. Wouldn't that suggest that your theoretical estimate of two minutes and 18 seconds, based on the Fowler article, that he would fall much closer to that end of the range than some of the outer bounds that you've expressed in your report?
A. Again, the two minutes and 18 seconds is the theoretical framework, and all of -- you know, there are other factors related to the actual circumstance. And so there's no way to predict how long it will lead to loss of consciousness for any given individual.
Q. Would you expect in the aggregate, across a sufficiently large set of patients, though, that the healthier they are, the fewer confounding variables that we've talked about -- underlying respiratory illness, mechanical ventilation, supplemental oxygen -- that the healthier the person is, the closer to that theoretical baseline they would be?
A. Actually, it's the exact opposite. The healthier the person is, the more able they are to tolerate hypoxia and low oxygen, and it would actually take longer. The healthier the person is, the longer it would take to loss of consciousness.
Q. Categorically?
A. I wouldn't say anything categorically; but if you have a

healthy person and a person with emphysema, forced nitrogen hypoxia is going to result in hypoxia and loss of consciousness faster in someone who has underlying lung disease than a young, healthy person that does not have any underlying lung disease.
Q. And for the unhealthy person, what explains that? What's the mechanism?
A. It's lack of reserve in cardiovascular fitness, lung function, ability to exchange gas. So when someone has an underlying lung disease or other kind of disease, they're more sensitive or more susceptible to perturbations, low oxygen, high carbon dioxide, et cetera.
Q. You said reserves. What do you mean by that?
A. So every organ in our body has reserve. We're not redlining any of our organs at any one moment. If I took out one of your lungs, you wouldn't be able to run a marathon, but you would be able to live a normal life and do your everyday activities. So we have a tremendous amount of lung reserve.
As patients get chronic illnesses, that reserve goes down. And the smaller that reserve, the faster it's going to -- in this circumstance, the smaller the reserve, the faster the nitrogen hypoxia is going to work because you don't have to overcome that reserve.
Q. Sorry, Doctor. Give me just one second.
A. Sure.
MR. THOMPSON: Your Honor, may I have just one moment?

THE COURT: You may.

(Brief pause in the proceedings.)

MR. THOMPSON: Your Honor, I should just have a couple more questions.

Q. Doctor, going back to the autopsies that you reviewed in this case, did you talk to any of the medical examiners who performed these autopsies?

A. No, sir, I did not.

Q. Do you think that that would have been helpful in forming your opinion?

A. No.

Q. Maybe not necessary, but helpful?

A. No.

Q. Did you review the testimony of Dr. Shante Hill?

A. That does not ring a bell. I don't believe I did.

Q. Well, Dr. Hill is the examiner who conducted Kenneth Smith's autopsy.

MR. THOMPSON: Your Honor, I think that's it.

THE COURT: All right.

MR. THOMPSON: Thank you.

THE COURT: You have redirect? I feel like now is a time to take a quick break.

MS. SHARPE: I do not have redirect, in any event.

THE COURT: All right. Then you can step down.

It is 3:22. We will take a break until 3:40.

(Recess was taken at 3:22 p.m. until 3:41 p.m., at which time the proceedings reconvened, as follows:)

THE COURT: Plaintiff will call its next witness.

MS. WIESNER: Thank you, Your Honor. Plaintiff Mr. Lee calls Sarah Clifton to the stand.

Your Honor, before we begin, we have witness binders for Ms. Clifton as well. May I approach?

THE COURT: Yes. Thank you.

MS. WIESNER: Your Honor, all of the exhibits contained in Ms. Clifton's binder have been previously admitted.

THE COURT: All right. Very good.

SARAH CLIFTON

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. WIESNER:

Q. Good afternoon. Can you please go ahead and state your name for the record.

A. My name is Sarah Clifton.

Q. Thank you, Ms. Clifton. Where do you currently work?

A. I work for the Montgomery Advertiser as a reporter.

Q. And how long have you worked at the Montgomery Advertiser?

A. Since August of 2024.

Q. Now, Ms. Clifton, have you attended an execution?

A. Yes.
Q. How many?
A. Three. Yeah.
Q. And have each of those three executions been here in Alabama?
A. Yes.
Q. Have each of the three executions been by nitrogen hypoxia?
A. Yeah.
Q. So I want to walk through those three executions.
Did you attend the execution of Demetrius Frazier, which was in February of 2025?
A. Correct.
Q. And did you also attend the execution of Geoffrey West?
A. Correct.
Q. And finally, did you attend the execution of Anthony Boyd?
A. Correct.
Q. Why was it that you attended each of those executions?
A. It's part of my job as a reporter. On paper I'm a business reporter, but the executions beat was open, and I took it up.
Q. Now, given that you were there in your capacity as a reporter, does that mean that you sat in the media witness room?
A. Correct.
Q. And did you take notes during each of those executions?
A. Yes.
Q. What types of things were you taking notes of?

A. Taking notes of every movement I see, times that correspond with movements -- correspond with movements, you know. It's mostly movements, times, keeping track of those things, any breathing. Anything that I can see gets written down.
Q. So is it fair to say that throughout those executions, you're focused on the inmate?
A. Yes.
MS. KENNY: Object. Leading.
THE COURT: Sustained.
Q. I'll reask. What are you focused on during those executions?
A. Everything that's happening.
Q. Does that include the inmate?
A. Yes.
Q. You also mentioned that you're writing down times. Are you keeping track of time on a clock while you're taking those notes?
A. There's a digital clock that's on the wall in the death chamber.
Q. And were you trying to record in real time what you were observing?
A. Yes.
MS. KENNY: Objection. Leading.
THE COURT: Sustained.
Q. I understand that you wrote articles describing your

observations of each execution.
A. Correct.
Q. And in writing those articles, were you doing your best to be as accurate as possible in describing your observations?
MS. KENNY: Object to bolstering.
THE COURT: I'm sorry. I couldn't hear you.
MS. KENNY: Objection. It's bolstering before she even testifies.
THE COURT: You need to do a better job rephrasing your questions.
MS. WIESNER: I can reask my question, Your Honor.
THE COURT: Please do.
Q. (Ms. Wiesner, continuing:) In the articles when you're describing -- well, strike that. In each of the articles, what are you basing the information contained in your articles on?
A. Can you ask that again? I'm sorry.
Q. Sure. And why don't I actually use an example to help.
A. Okay.
Q. If you can, Ms. Clifton, in your binder, there is an exhibit labeled P 0028. Do you recognize this article?
A. Yes.
Q. And is that an article that you wrote regarding Demetrius Frazier's execution?
A. Correct.
Q. And was Mr. Frazier's execution fresh in your mind when you

wrote this article?
A. Yes.
Q. And do you recall that you previously testified in this court regarding your observations of Mr. Frazier?
A. Yes.
Q. And do you recall that that was in September of 2025 in a case brought by Mr. Boyd?
A. Correct.
Q. Is the testimony that you provided last year about your observations during the Frazier execution still accurate today?
A. Yeah, it should be.
Q. And if you look at Plaintiff's Exhibit 28, which is the article on the screen, if you turn to page 2, do you see that there's an execution time line?
A. Yes.
Q. And did you, yourself, write this execution time line?
A. Yes.
Q. What information were you using to create this execution time line?
A. It's based on my observations during the execution. A very simple version of what happens is that, you know, they start the process, it goes through after all media sits, and, you know, I write what I see as I'm seeing it and notate times. It's a very straightforward witness account.
Q. And do you stand by the description of events that you

witnessed during Mr. Frazier's execution as relayed --
A. Yes.
Q. -- as what's on the screen?
A. Yes.
Q. Now, you also observed Mr. West's execution in September of 2025?
A. Uh-huh (positive response).
Q. And did you also write an article about what you observed during Mr. West's execution?
A. Correct.
Q. If you could, Ms. Clifton, please turn to Plaintiff's Exhibit 34, which is also in your binder. Do you recognize this article?
A. Yes.
Q. Is this the article that you wrote regarding Mr. West's execution?
A. Yes.
Q. And when you wrote this article, were the events in his execution still fresh in your mind?
A. Yes.
Q. If you can take a look at the first page, please, you'll see that there is a bolded header that says "Execution time line."
A. Uh-huh (positive response).
Q. Do you see that?
A. Yes.

Q. What information were you basing this time line on?
A. My notes that I was taking as the process happened.
Q. So I want to talk to you about a few of the entries contained in your time line. And if you can start with the very first bullet, please.
MS. KENNY: I'm going to object to this methodology. At this point, she's not established that she cannot testify as to her own recollection. This is improper refreshing of recollection if she's going to have her read her article out loud to this court.
THE COURT: What's your response?
MS. WIESNER: Well, Your Honor, I'm going to ask specific questions about certain entries and what her observations were, but I'm certainly fine to ask the question first, and if the witness requires refreshing, we can refer back to the article.
THE COURT: All right. Let's do that.
MS. WIESNER: Your Honor, I do, however, want to orient the witness to certain bullets in the article, which I think would be helpful for expediency today.
THE COURT: All right. Go ahead.
Q. (Ms. Wiesner, continuing:) The first bullet, you write at 5:52 that the drapes in the viewing room were drawn back --
MS. KENNY: Objection, Your Honor. She's reading the entry.

THE COURT: Why don't you ask her questions about her recollection? And then if you need to refer to the article, you can do that.

Q. (Ms. Wiesner continuing:) When you first entered the media witness room, are the curtains closed?

A. Yes.

Q. At some point in time during each execution, are the curtains drawn back?

A. Yes.

Q. Following the point in time when the curtains are drawn back, do you have a clear view of the gurney?

A. I would say so.

Q. And likewise, after the point in time at which the curtains are drawn back, do you have a clear view of the inmate?

A. Wait. Ask that again? I'm sorry.

Q. Sure. After the curtains are drawn back, do you have a clear view of the inmate?

A. Yes.

Q. And in the case of Mr. West, did you have a clear view of Mr. West?

A. Yes.

Q. Were you able to see Mr. West's face?

A. Yes.

Q. And do you recall during Mr. West's execution seeing a member of the corrections staff conducting some type of an

inspection of the mask on Mr. West's face?
A. I believe so. I would like to double check my article to be sure.
Yeah. Yeah. They do, like, a seal check where they run their hands along the edge of the mask.
Q. And that was something that you were able to see from the media witness room?
A. Yes.
Q. During Mr. West's execution, did you see Mr. West nod his head?
MS. KENNY: Object to leading.
THE COURT: Overruled. You can answer that.
A. When are you referring to? There's -- it's like a long period of time, so I would need a specific --
Q. Is there a document that would help refresh your memory on the points in time during Mr. West's execution?
A. Yeah. It would help if I could review this. As I've said previously, this is written directly after the thing happens, so --
Q. So why don't I ask my question, and if it would be helpful for you, I can direct you to a point in the article. You can review it silently to yourself, and then I can reask my question.
A. Okay.
Q. Was there a point in time at which you saw Mr. West moving

his head, nodding his head? And I would direct you, Ms. Clifton, to the bullet at time stamp 5:57, if you could read that to yourself.
A. Yeah. Everything that I've written, like I said before, is true as I witnessed it.
Q. So having reviewed this article, does that refresh your recollection about whether or not you saw Mr. West nodding his head?
A. Yes.
Q. And at approximately what time did you see that?
A. Around 7:57.
Q. Do you mean 5:57?
A. Yes. Sorry. 5:57.
Q. And did you also see what appeared to be like Mr. West trying to say something?
A. Yeah, at points.
Q. And did that also occur at approximately 5:57?
A. Yes.
Q. Now, based on your observations, did it appear to you that Mr. West's breathing changed at various points in time?
A. Yes.
Q. Can you describe that for us.
A. It's nothing that's, at least as far as this one goes, not consistent, but there are several points where I noticed the rate of breathing change, whether it was -- it became quicker,

became slower or shallower, more ragged. The quality of it changed over the process.
Q. Did you ever observe what looked like his breathing becoming heavier?
A. Yeah.
Q. And approximately when did that happen?
A. I would have to look at the time line. Probably --
You said heavier; right?
Q. Yes, ma'am.
A. His breathing becoming heavier? Sorry. I wrote a lot. Hold on. Starts at around 5:57, and it continues to get heavier, and then it shallows out minutes later.
Q. Did you see Mr. West make any movements with his body?
A. Yeah.
Q. Can you describe those movements, please.
A. One thing I do remember, without even having to review it, is his head sort of, like, lolling to the side and sort of rolling like this. There was a lot of movements in general that happened with these things, but that one is a big one I remember. He appeared to give a thumbs up towards the beginning of it and looked like he was trying to say something. His hands would curl. You know, the breathing impacts that. Not the hands thing, the, you know, just general stability of the body on the gurney. Those are the main things, I would say. My article is a lot more detailed, but, yeah.

Q. Fair enough. So you mentioned that you saw Mr. West's head loll to the side. Did you record in your article the approximate time at which you saw Mr. West's head loll to the side?
A. I did. 5:58, and then it continues into 5:59.
Q. You said that you also saw Mr. West's hand curl. Did you also record in your article the approximate time at which you saw his hands curl?
A. Yes. Let me find it. Somewhere in here. 6:00.
Q. And at any point in time, did you see Mr. West make any other movements with his upper body?
A. Besides ones that are impacted by heavier breathing, I suppose not, but it was mostly ones related to breath.
Q. Did you ever -- did it ever appear to you that Mr. West was pushing against the restraints?
A. It appeared that way. I don't necessarily know if that is -- or what -- if that is what was happening, but there were times that it appeared like that was the case, yes.
Q. And can you describe for me what he was doing.
A. I say it somewhere in the beginning, where he's, like, strapped cruciform to the gurney. There's points where, you know, as it went on, it looked like his arms were just fighting against the restraints. Yeah. Just like, you know -- yes.
Q. And did you record in your article the approximate time at which you observed Mr. West's arms fighting against the

restraints?
A. Yeah. I know it's in here. I've got to find it. 5:58. Did you not --
Q. Sorry. I didn't hear your answer.
A. 5:58 is when that happened. Sorry.
Q. Did you take notes on when you were able to hear Mr. West's last breath?
A. You can't -- well, "can't" isn't the word.
Q. Let me reask my question.
A. Yeah.
Q. Were you taking notes on what you could observe about Mr. West's breathing?
A. I took notes on when I saw his last breath.
Q. And when was that?
A. It was around 6:07. Yeah.
Q. And the four minutes leading up to when Mr. West took his last breath, what were you observing about his breathing?
A. In the four minutes leading up to it you said? Like I've said before, the quality of the breath changes a lot very rapidly over the course of this process. There is a lot of gasping breaths that are further apart and inconsistently timed, and at a point they start to shallow out. Everyone looks differently, but the gasping breaths and tapering off into more shallow ones is a common thing that I've seen. I remember he in particular had breathing that sort of appeared like he was

coughing. Again, I can't say exactly that he was coughing, but that's what it appeared like. But, yeah. Breathing that was gasping at first, shallowed out, sputters into some coughs, and then nothing perceptible to the eye.

Q. And did you record in your article the approximate times at which you saw the gasping and coughing breaths?

A. Yes, extensively.

Q. I want to turn to Mr. Boyd's execution, which was in October of 2025. Did you also attend that execution?

A. I did, yes.

Q. And where were you sitting for Mr. Boyd's execution?

A. Mr. Boyd's, I was in the second row of the viewing chamber. But the seats are staggered, so it's still a very clear view from where you're sitting.

Q. Did you write an article regarding your observations of Mr. Boyd's execution?

A. Yes.

Q. And if you can turn, please, to Plaintiff's Exhibit 30. Is this the article that you wrote regarding your observations of Mr. Boyd's execution?

A. Yes.

Q. And did you take notes of your observation during that execution?

A. Yes.

Q. If you take a look at Exhibit 30, do you see that there's an

execution time line reflected?
A. Uh-huh (positive response).
Q. What information were you using to create this execution time line?
A. The notes I take in real time as I'm watching the execution occur.
Q. And were the events of Mr. Boyd's execution fresh in your mind when you wrote this execution time line?
A. Yes. This is written directly after it happened.
Q. Is that true for Mr. West as well?
A. It's true for all of them.
The process the prison uses is that they have a separate media room on the site. We witness the executions, we're taken back to the media center, there's a short press conference with John Hamm, and then we have an hour to write in there before it closes. So it's always right after the execution occurs.
Q. Thank you. When you first entered the witness media room for Mr. Boyd, were the curtains closed?
A. Yes.
Q. And at some point, the curtains were opened?
A. Yes.
Q. After the curtains were opened, were you able to see Mr. Boyd on the gurney?
A. Yes.
Q. Did you have a clear view of Mr. Boyd on the gurney?

A. At that point, yes.
Q. There is a reference in your article to Mr. Hood.
A. Uh-huh (positive response).
Q. Who is Mr. Hood?
A. That was Boyd's spiritual advisor.
Q. Did Mr. Hood block your view of Mr. Boyd's face for any period of time?
A. For a portion of time, he stood next to him, holding his hand. So he was standing in front of his face, but I could see the rest of his body. I believe that's -- yeah, it's like 5:55 -- no -- no. That's not the part where he was blocking it. Yeah, at like 5:56 to 5:58.
Q. So to clarify, at some point in time, Mr. Hood stepped away?
A. Yes.
Q. And once Mr. Hood stepped away, did you have a clear view of Mr. Boyd's face?
A. Yes.
Q. But even when Mr. Hood was standing next to the gurney, you could see Mr. Boyd's body?
A. Everything except his face.
Q. And you indicate in your article that the gas apparently began flowing at 5:57. What did you observe happening with Mr. Boyd right after you believe the gas was flowing?
A. Like sudden movements, you know, like the body jerking a bit off the gurney. I forget exactly how I phrased it, but I

remember it was his, like, legs tensed. But -- yeah. Basically, sudden movements.
Q. All right. Did you see Mr. Boyd roll to the side or make any attempts to roll to the side?
A. Yeah. There was a point in the beginning where he did that. I would have to see the exact time in here. Yeah. 5:57 is when that happened.
Q. What other movements did you see from Mr. Boyd at 5:57?
A. He, like, jolted and rolled to the side. There was a bit of shuddering, too, bodily, like, shuddering. You know, that's the -- that's most of it.
Q. At any point in time, did you see Mr. Boyd's legs raise up off the gurney?
A. Yeah. I saw that twice.
Q. And did you document in your execution time line approximately when you saw Mr. Boyd's legs raise up off the gurney?
A. Yeah. It happens once at the beginning. I believe around 5:56 or 5:57, one of those -- no, 5:58. That's when it happened. And then it happens again somewhere towards the end. I have to find it. Sorry. I read slowly. 6:15. That's the second time it happens.
Q. And I saw in your article some descriptions of the time that passed in between each breath.
A. Yeah.

Q. How did you determine how much time was passing in between each breath?
A. Manually counting seconds as I watched.
Q. So you were literally counting to yourself in between each breath?
A. Yes. I do that during every execution, but that's how that was ascertained.
Q. And if you look at your article, beginning at time 6:01, how much time were you counting in between Mr. Boyd's breath?
A. Every time he took a new breath, I would start over my counting in seconds and write down each single one. So those were -- they came really inconsistently, and there were some intervals that were about five seconds long, some about 15. I remember a couple were like eight or ten. But that range of time intervals between breaths was what I observed.
Q. And if you look beginning at minute 6:02 and again at 6:06, did there come a period of time when Mr. Boyd's breath became more regular?
A. Yeah. Yeah.
Q. And how often was Mr. Boyd breathing?
A. There was a point where it -- where I counted two to three seconds between breaths. There was a couple of minutes where it seemed like it was three seconds between each one, and then it appeared to become less stable at a point, and there was more variation of two seconds and three seconds between them. But --

yeah.
Q. But were there multiple minutes where Mr. Boyd was breathing every two to three seconds?
A. Yeah. Yes, there was.
Q. And did you document in your execution time line approximately at what point in time Mr. Boyd was breathing every two to three seconds?
A. Yes. Yeah, I believe it starts somewhere in here. Yeah, at 6:02, there's longer intervals between them, and they get progressively shorter as you go on to 6:07, which is where he was breathing approximately every two to three seconds.
Q. And at some point in time after 6:07, did Mr. Boyd's breath start to become shallower?
A. Yeah.
Q. And did you again --
THE COURT: Sorry. Can you answer out loud?
THE WITNESS: Oh, sorry. Yes.
Q. And did you document in your execution time line approximately when that occurred?
A. Yes.
Q. How long was it before you saw what appeared to be Mr. Boyd's last breath?
A. I believe about -- hold on. It's in here. The last one was around 6:17.
Q. Thank you.

MS. WIESNER: Your Honor, I would pass the witness.

THE COURT: All right. Cross-examination.

CROSS-EXAMINATION

BY MS. KENNY:

Q. Good afternoon, Ms. Clifton. Polly Kenny.

A. Hi.

Q. Let's start with Mr. West's article, if you could turn back to Exhibit 34. I would like to turn your attention to the 5:58 entry. You state that West's hands seemed to lax as he began to apparently shake his head. His arms appeared to tense against the restraints, and his body appeared to shake slightly over about 20 seconds.

His body appeared, and then there's "appeared" two more times in that entry. Do you see that?

A. Yes.

Q. And then throughout the next 5:59, 6:00, 6:01, the word "appeared" appears multiple times; correct?

A. Yes, it does.

Q. And the word "apparently" appears multiple times as well; correct?

A. Yes.

Q. And you're not using -- when you say you're counting seconds, are you counting those in your head, or do you have a stopwatch-type thing?

A. You're not allowed to bring a stopwatch in there.

Q. So you're counting -- how do you do it? One Mississippi?
A. One Mississippi, two Mississippi, three Mississippi.
Q. Like every Southerner does.
A. Yes. Correct.
Q. Now, Mr. West -- you indicate that his body began to turn blue at 6:00; correct?
A. Yes. That was what I saw.
Q. And you testified on direct examination that the last four minutes, that the breathing was variable, I guess -- that might not be the word you used, but that's a word I would use to describe your testimony. Would you agree that it was sort of variable?
A. Yes.
Q. And would you agree that that's consistent with agonal breathing?
MS. WIESNER: Objection.
THE COURT: What's the objection?
MS. WIESNER: Lack of foundation. Calls for expert testimony.
THE COURT: Sustained.
Q. (Ms. Kenny, continuing:) You testified in the Boyd hearing; correct?
A. Yes, I did.
Q. And you testified in regard -- in regard to agonal breathing, that you saw Mr. Frazier having agonal breathing?

A. I believe what I said was I was aware of what agonal breathing was, not necessarily that I can attest that that was agonal breathing.
Q. What is agonal breathing?
A. That's not within my purview to define right now.
Q. So you knew what it was then, but you don't now?
A. I do know what it is, but --
Q. Have you ever seen someone die?
A. Several times.
Q. And have you seen end-of-life breathing?
A. Yes.
Q. Would you call that agonal breathing?
MS. WIESNER: Objection, Your Honor.
THE COURT: Overruled. She's laying enough of a foundation that this line of questioning can continue. Go ahead.
A. I am not a medical expert, so I am not going to attest to whether or not it was agonal breathing, but I do know what it is. I'm aware of that concept. But I can't say for certain if it was or wasn't.
Q. And excuse me if my question tended to that. What I was meaning to ask was whether that was consistent in your mind with what you had seen previously.
A. Consistent with what I had seen previously --
Q. In seeing other people die and end-of-life breathing.

A. Everyone is different when they die. The type of movements that happen, type of breathing, how hard or shallow or rough it is, it's all different. So I don't know if necessarily comparing visual stimuli is the most helpful, especially if the deaths occurred by different means. I've seen three executions, and I've watched several people die naturally, and those are all very different circumstances. So I would not feel comfortable, you know, making that decision one way or another.
Q. So that's fair. So in that several, the three executions and the people you saw die naturally, they were all different, you said?
A. Yes.
Q. Now, in a nitrogen execution, you do not know exactly when the gas begins to flow; correct?
A. Correct. The State does not tell us.
THE COURT: Ms. Kenny, could you pull the microphone down a little bit more? Thank you.
Q. And you cannot see the pulse oximeters to see what the blood saturation is; correct?
A. They're not publicly, like, available.
Q. So you cannot see them.
A. No.
Q. And you cannot see the EKG machine; correct?
A. Correct. For Boyd's case in particular, they told us when he flatlined, though, so that is information that I got from the

State.
Q. Was that during the press conference or prior to that --
A. Yes.
Q. And you don't know from your personal observations when the condemned inmate loses consciousness; correct?
A. Correct.
Q. You don't know when their heart stops, other than Boyd being --
A. I was about to say, in Boyd's case, they told us directly.
Q. Okay. But other than that --
A. General protocol is that we are not able to see the EKG.
Q. And of the movements you see, you don't know which movements are conscious movements and which ones are not conscious movements; correct?
A. Correct.
I'd like to clarify that all the things that I've documented in here are things that I've observed. I don't know the intention behind them or the thought process behind them, but these are all things I saw with my eyes.
Q. From your perspective on your angle and your observations; correct?
A. These are just literal events that I saw with my eyes, not colored by anything else. Just write what I see.
MS. KENNY: No further questions.
THE COURT: Any redirect?

MS. WIESNER: No, Your Honor.

THE COURT: All right. You can step down. Thank you.

Plaintiff will call its next witness.

MS. WIESNER: Thank you, Your Honor. Plaintiff Lee calls Defendant Commissioner Hamm.

Your Honor, again, I have witness binders. May I approach?

THE COURT: You may.

MS. WIESNER: Just for the record, Your Honor, Plaintiff's Exhibit 4 is highly confidential. I do not anticipate that I will have to show it, so hopefully we can avoid any issues there.

THE COURT: All right.

MS. WIESNER: And Plaintiff's Exhibit 114, I've had conversations with counsel for defendants. They agreed that I could publicly show this document. They did, however, ask that I redact the language "highly confidential," which we've done in the electronic version. So if it is published, I understand from defense counsel that I may do so without closing the courtroom.

THE COURT: That's correct?

MS. SIMPSON: Yes, Your Honor.

THE COURT: All right.

JOHN HAMM

The witness, having first been duly sworn to speak the

truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. WIESNER:

Q. Good afternoon.

A. Good afternoon, ma'am.

Q. Can you please state your name for the record.

A. John Hamm.

Q. Mr. Hamm, you've been the commissioner of the Alabama Department of Corrections since January 1st, 2020?

A. No. 2022.

Q. Thank you. And you approved Alabama's protocol for execution by nitrogen gas?

A. That is correct.

Q. And you have the authority to approve an execution protocol in Alabama? It's one hundred percent wholly yours?

A. Yes, ma'am.

Q. You did not personally write the protocol for execution by nitrogen gas?

A. That is correct.

Q. Attorneys at the Attorney General's office wrote it?

A. Yes, ma'am.

MS. SIMPSON: Objection, Your Honor. Again, leading the witness.

THE COURT: Sustained.

MS. WIESNER: Your Honor, this is a defendant in the matter. I would ask for permission to lead.

MS. SIMPSON: Your Honor, the witness hasn't proven himself to be hostile yet.

THE COURT: True.

Q. (Ms. Wiesner, continuing:) Who wrote the protocol for the execution by nitrogen hypoxia?

A. The Attorney General's office.

Q. Do you, yourself, have any medical training?

A. No, ma'am.

Q. Do you, yourself, have any training in physiology?

A. No, ma'am.

Q. What about mental health?

A. No, ma'am.

Q. Do you have any training in hypoxia?

A. No, ma'am.

Q. Did you consult with any medical professionals as part of the drafting process?

A. I did not.

Q. And did you consult with any medical professionals regarding the onset of unconsciousness from nitrogen gas?

A. No, ma'am, I did not.

Q. Are you aware of whether anyone on the drafting team consulted with any medical professionals or experts on nitrogen gas?

A. I'm not sure.
Q. Let me break that up.
Are you aware of whether anyone on the drafting team consulted with medical professionals?
A. I don't know who all they consulted with, ma'am.
Q. Do you recall I took your deposition on March 4th of this year?
A. Yes, ma'am.
MS. WIESNER: Court's indulgence.
(Brief pause in the proceedings.)
MS. WIESNER: Permission to approach, Your Honor, with a copy of that deposition transcript?
THE COURT: You may.
Q. If I could direct you, Mr. Hamm, to page 119, beginning at line one. Do you see that I asked, "Are you aware of whether anyone on the drafting team consulted with medical professionals?" And you answered, "I'm not aware." Did I read that correctly?
A. Hold on. I'm just now catching up, ma'am. Hold on. That is correct.
Q. Are you aware of whether anyone on the drafting team consulted technical experts?
A. No, ma'am, I'm not aware.
Q. Before approving the protocol for nitrogen gas, did you personally take any steps to confirm that it does not cause pain

or suffering?
A. No, ma'am.
Q. And before approving the protocol for execution by nitrogen gas, did you take any steps to confirm that it does not cause terror?
A. No, ma'am.
Q. Before approving the protocol for execution by nitrogen gas, did you personally take any steps to confirm that it does not cause psychological trauma?
A. No, ma'am.
Q. And are you aware of the fact that plaintiffs have alleged in this litigation and in others that the protocol for execution by nitrogen gas does, in fact, cause pain and suffering?
A. I understand that's some of the allegations. Yes, ma'am.
Q. After those allegations have been raised, did you take any steps to investigate whether execution by nitrogen gas causes pain and suffering or trauma?
A. No, ma'am.
Q. You've observed several executions by nitrogen hypoxia?
A. Yes, ma'am.
Q. In fact, have you observed all of the executions by nitrogen gas?
A. In Alabama, yes, ma'am.
Q. And are you generally familiar with the steps taken during an execution by nitrogen gas?

A. Yes, ma'am.
Q. Is there a point in time during the execution when someone on the execution team conducts a final inspection of the mask?
A. Yes, ma'am.
Q. Is that inspection a technical inspection of any kind?
A. No, ma'am.
Q. It's just visual?
A. And feel.
Q. Is there any negative pressure seal test performed on the mask?
A. No, ma'am.
Q. Now, when the mask is first placed on the inmate, is breathing air being pumped to the mask?
A. Correct.
Q. And would you agree with me that once the breathing air is turned off during the course of an execution, there will be some residual breathing air throughout the length of the breathing tube?
A. One would figure that.
Q. Does the protocol have any steps to purge the breathing air from the breathing tube?
A. I don't recall specifically.
Q. Sitting here today, you're not aware of any steps in the protocol?
A. To purge the air, no, ma'am.

Q. Are you aware of any tests that have been undertaken at any point in time to confirm how long it takes for the residual air to be flushed from the breathing tube and mask?
A. No, ma'am, I'm not aware.
Q. Are you aware of any independent investigation undertaken to ascertain how long it takes for the residual oxygen to be flushed from the breathing tube and mask?
A. No, ma'am.
Q. Do you know how long it takes for the nitrogen gas to displace the residual oxygen in the breathing tube and mask?
A. I do not, ma'am.
Q. Are members of the media permitted to witness executions by nitrogen gas?
A. Yes, ma'am. Witnesses to all of our executions.
Q. Where do the media witnesses sit?
A. If you're -- from my perspective or where I sit in the media room, they would be to my right.
Q. Is there anything that would obstruct the media's view from seeing the execution gurney when they're located in the media witness room?
A. Should not be, no, ma'am.
Q. And if I could show you, please, Plaintiff's Exhibit 114.
MS. WIESNER: And Your Honor, given representations of counsel, I would like to go ahead and put that up on the screen.
THE COURT: You may.

Q. Does this picture accurately reflect what witnesses can see from the media witness room during an execution?
A. That is correct.
Q. Now, you sit in a different room from the media?
A. That is correct.
Q. And do you have a different viewpoint of the inmate during executions?
A. Yes, ma'am.
Q. Would you agree with me that members of the media may have a better view of the gurney and inmate than you do?
A. I wouldn't say a better view. I'd say a different view, but not a better view.
Q. Would you agree with me that members of the media may have a better view of the witness's face during execution than you do?
A. Yes, ma'am.
Q. Now, the visual inspection of the mask that we've been discussing, if a witness is tracking what's going on, would they be able to see that final inspection?
A. They should be able to.
Q. And if a witness is tracking what's going on, would they be able to understand that that was the final inspection, and the execution is going to proceed?
A. They should.
Q. Do you know someone by the name of Kim Chandler?
A. I do.

Q. And do you know her to be fair and accurate in her reporting?
A. Yes, I think Kim's fair and accurate.
Q. Do you think she would say any falsehoods in newspaper articles?
A. No, ma'am.
Q. Do you know someone by the name of Marty Roney?
A. I do.
Q. And do you know Mr. Roney to be accurate in his reporting?
A. Yes, ma'am.
Q. I want to talk to you about some of the executions that have happened to date, and I'd like to start with Mr. Kenneth Smith. Did you personally observe Mr. Smith struggle against his restraints during the execution?
A. I did.
Q. And would you agree that Mr. Smith shook and writhed on the gurney for a period of time?
A. I probably wouldn't use those descriptive words, but, yes, he did move.
Q. Would you agree with me that Mr. Smith shook and moved on the gurney for a period of time?
A. Yes, ma'am.
Q. And is it your opinion that that shaking and writhing occurred after the nitrogen gas began to flow?
A. Some before and some after.

Q. So did you observe shaking and writhing after the nitrogen gas began to flow?
A. Yes.
MS. SIMPSON: Objection to the characterization of the testimony of the witness. I don't believe he said he endorsed the word "writhing."
MS. SHARPE: I've asked a question, Your Honor. I'm doing my best to just ask questions and letting him answer.
THE COURT: Overruled. He can answer.
Q. Are you aware of the fact that media witnesses have reported that Mr. Smith was shaking and writhing on the gurney for an approximate two-minute period of time?
A. That is correct.
Q. And do you have any reason to disagree with the fact that there was some movement by Mr. Smith over a two-minute period of time?
A. I'm not going to agree about two minutes continuous, but over a two-minute period of time, he did move some, yes.
Q. Did you give a press conference following Mr. Smith's execution?
A. I did.
Q. Do you recall making statements during that press conference about whether or not Mr. Smith was holding his breath?
A. I did.
Q. Did you personally observe Mr. Smith holding his breath?

A. I was told that by some of the execution staff.
Q. So I want to reask my question. Did you personally observe Mr. Smith holding his breath?
A. I did not.
Q. And so were the statements that you made at that press conference based entirely on what other people told you?
A. That is correct.
Q. I want to turn to Mr. Miller's execution, which was September 2024. You attended that execution?
A. That is correct.
Q. And would you agree with me that Mr. Miller also shook on the gurney for a period of time?
A. His body did move for a period of time, yes.
Q. And is it your belief that Mr. Miller was shaking after the nitrogen gas began flowing?
A. His body did move after the nitrogen started flowing.
Q. The next execution was Mr. Grayson?
A. If you say so.
Q. Did you attend Mr. Grayson's execution?
A. Yes, ma'am.
Q. And do you recall there being an execution in November of 2024?
A. Yes, ma'am.
Q. Did you observe Mr. Grayson making some movements with his body for a period of time after the warden asked if he could

proceed?
A. I don't recall Mr. Grayson's execution personally, but they have all had some type of body movement.
Q. Do you recall giving -- you recall that we took your deposition on March 4th?
A. Yes, ma'am.
Q. And do you recall that I asked you questions about Mr. Grayson during the deposition?
A. Yes, ma'am.
Q. Would it refresh your memory to look at what you testified to on March 4th?
A. It would help.
Q. If you could please turn to page 283, line 18, please.
A. Okay.
Q. Did you observe Mr. Grayson -- does that refresh your memory?
A. Yes, ma'am.
Q. Did you observe Mr. Grayson continuing to make some movements with his body for a period of time after the warden asked if he could proceed with the execution?
A. Yes, ma'am.
Q. And did you also see Mr. Grayson shake his head at some point in time during the execution?
A. Yes, ma'am.
Q. And at some point in time, did you see Mr. Grayson lift both

of his legs up off the gurney?
A. I believe he did.
Q. Did you attend Mr. Frazier's execution in February 2025?
A. Yes, ma'am.
Q. And would you agree with me that there was movement by Mr. Frazier after the nitrogen gas began flowing?
A. Yes, ma'am.
Q. Did you see Mr. Frazier twirling his wrists in a circular motion?
A. I do remember that happening. If it was Mr. Frazier, yes, ma'am.
Q. And did you see Mr. Frazier lift his legs a few inches off the gurney at one point during his execution?
A. Yes, ma'am.
Q. And would you agree with me that you saw movement at various points in time over a seven- to eight-minute period after the nitrogen gas began flowing during Mr. Frazier's execution?
A. I believe that's correct.
Q. You attended Mr. Hunt's execution in June 2025?
A. Yes, ma'am.
Q. And you would agree with me that Mr. Hunt was, in fact, making some shaking movements during his execution?
A. His body was moving, yes, ma'am.
Q. And those movements occurred after you believed that the nitrogen gas had begun flowing?

A. That is correct.
Q. You attended Mr. West's execution in September of 2025 as well?
A. Correct.
Q. And you saw movement by Mr. West during his execution as well?
A. Yes, ma'am.
Q. And the last execution that you attended, that was Mr. Boyd in October of 2025?
A. I believe that's correct.
Q. And do you recall that Mr. Boyd also had movement during his execution?
A. Yes, ma'am.
Q. And the movement that you saw by Mr. Boyd, that also occurred after you believed the nitrogen gas had begun flowing?
A. Yes, ma'am.
Q. Would you agree with me, then, that every inmate who's been executed to date by nitrogen hypoxia has shown some form of movement after the nitrogen has begun flowing?
A. That is correct.
Q. Does ADOC maintain an armory with rifles?
A. We do have an armory. It does have rifles.
Q. And does ADOC maintain ammunition for the weapons in its armory?
A. Yes, ma'am.

Q. Are law enforcement personnel required to undergo basic training and annual requalification with firearms?
A. Yes, ma'am.
Q. Could ADOC train people to use .30-caliber rifles for firing squad if approved by the legislature?
A. We could train in rifles, yes.
Q. And if the Alabama Legislature approved firing squad as a method of execution, would you be able to ensure that officers are trained appropriately in how to use that weapon?
A. Whatever weapon was chosen, yes, we would make sure they were properly trained.
Q. Could ADOC procure lumber?
A. Yes, ma'am.
Q. Could ADOC procure sandbags?
A. Yes, ma'am.
Q. Could ADOC procure armor steel plates?
A. Yes, ma'am.
Q. Could ADOC procure bulletproof windows?
A. Yes, ma'am.
Q. Does Holman have outdoor space that's secured with a perimeter fence?
A. Yes, ma'am.
Q. And if the legislature approved firing squad and approved the funds, could ADOC modify a space at Holman to carry out executions by firing squad?

A. Certainly we could look into that.
Q. If firing squad executions became legal in the state of Alabama and a protocol was enacted, do you believe that you could modify space at Holman to carry out firing squad executions?
A. We would certainly have to do our research to see what type of space we would need, and I'm sure we would be able to come up with an appropriate place.
Q. So is the answer to my question yes, that if the Legislature approved execution by firing squad and appropriated the funds, ADOC would be able to modify space at Holman to carry out executions by firing squad?
A. Yes.
Q. Thank you.
MS. WIESNER: I'll pass the witness.
MS. SIMPSON: Your Honor, I also have a small witness binder.
THE COURT: All right.
MS. SIMPSON: May I approach?
THE COURT: Your may.
MS. SIMPSON: Your Honor, I have a brief cross-examination, and then I request the Court's permission to take the witness on direct. We had also planned to take the witness on direct. Of course, plaintiff beat us to it.
THE COURT: Any objection?

MS. WIESNER: I certainly have no opposition to them doing the direct examination and asking questions within the scope of my direct. I'm not sure I would agree that they can take leading questions, as this is their own client.

THE COURT: I'm understanding her to say she's going to cross-examine him, and then after she's done, wants to then take him on direct. Do you oppose them going ahead and taking him on direct during your case in chief?

MS. WIESNER: No, Your Honor.

THE COURT: All right. Go ahead.

CROSS-EXAMINATION

BY MS. SIMPSON:

Q. Begin with cross-examination.

Commissioner, have you ever worn a full-face respirator?

A. I don't recall.

Q. So have you ever conducted a negative pressure test?

A. I'm sorry. Yes, I have worn a military gas mask. It is full face.

Q. Do you know what kind of military gas mask that was, sitting here today?

A. That was about 40 years ago. No, ma'am.

Q. But have you conducted a negative pressure test?

A. On those masks, we did.

Q. And how do you conduct a negative pressure test?

A. Those particular masks, once you fit them to your head, you

would cover the seal with your hand and then breathe out, you know, push air out.
Q. Can you conduct a negative pressure test on someone who doesn't want to cooperate --
A. No, ma'am.
Q. -- with the test? And why is that?
A. Well, it takes cooperation.
Q. Is that because you're cutting off the air supply?
A. You're going to have to have them cooperate on pushing the air out.
Q. You were asked some questions about reporters who have witnessed executions. Do you recall that?
A. Yes, ma'am.
Q. Do you recall that Mr. Roney reported seeing an IV line during one of the hypoxia executions?
A. Yes, ma'am.
Q. Does ADOC endorse the media time lines or descriptions of any of these articles concerning the hypoxia executions?
A. No, ma'am.
Q. You were asked about a statement you made during a press conference concerning Mr. Smith holding his breath.
A. Correct.
Q. Do you know specifically who gave you the information that Mr. Smith held his breath?
A. I believe it was Cynthia Stewart.

Q. Who is Cynthia Stewart?
A. At that time, she was regional director. She was over several prisons, Holman being one, and she's the former warden at Holman prison.
Q. Was she present at Mr. Smith's execution?
A. Yes, ma'am. She was in the chamber.
Q. Do you think she had a better view than you did?
A. She was right next to him. Yes, ma'am.
Q. You were asked some questions about movements that Mr. Grayson made after you cleared the way for execution. Do you recall that?
A. Yes, ma'am.
Q. What sort of movements did he make?
A. Grayson and all the inmates that have been executed, they've all had some type of body movements. They have had the raising of the legs. They've all had some type of body movement.
Q. Do you expect to see movement during hypoxia executions?
A. Yes, ma'am.
Q. Why is that?
A. That's just -- from information, when the oxygen is cut off, your body is going to have movement.
Q. Do you know specifically when the nitrogen begins to flow during an execution?
A. No, ma'am.
Q. Do you know when the inmates lose consciousness?

A. No, ma'am.
Q. And do you know whether all inmate movements made during hypoxia executions are consciously made?
A. No, ma'am.
MS. SIMPSON: At this point, Your Honor, I would request to turn over to direct examination.
THE COURT: All right. Let me ask this. Do you want an opportunity to redirect before they move into direct?
MS. WIESNER: Your Honor, for efficiency purposes, I would suggest I do all of my questions at the end, if counsel doesn't oppose.
MS. SIMPSON: No opposition here.
THE COURT: All right. Let's do that.

DIRECT EXAMINATION

BY MS. SIMPSON:
Q. Commissioner, have you testified in a hypoxia execution litigation before?
A. Yes, ma'am.
Q. Do you recall testifying in the Demetrius Frazier case?
A. I'm sure I did.
Q. Do you recall testifying in the Anthony Boyd case?
A. I'm sure I did.
Q. I would ask you at this time just to look at Exhibits 5 and 11 in your binder there.
MS. SIMPSON: Your Honor, I would note that these have

been pre-agreed for admission.

THE COURT: These have been admitted?

MS. SIMPSON: Yes.

THE COURT: Okay. Go ahead.

Q. Sir, do you recognize Defendants' Exhibits 5 and 11?

A. Yes, ma'am.

Q. And what are they?

A. These are transcripts of my testimony in this court in Demetrius Frazier and Anthony Boyd.

Q. Do you stand by your prior testimony?

A. Yes, ma'am.

Q. Is there anything in your prior testimony that you would change here today?

A. No, ma'am.

Q. Now, Mr. Lee has suggested that he would prefer to be executed via firing squad. Is that method currently available to ADOC?

A. No, ma'am.

Q. Does ADOC have a protocol for a firing squad?

A. No, ma'am.

Q. Training for a firing squad?

A. No, ma'am.

Q. Does ADOC have a facility today in which you could safely carry out a firing squad execution?

A. No, ma'am.

Q. Have you investigated implementing a firing squad protocol?
A. No, ma'am.
Q. Why not?
A. It is not the law of Alabama, it's not an approved execution method, so I have other things I can be doing.
Q. Sitting here today, can you identify five ADOC employees who you consider to be sufficiently skilled and willing to carry out a firing squad execution?
A. Not at this time.
Q. Do you have firearms training?
A. Yes, ma'am.
Q. What sort of firearms training do you have?
A. Handgun, long gun, or rifle.
Q. And where were you trained?
A. Started at Northeast Alabama Police Academy and then the Federal Law Enforcement Training Center in Glynco, Georgia. Then Tuscaloosa Academy and -- I'm sure there are some others in there.
Q. Are you trained to the level of a marksman?
A. No, ma'am. Well, Alabama Peace Officers Standards Training Commission, they're the ones that regulate firearms training or basic training for correctional officers and law enforcement in the state of Alabama, and they really do not have a classification. They give a numerical score. You have to shoot at least a 70 to pass, and 100 is the top score. But there is

no breakdown. Like at FLETC, Federal Law Enforcement Training Center, they did have different grades of marksman or, you know, you're a good shot or you just passed.

Q. The training standard for the state, is that commonly called APOSTC?

A. That is correct. That's Alabama Peace Officers Standard Training Commission -- everybody refers to it around here as APOSTC.

Q. Do you have to qualify under APOSTC personally?

A. Yes, ma'am, I do.

Q. Dare I ask, what's your qualification score?

A. Oh, it's kind of off. 96 was my last one.

Q. Thank you, sir.

As commissioner -- well, let's see. What role do you play in selecting members of the execution team?

A. I do not select members of the execution team.

Q. As the commissioner, could you compel ADOC employees to participate in executions?

A. No, ma'am.

Q. Why not?

A. That is -- it's kind of like when I was state police, I could not compel any agent to work internet crimes against children because of the type crimes they were. You had to volunteer to investigate those type crimes. So an execution, you would have to volunteer, but it depends on how the law would

be written and passed. Current law, the warden at Holman prison is the executioner. So that would have to be taken into account in any new legislation.
Q. Let's talk briefly about the execution chamber. Are you familiar with the execution chamber at Holman?
A. Yes, ma'am.
Q. Do you believe it could be used for a firing squad execution?
A. I think it's too small.
Q. Any other reasons why or why not?
A. I would -- yeah. I mean, just -- I think it would probably not -- be cost prohibitive to try to retrofit or remodel that, because we still have electrocution, lethal injection, nitrogen hypoxia, so all those methods are still available. So I don't think it could be retrofit to where you could have a firing squad and conduct those other three executions if so selected.
Q. In your opinion, is there another place at Holman that could be easily used for a firing squad execution?
A. Probably. Now, there's a lot of planning that would have to go into it. I think it would probably have to be constructed.
Q. So is there a currently standing facility at Holman that you believe could be used?
A. No, ma'am.
Q. What about the decommissioned part of Holman?
A. Well, it was decommissioned for a reason, so, no, I do not

think that would be acceptable.
Q. How about outside the prison, within the fence but outside the physical building?
A. That's what I'm saying. We would have to actually build probably a structure, would probably be the best choice.
Q. Did you witness Anthony Boyd's execution in October of 2025?
A. Yes, ma'am.
Q. And what kind of execution was that?
A. Nitrogen.
Q. Where did you sit?
A. We sit in the middle observation room. I sit front row, far right seat.
Q. Did you authorize the execution to proceed?
A. Yes, ma'am.
Q. Did you see Mr. Boyd make any movements?
A. Sure. Yeah, Mr. Boyd made movements.
Q. Were you concerned by those movements?
A. No, ma'am.
Q. Why not?
A. Like I said, that's to be expected.
Q. Sitting here today, do you know when Mr. Boyd lost consciousness?
A. No, ma'am.
Q. Do you know when he died?
A. We have a death time that we give out, but I do not know

when he quit breathing, no, ma'am.
Q. Is the official death time the time he quits breathing?
A. No, ma'am.
Q. Can you see the EKG during an execution?
A. No, ma'am.
Q. Can you see the pulse oximeters?
A. No, ma'am.
MS. SIMPSON: I have nothing further of the witness.
THE COURT: All right. Redirect and cross-examination.

REDIRECT EXAMINATION

BY MS. WIESNER:
Q. Mr. Hamm, you were asked a question about whether or not you know exactly when the nitrogen gas begins to flow. Do you recall that?
A. Yes, ma'am.
Q. Are there codes given during the execution that indicate when the execution can proceed?
A. Yes, ma'am, they have codes.
Q. And are you aware of those codes being given during the execution?
A. Not all the time, no, ma'am.
Q. Do you, yourself, have a role in authorizing the execution to proceed?
A. I do.
Q. And you inform the warden when the execution -- when there's

final authority to proceed with the execution?
A. The warden reads the death warrant to the inmate. Once he concludes reading the death warrant, he asks the inmate if he would like to make a final statement. After that the warden exits the chamber. Some period of time after that, he comes over the intercom and asks to proceed. I then ask the Attorney General if there is any legal reasons not to proceed, and if I get a negative, then I tell the warden to proceed.
Q. So even if you don't know the precise time that the nitrogen gas is flowing, you have an approximate estimate of when the execution proceeds and the nitrogen gas begins to flow?
A. I know when the warden has the authority to start the gas.
Q. And in your experience, does the execution typically proceed shortly after you give the authority to start the gas?
A. Some period of time after that, yes.
Q. But a short period of time?
A. I assume. He's -- I cannot see the warden when he does that.
Q. Now, you were also asked some questions about your statements that Mr. Smith was holding his breath. Were you relying entirely on information provided by Ms. Stewart for the statement that Mr. Smith was holding his breath?
A. Correct.
Q. Did you ever ask Ms. Stewart for how long Mr. Smith was holding his breath?

A. No, ma'am.
Q. So sitting here today, you have no idea how long Mr. Smith was or was not holding his breath?
A. That is correct.
Q. You were also asked some questions about whether or not the current execution chamber would accommodate execution by firing squad. Have you undertaken any efforts to understand what would be required from a physical space perspective?
A. No, ma'am.
Q. And have you spoken with anyone to confirm whether or not the execution chamber at Holman is large enough to accommodate execution by firing squad?
A. No, ma'am.

MS. WIESNER: Nothing further.

THE COURT: All right. Any further questions?

Is this redirect?

MS. SIMPSON: Redirect, Your Honor. And just one question.

REDIRECT EXAMINATION

BY MS. SIMPSON:
Q. Commissioner, based upon your experience with and training in firearms, would you authorize a firing squad execution in the chamber at Holman as it stands?
A. No, ma'am.
Q. Thank you.

THE COURT: All right. Anything further? All right. You can step down. Thank you.

Is this witness excused, or are you staying?

MS. SIMPSON: We have nothing further for this witness, Your Honor.

THE COURT: Okay. It is 5:00. I am open to moving forward with the next witness, depending upon how long that witness will be, or we can reconvene tomorrow. Why don't you confer for a moment and let me know what you would like to do.

MS. WIESNER: Your Honor, I think our next witness is likely no more than 30 minutes. If Your Honor is okay proceeding, we would be happy to proceed with him and then pick back up.

MS. SIMPSON: We're fine. Can we have a very brief comfort break?

THE COURT: Certainly. And one housekeeping matter, it appears to us as though you have not actually admitted Defendants' Exhibits 5 or 11.

MS. SIMPSON: We would move for their admission. I believe there was no argument to their admissibility.

THE COURT: Those are the transcripts from Frazier and Boyd?

MS. WIESNER: I think, Your Honor, we had actually agreed to preadmit those exhibits. Certainly no objection now.

THE COURT: All right. They're admitted, just so the

record is clear.

All right. We'll take a ten minute recess.

(Recess was taken at 5:02 p.m. until 5:12 p.m., at which time the proceedings reconvened, as follows:)

THE COURT: The plaintiff will call its next witness.

MS. WIESNER: Thank you, Your Honor. Plaintiff Lee calls Deputy Commissioner Williams to the stand.

Your Honor, again, I have witness binders for Mr. Williams. May I approach?

THE COURT: Please.

MS. WIESNER: For the record, one of the exhibits is marked as highly confidential. I'm, again, hoping that I don't need to use it.

THE COURT: All right.

CHARLES WILLIAMS

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. WIESNER:

Q. Good afternoon.

A. Good afternoon.

Q. Can you please state your full name for the record.

A. Charles Williams.

Q. And are you currently employed as the deputy commissioner of

the Alabama Department of Corrections?
A. Yes.
Q. Are you aware that the Alabama Department of Corrections designated you as its corporate representative in a deposition in this proceeding?
A. Yes.
Q. And if I could turn your attention, please, to Plaintiff's Exhibit 34, which is in the binder I handed you.
MS. WIESNER: Your Honor, Exhibit 34 has been previously admitted into evidence.
Q. Do you recognize this document, Mr. Williams?
A. Plaintiff's Exhibit 34, yes.
Q. And if you take a look at -- looks like page 3, there should be a topic of schedules -- I'm sorry -- schedule of topics listed. Do you see that?
A. Page 3. From the beginning?
MS. WIESNER: Court's indulgence. The printed copy appears to have a missing page, but perhaps we could put it up on the screen.
A. Yes.
MS. WIESNER: I stand corrected. The page is simply out of order.
Q. Mr. Williams, have you located the topics of examination in Plaintiff's Exhibit 34?
A. Yes. I have Exhibit 34, definitions and instructions,

Schedule A.
Q. And did you, in fact, provide testimony in a deposition on March 5th and March 17th on the topics listed in Schedule A?
A. Yes.
Q. What year did the Alabama Legislature approve the use of nitrogen hypoxia as a method of execution?
A. 2018.
Q. And when was the protocol for execution by nitrogen hypoxia finalized?
A. August 2023.
Q. Prior to 2023, had anyone in the United States, to your knowledge, been executed by nitrogen gas?
A. No.
Q. And to your knowledge, were any medical doctors or scientists involved in the development of the protocol for execution by nitrogen gas?
A. No.
Q. Were all of the people responsible for developing -- well, strike that.
Are you aware of the fact that people on behalf of ADOC's -- on behalf of ADOC conducted some tests or demonstrations of the nitrogen hypoxia system at various points in time?
A. Yes.
Q. And to your knowledge, were all of the people who were responsible for developing and administering those tests all

attorneys?
A. Further define administering and developing the tests. As that pertains to just the actual testing itself? The ones that were involved in the studies?
Q. Are you aware of any tests conducted as part of the development of the protocol of nitrogen hypoxia that were developed by anyone other than an attorney?
A. No.
Q. And to your knowledge, do any of the attorneys who were responsible for developing those tests or the protocol have any type of scientific or research background?
A. Not to my knowledge.
Q. To your knowledge, did any of the attorneys responsible for developing the protocol for execution by nitrogen gas consult with any independent or third-party experts?
A. Not in the development of the protocol of it, just as it relates to how the outcome would be.
Q. So is the answer to my question that you are not aware of anyone -- sorry. Is the answer to my question that you're not aware of any consultation with independent or third-party experts in the development of the protocol?
A. No, not in the development of it.
THE COURT: Can you speak more directly into the microphone, please.
THE WITNESS: Yes, ma'am. I'm sorry.

Q. And you're aware that attorneys with the Attorney General's office conducted some testing of the nitrogen hypoxia system?
A. Yes.
Q. Did any medical professionals oversee that testing conducted by the Attorney General's office?
A. No.
Q. Did any scientists oversee that testing?
A. No.
Q. Does ADOC take any real-time measurements of the oxygen level in a mask during an execution by nitrogen hypoxia?
A. The nitrogen inside the mask?
Q. Yes, sir.
A. No.
Q. Is there any documentation that reflects when each inmate loses consciousness?
A. No.
Q. Are inmates restrained to a gurney as part of execution by nitrogen gas?
A. Yes.
Q. And are the inmates restrained pretty firmly against the gurney?
A. Yes.
Q. Would you agree with me that as a result of those restraints, the inmate's movement is very restricted?
A. It's restricted, yes.

Q. Would you agree with me that their movement is very restricted?
A. Movement is restricted, but breathing is not.
Q. Would you agree with me that the inmate's movement is very restricted as a result of being restrained?
A. Yes.
Q. Now, Mr. Williams, you've observed several executions by nitrogen gas that took place at Holman?
A. Yes.
Q. And if I have my notes correct, I believe that was the executions of Mr. Miller, Mr. Grayson, Mr. Frazier, Mr. Hunt, and Mr. Boyd?
A. Yes.
Q. And where were you located in each of those executions?
A. In the commissioner's witness room.
Q. Did you observe movement during the nitrogen hypoxia execution by the inmates?
A. Yes.
Q. Did you also observe in multiple different executions that the inmates raised their legs for a period of time?
A. Yes.
Q. Did you observe some of the inmates raising their legs in a coordinated fashion?
A. Slowly went up and slowly went down.
Q. So, again, have you observed inmates raising their legs in a

coordinated fashion?

MS. SIMPSON: Objection. It's outside the witness's knowledge whether the movements were coordinated or not.

THE COURT: Overruled. He can answer if he believes he can.

A. Coordinated as in them being conscious or unconscious? Is that -- can you explain?

Q. Sir, I'm not asking for your interpretation of their consciousness. I'm simply asking whether you observed what appeared to be coordinated movement.

A. I have observed in all executions that they all have raised their legs at one point.

Q. And would you agree with me that you have observed inmates raising their legs in what appeared to be a coordinated fashion?

A. They're together.

Q. So in other words, it's not random jerking. It's both legs coming off the table at the same time?

A. In all executions, at the same time, yes.

Q. Have you also observed in some executions that at some point in time after the nitrogen gas begins flowing that the inmates have clenched their fists?

A. Yes.

Q. So I want to turn to the execution of Mr. Miller, which was in September of 2024. Would you agree with me that you do not dispute that Mr. Miller was shaking on the gurney for

approximately two minutes following the administration of nitrogen gas?
A. There was movement.
Q. And would you agree with me that there was movement for approximately two minutes following the administration of nitrogen gas?
A. I didn't time it.
Q. Do you have any reason to dispute that he was -- there was movement for approximately two minutes following the administration of nitrogen gas?
A. There was movement. I didn't time it, again.
Q. I want to turn to Mr. Frazier's execution, which was in February of 2025. Do you agree that at one point in time following the nitrogen gas, Mr. Frazier appeared to quiver and twitch on the gurney?
A. Again, there was movement.
Q. Would you agree with me that possibly due to the nitrogen and the depletion of oxygen that at one point in time following nitrogen gas, Mr. Frazier appeared to quiver and twitch on the gurney?
A. Oxygen deprivation causes that.
Q. So would --
A. Agonal breathing.
Q. I'm sorry. I didn't mean to cut you off.
A. Oxygen deprivation causes that.

Q. So would you agree with me that at one point in time following the nitrogen gas, Mr. Frazier appeared to quiver and twitch on the gurney?
A. I agree with movement. Quiver and twitch is not necessarily the characterization that I would use.
Q. And while you may not know the exact time, do you agree that Mr. Frazier was making movements for a period of seven to eight minutes?
A. Again, there was movement. I didn't time it.
Q. Would you agree with me that although you don't know the exact time, it's possible Mr. Frazier was making movements for a period of seven to eight minutes?
A. There was movement. I didn't -- again, I didn't time it to see how long it was.
Q. Is it possible that it was seven to eight months?
A. It's possible that it was not also.
Q. But it could have been seven to eight minutes, true?
A. I can't agree to that.
Q. You recall I took your deposition on March 5th, 2026?
A. Yes.
MS. WIESNER: Permission to approach, Your Honor.
THE COURT: You may.
Q. Mr. Williams, if you could turn with me, please, to page 255 of the March 5th deposition.
A. Okay.

Q. And if you look beginning at line four, do you see I asked, Question: "You just don't know how long there was movement for?" Answer: "I don't know." Question: "Is it possible it was seven to eight minutes?" Answer: "Could have been shorter. Don't know." Question: "But it could have been seven to eight minutes?" Answer: "It's possible."

Did I read that correctly?

A. You did.

Q. And did you, in fact, agree during your March 5th deposition that it was possible the movement could have been for a period of seven to eight minutes?

A. I also agreed that it could have been shorter.

Q. Did you testify at your March 5th deposition that it was possible the movement lasted for seven to eight minutes?

A. I did say it was possible.

Q. And do you also agree that Mr. Frazier lifted his legs a few inches off of the gurney?

A. Yes.

Q. And that could also have happened at some point in time after the nitrogen gas began flowing?

A. Yes.

Q. Turning to Mr. Hunt's execution, do you agree that Mr. Hunt had some shaking movements?

A. Some movement, yes.

Q. Do you agree that there were movements following the

administration of nitrogen gas?
A. Yes.
Q. And then turning to Mr. Boyd's execution, do you recall that Mr. Boyd did, in fact, lift his legs off the gurney?
A. Yes.
Q. And do you agree that Mr. Boyd lifted his legs off the gurney after the nitrogen gas began flowing?
A. Yes.
Q. Would you agree with me that once the oxygen is turned off and the nitrogen gas begins flowing, there is some awareness by the inmates that the oxygen has stopped?
A. Yes.
Q. And do you agree with me that the entire time the individual is conscious, they're aware of the fact that they're not getting enough oxygen?
A. They're aware of the entire procedure. Yes.
Q. And you would agree with me that the entire time the individual is conscious, they're aware of the fact that they're not getting enough oxygen?
A. They're aware of the nitrogen hypoxia. The nitrogen is now flowing, and the breathing air is turned off.
Q. And that means certainly for the entire time they're conscious, they're aware that they are unable to get sufficient oxygen?
A. Yes.

Q. And would you agree with me that the natural response to not getting enough oxygen is to panic?
A. Yes.
Q. Now, you testified that prior to 2018, the Alabama Legislature had not authorized execution by nitrogen hypoxia; is that fair?
A. Yes.
Q. Does that mean that there was no protocol for execution by nitrogen hypoxia prior to 2018?
A. There was no protocol for ADOC.
Q. So in other words, Alabama did not have a protocol to execute by nitrogen hypoxia prior to 2018. Is that fair?
A. Yes.
Q. And is it also fair that prior to 2018, the execution chamber at Holman would not have been set up to carry out an execution by nitrogen hypoxia?
A. Yes.
Q. But was ADOC able to develop a protocol for execution by nitrogen hypoxia?
A. Yes.
Q. And was ADOC able to develop training materials for the execution team members to carry out an execution by nitrogen hypoxia?
A. They had training, yes.
Q. And would you agree with me that if the Alabama Legislature

was to authorize execution by firing squad, ADOC could contract with the appropriate structural engineers to figure out what modifications might be required to the execution chamber?
A. That's a hypothetical question.
Q. And in my hypothetical question, if the Legislature approved execution by firing squad, would ADOC be able to contract with the appropriate structural engineers to determine what modifications would be required?
A. I have to speak -- I have to give you a hypothetical answer, counsel. I mean, if, in fact, it was approved, we would contract, find ways in order to accommodate.
Q. So you would agree with me, then, that if the State Legislature did approve firing squad as a method of execution, ADOC would be able to figure out how to contract with the appropriate vendors?
A. Again, it's a hypothetical question, counsel. I mean, if, in fact, the Legislature approved that, then we would actually seek measures in order to accommodate that method of execution.
Q. So is the answer to my question yes, if the State Legislature approved this as a method of execution, ADOC would know or be able to figure out how to contract with the appropriate vendors to modify an execution chamber?
A. Again, it's a hypothetical question. I have to give a hypothetical answer, counsel. Yes, hypothetically.
Q. If the State were to approve execution by firing squad,

could ADOC figure out how to train people to use a .30-caliber rifle for use in execution by firing squad?
A. Again, I'm going to speak to that all in the hypothetical. Yes.
Q. There's nothing that would make it infeasible to train people on the proper use of a .30-caliber rifle for firing squad executions?
A. If that was approved, yes.
Q. And just to make sure I have a clear answer from you, if the Legislature approved execution by firing squad, you're not aware of anything that would make it impossible to train members to use a .30-caliber rifle, are you?
A. No.
Q. And, in fact, ADOC personnel -- or ADOC does have some personnel who are already trained on the use of a .30-caliber rifle?
A. Yes.
Q. And do you agree with me that if, again, the State Legislature approved execution by firing squad, ADOC would be able to figure out how to appropriately secure an inmate for execution by firing squad?
A. If that were to happen, we would, hypothetically.
Q. And, again, you would agree with me that if the State Legislature were to approve execution by firing squad, ADOC would be able to staff an execution team?

A. Yes.
Q. Thank you.
MS. WIESNER: I pass the witness.
THE COURT: Cross-examination.
MS. SIMPSON: Thank you, Your Honor.

CROSS-EXAMINATION

BY MS. SIMPSON:
Q. Mr. Williams, have you ever been restrained to the execution gurney at Holman?
A. No, I have not.
Q. What reasons might DOC have for using restraints on that gurney?
A. The restraints would be -- I mean, if it's actually a lethal injection, or if it's nitrogen hypoxia, the individual knows that death is going to be imminent, so there would be some anxiousness. There would be involuntary movements. Safety concerns. There's a variety of reasons why you would have to put restraints on that gurney.
Q. And what do you mean by safety reasons?
A. You don't want the individual maybe to fall on the floor, and he could bump his head or get other injuries. The staff inside the chamber could be at risk.
Q. Is it possible that the inmate could decide he didn't want to be executed?
A. That's possible.

Q. All right. In the hypoxia executions you've observed, did you expect to see movement during those executions?
A. Yes.
Q. Why?
A. With the flow of nitrogen and the deprivation of oxygen, it causes agonal breathing. It causes involuntary movements. So, yes, I did -- we did expect to see movement.
Q. You were asked the question about legs moving in a coordinated fashion. Do you recall that?
A. Yes.
Q. Do you know, sitting here, whether those legs actually moved in a coordinated fashion?
A. No, I do not.
Q. Do you know whether the inmate consciously moved his legs?
A. No, I do not know if it was consciously moving; however, with the studies that showed how quickly the oxygen goes from the body once the nitrogen flows, unconsciousness is within a matter of minutes.
Q. You were asked about the possibility of an inmate who was not getting enough oxygen experiencing panic. Do you remember that?
A. Yes.
Q. Would you expect an inmate who's about to be executed to experience anxiety, just period?
A. Yes.

Q. How about fear?
A. Yes.
Q. Terror?
A. Yes.
Q. Psychological distress?
A. Yes.
Q. Regardless of the method of execution?
A. Correct.
Q. Why is that?
A. Well, your life is about to end, so it's anticipation, first of all, of the unknown, and that tomorrow now is not promised to you. So, yes.
Q. You were asked some questions about what ADOC could do to start a firing squad execution if it were legalized. You were specifically asked -- mentioned modifications to the chamber. Do you believe the chamber at Holman could be safely used today for a firing squad execution?
A. Currently, no.
Q. Do you believe it could be modified for a firing squad execution?
A. I think it would be very difficult based on the -- where it's located at. Even if you turned it around, you still have individuals in dormitories that bullets could possibly penetrate if not built effectively.
Q. Do you have firearms training, sir?

A. Yes.
Q. In what kind of firearms?
A. I was previously military. AR-15's, shotguns.
Q. Have you fired high-velocity rounds in a small space?
A. Yes, I have.
Q. And based upon that knowledge, would you shoot a high-velocity round in the chamber?
A. No.
Q. Do you recall specifically when in 2018 the hypoxia changed to the -- the statutes went into law?
A. Approximately March.
Q. Okay. And do you remember when the first hypoxia execution was?
A. I can't recall exactly. It was Smith, 2024.
Q. Was that early or late 2024?
A. October seems to ring a bell, but I'm not positive.
Q. Would you agree with me that it was about five and a half years from the time that the hypoxia went into law to the time DOC had the first hypoxia execution?
A. Yes.

MS. SIMPSON: Nothing further, Your Honor. Thank you.

THE COURT: All right. Any redirect?

MS. WIESNER: No, Your Honor.

THE COURT: Okay. You can step down. Thank you.

All right. So housekeeping, then, for tomorrow. We'll

plan to get started at 9:00 in the morning.

How many witnesses does the plaintiff still have? Am I correct that you have one more?

MS. SHARPE: Yes, Your Honor, we have one more.

THE COURT: All right. And what's the expectation for ADOC?

MS. SIMPSON: We'll be calling Mr. Houts, Warden McKenzie, Warden Clemons, definitely Dr. Antognini, and possibly Mr. Lee. I'm sorry. And possibly Warden Raybon as well. But most of ours are fact witnesses, Your Honor, so --

THE COURT: Do you think we will finish up tomorrow or go into Wednesday?

MS. SIMPSON: I will be as expedient as possible, Your Honor.

THE COURT: All right. Then so shall I.

All right. You can leave your things in here. We will secure the courtroom. And you can, obviously, get here as early as the court opens if you want to be in here. I think that's -- 7:30 is the earliest I think you can get in. And then we'll get started promptly at 9:00.

All right. Have a good evening.

(Proceedings concluded at 5:41 p.m.)

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COURT REPORTER'S CERTIFICATE

I certify that the foregoing is a correct transcript from the record of the proceedings in the above-entitled matter.

This 4th day of May, 2026.

/s/ Patricia G. Starkie
Registered Diplomate Reporter
Certified Realtime Reporter
Official Court Reporter

Exhibit G

THE UNITED STATES DISTRICT COURT

FOR THE MIDDLE DISTRICT OF ALABAMA

NORTHERN DIVISION

JEFFERY LEE,

Plaintiff,

Vs. CASE NO.: 2:25cv680-ECM

JOHN Q. HAMM, et al.,

Defendants.

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BENCH TRIAL

VOLUME II

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BEFORE THE HONORABLE EMILY C. MARKS, UNITED STATES DISTRICT JUDGE, at Montgomery, Alabama, on Tuesday, April 28, 2026, commencing at 9:01 a.m.

APPEARANCES

FOR THE PLAINTIFF: Ms. Paige Hester Sharpe
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Proceedings reported stenographically;

transcript produced by computer

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(The following proceedings were heard before the Honorable Emily C. Marks, United States District Judge, at Montgomery, Alabama, on Tuesday, April 28, 2026, commencing at 9:01 a.m.:)

(Call to Order of the Court.)

THE COURT: Good morning. We are ready to get started. The plaintiff will call its next witness.

MS. WIESNER: Yes, Your Honor. We're ready to proceed, although I understand that defense counsel would like to address the preadmission of certain exhibits.

THE COURT: Certainly.

MS. SIMPSON: Thank you, Your Honor.

By agreement, we wanted to preadmit Exhibits 1 through 45 -- I'm sorry -- 57 --

THE COURT: I'm sorry. 1 through 45?

MS. SIMPSON: And 57. We have that exhibit -- a couple in over objection. 58 and 59 are over objection, and 46 and 47 were over objection, and then 48 through 51 are in with no objection.

Does that comport?

MS. WIESNER: I believe that's correct, Your Honor. I would just note that the exhibits that they noted were in over objection, I believe Your Honor admitted for the limited purpose and not for the truth of the matter asserted. So that would be my only clarification.

MS. SIMPSON: That's correct. I'm sorry.

THE COURT: That's 58 and 59?

MS. SIMPSON: 58 and 59 and 46 and 47.

THE COURT: All right. So you're saying you want me to admit 1 through 45 and 57. The others I've already ruled on; is that correct?

MS. SIMPSON: Yes, Your Honor, that's correct. We have a few that we still need to establish a foundation for, but we ask that they be preadmitted.

THE COURT: So Defendants' Exhibits 1 through 45 and 57 are admitted.

MS. SIMPSON: Thank you, Your Honor.

MS. WIESNER: Plaintiff Mr. Lee calls Dr. James Williams to the stand.

Your Honor, Mr. Williams has a binder with him already on the stand, I believe, and I have binders for opposing counsel and the Court.

THE COURT: Very good.

MS. WIESNER: May I approach?

THE COURT: You may.

MS. WIESNER: Each of the exhibits contained in the binders have now been preadmitted. I have also included in the front pocket of the binder printed copies of electronic demonstratives that we intend on using. We did share those with opposing counsel over the weekend, and they informed us that

they have no objection.

And, Your Honor, we intend to put the demonstratives up on the screen. I think at points in time, it may be helpful for Mr. Williams to interact with the screen. Would it be okay if he leaves the stand as needed to do so?

THE COURT: Yes, that's fine.

MS. WIESNER: Would you like me to ask permission each time?

THE COURT: No. You have global permission.

MS. WIESNER: Thank you. I appreciate that.

JAMES WILLIAMS

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. WIESNER:

Q. Good morning.

A. Good morning.

Q. Can you please introduce yourself to the Court.

A. James Stewart Williams, MD.

Q. Thank you, Dr. Williams. What do you do for a living?

A. I'm an emergency physician.

Q. And how long have you been practicing as an emergency physician?

A. Since 1993 and exclusively since 2003.

Q. In the course of your career, have you treated people who have been injured by gunshot wounds and other chest trauma?
A. Many times.
Q. Can you approximate how many times?
A. Many thousands of times.
Q. Thank you. And have you also treated victims who have been shot with a rifle?
A. Yes, I have.
Q. Do you have experience evaluating pain and patients' descriptions of other noxious stimuli?
A. I do. It's a routine and basic part of my evaluation of every trauma patient.
Q. And do you have any certifications related to your trauma care?
A. I've been continuously certified in advanced trauma life support since 1994. I have other unofficial qualifications as well.
Q. In the course of obtaining that certification, did you receive any training or education on physiological response to trauma?
A. Yes, I have. I've got extensive experience in neurophysiology as it relates to trauma, as well as to other things.
Q. In the course of your medical education, have you also studied neurophysiology or neuroanatomy?

A. I certainly did in my bachelor's degree or bachelor's program. My emphasis was on physiology and particularly neurophysiology. And when I entered graduate school for my master's program, I initially started in a neurophysiology lab, and then I transferred to neuroendocrinology as my area of expert, biochemistry and neuroendocrinology, and I published papers in neurophysiological journals.

Q. Do you have any board certifications?

A. I've got a bunch, but I'm not sure what you're asking for.

Q. Are you board certified in anything?

A. Yes, ma'am. I'm board certified in family medicine, both in Canada and the United States.

Q. Thank you. Now, Dr. Williams, do you also have experience with firearms?

A. I have extensive firearms experience, lifelong experience as a shooter and a hunter. In the last 30 years, I have done extensive training in the use of defensive firearms in the law enforcement and civilian context as well. I've been a competitive shooter; have achieved championships as a shooter at regional -- state, regional, and even national levels in pistol, rifle, and shotgun.

Q. You mentioned law enforcement. Can you just briefly tell us a little more about your experience with law enforcement.

A. Certainly. I was the police medical officer for my city police department in Ripon, Wisconsin, from 2000 to 2010. And

then I joined our county deputy sheriff's office as the SWAT medical officer in 2008 and served in that capacity until 2010.

Q. Thank you. Doctor, we'll get into the details later, but have you also personally sustained a gunshot wound?

A. I have.

MS. WIESNER: Your Honor, we would submit that Dr. Williams is an expert in emergency and family medicine, gunshot wounds, firearms, and ballistics. I understand that defense counsel has agreed to stipulate to his qualifications as such.

THE COURT: Is that correct?

MR. THOMPSON: Yes, Your Honor.

THE COURT: All right. He's accepted.

MS. WIESNER: Thank you.

Q. Dr. Williams, you've given two opinions in a report you provided in this case. The first is that firing squad causes a quick and painless death, and the second is that firing squad is feasible and readily implemented.

We'll get into each of those opinions this morning, but before we start, are all of the opinions that you'll be providing today given to a reasonable degree of medical certainty?

A. They are.

Q. So I want to start with your first opinion, which is that execution by firing squad would cause a quick and painless

death. Did you help to prepare a slide to explain your opinion?
A. Yes, I did. It's a short summary slide.
MS. WIESNER: And if we could please put Demonstrative 1 up on the screen.
A. I'm sorry. It's just -- waiting on the computer.
Q. Do you have that on your screen, Dr. Williams?
A. I do.
Q. And is this the slide that you created?
A. It is.
Q. So we're going to talk about each of the three items on this slide, but can you first explain to the Court at a high level what this slide reflects.
A. This is a high-level representation of the argument in my report about why gunshot wounds by firing squad would be quick and painless.
The first item to be considered is the nature of noxious stimuli in a trauma patient. The second item to be considered is the ballistic and energy components of gunshot wounding. And the third is the anatomic target to be considered in a firing squad execution.
Q. Thank you. So let's start with number one, noxious stimuli. Could you please define for us what noxious stimuli is.
A. Any neurological stimulus that is transmitted to the brain from the periphery, which would include visceral as well as somatic or body part receptors --

Q. Sorry, Dr. Williams. I did not mean to interrupt. Please continue.
A. I'm sorry?
Q. I did not mean to interrupt you.
A. That's fine. Sorry.
THE WITNESS: I had to use my inhaler just briefly, Your Honor, and it gives me some phlegm. I apologize. I'm allergic to Montgomery. No judgment.
A. So any stimuli that come from the periphery of the body to the brain neurologically may be categorized as noxious or non-noxious. A noxious stimulus is one that the body is telling the brain is simply something that's going to cause some damage. And there are many types of noxious stimuli.
Q. You mentioned that there are many different types of noxious stimuli. Did you also prepare a report to help explain that concept?
A. I did.
MS. WIESNER: If we could please put up the second demonstrative.
Q. Is this your chart, Dr. Williams?
A. This is.
Q. And can you please explain this chart.
A. Certainly. I've organized this in three columns, the first being the type of stimuli, which may be noxious or non-noxious, and then common examples of each, and then the conscious

sensation that each may elicit in the cerebral cortex or the consciousness of the brain.

The first type of stimulus --

These categories are basically in no particular order.

Mechanical, thermal, and chemical, with a fourth being visceral or homeostatic, which we would consider sort of the autonomic or subconscious inputs that help our body maintain autoregulation and maintain life.

Mechanical stimuli would include things like pressure, a crushing, a puncture, stretching, those sorts of things. And those could produce a sensation of pressure, touch, sharp, or even aching pain.

The second type being thermal stimuli, extreme heat or cold. We're able to perceive these at different levels in the body. This gives us a warmth or cold sensation, burning or freezing sensations.

Chemical stimuli would include things such as being able to detect acid, pH in the blood, carbon dioxide levels in the blood and the brain, buildup of those types, but it also includes the ability to detect chemicals in the sensorium, such as the taste or the organs of the mouth, the nose, and so forth. These can produce sensations of burning, stinging, visceral discomfort in the extreme, but often are simply perceived as taste or smell.

Finally, we have visceral or homeostatic receptors, the systems which give the brain input on things such as the state

of oxygen in the blood, in the body, carbon dioxide as in hypercapnia, which was discussed in testimony yesterday. Others such as nausea, distention of the internal organs, and so forth. So these may all be sensations as simple as hunger, air hunger, nausea, cramping, itching, and so forth.

Q. Thank you. And is this concept of the different types of noxious stimuli well known in the medical field?

A. Absolutely. It's understood almost axiomatically by all medical practitioners.

Q. Now, Doctor, can a noxious stimuli cause suffering even if it does not cause pain?

A. Absolutely. Pain is a specific type of noxious stimulus which may or may not be related to any of the above. An example for that might be the -- if you look under our chemical stimuli, the common example, one of the examples it gave was capsaicin.

Capsaicin is the active chemical in red pepper, which we perceive in food as something that gives it some spice or some flavor. But if we get enough capsaicin, it becomes extremely noxious to the extent that we actually put concentrated capsaicin in spray form to be used as a weapon for subduing subjects by police. The exposure to high concentration capsaicin is extremely noxious, and anyone who experiences that will describe it as such, but the sensations it produces are not pain, even though they may override any other kind of sensation at the time.

We've also experienced this to some degree if we've eaten hot food, and it was a little hotter than we thought, and those hot peppers or hot food touched our lips, for instance, and caused our lips to start having the experience of chemical burning, which is extremely uncomfortable, but most of us would not actually describe that as pain.

Q. Looking at this chart, what type of noxious stimuli is a bullet wound?

A. Gunshot wounds fall under the mechanical category.

Q. Now, Doctor, when you evaluate pain, do you rank the severity of pain in some way?

A. Yes. We always want to help our patients' -- to help understand our patients' condition, their suffering, level of comfort, we ask for quantification. So I'll ask my patients typically to give me a number. We use a numerical pain scale typically, and we ask them to rate their pain from 1 to 10.

We use a similar thing for nausea. We can ask them, how is your nausea on a scale of 1 to 10, or we can similarly use pictorial representations for persons who are not numerically fluent. We've all seen the scales of smiley faces or happy faces, the old circle with facial expressions on them going from very happy to very sad. Any of those can be used for patients' rates of pain and discomfort.

Q. And you alluded to this with nausea, but do you rank sensations from other noxious stimuli in a similar way?

A. We can. Typically those would be the main ones, though.
Q. And is one type of noxious stimuli necessarily or automatically worse than another?
A. There is actually a well-defined hierarchy of noxious stimuli. Some are more immediately felt on the autonomic level and on the conscious level by patients, and this is physiologically based on the immediacy of the threat to life.

The example that I would give you for that is a person who's been trapped, say, in a collapsed building for several days and has had nothing to eat or drink for many days. When we get them out, they'll be tremendously hungry and tremendously thirsty. Offer those patients a Sprite and a cheeseburger, they're going to go for the Sprite every time because thirst is a far more immediate threat to life or represents an immediate threat to life. The reason being that a person can survive for weeks without food but only a relatively few days without water.

The same thing applies to the comparison between thirst, which is a very immediate threat to life. If you don't have water within seven days, you're going to be dead. Similarly, if we take that person and -- a person who is in extreme, and they have a choice between having a drink of water or a breath of actual air to treat their dyspnea, they'll want the air first, and the reason being simply that dyspnea is much more immediate. We know that without fresh air, without breathing, survival lasts only a matter of seconds.

Q. Now, in the third column, you list sensation. Do people feel the sensations in that third column immediately upon being exposed to the noxious stimuli?

A. They may, but that's typically based on learned experience. From infancy we learn how to interpret the stimuli in our conscious brains as being pleasant, unpleasant, or noxious, and that takes time to experience.

For instance, we've all seen the example, I'm sure, of a toddler who's experienced a new sensation that's painful for the first time. Imagine, if you will, a toddler reaching up to grab a pan on the edge of the counter and pulling it down, pulling it off, and it comes down and whacks them on the head. I'm not talking boiling water or anything; just the mechanical impact of the frying pan on the kid's head. There will be a lag before the child starts to cry, a look of -- an expression of surprise or something of that nature that lasts for two to three seconds, because this is a completely novel sensation. The child has to come to recognize that this is actually something bad that's happened. This neural processing is a well established neurological principle, and it takes a period of some seconds for that to happen.

This still happens later in life when we're exposed to new and powerful stimuli that may be noxious, such as being injured in a major motor vehicle crash. Motor vehicle crash victims almost always describe to me a sensation of having -- of being

stunned, even though they have not lost consciousness, but having been stunned and not really being able to understand what has happened to their body or feeling anything other than a sensation of surprise and stunning that persists for several seconds.

Q. Dr. Williams, did you prepare a slide to help explain this concept?

A. I did.

MS. WIESNER: Please put up the third demonstrative.

Q. Is this your slide, Dr. Williams?

A. This is.

Q. And could you please explain to the Court what this is.

A. Certainly. This is a very simple example of the neural pathway and the way that our bodies perceive this.

So if you follow the numerals with me, in the first case, number one, skin is exposed to a heat source. In this case we're imagining a match, which, being held a few centimeters away from the skin, one might feel the radiant heat, the infrared warming the skin, and the heat receptors in the skin will activate and cause a neural impulse to pass up the sensory nerve which runs from the -- we'll assume it's the back of the hand -- from the back of the hand up to the spinal cord. This will be a single neuron, a very long neuron, nearly a meter in length in an adult male. And when that neuron reaches the spinal cord, its synapses with a spinal neuron. The spinal

neuron then carries that impulse up to the processing centers in the lower parts of the brain. These would be things like the amygdala, hypothalamus, thalamus, and so forth. And that would be at level three we're talking about. At level three --

Oh, and I should backtrack and point out that depending on the amount of stimulus from the match or maybe a blow torch, if you look at magnitude of the heat being exposed, there may be one or two receptors, there may be a dozen, or maybe several hundred receptors activated. So this isn't always just a single nerve cell. This is amplified by multiple neural pathways if the stimulus is strong enough. Likewise, there would be multiple spinal nerves that would be stimulated by these various receptors and peripheral nerves.

The impulse carried up to the lower portions of the brain then, as I said, reach the processing centers of the brain, which will have numerous effects that will initiate the body's homeostatic regulatory systems to respond to this heat stimulus, and they will coordinate and produce a coordinated and cogent message that is then translated to the cerebral cortex at four. So the cerebral cortex is where we have the actual conscious perception of the injury. So in this case, it would be a sensation of burning.

This process takes -- it's a finite process. It takes a certain amount of time. We know that myelinated nerves in the human body transmit neural impulses at a rate of about 300

meters per second, so there's going to be somewhat of a lag from the stimulus at one to the delivery of the message to the processing centers at three, and then a further lag to the delivery of that message to the brain.
Q. And how is this lag relevant to your opinion that execution by firing squad is quick and painless?
A. Well, this is important because, using the example of the child who's pulled a pot onto his head -- and as I described, that's a novel stimulus that the child's conscious brain has never synthesized before and consciously given some meaning to -- the same thing applies to us when we have massive trauma to our bodies as adults. Something that's a novel neurological stimulus is going to require a longer period of processing, going from point number three to point number four on this diagram, and that processing lag may take several seconds.
Q. Now, Dr. Williams, you said that the second factor we have to consider is one of ballistics and energy?
A. Yes.
Q. At a high level, can you please explain what that factor is.
A. Certainly. The concept of gunshot wounding is -- the science of gunshot wounding, I should say, goes back relatively -- the beginning of a current understanding really started in the 1960s and 1970s. That's when we first really had the technological advancement to be able to measure and track and observe the event of a bullet arriving at its target and be

able to break it down into its component parts.

So the understanding of how bullets impact flesh and the effects that that produces is a term called terminal ballistics and then terminal effects, which is the area of ballistics in which I have spent most of my time.

Q. And before I ask my next question, do you need a drink of water, Dr. Williams?

A. Yes. Sorry. The phlegm just keeps coming up. You've got to love inhalers.

Q. I completely understand.

A. Thank you.

Q. How is this idea of terminal ballistics and terminal effects relevant to your opinion that firing squad will cause a quick and painless death?

A. There's multiple factors that need to be considered. Many of them are implicit in the design of the traditional firing squad, going back to the 17th century.

The concept is you need to use enough ballistic power to render the subject of the firing squad inoperable or completely dead as quickly as possible. So the concept is a matter of using more power rather than less to ensure that the process is quick and merciful.

Q. And are you familiar with the concept called neural stunning?

A. Yes. Neural stunning is highly important in a ballistic

injury, and it's well studied and well established as a physiological event that occurs with a massive transfer of energy such as gunshot wound. The .30-caliber bullets used in the firing squad of the military and in the Utah protocol, both of which I've outlined in my report, a single .30-caliber bullet at standard velocity is going to deliver something in the area of 2,000 foot-pounds of energy, which would be equivalent to being struck by -- if you can imagine being struck by a three-quarter-ton truck and moved one foot in a fraction of a second.

Q. And to clarify, when you're comparing or using the analogy of a truck, are you talking about the amount of energy that's delivered?

A. Yes. The amount of energy that's delivered to the body. So one bullet would be the equivalent of one three-quarter-ton truck. Four or five bullets, as in the Utah protocol, would be like being struck by four or five three-quarter-ton trucks stacked together.

Q. And have you prepared a demonstrative to help explain the concept of neural stunning?

A. I have.

MS. WIESNER: If we could please put up on the screen the fourth demonstrative. But before we press play, I would like to give Dr. Williams an opportunity to explain what we're seeing.

A. Certainly. This is a representation or high-speed video of a standard ballistic experimental process. We use these all the time. I've personally done dozens -- well, really more like hundreds of these -- in my career.

The block is what we call ballistic gelatin. It's a specific simulant for muscle tissue. Prior to the development of ballistic gelatin, experiments used to shoot living swine tissue. They'd anesthetize a hog and shoot it in the thigh. This became prohibitively expensive if one was to do enough experimentation to get good data.

Dr. Martin Fackler in the 1960s developed this simulant, so we shoot gelatin now to compare the ballistic behavior of bullets. But it does represent what happens to flesh when flesh is struck by a bullet.

This block of gelatin is 18 inches long, and it's 8 inches square in profile and weighs about 40 pounds. We shoot the bullet, you'll see shortly, it will enter the left side of the block and exit the right side of the block. The time frame that it represents is a matter of about three milliseconds.

So this is useful to have high-speed photography of this because before we had high-speed photography, to actually see this process, the impact of bullet on flesh or tissue simulant, was literally too fast for the human eye to see. So this allows us to see what actually happens in a ballistic injury.

Q. I'm going to go ahead and ask our hot seat operator to press

play, and then I'd like you to tell the Court what we've seen or explain --

A. Certainly. We'll just play it through one time.

(Video published.)

A. And if we can start again and stop it about two seconds in.

(Video published.)

Stop.

At this point, what we can see is the bullet has struck the left side of the -- in our view, the left side of the gelatin block and produced that splushing or splashing effect that pops outward. We've all seen that. You throw a rock in the water, it makes a dimple in the water, and the water splashes up.

What happens past that is the space that's created by the passage of the bullet radially past the passage of the bullet. So the bullet makes a permanent hole in the gelatin block that is roughly the bullet diameter and no more. So the bullet in this case, being a .30-caliber bullet or .30 inches, is producing a temporary cavity that you can see -- we could estimate that at about five to six inches in diameter -- which is essentially a vacuum created by the passage of the bullet and its energy being transmitted into the gelatin block.

This passage of energy causes the tissue to accelerate away from the path of the bullet at an extremely rapid rate. Hundreds of meters per second. And the energy transmitted thereby is capable of causing a ripping, tearing, fracturing and

so forth of the surrounding tissues. Typically, however, this is not perceived to the naked eye. It has to be observed microscopically and pathologically.

The temporary cavity, as you can see here, forms very rapidly, and by the end of the video snaps back down to the permanent wound cavity or the hole drilled by the bullet.

So if you can carry it through to the end, we'll finish the process.

(Video published.)

So you can see that the energy of the bullet passage radiates along the path of the bullet as the bullet moves forward, and it encompasses a volume which will vary depending on the type of tissue being shot and so forth.

So if we can -- I can explain this more clearly with a diagram that I also submitted as a demonstrative.

Q. Thank you, Dr. Williams. Before we get to the diagram, can you just please explain how this idea of the temporary cavity is relevant to your opinion.

A. Certainly. The temporary cavity, as I said, displaces tissue at -- a large volume of tissue at a very rapid rate. This causes disruption of the tissue of all kinds, which leads to microscopic stretching, compression, fracturing, and general disruption of the tissues. This includes things like muscle, connective tissues, blood vessels, and nerves.

And we know that because of that kind of -- because of the

formation of the temporary cavity, the two types of tissues that are of greater interest to us as surgeons and physicians is the blood vessels, which are damaged to the point that they may bleed extensively, being disrupted so the blood leaks out of them, out of the capillaries and arterioles and venules, and also nerves which may be stretched to the point that the cell membranes are damaged -- perhaps torn is too strong a word, but damaged so that they leak intracellular fluid out. As a consequence, they cannot transmit neural impulses, which are a function of the nerve membrane of the nerve cell.

So neural stunning, which we've already started to discuss, is caused by the formation of the temporary cavity which disrupts the membranes of the nerves in the vicinity of the temporary cavity. It's usually a -- it's not a permanent injury to that nerve cell, it's able to repair itself and come back on line and start working again within a period of time, but that period of time is, strictly speaking, several hours if not days.

Q. And is there any literature that discusses this concept of the temporal cavity in the human body?

A. Yes, there is.

MS. WIESNER: If we could please put up on the screen Plaintiff's Exhibit 58.

Q. Do you recognize this article?

A. Yes. This is a paper by Dr. Martin Fackler, published in 1996, and is a terrific summary of much of the work that he did

in the previous 30 years.

MS. WIESNER: And if we could turn, please, to page 3 and look at the figure on that page. I think we've prepared this as a separate demonstrative.

A. Yes. We have a diagram -- an enlargement of -- there it is. Yes.

Q. Dr. Williams, is this a demonstrative from the Fackler article?

A. Yes, it is.

Q. Can you please explain what this depicts.

A. This is a diagrammatic representation of what we just saw in the video of the passage of the bullet through tissue. The temporary cavity is demarcated there as you can see at the bottom of the diagram. The permanent cavity as shown here -- in this case it's documented as a .30-caliber or 7.62 millimeter bullet, which enters the body on the left and -- or the gelatin in this case -- and exits on the right.

The bullet expands. This type of bullet will expand, and that expansion causes greater permanent tissue damage. It really doesn't do anything to alter the shape or velocity of the expansion of the temporary cavity.

You can note that Dr. Fackler has demarcated certain areas within the temporary cavity as areas of detached muscles or fracturing or tearing of muscles. But we can also take that to include things like detached connective tissue, disrupted

vascular structures, and neural structures as well.
Q. What is the impact of this disruption to the nerves on the brain's ability to perceive pain from a gunshot wound?
A. If you think back to the demonstrative I put up earlier with the four numbers, the brain is unable to receive a message of pain if that message is not received and transmitted by the peripheral nerves. If the peripheral nerve is running along or near to the impact of the bullet, that peripheral nerve will be stretched, compressed, and otherwise disrupted such that it will not carry sensations -- or carry impulses to indicate a sensation has occurred. As a consequence, the spinal nerves, lower parts of the brain and cerebral cortex, will not receive the message and will not understand that something has happened that is an injury which could be perceived as noxious. So the noxious stimulus is disrupted before it can reach higher orders of the neural system.
Q. And what is the significance of that delay in the context of execution by firing squad?
A. This is very important because the neural stunning effect that occurs with a gunshot wound typically lasts for a period of several hours, whereas in the case of a gunshot wound or multiple gunshot wounds to the cardiovascular bundle in a firing squad execution, consciousness is only going to last a very few seconds. So the patient will be unconscious and then deceased long before these nerves begin to function again.

Q. Now, Dr. Williams, you testified that in your clinical experience, you've treated thousands of patients with gunshot wounds.
A. Yes.
Q. And this may be an obvious question, but when you're treating those gunshot wound patients in the emergency room, are these patients who have sustained a lethal shot to the cardiac bundle?
A. No. I've never seen anyone shot in the heart or cardiac bundle.
Q. And why is that?
A. Just luck of the draw. I haven't been on duty when those patients have come in. Also the issue of most people shot in the heart don't survive long enough to get to the emergency room. Most of them die in the field.
Q. But have you treated patients with gunshot wounds to the chest?
A. I've treated many.
Q. And in your experience, how do those patients typically describe what they're feeling?
A. I'll preface my comment by saying I'm typically seeing these people no sooner than perhaps 20 minutes after they've sustained their injury, so they've had some time to process what's going on. Also these patients are going to be -- if they're able to answer my questions as to whether they're having pain or other

noxious sensations, they're conscious and able to give me a good verbal description. So these are relatively stable patients.

When I'm able to converse with these patients and ask them about the quality of their pain, typically what they describe -- they have a hard time describing it because it's such a novel sensation, but those who are able to describe it describe it to me as being like having received a powerful blunt blow to the chest as if they've been struck with something, a foreign object or another body. Some people have likened it to being tackled or giving a hard tackle on a football field.

Q. Now, to be clear, when you say that these patients describe a feeling of a blunt blow or a hard tackle, is it your testimony that they have reported feeling that sensation within the first three to five seconds of being shot?

A. No. These people have had some time to think about what's happened to them. And when I -- typically when I ask them the question, they have to actually reflect upon it and think upon it because it's a unique experience in their life. They've never had this happen to them before. So they're coming up with their -- basically, their first attempt to try to describe what has happened to them.

Q. In your opinion, would an inmate being executed by firing squad likely feel before they've lost consciousness that sensation of a hard tackle?

A. My opinion is that they would not, based on the concept of neural stunning and the neural lag processing -- conscious processing of the novel neurological stimulus.
Q. You said that you've also been shot yourself?
A. I have.
Q. How, if at all, did your personal experience being shot inform your opinion?
A. It was actually a primary driver for me going into medicine to start with because of a personal experience with a significant trauma and wanting to be able to deal with such things.
Because of that and because of my experience, I've made a point of talking to my gunshot wound patients with that particular experience in mind. And I'll often tell patients, I have been shot myself, so I know what you're going through. Can you please tell me what you're feeling? It's a means of identifying with the patient and giving the patient a sense that I'm on their side and helping them. They're going to more likely be honest and accurate in the reporting of how much discomfort they may be feeling and what other sensations they may be feeling, so I can address those symptoms more effectively and relieve their suffering sooner and to a greater degree.
Q. When you were shot, did you feel pain immediately?
A. No, I did not.
Q. Approximately how long did it take before you felt pain?

A. The description, as I have given previously, when I was shot, the bullet struck me and I fell backward. So you can imagine how much time it takes to fall backwards very rapidly onto a couch. And then as I started to sit up, I was trying to -- it really didn't -- I really couldn't understand what had happened before. I had a conscious thought of what had actually happened, I said out loud, Gord, you just shot me. My friend who had been holding the pistol that I was shot with. And it was only as I heard myself say that that I realized, oh, I've been shot.

I still did not experience anything like pain. All I felt was a profound and powerful numbness of my entire right side of my torso, right shoulder and arm, down to the level of my waist and up into my neck and the side of my head. The most powerful sensation of numbness I've ever felt.

Q. And how long did that sensation of numbness persist for?

A. It persisted for about three hours.

Q. Now, finally, Dr. Williams, you said the third factor that we have to consider is the anatomical target. What do you mean by that?

A. Well, if we want to render the subject incapacitated as rapidly as possible, we need to shoot something that really matters. The traditional target for firearms, whether in hunting or in warfare or police, whatever, homicides, is the cardiovascular bundle. We know that gunshot wounds to the heart

and great vessels are a very effective way to incapacitate the subject.
Q. Let me just pause there. What exactly is the cardiovascular bundle?
A. The cardiovascular bundle is a term we use to describe the heart and the great vessels just above and around the heart that bring blood into the heart and take blood out of the heart.
Q. And can you please elaborate for us why you think the cardiovascular bundle is the appropriate target?
A. Yes. The cardiovascular bundle -- let me backtrack a bit.
If you go back to Dr. Fackler's paper which we looked at previously, Dr. Fackler has identified -- he and his colleagues identified very quickly that the most effective means of incapacitating a human being with a gunshot wound is either to destroy the central nervous system, which is the brain and upper spinal cord, or to destroy the cardiovascular bundle. We're doing an indirect disruption of the CNS, central nervous system, when we shoot the cardiovascular bundle. So basically by destroying the cardiovascular bundle, we destroy the delivery of oxygen to the heart, and the delivery of blood flow and oxygen to the heart renders the brain, the central nervous system, insensible within a very few seconds.
Q. Just to break that down, based on your training and experience, how quickly does a person lose consciousness when all blood flow to the brain is stopped as in the case of a shot

to the cardiovascular bundle?
A. I've done a great deal of reading and research on this. It's not something that people tend to focus on in the medical literature. It's not a medical question for the most part. But it is commonly assumed that -- the number that was commonly assumed when I was in medical school was, in fact, too long. There's a number of great studies that have been done that show definitively that if all blood flow to the brain is stopped, unconsciousness ensues within three to five seconds, and it's a very deep level of unconsciousness immediately.
Q. Is there a particular study or studies that support your opinion that loss of consciousness occurs within three to five seconds?
A. Yes. I was able to locate a study done by van Rijn and associates in the Netherlands in 2011, which is physiologically the best study done to date for showing this.
MS. WIESNER: And if we could please put up Plaintiff's Exhibit 88.
Q. Dr. Williams, is this the van Rijn study that you're referring to?
A. It is.
Q. Can you just tell us at a high level what the van Rijn study was looking at.
A. Certainly. Van Rijn was responding to a growing criticism of the medical research community for using animals in our

research. The most common means of sacrificing or killing animals in a laboratory setting is by decapitation using a laboratory guillotine. That's certainly what I used in my research in the 1980s, and they were still using it today.

This was criticized by animal rights people, saying that this was cruel and caused needless suffering. So van Rijn was trying to assess that issue and did so by studying the neurological mechanisms.

The rats which were used in this study were decapitated -- sorry. Some of the rats were anesthetized prior to incapacitation, some of the rats were awake, and van Rijn and associates took electroencephalographic readings from each of these rats before, during, and after decapitation. This produced an extremely precise end point for us to measure for the onset of unconsciousness and for brain death.

Q. Now, how is it that findings from studies conducted in rats could be extrapolated to application in humans with respect to loss of consciousness?

A. Well, it's actually quite simple. That mammalian neurons are indistinguishable in a Petri dish. So a rat's neuron, brain neuron or whatever, is identical to a human's brain neuron macroscopically, microscopically. You're only going to be able to find distinctions at a biochemical or physiological level, if that. So rat neurons respond to their milieu exactly the same as human neurons do.

MS. WIESNER: If we could turn, please, to page 2 and put up figure one, which should be the next demonstrative.

Q. Can you please tell us, Dr. Williams, what figure one is depicting.

A. This is one of the diagrams from the van Rijn study. These are two exemplars of EEG tracings of rats that were decapitated. The red line on the top was taken from an anesthetized rat, and the blue line at the bottom was from an awake rat.

You'll notice the frequency and amplitude of the impulses in both of these are very different before decapitation than they are after, characterized by very frequent discharges or potentials, and the amplitude is as you see here.

The distinction between anesthetized -- and people often ask, why are the anesthetized rats' impulses -- were are they bigger? Part of that is that these are not necessarily to scale. They may have been measured in a different manner from one rat to the other. But also we do know that anesthesia, surgical anesthesia, essentially approximates sleep. And what -- the best of our understanding is that it approximates the slow wave sleep of stage three and four sleep, which we often refer to as slow wave sleep. So the brain waves that we observe on electroencephalogram in a sleeping person versus an anesthetized person are very similar with slower, large amplitude, aggregate brain waves.

Q. And apologize if you've already said this, but which line

represents the anesthetized rats?
A. The red line on the top.
Q. Thank you. Now, how is it that decapitation compares to a shot in the cardiac bundle with respect to time to loss of consciousness?
A. They are different mechanisms for inducing exactly the same injury to the brain. In both cases what you're doing is stopping all blood flow to the brain in a very, very short period of time with decapitation or with a gunshot wound.
So from the time of injury, starting the stop watch, the loss of blood flow is going to be exactly the same. Because there's no forward blood flow from the heart, even though that's a greater distance than from the severing of the neck, the lack of forward blood flow, basically the stasis or the stationary aspect of it is exactly the same. So there will be no physiological difference that we can measure between the two.
Q. So in layman's terms, then, what does the van Rijn study show us about how long it would take to lose consciousness when blood flow to the brain is stopped?
A. Van Rijn has done quite a bit of work on the study of unconsciousness. This was their -- this was only one paper that van Rijn's group has published. And van Rijn was able to establish, based on previous research, that the cognitive band of brain activity, which I believe is between 100 and 200 hertz -- sorry -- megavolts, the cognitive band of brain wave

activity was diminished by at least 50 percent at 3.7 seconds after decapitation. Which means that -- and with their confidence intervals taken into account, which are about one second, plus or minus, that means we're talking about a time frame of 2.7 to 4.7 seconds that unconsciousness could ensue.

Q. And just to be clear for the record, the figures that you were just reading, the time to loss of consciousness, those are the results of the research reflected in the 2011 van Rijn paper?

A. Yes. This paper is the paper that definitively defines that period of unconsciousness as being 3.7 seconds, plus or minus.

Q. Does this van Rijn study tell us anything about the level of unconsciousness resulting when there's a complete cessation of blood flow to the brain?

A. Indeed it does, and this diagram up on the screen actually shows it very well. The level of unconsciousness that is recorded at 3.7 seconds is profoundly deeper than the level of consciousness with anesthesia. In other words, the amplitude and frequency of brain wave activity, 3.7 seconds afterwards, is a fraction of what it was beforehand. And whether it had -- whether the rat was anesthetized first or it was awake at first, we can see there's lots of brain wave activity on the diagram prior to decapitation.

If you extrapolate from zero to 10, go about a third of the way down and look at the nature of frequency and amplitude of

impulses at 3.7 seconds, you can see that it's qualitatively and quantitatively significantly reduced. So the level of unconsciousness that decapitation or cessation of blood flow produces is pronounced and much deeper than that induced by even surgical anesthesia.

Furthermore, this level of unconsciousness deepens over time and does not recover. As we can see going past about ten seconds, on to 30 seconds here, the brain wave activity in both graphs is markedly diminished and essentially flat lined.

Q. Is there any human data that corroborates the van Rijn findings with respect to the speed of loss of consciousness?

A. There is. We don't have anything where we've decapitated humans and taken EEG studies, but we've got a good approximation.

Q. And what is that good approximation?

A. That would be that of lateral vascular neck restraint or chokehold. I don't like the term, but that's the one commonly used in public parlance. LVNR or sleeper hold, lateral vascular neck restraint, as taught to police and as used by people in martial arts. This is a well known, well studied maneuver that produces unconsciousness by the similar mechanism, cutting off carotid circulation to the brain, in very few seconds.

Q. And is the paper that you're referring to by Dr. Bozeman?

A. Yes. That's the Bozeman paper that I included in my report.

MS. WIESNER: And for Your Honor's benefit, that's

Plaintiff's Exhibit 53.
Q. Did you also prepare a demonstrative to illustrate the effects of LVNR?
A. I did.
MS. WIESNER: If we could put up, without pressing play, please, the next demonstrative.
Q. And before we press play, can you just tell us what we're about to watch.
A. Certainly. This is a demonstration. I believe it's at a police academy. This is a public domain YouTube video in which the instructors are demonstrating to a group of trainees how the LVNR maneuver is accomplished and how rapidly it works.
The examiner, who you can see his finger on the right side, he's holding his index finger up. What he's doing, he's using the method for assessing the onset of unconsciousness that was used in the Bozeman experiments, which were very well done.
The means of assessing loss of consciousness is by having the subject follow the finger as the finger moves from side to side. The examiner's finger is causing the subject to perform lateral eye movements to follow the finger. And when unconsciousness ensues, the individual is no longer able to follow the finger.
This is a good approximation of loss of consciousness, but one must understand, looking at this, this is not a physiological measurement. This is a subjective, observational

measurement, and there's an observable lag even in this demonstration between the time that the patient stops following lateral eye movements to the time that they say that the patient has become unconscious. Actually, physiological laxity of the muscles then occurs about a second after that. It's very well demonstrated here.

Q. And does LVNR completely stop blood flow to the brain?

A. Not completely. When you look at blood flow to the brain, about 95 percent of the blood flow to the brain -- maybe 92 percent, something, 92, 95 percent of the blood that flows to the brain comes up through the carotid arteries, which are located in the anterior neck. The remaining circulation to the brain comes up through two arteries, the vertebral arteries that pass through the vertebrae of the spine and up into the posterior brain and supply those critical structures at the back of the brain.

So LVNR is a little bit different from -- is different from the decapitation study, in that there's -- the vertebral circulation is intact. So this may result in a slight delay compared to decapitation or gunshot wounding, but the difference is fairly short.

Q. Thank you.

MS. WIESNER: We can go ahead and press play, please.

(Video published.)

A. If we can replay that, I can actually walk you through

what's happening here.

Q. Thank you, Dr. Williams.

(Video published.)

A. Stop. So he just said three, so he's been counting. He's done one, two, three. So here we're at approximately three Mississippis or three seconds. And I think you can appreciate, this is not a precise means of measuring time compared to the van Rijn study where they're using actual instruments, instrumentation.

All right. Advance.

(Video published.)

Stop. So you see between -- going from three to four, the subject's eyes closed, and he stopped trying to follow the examiner's finger. He's come to four, but he hasn't yet gone to five, and then his involuntary resistance to the maneuver has lapsed and his arms have collapsed.

So this expresses two levels of loss of physiological function. First, the eradication of lateral eye movements, which I think approximates the van Rijn end point very well, but then we see the laxity of the muscles occurring after that, which is not necessarily dependent on consciousness or unconsciousness. This is -- sorry. I'm not saying that correctly. It suggests the -- there's a bit of a lag between muscle function and brain function. So because of the distance from the brain, it takes a little longer.

But clearly we see that unconsciousness ensues between three and four seconds. This demonstration repeats and recapitulates the findings of other medical researchers who have done -- Bozeman's work, as well as several other researchers who have duplicated that. So this is very well studied, very well established.

Q. Now, in your opinion, would an inmate who is shot in the cardiac bundle feel pain after they lose consciousness?

A. No. Absolutely not. In the first place, we know that the level of unconsciousness that would ensue after complete cessation of blood flow is profoundly deeper than anesthesia, and we know that people who are under anesthesia do not experience pain in the short term either. So we're talking about a very profound level of unconsciousness. And there would be no perception of any kind, even if by some miracle the patient was able to survive that injury.

Q. Now, you testified in this court in a matter last year?

A. I did.

Q. And did you prepare a report in that matter?

A. Yes, ma'am.

Q. Are you aware of the fact that the Court had an opportunity to review your report in that matter?

A. Yes, I am.

Q. And are you also aware that the Court concluded that your report supported the inference that an inmate would, in fact,

feel pain in the three to five seconds before loss of consciousness?
A. I'm aware of that conclusion.
Q. Is that what you had intended to convey in your report?
A. No, it's not. I intended to portray the loss of consciousness and insensibility to pain by this injury exactly as I've described it today. But I've taught school in college levels for many years, and I have found that I am not a perfect teacher, and I sometimes don't get my message across properly, and I think I failed to do that in my previous testimony.
Q. And so just to be clear, is it your opinion that a person would feel pain in the three to five seconds before they lose consciousness?
A. They will not.
Q. Aside from published literature and your own clinical experience, did you consider anything else in forming your opinion about the time to loss of consciousness?
A. I certainly did.
Q. And what is that?
A. When I first -- when I was first engaged in this line of research in 2016 for the Ledford case in Georgia, I was significantly -- I realized I did not have sufficient information to offer an opinion, and so I did a tremendous amount of reading, research, and reaching out to people who have experience in the immediate effects of gunshot wounds.

The people who have seen the most gunshot wounds immediately as they happen are military medics in war zones. I was able to, through friends and contacts in law enforcement, reach out and find several people who had served as medics in the United States Special Forces who had been in situations, many situations, where people were shot and killed in their very presence, sometimes right next to them.

Q. And how, if at all, did those conversations support your opinion?

A. Each of the individuals I debriefed was able to describe to me multiple cases where an individual was shot in the cardiac -- in the central chest, essentially the cardiovascular bundle, in a combat situation. The descriptions they gave to me without exception were that the individual so shot collapsed immediately and fell to the ground without any purposeful movement thereafter. And even when the medic attempted to render aid literally in the first one to two seconds after the injury was sustained, the patient exhibited no response, what we would call in trauma a Glasgow coma score of three, within one to two to three seconds after receiving the injury.

Q. Have you been able to find any historical data from an actual firing squad execution that is relevant to this question of time to loss of consciousness?

A. I have.

MS. WIESNER: If we could please put up Defense

Exhibit 48.
Q. Can you please describe for us, Dr. Williams, what we're looking at.
A. This is a reproduction of a newspaper article, Chicago Tribune, Tuesday, November 1st, 1938. The article describes the execution of an inmate by the Utah Department of Corrections. I believe it was the previous day. Might have been the same day. I'm sorry.
Q. And this article indicates that the defendant's heartbeat jumped from 72 to 180 during the preliminary for the execution. Assuming that reading is accurate, could that suggest the inmate had some fear or anxiety?
A. I think he must have had some fear and anxiety. I'm skeptical of the 180 number. We don't typically see heart rates of 180 unless there's a significant cardiac arrhythmia present, but certainly it could jump up to 150, maybe even 160 beats per minute under stress. Yes.
Q. Now, in your opinion, would that be the same fear or anxiety that an inmate would face regardless of the method of execution?
A. That would be my assumption.
Q. And in your opinion, would a firing squad cause any psychological terror once the inmate has actually been struck with the bullet?
A. No. As I've testified previously, in my opinion, based on extensive clinical experience, the initial impact of the bullets

is going to be a novel and extremely powerful stimulus that will overwhelm the conscious thought processes of the individual. Because of the ballistic injury to the neurological structures in the vicinity of the gunshot wound, he will not feel pain in the initial minutes to hours after injury, so there will be no increase in conscious anxiety or anything of that nature.

MS. WIESNER: Now, if we could please put up the next demonstrative, which is just a blowup from this article.

Q. What are we looking at here, Dr. Williams?

A. This is an electrocardiogram that was taken during the execution, I believe by the physician who's demonstrating here. As far as I'm aware, it's the only physiological record of anyone who's been shot by firing squad in existence.

This shows the electrical activity of the heart up until the moment of being shot, following the shot, for a period of about eight to ten seconds.

Q. And based on your view of this electrocardiogram, what do you believe it shows with respect to time to loss of consciousness?

A. I think it's pretty clear. You know, as an emergency physician, I evaluate electrocardiograms many times on every shift. This is a very, very common part of my work. And certainly I evaluate arrhythmias as well as normal rhythms all the time.

If I look at the area of the electrocardiogram underneath

the doctor's hands, I see a steady baseline with R waves, which would indicate the major beating of the left ventricle -- left and right ventricles, actually -- occurring at a rate of about 90 to 100 beats per minute. As we go right to the right of the examiner's hand, we see a sudden end of that steady baseline, and then a chaotic pattern where electrical discharges are highly variable in frequency and amplitude, which persists for a period of about three to four to five seconds. And then we see this rising and then slowly falling beat that occurs after.

So what that means is up until the time of the shot, the patient is experiencing a normal but rapid heart rate, but immediately following the gunshot wound, he goes into a pattern of -- a cardiac activity pattern which we would characterize as ventricular fibrillation.

Ventricular fibrillation is incompatible with life and incompatible with consciousness. When I see patients who are in ventricular fibrillation, they're unconscious. I've seen several patients in my career who have gone into ventricular fibrillation -- can I say V-fib?

Q. Sure.

A. They go into V-fib right before my eyes while I'm also looking at the monitor. Unconsciousness ensues in fractions of a second after the onset of V-fib. I have limited understanding of why that unconsciousness is so rapid, but I've observed it a handful of times in 35 years. I've spoken with other

colleagues, including professors of medicine in five or six different states, other emergency physicians with great experience. We have all seen this. It's a very well established phenomenon in emergency medicine that onset of ventricular fibrillation leads to very rapid onset of unconsciousness.

If we look at what happens past that period of initial V-fib, we see that climbing and then descending pattern of electrical beats. This would be what we would call agonal beats or nonfunctional electrical activity, not associated with any forward flow of blood. So what that tells me is that from the time the bullet struck the individual's heart, at the end of the normal baseline, there was no further blood flow forward from the heart from that point forward.

Q. And just to be clear, the article states that the heartbeat stopped 15.6 seconds after the bullet struck. Does that mean that the heart was pumping blood to the brain for 15.6 seconds?

A. No. I think that language just reflects the reporter's unfamiliarity with the distinction between an audible heartbeat and an electrocardiographic rendition.

There are numerous cardiac -- well, not numerous, but there are certainly cardiac arrhythmias that are well established and known where there is a pattern of electrical activity, but there is no organized beating of the heart to produce blood flow. Ventricular fibrillation is a classic example, but also

pulseless electrical activity is well recognized wherein it looks like a normal heartbeat, but the heart is, in fact, not pumping any blood at all.

Q. Dr. Williams, to a reasonable degree of medical certainty, what is your opinion about whether a person shot in the chest by firing squad would experience pain or suffering?

A. To a reasonable degree of medical certainty, I am confident that that person will not experience any pain or suffering.

Q. Now I would like to turn to your second opinion, which is that execution by firing squad is feasible and can be readily implemented in Alabama.

Before I do that, though, I do want to ask, what are your personal views on the death penalty?

A. I've done an extensive reading on this subject and research since 2016. That has informed my opinion on the generalities of the ethics of capital punishment. My position, essentially, is rather agnostic. I think for the most part, I don't like the idea of capital punishment emotionally and personally, but I can recognize that there are conditions in which it may be appropriate and ethically justified in society. So I'm kind of a 60/40 guy.

Q. And do your personal views on the death penalty impact any of the testimony you're giving today?

A. No, they do not.

Q. So turning back to your second opinion with respect to

firing squad being feasible and readily implemented in Alabama. What do you base that opinion on?
A. I base the feasibility on my practical knowledge of firearms, firearms safety, construction and construction materials and so forth.
Q. And are you aware of whether there are states that have protocols for execution by firing squad?
A. Yes. Multiple states have protocols.
Q. Have you reviewed any protocol for execution by firing squad?
A. I have. I rely heavily on the Utah state protocol for executions.
Q. And have you reviewed any other protocols?
A. The United States military -- actually, it's not military, but U.S. Army protocol. I've included one of their protocols from the 1950s.
MS. WIESNER: Your Honor, for reference, the Utah protocol is Plaintiff's Exhibit 44, and the Army protocol is Plaintiff's Exhibit 43.
Q. What, if anything, does the historical and modern use of firing squads tell you about whether it is feasible to implement execution by firing squad in Alabama?
A. Well, historically we see that firing squad was initiated as a means of execution in expeditious circumstances in times of war, as I said, early in the 17th century if not earlier. A

military tribunal or an officer capriciously may say, this soldier needs to be executed. The means of execution could be assembled in a matter of a minute or two, and the execution could be carried out quickly and expeditiously. So it's been used ubiquitously throughout the western world since 1600, if not sooner.

In the matter of whether Alabama can do this today, I simply refer you to the concept that several states are already executing inmates by firing squad, and they seem to have had very little difficulty inputting the other protocols and facilities for doing that.

Q. Now, based on your education and training, do you have any opinions about what specific weapons would most facilitate a quick and painless death?

A. Certainly. I think it's a general comment. I think any rifle and bullet combination that's capable -- you know, that may be used for deer hunting is going to work in a firing squad. So the standard kind of deer rifle in America for the last hundred and some years has been a .30-caliber centerfire rifle, .30-06, what have you, .308 caliber similar, so a .30 caliber rifle would be a good choice. The .30 caliber rifle -- various cartridge designations exist in virtually every law enforcement and department of corrections arsenal in America.

Q. And are you aware of whether or not Alabama law enforcement has access to .30-caliber rifles and ammunition?

A. They certainly do.
Q. Now, how is it that the firing squad would know where to aim on the body?
A. They might have their own personal knowledge, but the protocols stipulate that a member of the execution staff should place a paper target or some other kind of a visible target over top of the heart on the clothing of the condemned person.
Q. In your opinion, would it be difficult to affix the target in the proper location?
A. It's not a difficult prospect. Safety pin, glue, whatever you want to affix it. The location of that is not rocket science. It could be done by anyone who can listen for a heartbeat with a stethoscope and feel where the bony landmarks are. Anyone with a minimum of nursing or auxiliary medical training could do it.
Q. Do you have an opinion on a minimum number of riflemen that should be on the firing squad?
A. I don't have a real strong opinion on it, except to say that it looks like Utah has settled on four live rifle rounds and one blank, and that has been extremely effective for 150 years. I don't see any reason to go below that number. Over that number, if you want to -- well, whatever. I mean, I don't have an opinion on that. But I think it's reasonable to say that four rifles would be a safe minimum.
Q. And what distance should the rifleman stand from the

condemned?
A. In Utah the rifles are 21 feet from the condemned person. In the military protocol, it's 35 feet.
Q. Now, what level of marksmanship training would be required to hit a target of the size you've described at that distance?
A. That's well within the established marksmanship requirements for rifle qualification in the state of Alabama.
Q. And are you familiar with the Alabama certification standards for marksmanship?
A. Yes. Sorry. I preceded your question.
Yes, I'm very familiar with the Alabama Peace Officers Standards and Training Council recommendation for firearms qualification. I've reviewed their rifle qualification course of fire and target. And anyone who could shoot that course of fire and achieve a score of 80 percent or more, as the director said yesterday -- anyone who could do that is going to be capable of performing a firing squad execution effectively.
Q. In your opinion, how likely is it that a trained marksman could hit the target at the specified distance?
A. I think it's virtually a hundred percent that they will at this time hit the target at this distance. I mean, I -- a fluke could occur, but provided normal circumstances, they won't miss.
Q. And are you aware of any states beyond Utah that have a protocol for execution by firing squad?
A. Yes. I'm aware of the protocol in South Carolina, but I

haven't seen the document personally. I've just heard representations of it or read representations of it, I should say. I'm familiar with the general outlines of Idaho's firing squad protocol as well. But that, again, hasn't been published, and I only have secondhand information there.

Q. Based on the information you do have available with respect to South Carolina, are there differences between the South Carolina and the Utah protocol that you think could impact the ability to cause a quick and painless death?

A. Yes, there are. I was actually kind of asked in a kind of back-alley way to comment on this before they solidified it, through contacts in legal circles, to contemplate on what they were contemplating, and I said I disagreed with it even before it was published.

I think that they're using -- the rifles they've chosen to use are not .30 caliber. They're smaller than .30 caliber. I believe it's 6.5 millimeter caliber rifles. The bullets are lighter. And they select -- they decided to use a frangible bullet or a bullet that's designed to disintegrate on impact, which means the bullet is not going to penetrate as deeply or as powerfully as a standard jacketed soft-point bullet such as is used by law enforcement and departments of corrections throughout the country.

Q. So is it your opinion that a protocol more similar to Utah is necessary as compared to South Carolina to cause a quick and

painless death?
A. It would certainly be preferable, yes.
Q. What, if any, physical requirements does a firing squad execution impose on the execution chamber?
A. In the first place, it could be done outside. You don't necessarily need to have a chamber. I believe the state of Tennessee looked into that sometime ago.
But if we were to do an indoor execution, you're going to need to have ballistically impermeable barriers between witnesses and the actual execution chamber. You would also have to have ballistic protections for the execution staff, so an impermeable barrier in front of the firing squad and an impermeable barrier in front of the execution staff who are witnessing the execution.
Q. What types of barriers are you talking about?
A. Bullet-resistant glass, which is easy to come by and is used -- actually, there's bullet-resistant glass all over this building. It's commonly used in construction. Bullet-resistant glass is actually not marketed as bulletproof glass. It's used in many buildings. In fact, I'm sure if we looked around downtown Montgomery, we would find most of the modern buildings have bullet-resistant glass because it's the best glass. So you want to have that.
You want to have -- the walls that the glass is imbedded in need to be ballistically impermeable. So cinder block walls

with concrete inside of them would be an example, but there's other ways of constructing ballistically impervious walls.

You would want to have some means -- in the event that the bullet should pass through the body of the condemned person, a means of catching those bullets so they don't ricochet around the room like ping pong balls.

All of this has been taken into account in the Utah protocol which I've included with my report.

Q. And if you recall, can you give us some examples of the materials that Utah uses.

A. Yes. The materials behind the -- the execution chair is a steel and wood chair affixed to the floor with a wooden back. Then behind that they have sandbags followed by a Kevlar blanket or curtain. Kevlar is a synthetic material which is used in ballistic armor and will stop fragments very well. And then behind that, I believe they have steel plates, armor plates.

Q. And are all of those materials commonly available?

A. Very commonly available.

Q. Now, did you hear yesterday testimony from Commissioner Hamm and Deputy Commissioner Williams?

A. I did.

Q. Having heard their testimony, and based on your experience and training, is firing squad feasible and readily implementable in the state of Alabama?

A. I should think it would be. As they indicated in their

testimony, they would have to study it and make accommodations, but I think that reflects the fact that it would be entirely feasible.

Q. Thank you.

MS. WIESNER: Subject to any redirect, I have no further questions.

THE COURT: All right. We've been going for about an hour and a half. Why don't we take a 15-minute break? It is 10:24. We'll come back at 10:40.

(Recess was taken at 10:24 a.m. until 10:40 a.m., at which time the proceedings reconvened, as follows:)

THE COURT: Cross-examination.

MR. THOMPSON: Your Honor, we do have binders prepared. And just so that everyone is on the same page, two of the exhibits that are contested as to their admissibility are included in the binder. That is Defendants' Exhibits 46 and 47. And we will -- if I could --

May I approach, Your Honor?

THE COURT: You may.

MR. THOMPSON: Do you want me to ask each time?

THE COURT: No.

CROSS-EXAMINATION

BY MR. THOMPSON:

Q. Good morning, Dr. Williams. How are you?

A. I'm well, Mr. Thompson.

Q. So I just want to start very briefly with some of the discussion that you had earlier on direct about neural stunning. You testified that there was an initial entry into the body, and that that created a temporary cavity. Is it your position that the cavity is what is causing the neural stunning or the shock wave that extends beyond the boundary of that cavity?
A. You're confusing two terms. In terms of ballistics, if you read Dr. Fackler's paper, he makes it clear that the propagation of the temporary cavity -- so the movement of tissue as the energy passes through -- is distinct from a sonic or shock wave. So they've measured sonic waves, shock waves, and ballistic temporary cavities. They're different items ballistically speaking and in terms of physics. So, yes, the temporary cavity is what's causing the injury.
Q. So that would be some sort of observable injury to the nerves in that cavity?
A. Observable in a microscopic and very time-limited sense, yes.
Q. So what about the nerves outside the boundaries of the temporary cavity?
A. One would assume those would be intact.
Q. So the disruption of the nervous system would not extend beyond the temporary cavity. Is it your position that the body would have an inability to feel pain in those nerves beyond the cavity?

A. No. They would still be fully functional.
Q. Would they be firing?
A. They could be firing if they were stimulated, yes.
Q. In this case, you have reviewed a couple of protocols, and I just want to go through each of them briefly, starting with the U.S. Army protocol.
Do you have in front of you -- well, actually, could you please turn for me to Defendants' Exhibit 51. It should be the last one in your binder. And this is also Plaintiff's Exhibit 43.
A. Got it.
Q. On the first page, about three-quarters of the way down after the words Department of the Army, there is a date. Could you please tell me what that date is.
A. Are we talking about item 15?
Q. Exhibit 51. It's the procedure for military executions, the cover page.
A. Oh, cover page. Gotcha. Okay. Department of the Army, December 1947.
Q. Yes.
A. Yes.
Q. Do you know if this is the current U.S. Army execution protocol?
A. This is not the current protocol.
Q. Do you know if the current U.S. Army execution protocol

provides for firing squad?
A. I believe it does not. I haven't seen it, but that's my understanding.
Q. So what was your rationale for relying on a protocol that has been -- at least has not been renewed or is at least not operative in the eyes of the U.S. Army?
A. I presented it simply as an exemplar of a way and means of performing firing squad execution. I believe by looking at historical records you can draw inferences that may be applicable to present day.
Q. Do you draw any inference from the fact that the Army no longer uses firing squad?
A. No really, no.
Q. Why not?
A. I don't really care whether the Army executes by firing squad or not.
Q. So Utah's protocol. If you could turn to Defendants' Exhibit 50.
A. Okay.
Q. This is Utah's protocol; correct?
A. To the best of my knowledge, yes.
Q. Why did you select Utah to form the majority of the basis of your opinion about the feasibility of firing squad in Alabama?
A. For two reasons. Number one, Utah is currently prepared to use this protocol, so this is their current protocol. Secondly,

they've been using firing squad protocol for 150 years. They have the largest body of experience in the United States that we can rely upon for historical information and accuracy.
Q. Do you know when the last time Utah conducted a firing squad execution is?
A. 2010.
Q. Do you know why they haven't conducted one since?
A. I do not.
Q. Do you know of any state more recently that has conducted a firing squad execution?
A. Yes. South Carolina has executed, I believe, three people.
Q. What do you know about South Carolina's execution protocol?
A. I only know secondhand information of what they do.
Q. What is that secondhand information?
A. Well, the Utah -- sorry. The South Carolina protocol involves -- prescribes three shooters, three riflemen. Each of the rifles is loaded with a live round. I don't know the distance from the rifles to the condemned person. I don't know the length of that distance.
I do know that the ammunition that they've selected or I was told that they had selected was a round that is a smaller caliber than .30 caliber and is frangible. That is to say it breaks into pieces on impact with the target medium.
Q. If I were to represent to you that the South Carolina Department of Corrections has issued a formal press release with

information about the protocol listing the distance between the rifle and the condemned at 15 feet, would you have any reason to dispute that?
A. I would not dispute it.
Q. So with the knowledge that there are three riflemen shooting live ammunition, a condemned who is in a seated position -- well, let me back up. Strike that.
Do you know if the condemned in South Carolina is in a standing or seated position?
A. I believe they're seated. Yes.
Q. Do you have any reason to believe that that would be a substantially different setup or whether that would be substantially similar to how Utah affixes their condemned to the chair?
A. I believe it's very similar.
Q. So knowing that, what you know about South Carolina -- the distance, the number of shooters, three shooters, active ammunition -- on what basis do you conclude that South Carolina's execution protocol, their methods, are irrelevant or not worthy of consideration to your opinion in this case?
A. I didn't ever say that they were irrelevant or not worthy of consideration. I simply said that I presented the exemplar of Utah procedure because I had the entire procedure at hand and I could speak to it explicitly and in detail. In South Carolina I'm relying on hearsay or secondhand reports.

Q. What about your reliance on the 1938 execution in Utah that you discussed a little bit earlier on direct? Did you have information about the specifics of Utah's 1938 execution protocol?
A. I have some information that I've gleaned over the years, yes.
Q. Okay. And that informed your opinion and your reliance on that execution and the electrocardiogram data?
A. Yes, it does, plus my observation of that report. Yes.
Q. Do you know what sort of rifles were used in firing squad executions in Utah in 1938?
A. Yes. They were using Marlin lever action rifles, 30-30 caliber.
Q. Do you know how many riflemen there were?
A. There were five riflemen. One of the rifles was loaded with a blank.
Q. Do you know the impact location of one or more of those bullets in the execution discussed in the 1938 article?
A. I don't have the pathology report on the autopsy, but I have been -- well, what I was represented was that the bullets struck the individual's heart, right over the heart, and then destroyed the heart.
Q. You said it destroyed the heart?
A. Yeah. It broke apart the heart, obliterated the heart, macerated the heart, whatever term you like.

Q. Is that based on your reliance on the newspaper article that --
A. No. That's based on information I obtained from departments of correction officials later.
Q. Did you mention that information in your report?
A. No, I did not.
MR. THOMPSON: Your Honor, we would move to strike any testimony about the 1938 execution that goes beyond Dr. Williams' reliance on the 1938 Utah article previously discussed.
THE COURT: What's your response?
MS. WIESNER: We would certainly oppose that. Dr. Williams explained on direct examination that his opinion was derived on his review of the actual electrocardiogram tracing. I don't believe that Dr. Williams needs to have information about the specifics of the protocol to say that the tracing reflects -- regardless of whatever the protocol is, that it reflects a sudden onset of V-fib and subsequent loss of consciousness. That was the opinion that he provided on direct examination.
MR. THOMPSON: Dr. Williams has also offered opinions in his report that the more bullets that strike the target, the more lethal it is. The quicker there is a loss of consciousness. So if there are ten shooters in 1938 in Utah, that paints a very different picture about what you can

extrapolate from that execution and the electrocardiogram data as opposed to what would be going on in terms of cardiovascular activity for a condemned under the protocol proposed by Dr. Williams. And so the specifics do matter in terms of what we can extrapolate from what will be happening cardiovascularly.

THE COURT: I'm going to deny your motion, but you can certainly bring that out on cross-examination. Go ahead.

Q. (Mr. Thompson, continuing:) Doctor, you said on direct that you offered criticisms of the South Carolina protocol; is that correct?

A. Yes, I did.

Q. Do you know when you had those discussions in which you offered those criticisms?

A. I believe it was 2022.

Q. And do those criticisms reflect your current view?

A. Yes, they do.

Q. And has that view and those criticisms been a consistent opinion of yours since the time you gave them to now?

A. When I first discussed this with the people that had asked me about it, I had to do some shall we say mental gymnastics, thinking about the ammunition that they had required. So the opinion that I eventually relayed to you here developed over a period of two or three phone calls, but it's not changed since, no.

Q. And it's been consistent between 2022 and 2026?

A. Yes.
Q. Do you recall giving an interview to the Marshall Project in 2024?
A. I did.
Q. That formed the basis of an online article that was published February 4th, 2025?
A. Yes.
Q. Do you recall the substance of that conversation or the substance of that article?
A. No, I don't recall any specifics.
Q. Would it be helpful for you to review the substance of that article to refresh your recollection?
A. If you wish to discuss it, yes.
MR. THOMPSON: Your Honor, we are not offering Mr. Williams' -- the interview that is captured in the Marshall Project online article as substantive evidence, merely as potential impeachment. And I have copies for --
Q. Actually, if I could ask you one more question, Dr. Williams. In that interview, if I represented to you that you said something to the effect of the three shooters called for under the South Carolina protocol would be sufficient, would you have any reason to dispute that?
A. No. I think in the context, we would have to amplify, but I certainly could have said those words, yes.
Q. What sort of context do you think would amplify that?

A. Well, I would have to look at the context in which the question was asked and my answer was given.
Q. In this context at some point your opinion was, big or small, that three shooters called for under the South Carolina protocol could be sufficient.
A. Yes. I think that's what I would try to -- what I was trying to convey at that time, and I would certainly say today three rifleman could be sufficient. My view is simply that we want to err on the side of caution and use four or five.
Q. I guess my question is, what changed?
A. I don't think the two points are inconsistent or changed at all. I mean, the possibility of three being sufficient but four being better I think is the implied statement in that and certainly what I'm saying today.
Q. You're saying that?
A. I'm saying that the Utah protocol, four to five shooters, is what I would consider a safe minimum. Could three effectively do it? Possibly. Could two effectively do it? Possibly. But Utah has the best record. This is the state that has established a firm record of successful executions by firing squad. They use four rifles with one blank. I think that's a good standard to adhere to. Is it possible that fewer would work? That's certainly possible, but I couldn't give you a number of probability.
Q. Do you think it would be important to take into account the

fact that South Carolina has conducted the last three firing squad executions?
A. Important to account for in what way?
Q. Well, on direct you testified about, among other things, the historical progression of the firing squad, the historical context of firing squad in this country. You've talked about going all the way to the 17th century, you know, sort of long-standing use. You've, again, identified the 1938 Utah execution, you have relied on the U.S. Army's former firing squad protocol, and you have relied on the 2010 or I guess the most recent, current version of Utah's firing squad protocol, but you did not rely on protocol from the state that has conducted 50 percent of the firing squad executions in this country since the death penalty was reinstituted in 1977.
A. No, I did not rely on them.
Q. My question is why.
A. Because I don't have a copy of their protocol, and I haven't been able to look at their policies and procedures. I simply don't have the documentation to offer an authoritative opinion.
Q. But you knew or had reason to know about the distance between the riflemen and the condemned, the caliber of bullet that was used, the number of shooters, and the number of those shooters that had live ammunition. What other information would you need to form a reliable expert opinion about South Carolina's protocol and its efficacy?

A. Well, the same reason -- in the same way that I could say to you, I'm not going to rely on a scientific paper in the treatment of ventricular fibrillation if I don't read the paper. I can't see the flaws in the study or the details that are erroneous unless I actually read the study. Same thing applies to a protocol. I'm not going to attest to the overall reliability of a protocol unless I can review the entire document, preferably in conjunction with policies and procedures.

The devil is in the details, Mr. Thompson.

Q. So given what you know now about the South Carolina protocol, would an arguably botched firing squad execution carried out under that protocol change your view of the efficacy of firing squad as a method of execution generally?

A. No.

Q. Why not?

A. Because as I've previously stated, I believe that they're skirting on the edge of failing in the procedure that they put together. They're using a number of riflemen that is reduced. They're using ammunition that I think is not appropriate for the target being shot. The chances of that being a failed execution or botched execution versus the chance of an execution failing in Utah under the Utah protocol, it's substantially larger using the South Carolina protocol.

Q. Despite the fact that Utah -- or that South Carolina calls

for their riflemen to be six feet closer than Utah?
A. The range that we're talking about in these executions is of no importance.
Q. Do you think that the range or the distance between the shooter and the condemned is important in terms of the second part of your opinion, which is -- and I don't want to misquote you, but I understood you to be saying that you have a medical view on the results if everything goes perfectly. Would you agree with that statement?
A. I'm sorry. Restate it?
Q. So if everything goes perfectly, you have a firing squad with four to eight riflemen with live ammunition, and those rounds strike the cardiac bundle, you've offered a medical opinion that that would result in instantaneous loss of consciousness, death following shortly thereafter, and that that would be a painless process for the condemned; is that correct?
A. Yes.
Q. And then the second part of your opinion proves that up by establishing, in your opinion, about the likelihood that everything will go correctly under the protocol. Is that fair?
A. That's fair.
Q. So do you think that the fact that there is evidence of a South Carolina execution in 2025 where one of the three riflemen using live ammunition missed the target from 15 feet, that that

would inform your opinion about the efficacy of firing squad?
A. In the first place, I would dispute that one of the riflemen missed. In the second place, no, it doesn't -- it does not change my opinion.
Q. Do you think that that's cherry picking data?
A. How would that be cherry picking data?
Q. There have been six executions by firing squad since 1977.
A. Yes.
Q. Three of them in South Carolina, three of them in Utah.
A. Right.
Q. Each of the three most recent were in South Carolina. You've said that you didn't see it -- you didn't see it necessary for you to consider the South Carolina protocol, and that that -- and that the specifics of that protocol and how that protocol has been carried out would not change your opinion about the efficacy of firing squad generally.
A. That's correct. I don't think it changes my opinion.
Q. And so what I'm asking you is given the small sample size, do you think that excluding from your consideration 50 percent of the firing squad executions, including the three most recent, one of which, at least according to that condemned's attorneys in the forensic report that that attorney commissioned, that that would be cherry picking data?
A. Well, I think if we use the time frame that you've advised, in the last -- 40 years are you saying?

Q. Since 1977.
A. Since 1977. Yes.
So in the last 40 years, that's only a fraction of the time. So by limiting it to that time frame, I think you're cherry picking.
Q. Since 19 -- so --
A. Let's go back to 1860.
Q. Sure.
A. If we go back to then, then we've got 43 firing squad executions in Utah and six in South Carolina. We have knowledge of two botched firing squads in Utah under circumstances that were substantial departures from the prescribed procedure. We have three in Utah. So we have a total of 46 executions, of which three have been botched. That's a -- and if we can state the ones that were performed according to the procedure, which as far as I'm aware, is the only one that does conform to procedure, the South Carolina execution that was allegedly botched, that's one out of 46.
Q. So do you think that an execution over 200 years ago has more to say about the efficacy of firing squad in 2026 than three executions conducted by firing squad in 2025?
A. I don't think that you can make that assumption, no.
Q. You don't think you can make what assumption? I'm sorry.
A. I don't think you can say that an isolated set of firing squad executions 200 years ago can be compared to firing squad

executions more recently. You have to took at the total corpus of data, the total number of executions, and draw your conclusions from that.

Q. And that would include the three South Carolina executions, would it not?

A. Well, yes. You can add them to the total. Absolutely.

Q. Are you familiar with the Mikal Mahdi execution?

A. Yes, I am.

MR. THOMPSON: Your Honor, at this time, we would move to admit Defendants' Exhibits 46 and 47.

THE COURT: Any objection?

MS. WIESNER: Your Honor, we would preserve the previously stated objections and continue to dispute the relevance. Certainly Dr. Arden's report, if not both, contain hearsay. We would continue to maintain the previously stated objections.

MR. THOMPSON: Your Honor, if I may respond.

THE COURT: Go ahead.

MR. THOMPSON: All of plaintiff's exhibits have been admitted, including Dr. Williams' report. If you turn to page 14 of that report --

THE COURT: Which is exhibit --

MR. THOMPSON: It is Plaintiff's Exhibit -- I apologize, Your Honor. Plaintiff's Exhibit 38, Your Honor.

THE COURT: What page?

MR. THOMPSON: Page 14. The end of the paragraph, Roman numeral i, the very bottom of that paragraph, next to last sentence: The state of South Carolina executed three condemned inmates by firing squad in 2025, and further firing squad executions are expected in that state.

And in context, he puts -- he, I guess, raises the happening of those executions as support for his conclusion, without offering the context provided by the specifics of those executions.

MS. WIESNER: So, Your Honor, I would submit that Dr. Williams did testify clearly on direct that he believes there are substantial differences and material differences in South Carolina. He's already explained that he's not putting forth the South Carolina protocol as the protocol that he's suggesting is feasible and most likely to result in a quick and painless death.

With respect to Dr. Arden's report in particular, again, I'm not sure how that report, which is classic hearsay, would have any relevance on questions about the protocol itself. Certainly counsel has asked Dr. Williams about the protocol, which we've not objected to, but the admission of those two documents I think is objectionable.

THE COURT: What are you offering this for other than the truth of the matter asserted?

MR. THOMPSON: May I have a moment to respond to the

hearsay point, Your Honor?

THE COURT: Sure.

MR. THOMPSON: If I could ask Dr. Williams, for purposes of Rule 807 evaluation, certainly as to Dr. Arden's report, whether he would consider a report conducted by somebody with the credentials laid out in the first paragraph -- and this is Defense Exhibit 46 -- whether he would review a forensic report provided under those circumstances and by somebody with those qualifications as being sufficiently reliable.

THE COURT: Well, are you going down, then, the line of this is official business records that's not hearsay?

MR. THOMPSON: No, Your Honor. That it would be admissible under the residual exception under 807 because it is -- I don't know that there is any other evidence that could establish the point that 46 does in context with 47, which is the state medical examiner's forensic analysis of Mr. Mahdi's I guess autopsy. Dr. Arden's response is the only evidence that can contextualize that report and give the full scope of what happened in Mr. Mahdi's execution.

THE WITNESS: Your Honor, if I may.

THE COURT: Let him ask you a question.

Go ahead and ask your question, and let me see where you're going.

Q. (Mr. Thompson, continuing:) Doctor, could you turn to Defendants' Exhibit 46, please.

A. I have it.
Q. So the first page, under introduction, would you start reading the second sentence, please.
A. Before I do so, I must inform the Court that I am currently retained by counsel for Mr. Mahdi and his estate, and I am enjoined from discussing any specifics of the case under attorney-client privilege.
Q. Did you disclose that conflict in your report, Doctor?
A. I did not disclose it as a conflict, because I did not offer this as evidence.
MR. THOMPSON: May I have a moment, Your Honor?
THE COURT: You may.
(Brief pause in the proceedings)
MR. THOMPSON: Your Honor, on that basis of that conflict, the State would move to exclude Dr. Williams' testimony in its entirety because it prevents -- the assertion of that privilege prevents us from meaningfully cross-examining him.
THE COURT: What's Mr. Lee's response?
MS. WIESNER: I mean, Dr. Williams has testified repeatedly that he is not, in fact, offering an opinion about the South Carolina protocol, other than to say there's material differences from Utah.
His core opinion, there's two. One is the physiological impacts of a strike in the cardiac bundle. That

is based on his medical knowledge and has nothing to do with whatever retention there is in South Carolina. I think the two items are completely separable. Similarly, with respect to the feasibility of the protocol, he has been very clear throughout his testimony today that he is relying on the Utah protocol and his own personal knowledge of firearms and ballistics. They have free rein to cross-examine him on both of those things.

THE COURT: Well, but he has testified about the South Carolina protocol on direct. He is unable to be cross-examined about the South Carolina protocol based on his now asserted conflict. Wouldn't you agree that cabins his testimony in a way that he's not subject to cross-examination?

MS. WIESNER: Your Honor, if I could, I think what may be helpful is if we could speak with Dr. Williams solely to ascertain the bounds of the privilege that he is asserting. I think that may facilitate.

THE COURT: Let's take a ten-minute recess.

MS. WIESNER: Thank you, Your Honor.

(Recess was taken at 11:09 a.m. until 11:26 a.m., at which time the proceedings reconvened, as follows:)

MS. WIESNER: Thank you for that recess, Your Honor.

We did have an opportunity to consult with Dr. Williams about this particular issue. I think he was being overly cautious; but after conferring with him, we are comfortable that he can be cross-examined on this topic without issue.

I would continue to maintain my objections as to the admissibility of those particular documents as substantive evidence. Certainly if counsel is going to pursue them for cross-examination, that is one thing, but we would maintain our objections to the extent they're trying to admit those two documents for the truth of the matter asserted.

THE COURT: All right. I don't see how you get around the hearsay exclusion here. If you look at --

Well, let me hear from you on how you get around the hearsay exclusion.

MR. THOMPSON: Are you -- just to be clear, Your Honor, I'm sorry, is this -- I guess in -- I'll -- you're absolutely right. Under 807 --

I apologize, Your Honor. I was prepared to take those in reverse order.

So under the exclusionary rule -- sorry -- under the residual exception of 807, which is what we would be traveling under, the statement is supported by sufficient guarantees of trustworthiness, which would be the predicate questions that I would ask Dr. Williams, whether he would rely on a forensic report prepared by somebody with those credentials. That's 807(a)(1). And then 807(a)(2), it is more probative on the point for which it is offered than any other evidence the proponent can obtain through reasonable efforts. I'm not sure how we could get this information in in this way, competing

forensic reports that properly contextualize the conclusions that the State's forensic examiner reached. There's simply no other evidence that can replicate what Mr. Arden's report does.

THE COURT: Well, you would agree with me that the residual exception under 807 is exceedingly narrow. And under your reading of it, any record that you don't have someone come testify about or a document where it's not -- a report is not made under oath, as long as you could get someone to testify that they would rely on it, then it would be admissible under 807. I think that's an expansive reading of 807.

MR. THOMPSON: Just to be clear, Your Honor, we wouldn't say anyone would rely on. That Dr. Williams, in his estimation, those credentials, that experience, whether he would question in any way Mr. Arden's qualifications and therefore the reliability of his forensic conclusions. So we would be moving sort of in accordance with the narrow scope of 807.

THE COURT: I'm going to allow you to ask the questions, and I'll -- let me hear the answer, and I'll make a ruling on whether it's admitted.

MR. THOMPSON: Your Honor, just one point of clarification. Are you overruling our motion to strike Dr. Williams' testimony?

THE COURT: Based on the representation that he is going to answer some questions, I'm overruling it. If something occurs and you need to renew it, that's certainly fine. But I'm

overruling the objection based on the representation that he's going to answer questions.

MR. THOMPSON: Okay. Your Honor, just given sort of how the last few minutes have proceeded, may I have two minutes just to confer, just to sort of reorient?

THE COURT: You may.

(Brief pause in the proceedings.)

Q. (Mr. Thompson, continuing:) Dr. Williams, you testified a moment ago that you had been retained by the Mahdi family; is that correct?

A. That's correct.

Q. And you said that you could not discuss the facts of that case, invoking the attorney-client privilege; is that correct?

A. I did say that. I was mistaken.

Q. Can you tell me what part you were mistaken about and how you would then define the scope of the restriction based on that relationship, your ability to testify about the facts of the Mahdi case.

A. Well, I'm not an attorney, so I don't really know the ins and outs of privilege. But I had been made aware by the attorneys for Mr. Mahdi that I am retained, and my communication needs to be circumspect. I thought maybe that might apply. And perhaps I should have said before I testify, can I confer with counsel to see if I would be violating that privilege. That's really what the basis of my statement was.

I have no specific instruction from Mr. King, who's Mr. Mahdi's attorney, about any testimony that I'm giving here today. I communicated with him on Sunday that I would be here, and he wished me all the best in testifying here in court this week.

Q. You said, I think, communication needs to be circumspect. What do you mean by that?

A. By -- being by which?

Q. You said that -- your understanding of the limitations of your ability to speak to the Mahdi case.

A. Yes.

Q. And in response to that question, you said something to the effect of your communications need to be circumspect.

A. Yes. There were -- there was a lot of media activity following the Mahdi execution. I was being pestered for interviews. I spoke with Mr. King as to what I could and could not say, and he said in media interviews, he'd like me to stay away from certain topics. The implication was that in public discourse with media, I had to be more careful, and that was really the context.

He and I are in frequent communication with each other about the Mahdi case and other general topics in this field, so I had just notified him by -- just out of courtesy on Sunday that I would be testifying, and he simply said, you know, go ahead and have a good time.

Q. You said avoid certain topics in public comments about case. What topics --
A. The specifics of the autopsy findings and my opinion on them. He asked me to stay away from those for media reports.
Q. Does that apply in this case?
A. No. We're in open court here, and this is certainly a different level of information. I think it's -- and counsel advises me this is not privileged.
Q. When did the relationship between you and either Mr. King or the Mahdi family begin? When were you hired?
A. I was actually hired after the execution, a couple of days after.
Q. So that would have been, what, mid -- early April 2025?
A. That sounds about right.
Q. And when did you submit your report in this case?
A. I did not submit a report. I was not asked to submit a report.
Q. No. In this case.
A. Oh, in this case? I don't recall a date.
Q. Would September 2026 -- excuse me. September of 2025, does that sound correct?
A. It could be, yes.
Q. I have it right here. I apologize. I can just confirm. It's not a gotcha question, I promise. I just want to get the time line down.

A. Sure.
Q. March 2nd, 2026.
A. Sure. Sounds right.
Q. So if Mr. Mahdi was executed early April of 2025, and you submitted a report in this case in March 2026 --
A. Yes.
Q. -- you had been representing Mr. Mahdi in some capacity for nearly 11 months before you submitted your report.
A. I guess that's true.
Q. And do you think that that calls into question your ability to accurately evaluate and offer opinions on specifics of Mr. Mahdi's case?
A. The fact that I submitted my report before his execution -- sorry -- after his execution?
Q. No. The fact that you have said that you have not relied on the South Carolina execution protocol.
A. Right. Yeah. I have not relied upon it. I've spoken specifically to the questions that I've outlined in my report.
Q. I guess what I'm asking is, do you think that your relationship, your, I guess, formal relationship with Mr. King and Mr. Mahdi's family, that predates your submission of your report in this case in which you have made the decision not to rely on the South Carolina protocol, and that one of the executions carried out under that protocol was Mr. Mahdi, do you think that your decision not to rely on the South Carolina

protocol was influenced by that relationship?
A. No, it was not. My decision not to include the South Carolina protocol was specifically based on two things: First, I offered two exemplars of firing squad executions that were well known and established and proven to be effective, which was the Utah and the United States military protocols.
In the second place, I did not offer the South Carolina protocol because I did not have a copy of it, had never been given a copy of it or shown a copy of it, nor was I given any information on the policies and procedures of South Carolina Department of Corrections as I've had -- have had done for the Utah protocol. So that is why I did not rely on South Carolina. Had nothing to do with the executions of Mr. Mahdi or Brad Sigmon before that. No.
Q. Did you speak to Mr. King in between the most recent recess and your testimony here right now?
A. No, I didn't speak to him.
Q. Did you disclose your relationship with the Mahdi family in the Boyd litigation?
A. I don't recall.
Q. Do you think that it is appropriate practice for an expert in a scientific field to disclose personal and financial interests that could affect the reliability of the conclusions that they reach?
A. I suppose that's a question for the attorneys and for the

Court. I don't have an opinion.
Q. No opinion on whether potential biases should be disclosed to properly contextualize the opinions that you've reached?
A. If biases are perceived, certainly they can and should be disclosed. If they're -- but I can't comment on what does or does not constitute a bias.
Q. Are you getting paid by the Mahdi family?
A. No, I haven't been paid anything.
Q. So what is the scope of your representation?
A. I've been asked to -- counsel asked me to be on their expert team, basically to advise them on matters relating to the execution of Mr. Mahdi; the autopsy reports. And if they proceed to bring an action against the state of South Carolina, then I would already be on their team to testify to what my expertise might be in that case.
Q. What is your understanding of what form that potential action against South Carolina might take?
A. I have no idea.
Q. You haven't discussed that at all? You haven't been --
A. Not at all. The term literally was, if we proceed with some action.
Q. So you testified that you were in -- I don't want to misquote you, but you said you were in fairly regular -- I think you may have said constant contact with Mr. King, but certainly more than sporadic. Is that fair?

A. I wouldn't say constant, as you say. I text or call with Mr. King approximately three to four times a year.
Q. And what are some of the discussions that you have had?
MS. WIESNER: Your Honor, at this point in time I do think I need to lodge an objection. I think it is fair game for counsel to ask questions of Dr. Williams about facts related to the South Carolina protocol and facts related to what has happened in the three executions in South Carolina. To the extent they're trying to cross-examine him on any potential bias, fine. But now he's directly asking about communications with counsel. I'm not sure how those are at all relevant, and I now do have some concerns that he is getting into privileged materials that are just totally irrelevant to the testimony.
MR. THOMPSON: Your Honor, if I may. My understanding -- and counsel and Dr. Williams can correct me if I'm wrong, but my understanding was that they've represented there was no privileged relationship between Dr. Williams and any of Mr. Mahdi's attorneys.
MS. WIESNER: Sorry. If I was unclear in any regard, that was not my representation. What I intended to convey, I do understand that Dr. Williams has a privileged relationship with counsel for the Mahdi family. I do not think, however, that presents a conflict with him being questioned about his knowledge of the South Carolina protocol and the executions that have occurred in South Carolina. So I think all of the facts

are completely fair game for questioning. Certainly they have already elicited testimony about when he was retained. I think that is fine. They've asked about compensation already. I've not objected there. But I do have concerns now that we are getting into privileged communications, which I'm just not sure how they're relevant.

THE COURT: How are his communications with the attorney not privileged?

MR. THOMPSON: Well, if they've privileged, Your Honor, that's -- my understanding was that they were not. If they are privileged, then we would renew our motion to exclude under Daubert on the basis that it calls into question, I think in its entirety, the reliability of Dr. Williams' methods and his ability to apply those methods faithfully in this case. And it prevents -- and this is sort of relying on Daubert -- the ability to test the reliability of an expert's methods, which includes both the data that he relied on and the data that he did not.

The reliability of those methods through vigorous cross-examination, which -- given the privileged nature of Dr. Williams' relationship with Mr. Mahdi's attorneys -- we're not able to do, calling into question, I think fatally, the reliability and warrants his exclusion under 702 and Daubert.

THE COURT: That he has been retained in another case, I don't see how that goes to the reliability of his methods.

I'm understanding from Mr. Lee's attorneys that you can question him about the South Carolina protocol and certain facts. You just can't get into the communications that are privileged with counsel. I don't see how that goes to the reliability of his methods.

MR. THOMPSON: Certainly, Your Honor. And we're not asking Dr. Williams to break privilege. We're just highlighting the constraints that that assertion of privilege puts on our ability to cross-examine an expert witness who has not disclosed until the beginning of his cross-examination a relationship with one of six condemned that have been executed by firing squad. We're sort of doing this on the fly, Your Honor, and that's -- I wasn't meaning to infringe on privilege. It's just that we're -- he did not disclose this. We didn't have an opportunity to probe this during a deposition or in any sort of written discovery. We're sort of doing this in real time.

THE COURT: I'm going to permit him to testify. You can ask your questions. You cannot get into attorney-client privileged communications. If for some reason you need to brief this at a later date and ask that I not consider any particular testimony, I can certainly allow post-trial briefing. But for now, he's going to testify.

MR. THOMPSON: A brief response, if I may, just to the second part of counsel's statements about questions for

Dr. Williams that go beyond asking about the scope of his privileged communications. Any follow-up questions about the specific nature of that relationship do go to Dr. Williams' bias, and bias is always relevant on cross-examination to the witness's credibility. So we would disagree with counsel on that point as it relates to questions that do not touch on communications he may or may not have had with Dr. King.

THE COURT: I heard her to say bias questions are fair game.

MR. THOMPSON: Sure. Sure. Just clarifying. Thank you, Your Honor.

THE COURT: Go ahead.

Q. (Mr. Thompson, continuing:) So, Dr. Williams, just to sort of reorient. I think before we were talking about -- we were sort of gearing up to talk about the forensic reports in the Mahdi case. Do you have that in front of you, Doctor?

MR. THOMPSON: Your Honor, may I have one more moment?

THE COURT: You may.

(Brief pause in the proceedings)

Q. (Mr. Thompson, continuing:) So, Dr. William, would you please turn back to the forensic report that appears at Defendants' Exhibit 46, please.

A. I have it.

Q. Could you please turn to page 3. Let me know when you're there.

A. I have it.
Q. Would you look at the second paragraph, please. It starts, "The autopsy report."
A. Page 3?
Q. Yes. The top of page 3.
A. Top of page 3. Okay.
Q. Do you see where it says, "Two entrance gunshot wounds to the left chest"?
A. Sorry. What --
Q. First sentence of the paragraph.
A. Page 3 at the top, the sentence is, "I believe the gunshot wound labeled A, two gunshot wound pathways." Is that the sentence you're referring to?
Q. Are you reading from the Arden forensics report or the state examiner's report?
A. Dr. Bradley's exam, 46. Do you want me on Arden? That's 47, I believe.
Q. I apologize. 47, Arden.
A. Gotcha. Page 3.
Q. Yes, sir.
A. All right. Got it.
Q. Second paragraph, first sentence.
A. Yes.
Q. You see where it says, "Two entrance gunshot wounds to the left chest"?

A. Yes.
Q. In a firing squad execution involving three riflemen with three rounds of live ammunition, would you be surprised at a forensic report detailing only two entry wounds?
A. Yes, it was surprising to see that. But when I referred back to Dr. Bradley, I saw that it appears that Dr. Arden was mistaken.
Q. You believe he was mistaken?
A. Yes.
Q. Why is that?
A. May I refer you back to Exhibit 46?
Q. Sure.
A. If we go to page 2 of 4 of Exhibit 46, about four paragraphs from the bottom, Dr. Bradley stated -- it starts with, "An approximate 0.5 to 0.4 inch entrance wound labeled B is to the left chest, 19 inches to the top of the head and 2.4 inches to the left of midline. An eccentric abrasion border up to 0.35 inches is at the 10:00 position. Soot is not grossly visualized. Stippling is not grossly visualized."

The statement, "an eccentric abrasion border up to 0.35 inches is seen at the 10:00 position," this is the classic presentation of a second bullet striking very close to a first bullet and producing an eccentric entrance wound. This is well documented as a phenomenon seen in gunshot wounds and targets. The gunshot wound portion is described clearly in Vincent Di

Maio's book Gunshot Wounds, which I've cited in my report. And eccentric entrance wounds or eccentric bullet holes in competition targets are a frequent phenomenon which I have learned to recognize through competitive shooting. So I believe the two bullet strikes occurred in that position.

Q. In the competitive target shooting context where you have two bullets striking essentially the same point at the target, is that being fired from the same rifle?

A. Would they be fired from the same rifle?

Q. You said you have extensive experience with target shooting where you have two bullets that strike the target in effectively identical positions; is that correct?

A. That can happen, yes.

Q. In those circumstances, were they uniformly mostly fired from the same rifle, or were they fired from two different rifles simultaneously, two different shooters?

A. Usually in -- usually from the same rifle sequentially.

Q. So the rifle -- or the rifleman firing those two bullets would be in more or less the same position? It wouldn't be two different riflemen in two different positions firing at the same time?

A. That's most of what my experience is, but I have seen occasions where, yes, two bullets from two different rifles or two different handguns, firing more or less simultaneously, entered what appeared to be the same hole.

Q. Do you know how far apart the riflemen are when they're firing at the condemned under South Carolina's protocol?
A. I don't have that knowledge.
Q. Do you assume that there is some distance between the muzzles of the two rifles?
A. Yes, there would be a distance between them.
Q. Dr. Williams, are you familiar with the concept of minute of angle?
A. Very much so.
Q. Can you explain that to me briefly.
A. Minute of angle is when we -- in mathematics, geometry, one minute of an angle is 1/60th of a degree of arc. It's as simple as that. We use the same principle in shooting.
Q. And when that concept, that minute of angle, is 1/60th of one degree, what does that tell us in the context of shooting, specifically with regard to a firearm's precision and its accuracy?
A. We often measure, and certainly in military competition or military rifle competition, we measure the distances between the landmarks on a target in minutes of angle.
Q. Okay. And so is that a fixed angular relationship that tells you something about dispersion across distance between the intended target and the actual point of impact?
A. That could be taken that way, yes.
Q. And what is the relationship between a minute of angle and

that linear dispersion between the intended target and the point of impact?
A. Sure. If we're talking -- let's use the example of a range of 100 meters -- sorry -- 100 yards more specifically. One minute of angle is equal to one inch distance horizontally across the target.
Q. And that scales linearly; correct?
A. That scales linearly further away and closer toward.
Q. So one minute of angle deviation or -- one minute of angle between the intended start line of the bullet and the actual start line of the bullet at 200 yards would be a two-inch linear dispersion. Then at 300 yards, three inches, 400 yards, four inches, so on?
A. Precisely.
Q. And that scales linearly going backwards; right?
A. That's correct.
Q. So at ten yards, a one minute of angle deviation would result in a .1 inch linear dispersion between intended target and actual target, correct?
A. Yes.
Q. And just to sort of put a bow on it, one minute of angle is 1/60th of one degree.
A. Yes.
Q. Do you have any idea what sort of dispersion in the location of the muzzle would result in a one minute of angle change in

the actual flight path of the bullet?
A. Well, actually, you can measure that specifically if you've got the equipment, but the deviation of the muzzle -- the actual beginning of the bullet's path is in the chamber where the bullet is at rest in the chamber. So if the muzzle of the rifle deviates one minute of angle from the -- when the firing pin falls on the bullet and the bullet leaves the cartridge, enters the rifle barrel, that's going to designate the line of flight of the bullet. So if the marksman is aiming at a specific target prior to the firing pin striking, and as the firing pin strikes, the rifle deviates one minute of angle in some direction, then the bullet will strike one minute of angle from that intended target at any point. So the muzzle of the rifle is actually going to move one minute of angle as well.
Q. Sure. But I guess what I'm trying to get at is how small these changes are; what one minute of angle looks like in terms of orientation of the muzzle.
A. It's going to be a tiny amount. Perhaps a millimeter or two.
Q. Perceptible to the human eye?
A. No, not perceptible -- usually not -- well, let me see. You would be able to perceive the movement, but the human eye would not see -- if you looked at two still photographs, I'm sure you wouldn't see the difference.
Q. So in other words, you're threading a very, very fine

mathematical needle to have two rifles that fire two bullets that hit at identical spots on the body?
A. Yes.
Q. I mean, you said millimeters. I mean, even, let's say, two minutes of angle at ten yards, that would be .2 inches in lateral dispersion.
A. Right.
Q. So the margins are very fine.
A. Very fine.
Q. Would you expect -- assuming that you did have two bullets fired from two different rifles hit the same point on the target, they're firing from different angles, would you expect the exit wounds to be similarly identical?
A. Yes, that would be a reasonable expectation if the bullets remained intact and didn't -- and exited the body. But these are frangible bullets, and the bullet tracks did not exit the body, I believe. I might be mistaken.
But it could also -- because the exit wound is much larger than the entrance wound. It could be that they would both exit from the same location and appear to be a single exit wound. Yeah.
Q. So if you would return, Doctor, to page 4 of Dr. Arden's report.
A. Will do.
Q. I just want to -- let me know when you're there.

A. I have page 4.
Q. So the second paragraph, call your attention to a couple different things. It starts with, "Dr. Marcus informed me." It says -- and this is Dr. Arden reporting that Dr. Marcus was surprised to find only two bullet wounds.
A. Yes.
Q. You disagree with Dr. Marcus?
A. No.
Q. Would you have been surprised?
A. Perhaps mildly, but not excessively. As I said, I've seen bullets strike through the same hole many times, certainly at such a close range.
Q. Would you look at the third paragraph for me, Doctor, also on page 4.
A. I see it.
Q. So the second sentence in that paragraph, the second clause, "but in Mr. Mahdi he found only the four perforations of the walls of the right ventricle, two front, two back."
A. Yes.
Q. Do you take that to mean that there were two identical entry wounds and two identical exit wounds?
A. That would be my assumption. If I'm making the assumption based on the entrance wound that the eccentric abrasion border represents the passage of two bullets separated by a very short period of time, those two bullets would follow the same path as

they went through the body. Yes.
Q. So you would expect two bullets, fired from two rifles at two different angular relationships to a body, to not only -- even if they did somehow mathematically -- and we talked about the precision that you would need for that to happen. If they're coming from two different angles at a single point at the target, that they would then change their linear flight path to exit the body the same way?
A. No. The linear flight path is going to be close enough that through the -- a pliable medium of tissue, I think they're going to follow roughly the same path. Remember, the second bullet is going to, quote unquote, follow the path of least resistance, so it is more inclined to follow the path of the bullet that went before it as a general principle of physics, friction, and resistance. But it's highly unusual. Highly unusual.
Q. So there was a lot in there. I just want to clarify.
When you say it was highly unusual, what is the antecedent of that sentence?
A. What is the --
Q. What is the --
A. Oh. The antecedent is it would be highly unusual to see two bullets strike this closely and follow the same identical path through the body.
Q. Nearly inconceivable?
A. I wouldn't go so far as to say nearly inconceivable. Highly

unlikely.
Q. Have you ever seen this?
A. Personally, no.
Q. Three bullets leaving four perforations, four perforations, two entry wounds, two exit wounds --
A. Yes.
Q. -- each of which are identical.
A. Yes.
Q. So different flight paths reaching the same point, and then that flight path for both bullets changes to merge into a single flight path to cause the exit wound.
A. Yes. I think that's a conceivable possibility. Remote, but it's conceivable.
Q. Even with the criticisms that you've had of the frangibility of the ammunition that you understand South Carolina to use?
A. I think that that may contribute, actually, to the second bullet following the path of the first bullet. That the nature of the bullets being somewhat less likely to maintain their integrity during their flight through the tissue, the second bullet might be more inclined to follow the first bullet as it passes through. But that's speculation on the basis of some very limited and dim memories of physics.
Q. So what would you -- what do you think explains the -- mystery is the wrong word, but what do you think explains the potential ambiguity of three bullets leaving two entry wounds,

two exit wounds in this case?
A. Well, I think that it would -- if I can amplify, Dr. Arden -- and I reviewed Dr. Bradley's autopsy. He only presented one photograph in the report of the entrance wounds which I rely on for making my comment about that possibly being a double entry wound. He didn't take any photographs of the internal damage, which would normally be done in an autopsy at this level. So the -- and he didn't give us any measurements of the point of exit and the amount of damage done at the point of exit by these two paths. He simply said there were two points of exit from the ventricles without any quantitative measurements. So it's conceivable that the one point of exit was considerably larger than the other, which would be the case one would expect if you had two bullets that were beginning to diverge in trajectory. But we have no way of knowing that because he did not include those details in his report, and Dr. Arden commented on that.
Q. If you saw in a forensic report somebody who was executed by firing squad, that they had four perforations in their ventricles, what would that tell you about the specifics of those wounds?
A. Of the right ventricles specifically?
Q. Or just perforations of the heart.
A. Well, there's a great deal of difference between a perforation of the right ventricle versus the left ventricle.

Q. I'm just asking, without regard for where in the heart, just what is your understanding of a perforation caused by some sort of high-velocity rifle round entering the heart -- what is your understanding of what that description means about the specifics of the entry and the exit wound?
A. Perforation is defined simply as an injury or physical process that transects an organ from one side of it to the other. So when he talks about perforations, he's talking about a perforation from outside the heart to inside the right ventricle, into the ventricular space, then through the posterior wall of the right ventricle and outside of the ventricular wall. So two perforating injuries represented by four different wounds in the wall of the heart is what that -- that's what that means.
Q. So in contrast, for example, going back to that same third paragraph, it discussed briefly the injury sustained by a Mr. Sigmon, which I will represent is one of the other three condemned who were executed by firing squad under South Carolina's current protocol in 2025, which states that Mr. Sigmon's heart was -- both ventricles of his heart were obliterated.
A. Yes.
Q. So relative to obliteration, would you say a perforation is a relatively clean entry and exit wound?
A. We can say qualitatively they would be less clean -- or less

damaging, but there's no qualitative -- sorry -- no quantitative measurements. So he's speaking qualitatively only.
Q. You said just a bit ago that one wound could be slightly larger than the other or substantially larger than the other.
A. Yes.
Q. Would you read the very last part of the third -- the next to last sentence of that third paragraph starting with, "Representing two projectile paths."
A. Starting at "representing"?
Q. Yes.
A. "Representing two projectile paths through the chamber."
Q. And then how does that sentence end?
A. "That were about one half inch apiece."
Q. Do you take that to mean that the size of the entrance and the exit wounds of Mr. Mahdi were about one half inch apiece, meaning that they were about the same size?
A. He's saying they were about one half inch apiece, which is pretty loose language. He did not -- clearly did not measure them, or he would have given us a precise measurement, typically in millimeters. So I think this, again, is a qualitative estimate.
Q. That might be absolute precision, but we're talking about relative precision; right? Comparison of the size of the two wounds; right?
A. Compared to what happened with Mr. Sigmon.

Q. No. Comparing one wound to the next.
A. It seems to imply that he was -- we can draw from this the inference that he thought the two wounds were the same size.
Q. And what does that suggest to you about the likelihood that one of those two wounds was caused by two simultaneous bullet strikes to identical points, as we've been discussing?
A. It makes it less likely, to my mind.
Q. Doctor, could you turn to page 5 of Dr. Arden's report.
A. Certainly.
Q. Specifically the third paragraph, second full paragraph, about halfway down the page. The last paragraph -- the last sentence in that paragraph following the semicolon, the clause starting, "Mr. Mahdi sustained substantial disrupting injuries." Do you see that?
A. I do.
Q. And it continues that he "sustained substantial disrupting injuries to his liver and pancreas and perforation of the lower lobe of the left lung."
A. Yes.
Q. Is that the sort of damage that you would expect to see from somebody who was struck by three bullets in the cardiac sac?
A. No. That's not at all what I would expect to see if this execution had proceeded according to -- as intended.
Q. So what does that tell you? What does that damage in particular tell you about the point of impact?

A. It tells me that the point of impact was too low or inferior on the body.
Q. Did it still hit some -- did both of those bullets as described by Dr. Arden still hit some part of the heart?
A. They did.
Q. So is the heart included in the cardiac sac?
A. The heart is include in the cardiac bundle, yes.
Q. So would you please turn to page 7.
A. I'm there.
Q. Under the heading Conscious Pain and Suffering, can you scroll all the way down to the bottom of that section, please.
A. Okay.
Q. Do you see the sentence that precedes the words, "although groaning"? It's the next-to-last sentence.
A. Okay. I've got it.
Q. And it starts, "I note that the press observers described that Mr. Mahdi cried out when he was shot and then made two groans about 45 seconds later."
A. Yes.
Q. Is that something that you would expect to see from somebody who was struck in the cardiac bundle with a high-velocity rifle round?
A. If the high-velocity rifle rounds had obliterated the heart as they did for Mr. Sigmon and for other firing squad executions, no, I would not expect that at all. This suggests a

suboptimal injury.
Q. I want to just quibble with one assumption in your answer. You said obliterated, but we know Mr. Mahdi's heart was not obliterated, at least in comparison to Mr. Sigmon. There were four half-inch approximately perforations; is that correct?
A. I would agree with that.
Q. So I guess what I'm asking is, is it your testimony, is it your opinion that any -- I understand your concerns with the ammunition that South Carolina uses.
A. Sure.
Q. But every part of the cardiac bundle would result in a lethal injury if hit by a sufficiently high caliber round?
A. No, that's not my position. My position is that if we obliterate the heart with sufficient energy, the pumping activity of the heart would be stopped. You have to understand that both of the -- both of the apparent bullet paths through Mr. Mahdi's heart went through his right ventricle, which does not pump blood to the brain. The right heart pumps blood from the heart to the pulmonary circulation, and then it circulates back to the left side of the heart. In order to stop blood flow to the brain, which is the representation of the effectiveness of firing squad I'm making, you must obliterate the left ventricle or the great vessels above the heart. The right ventricle may be struck as well in the process, but the mechanical disruption of the left ventricle is essential.

Q. So in that case, cardiac bundle is not a synonym for sort of zone of lethality in the firing squad context?
A. I would agree.
Q. So the conclusions that you have reached about pain and consciousness necessarily depend on the obliteration of the heart?
A. On the obliteration of the left ventricle, but, yes, we would call it the heart.
Q. So it's a much narrower point of impact, in your opinion.
A. I wouldn't say much narrower, but certainly more specific, yes. If you want to call it much narrower, I'll allow it.
Q. So just sort of pivoting a little to the van Rijn study that you've discussed, does that distinguish -- or does that limit the extent to which you can extrapolate pain, consciousness from the decapitation of rats to a high-caliber rifle round striking the cardiac bundle? In other words, your opinion presupposes that there will be a similar instantaneous loss of blood pressure and blood delivered from the heart to the brain that mimics the loss of blood pressure and blood to the brain that you would see in an animal or human who has their head cut off.
A. Yes.
Q. So would you agree with me that your assumptions in many ways beg the question that we're here to answer, which is, is this a feasible method of execution?
A. Yes, it is a feasible method the execution.

Q. But does your conclusion depend on the assumption that what will happen is what we are here today arguing about what will happen? In other words, that there will be the obliteration of the heart; and if that obliteration does not occur, then the underlying assumption of your opinions falls apart and your opinion with it?
A. I would agree to a high degree of probability, if you obliterate the heart, the same thing will happen with destruction of the heart as would happen in the van Rijn study or the -- or the human studies.
Q. If you obliterate the heart.
A. Yes.
Q. But the second part of your opinion is that firing squad will invariably obliterate the heart.
A. To a reasonable degree of medical certainty, yes.
Q. Do you think that one out of six is a reasonable degree of medical certainty?
A. We're talking, again -- as I said earlier, that's cherry picking data. This is one out of 46.
Q. Do you think that there is a difference in the efficacy of a firing squad using modern rifles and modern ammunition with modern firearms training versus the rifles, the ammunition, and the training that would have been in place going back to the 17th century, which I understand to be the sort of loose beginning of your historical evaluation?

A. Sure. Do I think there's a difference?
Q. Uh-huh (positive response).
A. Substantially, no.
Q. You don't think there's a substantial difference?
A. Ballistically, no.
Q. Rifling hasn't improved?
A. It's not a matter of rifling. It's a matter of the energy and the size of the projectile striking the cardiovascular bundle and obliterating the heart.

Keep in mind that black powder weapons, black powder rifles or rifles used prior to roughly 1890 were using lower velocity projectiles, and they compensated for that by using much larger projectiles. So instead of a .30 inch bullet, you're using a .75 inch bullet, which is much heavier and creates much more destruction by mass versus by velocity. But the equation works out to roughly the same in terms of tissue destruction.

Q. So do you think that it's easier or harder to be precise from 15, 21, 35 feet with a rifle manufactured in 2026 or a rifle manufactured in 1790?
A. It would be -- I think you could be slightly more precise, yes, but the distance -- at those distances you're talking about, a pretty good range of accuracy, even with a black powder rifle, up until -- which would date back to about the Napoleonic era. Prior to that, unrifled muskets would have been the case, and they would be substantially less accurate.

Q. But pretty good.
A. Pretty good.
Q. Is pretty good in terms of accuracy sufficient in your mind?
A. Yes.
Q. Sufficient in your mind to render your opinion that firing squad is a viable method of execution?
A. Yes.
Q. I want to be clear. How do you -- what do you understand pretty good to mean in terms of mathematical certainty? I'm not asking you to put a number on it, but what is pretty good to you?
A. I understand. The four-inch circle that they place over the inmate's heart in Utah, the chances of a shot being outside of that under the Utah protocol -- my understanding is that in their training, they're simply -- that misses almost never happen.
Q. What is the basis for that opinion?
A. That was discussed in the McGahee case, I believe. It may have been in deposition. But the -- there was representation from the state in the McGahee case that the riflemen in the firing squad are selected for their skill, and then they are trained extensively so that they hit the four-inch circle almost unfailing. But I don't have an actual number.
Q. So, again, the assumption of your conclusion is that the protocol will work as intended?

A. That is my contention. Yes.
Q. Invariably?
A. To a reasonable degree of medical certainty, the chances of it not working are extremely remote.
Q. And I'm asking you to -- you know, if I were to tell you that over the course of 49 years since the death penalty was reinstituted, and I understand your quibbles with that, but if over a period of 50 years there were six executions done by a particular method, and that 16 approximately percent of those did not go as intended, is that substantially -- is that precise enough?
A. I think your terms are precise, but I would caution you that the protocol used in South Carolina is not the protocol that I had reviewed for Utah and the one that I think is effective.
Q. Understood. So let's talk a little bit about the distinctions between the South Carolina protocol and the Utah protocol and what we can sort of draw from both.
So setting aside the caliber of the round for a moment, do you think that it is more -- it is easier or harder to hit a target from 15 feet or 21 feet?
A. I think the difference is immaterial, but theoretically it would be easier to hit it at 15 feet.
Q. Do you think that the caliber of round used in the rifle would affect the accuracy of the shooter?
A. Likely not. I think any caliber of rifle in the service

rifle category would be accurate enough.
Q. So setting aside the criticisms you have about the way the ammunition used under the South Carolina protocol interacts with the body once it enters, you can still draw from Mr. Mahdi's case inferences in theory about the conditions under which these shots are being taken and the impact that those conditions have on the accuracy of the shooter, can you not?
A. I can.
Q. And is that not something that you would have taken into account in assessing the overall viability of firing squad as a method?
A. I did not specifically take it into account, as I've already testified.
Q. Do you think that that speaks to the viability of firing squad?
A. In the overall history of effectiveness of firing squad, I think it's a glitch. It's an exception to the rule.
Q. Switching gears a little bit, Doctor, you testified about the feasibility of firing squad in Alabama?
A. Yes.
Q. And you testified -- and I just want to get you to clarify what you mean. I think that you said that your opinion was based on your firearms training, your firearms experience, and I think you mentioned something about construction and materials?
A. Yes.

Q. Could you elaborate on what you meant by that.
A. Like a lot of men in America, I've done some work in the building trades as a young man. I've built structures, framing, concrete work and so forth. I know that these are not highly difficult skills and in -- you know, in a matter of, like, home remodeling. And for buildings that are built to code, the skills involved are not any different, the materials are not any different, just the precision of the construction is perhaps different because it must be done in accordance with building codes.
Q. Have you ever retrofitted a chamber used for other forms of execution to be used for firing squad?
A. No, I have not.
Q. Have you ever visited Holman prison in Atmore, Alabama?
A. I have not.
Q. Are you aware of the dimensions of the prison?
A. I am not.
Q. Or the orientation of the execution chamber to other parts of the complex?
A. I am not.
Q. Are you aware of the dimensions of the execution chamber?
A. No.
Q. So your opinion that this could be readily implemented by Alabama is based -- does not take into account the specifics of the location in which the retrofitting will have to take place?

A. I assume there are more than one -- there's more than one room at Holman prison. There may be other outdoor spaces that could be used as well.
Q. Outdoor spaces. What is the basis for your opinion that an outdoor firing squad execution would be a feasible way to carry that out?
A. I know from a case I was involved in some years ago that in Tennessee, they were considering -- I couldn't tell you exactly whom, whether it was the state or whether it was the plaintiffs in the case, were considering the possibility of an outdoor firing squad.
Q. Does that give you security --
A. That's the only one I can think of.
Q. Does that give you security concerns?
A. I think you would have to look into security concerns, absolutely. I think that would be reasonable.
Q. So you testified that anyone who could get an 80 percent on Alabama's APOSTC score standard could serve as an executioner on a firing squad team?
A. I think that would be the pool that you would draw from, yes.
Q. So what other requirements would somebody who's able to meet that threshold need to prove themselves able to do to -- to, in your opinion, be a viable member of the hypothetical execution team?

A. Well, I think it would be necessary -- it would be incumbent upon the Department of Corrections to find riflemen who can shoot considerably more accurately than that. Just as they select riflemen of considerably higher skill to serve as snipers on SWAT teams, hostage rescue teams and so on, I think they would want to select personnel who have that higher level of facility with their rifles to be on the firing squad.
Q. What do you mean by considerably more? What does that look like?
A. Well, I couldn't give you the specifics for the state of Alabama. I know from -- generally speaking, in the states that I have -- well, the only state that I've served in law enforcement, in Wisconsin, the requirements for qualification as a SWAT sniper require a significantly higher score and smaller target at the ranges that they shoot the qualifications. So the team sniper has to hit better and more accurately than the other guys on the team.
Q. Do you have any idea generally the effect that higher requirement has on shrinking the size of the available talent pool?
A. I don't know specifically, but in general terms, I know that it did not shrink the pool of candidates in Utah significantly from communications I received or learned during McGahee.
Q. So in your report, I think you conclude that any law enforcement official in Alabama, ADOC employee in Alabama who is

APOSTC certified, could serve on the firing squad team; is that correct?
A. That would be the pool you would draw from, yes.
Q. But that's different than APOSTC qualifications being sufficient.
A. I get your point. Yes, that is different.
Q. And there's no way to really estimate what that pool might look like?
A. Not to my knowledge.
Q. So on direct you testified a little bit about some of the research that you have done in this case. Have you published any of that research?
A. No. This has all been on my own dime.
Q. Have you ever published anything in a peer-reviewed journal?
A. Not since I've left graduate school. Actually, shortly after graduate school I had a couple of peer-reviewed publications.
Q. Is your training manual that you published in 2006 for your firearms training course the only publication that you've had since graduate school?
A. Yes.
Q. Are you still actively offering that course?
A. I've limited the courses that I do offer, but, yes, I do offer the instructor level version of that course on an annual basis.

Q. How many, I guess, students do you have a year in that course?
A. I typically limit it to 30 students.
Q. About how much do each of them pay?
A. This year they are paying $600 for a two-day course.
Q. Has the number of students and the interest in the course been pretty consistent since 2006?
A. No. It was much greater in the period from about 2008 to around 2012. There was a lot of activity in law enforcement at that time in this area. It dipped off after that, at least in terms of people hiring me to teach this material. A lot of the training still continued, but the people who were offering the training were people that I had trained in several police departments in Canada and the United States and elsewhere.
Q. Switching gears again -- I'm sorry for bouncing around. Part of your conclusion is based on your own experience with a gunshot wound; right?
A. Yes.
Q. What was the caliber of the round that you were struck with?
A. It was a .22 magnum.
Q. From a pistol?
A. Yes.
Q. And in your report, I think you draw a distinction between the ballistic force of a rifle and a pistol; is that correct?
A. Yes. Very much so.

Q. So I think you said -- I think you may have described it as a .224 high-velocity round, and I just want to clarify because I think in your report you said it was a .224 high-velocity round fired out of a rifle. So is it your position -- I guess in light of that answer that you just gave, is that incorrect?
A. I'm sorry?
Q. Was the bullet that you were shot with fired from a rifle or a pistol?
A. No, it was fired from a pistol.
Q. So do you think that that undermines anything that you can extrapolate about the pain that someone would suffer, given your own experience, based on the fact that you were struck with a .22 caliber bullet fired from a pistol, whereas condemned will be struck with a .30 caliber or similar round fired from a rifle?
A. There is definitely a difference in kind. No question of that. And I've tried to recognize that in my treatment of this subject, which is why I've been curious to find out what the experience of other of my patients who have been shot with pistol and rifle rounds has been, whether it seems to be equivalent. Qualitatively, the description seems to be the same.
Q. But would you agree with the statement that in terms of ballistic force, the .22 caliber pistol is going to be substantially less than --

A. Absolutely.
Q. -- a .30-caliber rifle?
A. Absolutely.
Q. You'd rather be shot with a 9 millimeter than a .308?
A. I'm sorry?
Q. You'd rather be shot with a 9 millimeter than a .308?
A. In terms of ability, you know, in the hypothetical, I guess I could say so, but I'd rather not be shot at all, thank you.
Q. I don't mean to be pushy, Doctor, but you've put your own personal experience and the opinions you've drawn from those experiences at issue.
A. Yes. Absolutely.
Q. So I'm asking you, would you rather be shot with a 9 millimeter or a .308?
A. Hypothetically, I would prefer to be shot with the less powerful round.
Q. Is it a particularly close call in your mind?
A. Not really.
Q. Not at all? Is there any part of you that thinks maybe the .308 would be better?
A. Yeah. I mean, if you wanted to start parsing it, if you were going to shoot me with a hollow-point 9 millimeter projectile, 147 grain, versus a .308 caliber bullet, 150 grain military NATO round, full metal jacket, I'll take the NATO round ten days out of ten. That full metal jacket out of a rifle is

going to do a hell of a lot less damage to my body than the hollow point pistol round will do. Again, it's what you're shot with and where you're shot that determines a great deal of the incapacitating power.
Q. And I'm not asking about hollow points. I'm asking about full metal jacket, 9 millimeter, versus the round --
A. Okay. Comparing --
Q. A .308, .30-caliber --
A. Sure. Sure. FMJ, no question, 9 millimeter would be preferable.
But, again, where were you going to shoot me? Are you going to shoot me in the brain stem? It doesn't matter then which one you pick.
Q. But just in terms of pain.
A. Again, it's where you're shot.
Q. Same position.
A. They're -- oh, in terms of pain that they're going to produce?
Q. I'm asking you, identical point of entry on the body.
A. Yes.
Q. Let's just say the upper thigh. And I could guarantee you that the bullets would hit on the same path and at the same point. No malfunctions, nothing like that. Same distance. Would you rather be hit with a 9 millimeter or a .308?
A. I'll take the 308, but I will qualify based on I'm not

basing that on any particular results.
Q. You'll take the .308?
A. No, I'd say I would take the 9 millimeter. Yes.
Q. And that is not a particuarly close call in your mind?
A. No, it's not.
Q. What was the orientation -- I guess -- was your entry wound when you were shot shallow?
A. No, it wasn't. It entered just below my right clavicle, and it exited over my spine.
Q. Maybe shallow was the wrong word. I'm saying flat. In other words, did it enter at sort of a lateral angle?
A. You could think of the angle as being from here to here, so extrapolate the trajectory accordingly.
Q. Was it a straight shot or a little bit more oblique?
A. I think I would describe it as oblique.
Q. Does that affect the damage that the bullet can cause upon entry?
A. It depends on what structures are hit, not necessarily the direction of the bullet. In my case, if it had gone straight through anterior posteriorly, it would have done much less damage than it did striking me obliquely as it did.
Q. And I think you concluded in your report that it passed close to a bundle of nerves just below the right clavicle?
A. Yes.
Q. Do you think that explains the numbness that you experienced

in the immediate aftermath?
A. It partially explains the numbness in the right arm, but, again, it didn't strike the brachial plexus. The damage to the brachial plexus that produced that numbness was caused by the temporary cavitation caused by the bullet's passage. I would also offer that the brachial plexus does nothing for the innervation of anything but the shoulder and arm. So the fact that I experienced numbness and tingling elsewhere, from the side of my head all the way down to my waist, front, and back, had nothing to do with that bundle of nerves being in proximity of the bullet path.
Q. Did you eventually get some sort of treatment for pain at some point after the gunshot wound?
A. Yes, I did. About two or three in the morning, I was given a single shot for pain.
Q. What did you receive?
A. Demerol.
Q. What is Demerol?
A. It's an opioid narcotic.
Q. Schedule II?
A. Yes.
Q. What do you normally prescribe that for?
A. Severe pain.
Q. I just want to, I think, briefly conclude with one follow-up question about the van Rijn study. This is just on your report,

Doctor. I apologize.

Reliance on the van Rijn study and the decapitation of mice, what was the purpose of that study? What were they trying to identify?

A. They were trying to identify -- the larger question they were trying to answer was whether execution by decapitation caused pain and suffering in the rodents that were being sacrificed.

Q. It was specifically designed to test pain or test consciousness?

A. I believe they say they were trying to -- well, they were trying to assess pain on the basis of how soon consciousness was ended.

Q. And is that something that you can reliably do in lab rats?

A. I think on the understanding that neurological impulses and the perception of neurological impulses is similar in lab rats and people, yeah, you can make that assumption.

Q. And just a couple more, Doctor.

A. Sure.

Q. I think in your report you stated that you would recommend a circular target placed over the center of the heart, and that the size of the target should be anywhere from three to four inches in diameter; is that correct?

A. Yes. Relying on the Utah protocol, that's what I represented.

Q. So is it your understanding that any point within that target would be lethal?
A. My understanding is that if four rifle bullets strike within that target, that will be lethal.
Q. Anywhere in that target?
A. Reasonably speaking, yes.
Q. So I want to -- putting aside your report, circling back a little bit to your relationship with Mr. Mahdi and his attorneys, and I think you testified that you have not yet been paid?
A. Right.
Q. Do you anticipate being paid?
A. No, I doubt I will be paid. I doubt I'll submit a bill.
Q. You doubt -- you won't submit one?
A. My feeling -- and it's only a feeling -- based on the conversations I've had with the attorney, it's unlikely that this will proceed to litigation that would require my participation. So I'm acting in an advisory capacity only, and I don't charge for off-the-cuff advice, shall we say.
Q. If it were to proceed to litigation, would you anticipate being paid?
A. Yes. If I'm asked to provide a report and testify, I would be submitting a bill.
Q. Have you discussed the terms of any payment structure with Mr. Mahdi's family or Mr. King?

A. I don't recall if I have or not. I think it might be stipulated in the agreement, the retainer's agreement, yes.
Q. Would it be substantially similar to what you charge in other cases?
A. Yes.
Q. And what is that, Doctor?
A. I was charging $350 an hour, but now I charge $500 an hour this year. I think I specified 500 in all the cases that I've been retained in since late '25.
Q. And that's 500 an hour. Does that apply to live testimony as well?
A. Yes, sir.
Q. How many hours -- I mean, to the extent you can estimate -- would you expect to put into a particular case in which you testify as an expert witness and provide a report?
A. It varies between four to five, up to perhaps 15. I would say average, about 15.
Q. You said 15 or 50?
A. Fifteen.
Q. Have you ever gone beyond that?
A. I might have gone a little bit past that, I might have gone up to 20 on one case, but that would be the upper limit. Yes.
Q. Okay.
MR. THOMPSON: Your Honor, if I have one moment, I think we're just about done.

(Brief pause in the proceedings)

MR. THOMPSON: Nothing further.

Q. Thank you, Doctor.

A. Thank you, Mr. Thompson.

THE COURT: Any redirect?

MS. WIESNER: Very brief, Your Honor.

REDIRECT EXAMINATION

BY MS. WIESNER:

Q. Dr. Williams, when you were shot, how did you get to the hospital?

A. I drove myself.

Q. And how long after you were shot was it before you received any pain medication?

A. About three hours.

Q. And when you were being asked questions about which bullet you would hypothetically prefer to be shot with, were you assuming in that hypothetical that you were going to stay alive?

A. Yes. That was my assumption.

Q. Thank you very much.

MS. WIESNER: Nothing further.

THE COURT: All right. Any recross?

MR. THOMPSON: No, Your Honor.

THE COURT: You can step down. Thank you, Doctor.

THE WITNESS: Thank you, Your Honor.

THE COURT: All right. It's 12:36, and I'm sure

everybody's hungry and needs a break, so we are going to take a lunch break. We will reconvene at 1:40. Have a good lunch.

(Recess was taken at 12:36 p.m. until 1:46 p.m., at which time the proceedings reconvened, as follows:)

THE COURT: Welcome back from lunch.

The plaintiff will call its next witness.

MS. SHARPE: Good afternoon, Your Honor. Plaintiff rests its case, with the reservation for rebuttal based on defendants' presentation of evidence, as well as any evidence that we produce based on the pulse oximeter data.

THE COURT: Now that the plaintiff has rested its case, do we have any motions?

MR. THOMPSON: Not at this time, Your Honor.

THE COURT: All right. Defense will call its first witness.

MS. KENNY: Your Honor, I think we need to do a little bit of housekeeping on our exhibits, if we can.

THE COURT: All right.

MS. KENNY: Beg the Court's indulgence for just a minute.

We resolved almost everything earlier today, but we do have a couple of exhibits that I'm not hundred a percent clear on. And that would be Exhibits 46 and 47, which are the two exhibits from the Mahdi autopsy. And I believe that Your Honor had admitted them for a limited purpose only, but I just wanted

to make sure we all know what the ruling was on that. And then there's a few others of the exhibits as well that I wanted to discuss.

THE COURT: What's your understanding about the limited purposes for which those have been admitted? Was that based on a prior ruling from the pretrial conference, or are you talking about from today?

MS. SIMPSON: Yes, Your Honor. I believe 46 was very limited. 47 was the Arden report just for cross-examination, I believe, but just wanted to make sure the Court's --

MS. KENNY: And I believe last week, Your Honor, you said because Dr. Antognini had relied on 47, that that was how Your Honor distinguished between 47 and 46. And so -- and we can -- I guess we can readdress 46 and 47 after Dr. Antognini testifies, but I'm just trying to do some housekeeping right now. So that's --

THE COURT: Let's do that. Let's --

MS. KENNY: Hold on those two.

THE COURT: -- hold on 46 and 47 until after Dr. Antognini testifies. And I will clarify as well.

MS. KENNY: And we also have Exhibits 48 through 51 that we had agreed to preadmit with opposing counsel, and I think we failed to address those on the record.

THE COURT: All right. Is that correct, this is unopposed?

MS. WIESNER: Can you just repeat those exhibit numbers?

MS. KENNY: 48 through 51.

MS. SIMPSON: That's the two protocols, the two articles.

MS. WIESNER: No objection, Your Honor.

THE COURT: All right. Those are admitted.

MS. KENNY: And then last we have provided Your Honor with copies of a newly marked exhibit, Exhibit 60, with agreement and stipulation by opposing counsel, which is the -- Mr. Lee's -- the transcript of his deposition.

THE COURT: All right. There's no objection to the admission?

MS. SHARPE: That's correct, Your Honor, with the understanding that they will not be calling Mr. Lee to the stand.

THE COURT: All right. Exhibit 60 is admitted.

MS. KENNY: Thank you. That takes care of the housekeeping. I appreciate it.

THE COURT: All right.

MS. SIMPSON: And at this time, defendants call James Houts.

JAMES HOUTS

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as

follows:

DIRECT EXAMINATION

BY MS. SIMPSON:

Q. Would you please state your full name for the record.

A. James Houts. H-O-U-T-S.

Q. Are you presently employed?

A. I am.

Q. Where?

A. The Alabama Court of Criminal Appeals.

Q. And for how long?

A. I think 15 months.

Q. What did you do before your present job?

A. I was employed by the Office of the Alabama Attorney General.

Q. And how long were you with the AGO?

A. All told, I believe it was approximately 23 years.

Q. And what was your role in that office?

A. I had several. Attorney would be -- or Assistant Attorney General would be the most direct, but I worked in the Capital Litigation Division, the Appeals Division, the Special Prosecutions Division. I think that covers it.

Q. What is your educational background?

A. Went to undergraduate at Mississippi State University, law school at Tulane University, and -- I mean, as far as formal education, that's --

Q. So just to be clear, are you a doctor?
A. No.
Q. Are you an engineer?
A. No.
Q. A scientist?
A. No.
Q. Okay. Do you have any military experience?
A. I do.
Q. And could you describe that.
A. I was in ROTC at Mississippi State. I didn't go on contract because I wanted to go to law school and didn't want Uncle Sam telling me whether I could or could not. After I graduated law school, I did a direct commission through the U.S. Army Reserve. Served in the Army Reserve for I want to say approximately three or four years, deployed twice, came back, transferred to the Alabama Army National Guard, and then retired from the Alabama Army National Guard a couple of years ago.
Q. When you were in the military, did you have any training for or experience with chemical, biological, and nuclear weapons?
A. I did.
Q. Could you elaborate.
A. I think the first thing that comes to mind is, like anyone else, I went through the same -- even though I was an officer, I went through the same basic training on operating in a chemical environment that everybody does in basic training, including the

OC gas chamber, to prove that our masks worked. You know, you were asking about if it's done, it leaves a lasting impression.

When I transferred to the Alabama National Guard, I was also put with a unit that was specifically nuclear, chemical, biological, and explosives was their job, and so I was assigned to that unit for five years, I believe.

Q. I heard you say the word mask. What do you mean by that?

A. Field gas masks, a self-contained gas mask with canisters for operating in contaminated environments.

Q. So have you ever had to use a gas mask?

A. Yes.

Q. Can you describe.

A. Well, I mean, like I was saying, in basic training or officer basic, you learn how to do -- to fit the mask, how to put it on within a certain amount of time to get a go or a no go; to check the seal to make sure that the mask is seated appropriately to your face. Then you're taken into a chamber where a live agent, OC or pepper spray, an irritant, is filling the room. Then you're asked a bunch of questions while you're wearing the mask to show that you can breathe and communicate. You do pushups, burpees, things to show that you can actually be physically active inside of a contaminated environment.

Then to prove that it's not all some big trick, they make you take your mask off and recite the alphabet or tell someone your social security number or do something to where you have to

talk and breathe the agent in and actually see that you were, in fact, in a contaminated environment. And then only after you have satisfied whatever cadre's demands are you allowed to exit and clean your face off.

Q. What is vibrant response?

A. Vibrant response is a Department of Defense -- I guess it's Department of War -- exercise that they hold every year now at Camp Atterbury, Indiana, which also includes the -- I never say this right -- Muscatatuck Urban Training Center, which is south of Camp Atterbury, focused on the nation's response to a potential nuclear, biological, or chemical incident, including toxic industrial chemicals. So, for example, if a barge on the Mississippi River were to release caustic gases, it would be a command and control element that went back to set up the Department of War -- when it was me, Department of Defense -- response to bring in military or green suits to deal with the issue.

Q. Mr. Houts, are you familiar with the term supplied-air respirator?

A. I am.

Q. What is a supplied-air respirator?

A. A supplied-air respirator is similar to the field gas masks that the military uses, except the military uses masks that use canisters to filter the air. A supplied-air respirator uses an air hose attached to an air source to maintain breathing air for

the individual that's wearing the mask.
Q. Would you consider yourself to be generally familiar with their use?
A. I would say generally familiar, yes.
Q. What is a Type-C supplied-air respirator?
A. A Type-C supplied-air respirator is one that has been approved by the federal government for use in industrial settings with the exception of sandblasting. And there's one other use that it's not approved for that I can't think of at this point.
Q. Do you have any experience in aviation?
A. I do.
Q. Can you elaborate.
A. I have an Airplane, Single Engine Land certificate from the FAA. I used to fly before it became too expensive to maintain and do your biannual flight review and all of that.
Q. Did you have to undergo any training to obtain your license?
A. Yes. You have to do 40 hours of instruction to get your private pilot license. You have to do a certain number of cross-country trips, night trips, takeoffs, landings, have to pass a check ride with an FAA instructor to get to that point.
Q. As part of your training, were you instructed on hypoxia at any point?
A. I was. I took a long-distance, cross-country trip that went to Chattanooga Tennessee, and then -- north of Chattanooga,

Tennessee, and then came back to Birmingham, Alabama. That's the -- I guess you would call it the foothills of the Smokey Mountains. And I was going to be flying in my Cessna higher than I normally would fly like in the Birmingham area. So my flight instructor basically talked to me about hypoxia that was caused by altitude; that if you're not getting enough oxygen at altitude, you can pass out.

I did this before Payne Stewart lost consciousness in his private aircraft, and it crashed.

But that type of situation where if you get to an altitude where your body is not able to absorb enough oxygen out of the ambient air, you can lose consciousness and pass out. That typically happens higher than where I would be flying, but at the same time you can become inattentive, become drowsy, and have other issues that are associated with not getting enough oxygen if you start to experience hypoxia.

Q. What kind of restraints do you wear while flying a plane?

A. I believe on the 172 that I flew, it was four-point with the harness here, and so you had two and two. But I also have recollection of flying an aircraft that had just lap belts, and then I've flown an aircraft that, if I recall correctly, had what you would think of in a car with the across the shoulder, across the lap. So I've flown in several types of aircraft that have different restraint systems.

Q. Were they fairly loose or fairly tight?

A. You could adjust -- I mean, it's adjustable.
Q. Briefly, do you have any experience in diving?
A. I do.
Q. And what sort of experience do you have?
A. I got my open water in the nineties, and then with school and law school, I didn't have a lot of opportunity to use it. Then I guess about 15 years ago, I decided to get back into it, and so I got my advanced and then a lot of special certifications that go along with it, and just started diving very heavily as a hobby.
Q. Are you a licensed scuba diver?
A. I am.
Q. When you go diving, what sort of air do you carry with you?
A. I mean, just compressed air, breathing air. It can -- I'm a Nitrox certified diver, so I can actually dive with compressed air that contains more oxygen than the normal ambient air that we're breathing right now has -- up to 31, 32 percent -- to enable longer dives or shorter decompression times.
Q. And when you say Nitrox, what is Nitrox?
A. It's how you blend the nitrogen and oxygen.
So like right now, you have, you know, 20, 21 percent oxygen in the air, and the rest is nitrogen with a couple of trace gases thrown in. Probably less than a percent. When you start mixing Nitrox, you're actually increasing the amount of oxygen in that mixture and lowering the amount of nitrogen in that

mixture.
Q. Based upon your training as a pilot, as a scuba diver, do you know what the oxygen percentage generally is at sea level?
A. About 21 percent.
Q. Thank you.
Let's change a little bit here. When did nitrogen hypoxia become a legal method of execution in Alabama?
A. 2018.
Q. Did ADOC have a hypoxia protocol when the law was passed?
A. They did not.
Q. When did they announce a protocol?
A. If my recollection serves, 2023.
Q. Did you have any involvement with nitrogen hypoxia during your time at AGO?
A. I did.
Q. Can you elaborate.
A. Initially in 2018, I and another Assistant Attorney General went just to see what it would take to set up nitrogen hypoxia. Through that, inadvertently, we met an individual that worked for a company that built medical gas supply systems. I didn't know it at the time, but apparently, that ended up being who DOC eventually used to build the hypoxia system that's at Holman prison -- sorry -- Holman Correctional Facility.
I had nothing to do with it after that. I was in special prosecutions, appellate division.

Several years later, Commissioner Dunn left ADOC. Commissioner Hamm was selected to replace him. I was asked to come back in and help assist DOC with finalizing nitrogen hypoxia.

Q. In general, how does nitrogen hypoxia work as a method of execution?

A. It displaces the oxygen available. It's basically a confined space type situation where -- with the oxygen in this room, we're all fine. If someone were to come in and displace all of the oxygen in this room with helium, argon, nitrogen, and push the oxygen out, even though we're breathing like we are now, our bodies would not be absorbing oxygen out of the air. Eventually our brains would run out of oxygen, and we would pass out and then, if not resuscitated, we would eventually die.

Q. How does ADOC deliver gas to the inmate during an execution?

A. Through a medical gas supply system in a Type-C supplied air respirator.

Q. And what gases are used in a hypoxia execution?

A. Breathing air and nitrogen.

Q. When you say breathing air, what does that mean?

A. I believe -- when I was with the Attorney General's Office, they were using Grade D breathing air, which is the same that a worker at Hyundai in the paint shop, if they're using supplied air respirators, would plug into. It's approved for industrial use by humans. So that would be the breathing air.

And then the nitrogen gas would just simply be -- you know, I believe it's 100 percent nitrogen gas, but there's obviously testing that would show the percentage on each batch that's delivered to the Department of Corrections.

Q. At the beginning of an execution, what is the inmate breathing?

A. Breathing air.

Q. And then what happens?

A. At the appropriate time, when the warden gives a certain signal, the breathing air is transitioned to pure nitrogen gas. Whatever residual breathing air is in the line is pushed out, the nitrogen gas reaches the mask, displaces the oxygen, and deprives the inmate of oxygen.

THE COURT: Can you speak a little more directly into the microphone.

THE WITNESS: I'm sorry, Your Honor.

Q. And how, if at all, does the system deal with carbon dioxide that the inmate exhales?

A. Well, I mean, the supplied air --

MR. CLINE: Objection. Foundation. Calls for an expert opinion.

THE COURT: Well, she's asked him in the -- in the purview of the execution process. To the extent that he can answer how the -- that he knows how the protocol works, I think he can answer it.

MS. SIMPSON: Or I can rephrase, Your Honor.
THE COURT: All right. Go ahead and rephrase.
Q. Based upon your knowledge of the Type C respirator that ADOC uses, is there a feature of the respirator that is designed to deal with carbon dioxide?
A. Yes.
Q. And what is that feature?
A. It has a one-way exhalation valve that allows air out of the mask. But when you breathe in, it seals on itself so that you cannot breathe outside air in.
Q. Did you conduct any testing of ADOC's nitrogen hypoxia system before the protocol was announced in 2023?
A. I conducted assessments on it, yes.
Q. Who authorized you to do so?
A. ADOC legal, and it's my understanding the commissioner; and then, obviously, because I was at his institution, the warden on the Department of Corrections side and Clay Crenshaw and the Attorney General on the Office of the Attorney General side.
Q. In these assessments that you conducted, did you use any human volunteers?
A. At a certain point, we did, yes.
Q. To be clear, were any of the human volunteers you used exposed to a potentially lethal level of nitrogen gas?
A. No. And in fact, a prerequisite to anyone that wanted to participate was they had to confirm that all of the lockout

valves were, in fact, closed and locked out, that the manifold for the nitrogen gas was off and unpowered, and that the cylinder heads for the nitrogen gas were closed and not open. And more specifically, before any type of -- before anybody wore the respirator mask, even with breathing air supplied, there had to be a 90-second period of air blowing over a portable O2 meter showing that it was, in fact, blowing breathable air before anybody could put the respirator mask on.

Q. Mr. Houts, did you record any of these assessments?

A. Yes.

Q. Why did you make recordings?

A. Well, I did not record all of them. It was a team effort, so different individuals may have been the person that pressed the record button at a particular time. But I was present when they were recorded. And, on some of them, undoubtedly, I pressed the record button.

But it was to allow the Department of Corrections personnel that had to make the final decision to see the results that we were seeing, so it wasn't just us trying to explain what we were finding out about the system.

Then at a later point, I believe it was Kenneth Smith filed a lawsuit that alleged as one of its foundations that the Department of Corrections staff would be unable to properly seat a respirator mask on an inmate's face, so videos were taken for use to demonstrate the proper seating of the mask.

MS. SIMPSON: Your Honor, at this time, I have several highly confidential exhibits that were not preadmitted that the witness will lay the foundation for. I would like to ask him some questions about that and also cover the screens for that purpose. May we proceed?

THE COURT: You may.

MS. SIMPSON: Thank you.

Q. All right. Mr. Houts, I would like to direct your attention to Defendants' Exhibit 55.

THE COURT: Let me ask -- they're not going to show up on this screen? They're not?

THE COURTROOM DEPUTY: No, ma'am. They're supposed to be off.

THE COURT: All right. So this --

MS. KENNY: Just making sure we've got good logistics on her screen as well.

Q. Mr. Houts, this is Defendants' Exhibit 55, which is a video entitled "6/9/23 mask test video." Are you familiar with this video?

A. Yes.

Q. Have you seen it?

A. I watched it either yesterday or the day before yesterday. Yes.

Q. Was that the first time you had ever seen it?

A. No, but it was the first time in a while.

Q. Okay. Who made the video or caused it to be made?
A. I think you could say I did.
Q. Were you present when the video was recorded?
A. Yes.
Q. Does the video fairly and accurately reflect what occurred at the time that it was made?
A. To answer that directly, 55 is the one with the Nitrox tank and the -- yes.
MS. SIMPSON: Your Honor, at this time, we would move for its admission.
THE COURT: Any objection?
MR. CLINE: No objection.
THE COURT: All right. It's admitted.
MS. SIMPSON: Your Honor, I would like to publish the exhibit for the witness to view.
THE COURT: Go ahead.
(Video published.)
Q. So, Mr. Houts, where was this video made?
A. At the execution chamber at the Holman Correctional Facility.
Q. And the video file as we had it was titled 6/9/23. Do you know if it was recorded on June 9th, 2023?
A. The only way I know that is I'm the one that assigned the name to it, and at the time I did that I would have used the date that we were there.

Q. Okay. There was a male voice heard in the first few seconds of the video saying "Switch." Whose voice is that?
A. That was mine.
Q. And another male voice responds a few seconds later off camera. Do you recognize that voice?
A. I do.
Q. And whose voice was that?
A. It was a coworker.
Q. What does this video depict?
A. That particular video -- at the time, we were looking to see -- so the Nitrox tank was an analog for the curvature of the human face; but because it's metal and not flexible, you know, we still knew that we were going to have some open spaces at the top and the bottom. You would see a white towel there which was placed there to just kind of be a permeable barrier, but to kind of keep some of that air in. It was designed to be able to show decision makers at the Department of Corrections how quickly, once the system transitioned from breathing air to nitrogen gas, the oxygen was purged out of the line. And then you would see an audible alarm from the O2 meters, which go off at 19 percent or less oxygen, and then to show how much oxygen was able to be displaced from the inside of that mask.
Q. Okay. Was there a tight seal between the mask and the Nitrox tank?
A. I mean, it was as tight as we could get it, but, again, we

knew -- I mean, that was one of the points of this was even with -- I mean, there are later videos where we were sticking pens through gaps to show how oxygen deficient you could get the inside of the mask, even with a hole in the seal. Because that was one of the issues that Kenneth Smith, for example, brought up in his litigation.

Q. Without using the specific number, do you recall what the air flow rate was during this test?

A. It was flood.

Q. Is that the rate used during executions by ADOC?

A. It's one of two rates that the protocol allows for.

Q. Around 13 or 14 seconds into the video, the oxygen percentage on the meter suddenly drops below 20 percent, and you say, "six seconds." What does that signify?

A. That was the audible alarm as it dropped below 19 percent oxygen inside the mask.

Q. So what does six seconds mean?

A. From the time that I heard my colleague say "switch," that the air had been transitioned to nitrogen, until the alarm, there was a stopwatch.

Q. And what did that signify when your colleague said "switch"?

A. That the system was no longer providing breathing air, but was now providing nitrogen.

Q. Would it be fair to say, based on the video you just watched, that the oxygen meter was reading a number less than

six percent at 25 seconds into the video?
A. Yes. I mean, I believe it bottomed out at .19 or .18, which was typical.
Q. So you said earlier you had some training concerning hypoxia as a pilot; correct?
A. Yes.
Q. So based on your training, what would you expect to happen to a person in an environment with less than two percent oxygen?
A. Less than two percent?
MR. CLINE: Objection, Your Honor. Again, he's not qualified as an expert. He's testified he's not a medical doctor; not a pulmonologist. Now she's asking him what would you expect to happen in a person once the oxygen environment falls below two percent. That calls for classic expert opinion testimony.
MS. SIMPSON: He stated that he has had some training in hypoxia as part of his pilot's licensure, Your Honor. I could ask, based upon his pilot's licensure training, what he would anticipate if you are flying a plane at two percent of oxygen.
THE COURT: If she rephrases the question --
MR. CLINE: If she rephrases the question, tries to lay a foundation that enables him to answer that; but right now, we're talking apples and oranges.
THE COURT: All right. It's sustained. You can

rephrase your question.

MS. SIMPSON: Thank you, Your Honor.

Q. Mr. Houts, you said earlier you had some training in your pilot training concerning hypoxia; correct?

A. Yes.

Q. Were you warned about the effects of hypoxia upon pilots?

A. I was. But to be clear, for the purposes that we're here today, you know, my current knowledge of that comes from the documents and literature that we were providing to Commissioner Hamm.

THE WITNESS: Not, Your Honor, because I believe I'm an expert in this court, but because Commissioner Hamm -- one of the legal standards is he is subjectively blameless for Eighth Amendment purposes. And we were giving him what the FAA says, what OSHA says, what certain federal agencies have concluded in their literature, or what the best literature we could find said, knowing that inmates who challenged hypoxia could come in.

So I would like to be clear, I'm not offering myself to Your Honor as an expert. What I have read is only stuff that I passed on -- learned to pass on to Commissioner Hamm so that we would have the ability to say, this is why DOC made the choices that they made, if that makes sense.

So I'm not going to tell the Court that from my long -- you know, what I was warned is you can be drowsy, you can make mistakes, if you lose consciousness. It wasn't about

percentages. Anything I know about what percentages do would come from the government literature that we provided the Department of Corrections during this.

And so I don't know how to answer that, because I don't want to make it sound like I'm basing it on an experience that happened 20 years ago, when it's based on literature I read four years ago.

MS. SIMPSON: I'll move on, Your Honor.

Q. Mr. Houts, did you make any assessments of the system after the protocol was announced in 2023?

A. Yes, but it was also demonstrative in nature of responding to claims that had been made as part of other litigation involving nitrogen hypoxia.

Q. Okay. I have three additional highly confidential exhibits I would like to direct your attention to, Defendants' 52, 53, and 54. 52 is entitled Houts Air Flow Cut. 53 is entitled Houts NP Test One. 54 is entitled Houts NP Test Two.

Are you familiar with these videos?

A. Yes.

Q. Have you seen them?

A. Yes.

Q. Who made the videos or caused them to be made?

A. Again, you could say I did.

Q. Were you present when the videos were recorded?

A. Yes. I believe I'm in all three of them.

Q. And do the videos fairly and accurately reflect what occurred at that time?
A. They do.
MS. SIMPSON: Your Honor, request permission to publish the videos to the witness.
THE COURT: You may.
MS. SIMPSON: And I would also move for their admission.
THE COURT: Any objection?
MR. CLINE: No objection.
THE COURT: All right. They're admitted.
MS. SIMPSON: Thank you, Your Honor.
I will start with the first one, Defendants' 52.
(Video published.)
Q. Mr. Houts, again, where was this video made?
A. At the execution chamber at the Holman Correctional Facility.
Q. And what does it depict?
A. That depicts the air flow being cut off of the system while I was wearing the mask that had been placed by the correctional captain on the execution team to show that when the air quit flowing, there was a negative seal or negative pressure created on the mask. When no air is supplied or no gas is supplied, that there is, in fact, a seal, a negative pressure created.
Q. Okay. Just for clarity here, there is a female voice

narrating at the beginning of that video. Who is speaking?
A. I believe that was you.
Q. Okay. Is the mask or respirator you're wearing in the video the one that ADOC uses for executions?
A. At the time I left the Office of Attorney General, it was. I assume it still is.
Q. I'm going to show you Defendants' 53 now.
(Video published.)
Q. Again, where was this video made, Mr. Houts?
A. Inside the execution chamber at Holman Correctional Facility.
Q. Are the same individuals in the video as in the previous video?
A. Yes.
Q. What is the purpose of the activities you showed in the video?
A. That's a negative pressure check to show that there is a seal on the mask. Again, with -- I believe it was Kenneth Smith, there was allegation that the protocol should call for a negative pressure test. So, one, that was to show the judge what a negative pressure test is, how you do it, and then, two, also to allow the Department of Corrections to explain their penological reason for not having a step that requires the inmate to cooperate with them.
Q. The respirator doesn't appear to be connected to an air

source during that video. Why is that?
A. Because, again, to perform a negative pressure test, like with a canister gas mask, you cut the air intake off and cover the canisters and make sure that it presses against your face with. With a supplied-air respirator, if you're fit testing the mask, you just cover the supply hose and take a deep breath to show that it's not getting any air in through the seal.
Q. I've got one more here for you. This is Defendants' 54.
(Video published.)
Q. So, Mr. Houts, same question as before. Where was this made?
A. The execution chamber at Holman Correctional Facility.
Q. Same personnel as before?
A. Same.
Q. And what was the purpose of this video?
A. Same as the previous video, except that was more of a profile because -- again, trying to convey, whether to the Court or to decision makers at the Department of Corrections, what the correctional captain or other execution team members are going to see if there's a negative seal on the mask or how you can, you know, tell if there's no air getting in. Again, it was just to educate on what a negative pressure test looks like.
Q. Mr. Houts, have you been restrained on the gurney under execution conditions in terms of tightness?
A. I have, on more than one occasion.

Q. And how do you know it was under execution conditions in terms of tightness?
A. Because it was done by the execution team, and they were instructed to do that.
Q. When you were restrained on the gurney in that fashion, did that affect your ability to breathe?
A. It did not.
Q. Could you take deep breaths?
A. I could.
Q. Could you take rapid breaths?
A. Yes. In fact, you asked about human volunteers earlier, and each of them was asked to hyperventilate for a period of two minutes while wearing the mask.

MS. SIMPSON: At this time, I'll pass the witness.

CROSS-EXAMINATION

BY MR. CLINE:
Q. Good afternoon, Mr. Houts.
You're a lawyer; correct?
A. Correct.
Q. And you were previously employed as an Assistant AG for the State of Alabama; right?
A. Correct.
Q. All of your work on the nitrogen hypoxia protocol and any assessments conducted were done in your capacity as an attorney employed by the AG's office. Fair?

A. That's accurate.
Q. You testified you were a certified scuba diver; correct?
A. Yes.
Q. None of the scuba certifications that you obtained discussed at a medical or scientific level the experience of nitrogen hypoxia; correct?
A. Correct.
Q. You're also a pilot?
A. Yes.
Q. None of the course work that you took to obtain your pilot's license discussed from a scientific or medical level the experience of depriving someone of oxygen through the use of nitrogen; correct?
A. As phrased, correct.
Q. I think you already testified you're not a doctor; right?
A. Correct.
Q. So that means you're not a pulmonologist?
A. I'm not.
Q. Have you had any training in respiratory and critical care medicine?
A. No.
Q. Not an expert on the impact on the respiratory system between high altitude versus sea level?
A. Again, I don't recall how much the barometric component of hypoxia was on the private pilot's license written exam, which

would have been physiological in nature. But to your point, I have not gone to a school, other than ground school, that would have exposed me to anything like that.
Q. You don't consider yourself an expert on the difference -- strike that -- an expert on the impact on the respiratory system between high altitude versus sea level; correct?
A. No.
Q. Am I correct?
A. You're correct.
Q. Earlier counsel showed you four videos; right?
A. She did.
Q. And I believe Exhibits 52, 53, and 54 depicted you wearing the mask; correct?
A. Correct.
Q. You weren't being exposed to nitrogen in those videos; right?
A. I was not.
Q. You weren't wearing a pulse oximeter to measure your blood saturation in those videos; correct?
A. I believe that is correct.
Q. In fact, none of those assessments depicted in those videos that you testified to today subjected a person to nitrogen gas. Fair?
A. That is correct.
Q. None of those videos measured how long it would take for

someone to lose consciousness when exposed to nitrogen gas; correct?
A. That is correct.
Q. None of the assessments depicted in these videos measured anyone's blood oxygen level; correct?
A. Correct.
Q. The portable O2 meter that you talked about in Exhibit 55, that was not a pulse oximeter used to measure a person's blood oxygen saturation; correct?
A. Correct.
Q. You gave some testimony that you've been restrained on the gurney a number of times; right?
A. Yes, I did.
Q. You've never been restrained on the gurney while nitrogen was being administered into the mask; right?
A. Correct.
Q. You testified about some assessments you were involved in after the protocol was adopted in late 2023; correct?
A. Yes.
Q. No medical professionals or scientists oversaw those assessments; right?
A. That is correct.
Q. Those assessments were never submitted to any scientific review board?
A. They were not.

Q. In fact, you did those assessments in response to the Kenny Smith litigation specifically to address claims being raised in that lawsuit; right?
A. The three latter videos, that is correct.
Q. When you were performing your work on the nitrogen hypoxia protocol, in any assessments of the nitrogen hypoxia system, no physicians or medical scientists were ever present. Fair?
A. Fair.
Q. None of the assessments that you conducted sought to understand whether or not an inmate exposed to nitrogen hypoxia protocol would experience the sensation of air hunger; correct?
A. I disagree with that.
Q. You sure?
A. I do.
Q. Let me ask it again: Did you perform any assessments that actually sought to understand whether or not an inmate exposed to the nitrogen hypoxia protocol would experience the sensation of air hunger?
A. I believe all of the assessments that we conducted, certainly before the protocol was adopted by Commissioner Hamm, served that purpose.
Q. You were deposed in this case back on March 20th, 2026; correct?
A. I was.
Q. You were. And that testimony was given under oath; correct?

A. It was.

MR. CLINE: May I approach, Your Honor?

THE COURT: You may.

MS. KENNY: Do you know a page number?

MR. CLINE: Yes. It's 193, lines 18 through 23.

Q. Have you found it on that page?

A. Uh-huh (positive response).

Q. In this deposition on March 20th, 2026, you were asked, question: "Did you perform any assessments that actually sought to understand whether or not an inmate exposed to the nitrogen hypoxia protocol would experience the sensation of air hunger?" Answer: "No."

Is that how you testified in March of this year?

THE COURT: If you're going to question him, please go back to your podium.

A. That's how I answered in my deposition. Yes.

Q. You've not done any assessments where you've exposed a person to nitrogen gas. Fair?

A. That is fair.

Q. And to your knowledge, nobody has ever put on the mask and permitted the flow of nitrogen gas as part of any assessment of the nitrogen hypoxia protocol?

A. That is incorrect.

Q. Other than one time where you put it on yourself, no one has ever put on the mask and permitted the flow of nitrogen gas;

correct?
A. That is correct.
Q. You testified about some volunteer tests that were done as part of your work on the nitrogen hypoxia protocol; correct?
A. I did.
Q. Those volunteer tests you described were just intended to show that those volunteers could breathe when the breathing air was supplied. Fair?
A. Fair.
Q. None of the tests you performed involved subjecting a person to nitrogen gas to see how long it took that person to lose consciousness; correct?
A. That is correct.
Q. And sitting here today, you don't know whether or not nitrogen hypoxia executions are painless. Fair?
A. Definitively, I don't know.
MR. CLINE: Court's indulgence.
(Brief pause in the proceedings)
MR. CLINE: No further questions.
THE COURT: All right. Any redirect?
MS. SIMPSON: Very briefly, Your Honor.

REDIRECT EXAMINATION

BY MS. SIMPSON:
Q. Mr. Houts, what did you mean during your deposition on page 193 where you said you did not perform any assessments that

actually sought to understand whether or not an inmate exposed to the hypoxia protocol would experience the sensation of air hunger?

A. So, again, I go back to my role, as I understood it, was to supply the commissioner of the Department of Corrections with the best literature we could find --

THE COURT: Could you speak up a little?

A. -- whether it be from government sources, medical literature, scientific literature, on what was known about hypoxia and why individuals who plugged air line respirators into nitrogen tanks died without knowing that they were dying.

When we would take videos back to the Department of Corrections for them to review and consider, my response to your colleague was, you know, it was so bad, the federal government put out a brochure that said stop making it easy for your employees to plug respirators into nitrogen sources, because it's killing hundreds of people a year. And we had the OSHA data. And so, again, I go back to I believe the Department of Corrections was considering that as part of what our data was showing from the system.

So if you look at those two pieces together, I just can't agree that we weren't concerned about air hunger. That's why you have the hundreds of pages of documents from OSHA and the different governmental entities.

Q. I guess a different way of phrasing it, was the specific

purpose of that assessment to study air hunger?
A. No, because, again, the only person that's breathed nitrogen out of that system other than an inmate is myself, for good reason.
Q. And you said that you have breathed nitrogen from the system?
A. I have.
Q. Did you breathe it to the point of unconsciousness?
A. I did not.
Q. How did you avoid unconsciousness?
A. One, I did not secure the mask to my face so that I could remove it quickly. Two, I had a pulse oximeter attached to my hand.
The purpose was so that the execution team captain would see what to expect with the pulse oximeter's dropping before having to see it under real conditions. The purpose was not to create a risk of life or unconsciousness, it was to get the pulse oximeter to respond, and you cannot hold your breath long enough to make a pulse oximeter respond.
Q. Did it drop?
A. Oh, it dropped.
Q. And then what happened?
A. I ripped the mask away from my face.
Q. Thank you.
MS. SIMPSON: Nothing further, Your Honor.

THE COURT: Any recross?

MR. CLINE: No, Your Honor.

THE COURT: You can step down. Thank you.

The defense will call its next witness.

MS. SIMPSON: Your Honor, we call Defendant Raybon.

TERRY RAYBON

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MR. BUTTS:

Q. Good afternoon, sir. What is your name?

A. Terry Raybon.

Q. And what's your occupation?

A. I'm the warden at Holman Correctional Facility.

Q. How long have you been the warden at Holman?

A. I've been the warden at Holman since 2014. I came in in 2014 as deputy warden, and I was promoted to the facility head in 2020.

Q. And how long have you been with the Alabama Department of Corrections total?

A. Little over 25 years.

Q. And so as the -- strike that. At Holman, what's that top tier of your warden status?

A. Warden III.

Q. And as Warden III, does that mean you're the statutory executioner for the State of Alabama?
A. That's correct.
Q. And you've testified in a nitrogen hypoxia case before?
A. Yes, I have.
Q. Do you recall testifying in the Anthony Boyd case?
A. Yes.
MR. BUTTS: Your Honor, at this time, I've got Defendants' Exhibit 12, which has been preadmitted and stipulated to. May I approach?
THE COURT: You may.
Q. Do you recognize this as your prior testimony, warden?
A. I do.
Q. And do you stand by this testimony?
A. Yes, I do.
Q. Is there anything in that prior testimony that you don't agree with, sitting here today?
A. No.
Q. Did you participate in the execution of Anthony Boyd in October 2025?
A. Yes, I did.
Q. And what was Boyd's method of execution?
A. Nitrogen hypoxia.
Q. Do you remember discussing the steps you take during an execution during the Boyd hearing?

A. Yes.
Q. So just reiterating some of those points, in a nitrogen hypoxia execution, who turns on the nitrogen?
A. I do.
Q. Do you note the time that you turn it on?
A. Do I note the time?
Q. Yes, sir.
A. I don't note the time. I just keep up with the time from the time I turn it on until either 15 minutes have passed or flat line.
Q. And how long does it take for the nitrogen to reach the mask?
A. I can't tell you exactly, but probably a few seconds.
Q. Can you see the inmate during the execution?
A. I can if I am -- position myself through a little window that's in there; but I normally don't because the EKG machine, which we use to indicate flat line, I have to be in a position where I can observe it.
Q. And do you have any idea when the inmate loses consciousness?
A. No.
Q. What is your role after you've turned the nitrogen on?
A. After I've turned it on, like I say, I'm watching my stop watch for the 15 minutes. According to our protocol, it's either 15 minutes or five minutes after flat line, whichever is

longer. Watching that. And then after that it reaches either one of those, then we turn it off, turn the nitrogen off.
Q. And are you looking at any other equipment?
A. No, not during that time.
Q. And just to clarify for the record, when exactly does an execution end?
A. It ends when the flat line and nitrogen is turned off. After that, the rooms are emptied out except for the commissioner's room, and then the medical doctors come in and give a pronouncement of death.
Q. Could you specify for us the time sequence there of the flat line?
A. I don't understand your question.
Q. It's the 15 minutes or five minutes after flat line; is that correct?
A. Correct, whichever is longer.
Q. Okay. And then when is the time that's actually logged as the official time of death?
A. The time of death that the doctors give me, I give to the commissioner.
Q. And that takes some time?
A. It takes some time, yes. Because you're moving witnesses and you're -- also the doctors come in and do what they do.
Q. Did you notice anything about Boyd during the execution?
A. I didn't, because I didn't -- like I say, there's a little

window there in the control room that you can see where he's at, but I did not look out through there. No.
Q. Shifting gears a little bit here, warden, do you have any military experience?
A. I retired after 23 and a half years with the military.
Q. And were you trained on any firearms?
A. Yes.
Q. Which kinds?
A. We were trained with the .45 pistol, the 9 millimeter pistol, as well as the M-16 rifle. Those were it in the military.
Q. So were you trained as a marksman during that time?
A. Yes.
Q. And what all does that training entail?
A. You go to a range once a year or sometimes twice a year, and you qualify either marksman, sharpshooter, or expert, based upon your score.
Q. Were you ever trained as a sniper?
A. I was when I was with the State Troopers, yes.
Q. And to your knowledge, is anyone at the Alabama Department of Corrections a trained sniper?
A. The CERT teams, yes, they are.
Q. Warden, have you ever seen someone be shot?
A. No.
Q. Sitting here today, could you identify five Department of

Correction employees willing and sufficiently skilled enough, trained enough, to be able to conduct a firing squad execution?
A. Not without going through evaluating those individuals, I could not.
Q. Do you believe that you are presently qualified to be a member of such a team?
A. And what do you mean by qualified? Qualifications would have to be -- what those qualifications are. I'm qualified to shoot a weapon, yes; but qualified to actually pull a trigger on a live body, that's -- I wouldn't -- I can't say that.
Q. Do you believe that the execution chamber at Holman is currently sufficient for a firing squad execution?
A. No, not given the velocity of the bullet, as well as the makeup of the facility there with cinder block, no, it's not.
Q. Could you expand a little more on the cinder block.
MR. CLINE: Your Honor, Warden Raybon hasn't been disclosed as an expert in this case. This is really getting close, I think, across the line in eliciting expert opinion. It goes beyond lay person opinion.
THE COURT: What's your response?
MR. BUTTS: Well, Your Honor, as warden of Holman, Warden Raybon is familiar with the construction of the facility, so he can certainly speak to how the actual walls are constructed if he has that personal knowledge.
THE COURT: Are you asking him how it's currently

constructed, or are you asking him how it would need to be constructed for firing squad execution?

MR. BUTTS: Strictly how it's currently constructed, Your Honor.

THE COURT: All right. Then I think he can answer that question. Go ahead.

Q. So I'll restate my question. Given what you know of the execution chamber's current construction, how are the walls of the chamber currently constructed?

A. Cinder block.

Q. Are those hollow cinder block blocks?

A. Yes, they are.

Q. So they're not filled with any cement or rebar?

A. Not that I'm aware of. They could be, but not that I'm aware of, no.

Q. Are there other walls at Holman that are reinforced in such a way?

A. No.

Q. Would any of the inmate cells -- are they reinforced in any kind of way?

A. Not the way you just described, no.

Q. Do you believe that the chamber could be retrofitted in some way?

MR. CLINE: Again, objection, Your Honor. Now he's asking him what he could believe could be done in the future,

and not him describing the -- what the chamber looks like today and the walls of the chamber. So I think it's eliciting opinion that is the province of expert testimony.

THE COURT: Can you be more specific when you say retrofitted? Retrofitted for what?

MR. BUTTS: Sure, Your Honor.

Q. Warden, given the size of the chamber, could the chamber be expanded, to your knowledge? Built on?

MR. CLINE: Same objection, Your Honor.

THE COURT: Overruled. He can answer that.

A. It could be expanded, but you would have to -- there would have to be some other modifications made in order to be able to continue to do what we do there with lethal injection, as well as the nitrogen and the electrocution is still part of the methods.

Q. So are there currently any parts of Holman that you believe would be fit for a firing squad execution?

MR. CLINE: I have to object again. It's calling for expert opinion.

THE COURT: What's your response?

MR. BUTTS: Well, Your Honor, as warden of Holman, he's in charge of inmate safety; personnel safety. He has the operational duty and authority to be a part of those discussions, so --

THE COURT: I think you need to ask him specific

questions about the current condition of Holman. Sustained.

MR. BUTTS: Yes, Your Honor.

Q. Warden, is there a decommissioned part of Holman?

A. Yes.

Q. Would the decommissioned part be suitable for a firing squad execution?

MR. CLINE: Same objection.

THE COURT: Sustained. Ask him specific questions.

Q. Is the decommissioned part fortified in any way?

A. No.

Q. Is the decommissioned part -- does the decommissioned part have bulletproof glass?

A. No.

Q. Does it have bulletproof walls?

A. No.

Q. Does it have any kind of fortification around the perimeter of the decommissioned part?

A. No.

Q. Is the decommissioned part currently securable for purposes of security both of inmates and personnel?

A. I don't understand what you mean by security.

Q. Are there any security concerns to the decommissioned part?

A. Oh, yes. Yes.

Q. Is that part of why it's decommissioned?

A. Yes.

MR. BUTTS: Nothing further, Your Honor.

THE COURT: All right.

CROSS-EXAMINATION

BY MR. CLINE:

Q. Good afternoon, Warden Raybon.

A. Afternoon.

Q. After the inmate's given their final statement in the execution chamber, you immediately go into the control room; right?

A. That's correct.

Q. And it can be as short as one minute but up to a minute and a half from the time you leave the chamber until the time the first code is given; right?

A. About, yes.

Q. And the first code indicates the process is starting; right?

A. Correct.

Q. And you instruct another employee in the room with you to give the first code; correct?

A. That's correct.

Q. And then you personally turn on the flow of the nitrogen gas; correct?

A. That's correct.

Q. So the code is given, and you turn on the nitrogen gas in a matter of seconds; right?

A. Correct.

Q. So it's fair to assume, if you see code one in the log, somewhere within seconds of the time of code one, the gas has been turned on; right?
A. That's correct.
Q. Then once you've turned on the nitrogen gas, you turn around to look at the EKG and start your timer; right?
A. I do something else prior to that.
Q. I'm sorry. I didn't hear you.
A. I do something else prior to that.
Q. Okay. And once the nitrogen gas starts flowing, under the protocol, it flows for either 15 minutes or five minutes after flat line on the EKG, whichever is longer; correct?
A. That's correct.
Q. Now, the time of flat line is not documented in the duty post logs; correct?
A. That's correct.
Q. And other than you mentally logging it, it's not documented anywhere; correct?
A. That's correct.
Q. ADOC does not keep any documentation of EKG readings during an execution?
A. That's correct.
Q. And once you see the flat line, you wait another five minutes, and then you give a second code; correct?
A. Yes. Well, if the flat line comes before the 15 minutes,

then we wait 15 minutes.
Q. Right. And if it goes beyond the 15 minutes, once you see the flat line, you wait another five minutes past flat line, and then you give the second code.
A. That's correct.
Q. And after you give the second code, you switch off the gas.
A. That's correct.
MR. CLINE: No further questions.
THE COURT: All right. Any redirect?
MR. BUTTS: No, Your Honor.
THE COURT: All right. You can step down. Thank you.
Defense will call its next witness.
MS. SIMPSON: Your Honor, might we have a brief break for a comfort break?
THE COURT: Certainly. It is five minutes to three. We will take a break until 3:10.
(Recess was taken at 2:55 p.m. until 3:10 p.m., at which time the proceedings reconvened, as follows:)
THE COURT: Defense will call its next witness.
MS. KENNY: Defense calls Brandon McKenzie, warden.

BRANDON MCKENZIE

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. KENNY:
Q. Could you please state your name.
A. Brandon McKenzie.
Q. And what is your position?
A. Correctional Warden I.
Q. Is that with the Alabama Department of Corrections?
A. Yes.
Q. And where are you a Correctional Warden I?
A. Fountain Correctional Facility.
Q. Where is Fountain Correctional Facility located?
A. Atmore, Alabama.
Q. Are you a member of the Alabama execution team?
A. Yes.
Q. What roles have you had on the Alabama execution team?
A. Execution team captain and assistant warden.
Q. How long have you been on the execution team?
A. I believe sometime in 2023.
Q. Have you been involved in all seven nitrogen hypoxia executions that the State of Alabama has carried out?
A. Yes, in some capacity.
Q. Let's talk about first your role as the team captain. Were you the team captain for the first five of the seven nitrogen hypoxia executions?
A. Yes.
Q. What is the team captain's role once the nitrogen begins to

flow?
A. Basically, to monitor the condemned inmate as far as to check to see if he's conscious, unconscious. Also observing the pulse oximeters that's attached to him.
Q. And in observing the pulse oximeters, what are you looking for or at?
A. Basically, the oxygen saturation levels inside the condemned inmate during the process of the nitrogen flowing.
Q. How close are the pulse oximeters -- well, let me back up.
When you're monitoring the pulse oximeters during the nitrogen hypoxia execution, and you're the team captain, where are you standing in relation to the condemned inmate?
A. At the condemned inmate's, say, head to the -- I guess it would be his left, to the left of his head, right there at the top of the yellow gurney.
Q. On the top of the gurney?
A. Yes.
Q. So if you were to describe, as you look straight out from there -- from where you're standing, are you looking -- the head is closest to you and then the feet are the furthest away?
A. Yes.
Q. And you said you're to the left of their head.
A. Yes.
Q. From that position, can you read the pulse oximeter O2 saturation?

A. Yes.
Q. And about how far are you -- is your -- are your eyes from those pulse oximeters?
A. Well, I'm kind of tall, but if I look directly down at the gurney, it's in my direct line of sight.
Q. Do you watch the pulse oximeters a hundred percent of the time --
A. No.
Q. -- that you are in the -- during the execution?
A. No.
Q. How much a percentage of the time are you watching the pulse oximeters approximately?
A. Sixty to eighty percent.
Q. And then the rest of the time, what are you doing?
A. I might take a visual of the time that's going -- the time during the process. I'm also monitoring the condemned inmate.
Q. You mentioned monitoring consciousness. Is there a consciousness check during a nitrogen hypoxia execution?
A. No.
Q. So what do you mean by monitoring consciousness?
A. Just seeing whether I could tell or not other than just -- see if he stops breathing, or just checking his -- some motions he might make or just checking if I can tell when he lose consciousness or not.
Q. Can anyone else on the execution team read the pulse

oximeters?
A. During the process of it?
Q. During the execution.
A. No.
Q. Do you know exactly when the nitrogen begins to flow as the team captain?
A. No.
Q. What indication do you get that the nitrogen is about to flow?
A. I get a verbal indication through my ear piece of my headset when the nitrogen is about to flow.
Q. Warden McKenzie, what is the purpose of using the pulse oximeter during a nitrogen hypoxia execution from your perspective?
A. Just to ensure that the nitrogen is getting to the mask and that the inmate is actually breathing in the nitrogen gas.
Q. So working backwards, there's been testimony in these proceedings about mask fit. Is the team captain responsible for ensuring that the mask fits on the condemned inmate?
A. Yes.
Q. And how do you do that?
A. The mask is placed under his -- the chin cup is placed under his chin, and then the mask -- the restraints -- not the restraints, but the head restraints that you pull back to lock them into place is pulled back over his head. Then you'll strap

the head down using those straps and do kind of a physical check of the mask to ensure its tightness.
Q. When you say strap the head down, you're not talking about strapping it down to the gurney; right?
A. No.
Q. You're talking about strapping the mask to the head?
A. Correct.
Q. And then how do you ensure that there is a good fit?
A. Process of just running my hand around the mask to ensure that I don't feel any air or, you know, any breathing air coming from the mask. Like I said, check the tightness of it with the straps that's on the mask, ensuring that the chin cup is firmly in place to the chin, and listening for any -- trying to put my -- listening for any sounds of air that might be protruding from the mask.
Q. So you listen for air and feel for air?
A. Yes.
Q. Were you the team captain for Kenny Smith's execution in January of 2024?
A. Yes.
Q. Was that the first nitrogen hypoxia execution?
A. Correct.
Q. What did you observe about the pulse oximeters in the Kenny Smith execution?
A. For some time, they remained at a high oxygen saturation

level. Don't know exactly the time frame of it, but for some period of time they remained at -- I believe -- what -- 98, 97 percent of oxygen level.
Q. And then what happened?
A. At some point, if I remember correctly, he kind of -- his arms kind of tensed up against the restraints. He blew out a kind of a big breath and fell backwards onto the gurney. This -- he kind of -- his body kind of raised up a little bit, tensed up a little bit, then he fell backwards onto the gurney. Once he did that, he kind of released a small bit of saliva, kind of blowing off his lips, onto the mask screen, and from that point the 02 monitor decreased. It declined pretty quickly.
Q. To what level, do you recall?
A. I believe it was 43 percent.
Q. Was that in a matter of seconds?
A. Yes, it was a matter of seconds.
Q. So in previous litigation, you had testified that that period of time was longer than you had expected before the O2 meter went down. What do you mean by that?
A. At the beginning, I felt like it probably went as fast as it did once he blowed his breath and fell back onto the gurney as far as, like, the decline of the O2 saturations, by it declining so quickly, but it didn't. Not sure exactly how long it took, but that's what I would -- that's what I expected in the

beginning, that within seconds the nitrogen would have took over.

Q. Was Smith cooperative during his execution?

A. Not really, I wouldn't say he was.

Q. Why not? What did you think was not cooperative?

A. I believe -- I didn't notice it, but I think a couple of --

MS. WIESNER: Objection, Your Honor. I have some concerns he's about to give testimony that's hearsay. The start of his comment, "I didn't notice it."

THE COURT: I agree. So to the extent it's a little bit of a precipitatory objection for hearsay, it's likely sustained.

Do you want to rephrase your question?

MS. KENNY: Certainly.

THE COURT: I meant anticipatory. Excuse me. I used the wrong word.

MS. KENNY: I didn't even notice, Your Honor. I knew what you meant.

THE COURT: Thank you.

MS. KENNY: Isn't that the way it is in the courtroom?

THE COURT: Thank you.

Q. So without saying what was told to you, did you later come to a conclusion about his cooperativeness?

MS. WIESNER: Same objection, Your Honor, to the extent it's based on hearsay. It's still unclear to me whether this is

based on his own personal observations.

THE COURT: Let's make that clear to him.

Q. Did your personal observations of the amount of time it took for the pulse ox to drop -- can you explain those in light of information that you later heard, without telling me what you heard?

A. From my experience through the five I've done, the pulse oxes pretty much kind of went -- decline pretty quickly. From Smith's, in the knowledge -- it just kind of -- from what I seen with him, you could tell it was something a little different.

MS. KENNY: If I could have a moment.

(Brief pause in the proceedings.)

Q. Turning your attention to the Miller execution, which was in September of 2024, were you the team captain?

A. Yes.

Q. And what did you observe of the pulse oximeter in your role as the team captain in the Miller execution?

A. Trying to recall. You have -- trying to recall -- directly recall. I know within pretty much a few seconds -- pretty much seconds, the pulse oximeter decreased. Maybe sometime -- somewhere in the 40 percentile.

Q. And then what happened after that decrease within a few seconds to the 40th percentile? What happened after that?

A. I remember he tensed up against -- his arms tensed up against the restraints. I remember vividly the couple of coughs

he made. Trying to recall this all back.
Q. Do you remember what the pulse oximeter did next?
A. I can't recall off the top of my head. Do I have a copy -- can I get a copy of my declaration I probably made with this?
Q. Would the declaration that you made in the Grayson litigation in October of 2024 help refresh your recollection?
MS. KENNY: May I approach, Your Honor?
THE COURT: You may.
MS. KENNY: Would Your Honor like a copy?
THE COURT: No. If it's just being used to refresh his recollection, not being offered, I don't need to see it.
Q. Turning your attention, Warden McKenzie, to paragraph three on the second page about halfway down -- six lines down, if you could read that silently to yourself. And let me know when you're ready.
A. Okay. I'm ready.
Q. Okay. Putting that aside, does this refresh your recollection?
A. Yes.
Q. So what was -- after the pulse oximeter dropped down to the forties, what did you witness next with Mr. Miller?
A. The oxygen level had pretty much bottomed out, so it did not register an oxygen level again.
Q. Okay. And how quickly did that happen?
A. Few seconds to a minute, within a minute.

Q. I'm going to ask you again to look at line six, please, the sentence starting "After," if you could read that carefully to yourself.
A. Uh-huh (positive response).
Q. Okay. If you could put that aside.
How long was the pulse oximeter at 43 percent?
A. Approximately two minutes.
Q. Okay. And then what happened?
A. He then lifted and coughed, I believe, twice.
Q. When you said the pulse oximeter bottomed out, what do you mean by that?
A. That his oxygen level was so low that the machine had stopped registering.
Q. All right. Let's turn to the Carey Grayson execution. Did Mr. Grayson cooperate?
A. No.
Q. How did he not cooperate?
A. Mr. Grayson was attempting to dip his chin under the chin cup in an attempt to kind of maneuver or get out of the mask.
Q. Was Mr. Grayson successful in getting his face out of the mask?
A. No.
Q. Was he successful in breaking the seal on the mask?
A. No.
Q. Was there anything else Mr. Grayson did to show his lack of

cooperativeness?
A. Yes. He made obscene gestures with his middle fingers to the viewing rooms. I believe some of his last words were "F all of y'all," things of that nature.
Q. What happened with the pulse oximeter with Mr. Grayson?
A. In the beginning, it didn't register an O2 level. In the beginning when I received the indication that the nitrogen was going to begin flowing, for a period of time there, it didn't indicate an oxygen level.
Q. And then did that change?
A. Yes.
Q. How did it change?
A. When it reappeared, it reappeared at around, I believe, 43 percent, if I'm not mistaken.
Q. So you said that he had his middle fingers up. Are you talking about he was shooting birds?
A. Yes, ma'am.
Q. Was he able to continue to shoot birds throughout the execution?
A. No. Once the O2 returned, and I viewed it, you can clearly see that his hands start -- his middle finger started to cringe back into, like, the palm of his hands.
Q. And when was that in relation to the drop of the O2 sensor to the 43 percent?
A. I'm sorry?

Q. When did his fingers change in relation to when the pulse oximeter came on and showed 43 percent?
A. Almost simultaneously.
Q. Do you recall seeing any other specific movements by Mr. Grayson?
A. Arms raised, eyes -- his arms raised up, tensed against the restraints, and some leg movements -- some leg lifting with his legs raised slowly and then slowly went back to the gurney.
Q. And were both -- did both legs -- were they together? Not necessarily together, but did they move at the same time and together?
A. Yes.
Q. Now, how is that possible when they have leg restraints on and from your knowledge?
A. From just observing what his oxygen level was and his body, I would probably say it was some type of involuntary movement.
MS. WIESNER: Your Honor, I would move to strike that answer. I think it was both nonresponsive to counsel's question, but also veering into expert testimony.
THE COURT: What's your response?
MS. KENNY: My response, Your Honor, is that he has seen seven of these executions. He has reviewed literature. He knows what an involuntary movement looks like and what to expect in the execution setting. So, yes, the answer was unresponsive, but it was within the scope of this witness's abilities. We're

not talking about medical certainty, we're talking about a lay witness's observations.

THE COURT: I'll strike it as nonresponsive.

Q. Why do you think that the legs were moving from your perspective and experience?

A. Just from my experience, just for the majority of most executions, we have seen that type of movement before in around that time frame of the oxygen level being so low. It was just -- it's something we have seen in a few of our executions.

Q. And based upon your experience, did you believe that to be a voluntary movement?

MS. WIESNER: I would object to this, Your Honor, as calling for expert testimony.

THE COURT: Overruled. He can testify about what he observed in his experience.

A. Could you repeat it?

Q. Did you believe the leg raises in the various executions that happened about the time that the pulse oximeters were bottoming out, did you believe those to be a voluntary movement or an involuntary movement?

A. Involuntary.

Q. Turning to the Frazier execution, which was conducted in February of 2025, was Mr. Frazier cooperative?

A. Yes.

Q. Did he move his head back and forth like Grayson and try to

get his head out of his mask?
A. No.
Q. Did he resist in any way?
A. No.
Q. Did he make any movements that you recall?
A. I recall him -- he was rotating his wrists -- rotating his hands in a circular motion early on.
Q. When you say early on, when do you mean?
A. In the period before and shortly after the indication was given that the nitrogen would flow.
Q. What about the pulse oximeter with Mr. Frazier? What did you observe from the pulse oximeter?
A. I can't recall exactly. Could you -- I just can't really -- that's what I'm trying to remember with the pulse oximeter. I believe -- do I have that declaration as well?
Q. There's not a declaration on this.
A. Okay. I'm trying to remember. I know his pulse ox dropped within some seconds. I can't remember if it was, like, in the 40 percents or the 50 percents, but it dropped pretty quickly.
Q. And so, you know, it's important that you tell us what you do recall; right?
A. Right.
Q. So after it dropped to either the 40 or 50 percent, what happened after that?
A. I noticed his hands started rotating. At some point after

that, it was kind of like his upper body, his arms, kind of really tensed up against the restraints, and the earlobe piece for the pulse oximeter flung off of his ear.
Q. It flung off his ear?
A. Yes.
Q. Do you recall what the pulse oximeter reading was at that point?
A. I don't.
Q. Did you see Mr. Frazier's legs raise?
A. Yes.
Q. Let's move to the Hunt execution, which was in June of 2025. How did it compare to the prior execution of Frazier?
A. The pulse oximeter -- like I said, it declined -- his oxygen level on the pulse oximeter declined within some seconds.
Q. And by decline, how far generally are you talking about?
A. Not exact sure, but I know it went from, like, the nineties, 90 percentile, to the 40 percentiles within seconds.
Q. Did you see Mr. Hunt's legs raise?
A. I do not recall. Possibly. I do not recall exactly.
Q. Let's move to the Boyd execution, which was the last execution -- I'm sorry. Let's stop with Hunt.
Moving to the next one, which was Geoffrey West, in September of 2025, were you still the team captain?
A. No.
Q. What position were you in for that execution?

A. I was the position of the assistant warden.
Q. And in your position as the assistant warden, where are you during the nitrogen hypoxia execution?
A. In the control room.
Q. Likewise, with Mr. Boyd's execution, the last one in October of 2025, what position were you in at that time?
A. Assistant warden position.
Q. So you were in the control room for that one?
A. Yes.
Q. When you are in your role as the assistant warden, how do you assist the team captain regarding the mask?
A. I would go -- when he checks for the fitness, I would go right behind him and also check to confirm the proper fitting of the mask for -- you know, just two eyes to have a look at it and confirm that he is correct on the fitting of the mask.
Q. And did you do that for the last two executions?
A. Yes.
Q. So for all seven executions, were you involved in checking the seal of the mask?
A. Yes.
Q. And was there a good seal on all seven masks?
A. Yes.
Q. Was there ever an IV line used in any nitrogen hypoxia executions?
A. No.

Q. The movements you've described of legs lifting, shoulders lifting, I think you described head lifting, arms tensing against restraints, do your observations in those regards happen before or after the pulse oximeter drops?
A. After the pulse oximeters drop.
Q. In the five executions that you were in the chamber with the condemned inmate and you were the team captain, did any of them cry out in pain?
A. No.
Q. Did any of them indicate in any way that they were in pain?
A. No.
Q. Did you see any indication of pain?
A. No.
Q. Have you worn the chest plate strapped down in execution conditions?
A. Yes.
Q. And by execution conditions, I don't mean with nitrogen flowing into the mask, but in the condition that an inmate would be strapped to the gurney.
A. Yes.
Q. What is the chest plate made of?
A. It's basically like a seat belt material I guess you would say, maybe nylon, something to that nature. I'm not exactly sure what the material is, but it's almost -- it's the same type material that you would make a seat belt out of.

Q. Is it flexible or rigid?
A. I mean, it's flexible. I wouldn't say rigid.
Q. When you wore the chest plate strapped down as in execution conditions, was it the tightness of an execution condition?
A. Yes.
Q. Who strapped you down? If it's Warden Clemons, you can name it. If it's someone else, just say a member of the execution team.
A. Warden Clemons and a couple members of the execution team.
Q. Did it restrict your breathing in any way?
A. No.
Q. Did you try to take deep breaths?
A. Yes.
Q. Did it restrict your breathing when you tried to take a deep breath?
A. No.
Q. In your role as the team captain, have you witnessed anybody having issues with breathing because of the chest plate?
A. No.
Q. In your position at ADOC that you've held over the years, as well as your position as execution team captain and a Warden III, are you familiar with firearms?
A. Yes.
Q. Could ADOC safely use the current chamber for a firing squad

execution?

MS. WIESNER: Objection, Your Honor. I think similarly to the prior witness, he can testify about the current conditions, but I think this question is calling for an undisclosed expert opinion.

THE COURT: What's your response?

MS. KENNY: It's not an undisclosed expert opinion. It is the opinion of a lay witness what has conducted not just these seven executions in the chamber, but many lethal injection executions. He's been the team captain of the execution team for several years and is very familiar with firearms. I can talk more about his familiarity with firearms if I need to lay that foundation, but he certainly understands the size of the chamber and what safety ramifications would happen if five to ten people were shooting high-velocity bullets in that chamber.

THE COURT: Overruled. He can answer.

Q. So what is your opinion about the current chamber and the safety of using that current chamber for a firing squad execution?

A. I think it would pose significant risk to staff due to the size of it.

MS. KENNY: No further questions.

MS. WIESNER: Your Honor, I do have one exhibit. But don't be scared by the size of the binder. We just ran out of smaller sizes.

THE COURT: That's fine.

MS. WIESNER: Permission to approach?

THE COURT: Yes, please.

CROSS-EXAMINATION

BY MS. WIESNER:

Q. Good afternoon, Warden McKenzie.

A. Good afternoon.

Q. You testified that you've previously held the role as execution team captain at Holman?

A. Yes.

Q. And you were the team captain for the executions of Mr. Smith, Mr. Miller, Mr. Grayson, and Mr. Frazier and Mr. Hunt?

A. Correct.

Q. You were not the team captain for Mr. Boyd or Mr. West?

A. No, ma'am.

Q. And for the executions of Mr. Boyd and Mr. West, you were located in the control room the entire time the nitrogen gas was flowing?

A. Correct.

Q. Now, in your role as team captain, you testified that you placed the mask on the inmate?

A. Yes.

Q. You also placed the pulse oximeters on the inmate's ears?

A. Correct.

Q. After the death warrant is read, Warren Raybon leaves the execution chamber and goes to the control room?
A. Correct.
Q. And then you conduct a final visual inspection of the mask?
A. Correct.
Q. And if witnesses are watching, they can see you conduct that final visual inspection?
A. Correct.
Q. After you conduct that final visual inspection, you also give a signal to the warden?
A. I'm sorry?
Q. After you conduct your final visual inspection of the mask, you give the warden a signal that the execution can proceed?
A. Correct.
Q. And, again, if witnesses are tracking what's going on, they can see you give that signal?
A. Yes. If they're paying attention, they can see what I'm doing in the chamber. Yes.
Q. And in your experience, the time between when you give the signal until the gas starts flowing, it could take only a few seconds or, in your experience, under a minute?
A. It just depends on whenever I receive the verbal indication in my microphone, whenever the -- they're letting me know that they're about to present nitrogen gas into the mask.
Q. But, again, from your experience, what you've seen in

executions is between the time when you give the signal until the gas starts flowing, it could be as short as a few seconds or up to a minute?
A. I mean, I don't know. I'm not back there -- I wasn't back there with -- using the -- utilizing the gas, turning the gas on, so I wouldn't know.
Q. Do you recall being deposed on March 10th of this year?
A. I believe so, yes. I'm not exactly sure of the date.
Q. Okay. I would direct you, please, to page 202 of your deposition.
A. 202?
Q. Yes, sir.
A. Okay.
Q. Beginning at line 12, through page 203 at line 7, do you see that you were asked: "Between the time you -- between the time you" --
And I'm going to modify this for confidentiality purposes.
"Between the time you give the signal that everything in the execution room is a go and when someone in the control room communicates to you that the nitrogen gas is about to start via a code, how long is that period of time?" And you say, answer: "It varies. In my experience, seconds. Could be up to -- from my experience -- I'm not saying it could be shorter, it could be longer, but from my experience and what I've been through with the executions as being generous, sometimes it could be a few

seconds, 30 seconds, sometimes it can take closer to up to a minute."

Do you see that?

A. Yes.

Q. And were you being accurate when you provided the testimony that it could be seconds or up to a minute?

A. Yes.

Q. Once the gas begins to flow, your focus is on monitoring the oxygen levels on the pulse oximeters; correct?

A. That's part of my focus, yes.

Q. And because your focus is what the pulse oximeter is showing you when you're the team captain, you're not focused on the inmate's movements. Is that fair?

A. I won't say that's fair, because I have observed some movements the inmates have made, but, like I said, that's part of my duties, is just look at the pulse oximeters; also to try to make a mental note of the time frames going on and to kind of observe the condemned inmate.

Q. You would agree with me that your primary focus is not on the inmates?

A. My primary focus is just the process of the execution at that point, just ensuring that the execution is going through as protocol states.

Q. Okay. But you would agree with me that your focus during executions is not primarily on the inmate's movements?

A. Not primarily, no.
Q. So you might not notice if an inmate moves.
A. I mean, it's possible, yes.
Q. But as you testified, you have noticed some movements during each of the executions you've observed?
A. I've noticed some movements.
Q. Starting with Mr. Smith's execution, you don't recall exactly how long Mr. Smith appeared to be conscious to you, but it seemed like a while?
A. I'm sorry?
Q. Although you don't recall exactly how long Mr. Smith appeared to remain conscious after the flow of nitrogen gas, it seemed like a while to you; correct?
MS. KENNY: Object to the form of the question. If it's from direct examination, I did not ask about consciousness and the length of time.
THE COURT: What's your response?
MS. WIESNER: I'm sorry. I'm unclear if she's objecting to the form or the scope.
THE COURT: I thought you said to the form of the question.
MS. KENNY: The form.
MS. WIESNER: I can reframe my question.
THE COURT: All right. Go ahead.
Q. It seems like Mr. Smith remained conscious for a while after

the flow of nitrogen gas started; correct?
A. I mean --
MS. KENNY: I'm going to object to outside the scope of the direct.
THE COURT: Overruled. He can answer.
A. During that process, like I said -- I've said this before, and I'm going to say it again -- the time frame, I'm not exactly sure of. I mean, it -- from what it seemed to me, I can't tell. It was the first nitrogen execution we've done. Inside that chamber at that moment, it can seem like forever. So, I mean, the time frame, I'm not sure exactly what it was, so I can't speak to that.
Q. Although you're not exactly sure, it seemed like a few minutes. Fair?
A. I wouldn't know. I'm sorry, I don't -- I wouldn't know what time frame it was.
Q. I'm going to ask again. Although you're not exactly sure how many minutes it was, would you agree with me that it was a few minutes?
A. I'm not sure.
Q. Are you aware of the fact that media witnesses at Mr. Smith's execution reported that he appeared to remain conscious for as many as five minutes?
A. Whatever the media says, I mean, I guess that's what they -- their determination of it, I mean. But I've heard of it through

some of these court procedures, yes.
Q. Again, although you're not exactly sure how many minutes, you would suggest that he was conscious for a few minutes?
A. I don't know.
Q. Do you recall giving testimony in court in a matter brought by Mr. Grayson?
A. Yes.
Q. And if you could turn, please, to page 146 at line 14, and let me know when you're with me.
A. Okay.
Q. Do you see that you were asked, question: "And if I were to represent to you that media witnesses at Mr. Smith's execution reported that he appeared to remain conscious for as many as five minutes, would you have a reason to disagree with that observation?" Answer: "He -- I'm not exactly sure how many minutes it was. I would suggest it was a few minutes. But not -- I'm not sure what exactly they seen or what time frame they entered the execution, because I'm just focusing on him at that time." Do you see that?
A. Yes.
Q. And were you being truthful and accurate when you said, "I'm not exactly sure how many minutes, I would suggest it was few minutes"?
A. Yes, I was saying it could have been a few minutes, could have been a minute. I'm not sure. But the testimony is

accurate.
Q. Do you recall that you performed a consciousness check on Mr. Smith?
A. Yes.
Q. And do you recall that that consciousness check occurred roughly ten minutes after the flow of nitrogen gas?
A. I'm not sure exactly what time it came.
Q. If we can take a look, please, at Plaintiff's Exhibit 11, which is the execution log for Mr. Smith. We'll put it up on the screen, but, Warden McKenzie, it should also be in your binder.
A. Okay.
MS. WIESNER: Court's indulgence while we get it up.
THE COURT: Sure.
Q. Do you recognize this as an execution log?
A. Majority of it appears to be the activity log during the week of the execution. I see on the back page it has the -- some information regarding the actual execution of Mr. Smith.
Q. Thank you. And since you're already on the last page, if we could please turn the exhibit to the last page.
A. Uh-huh (positive response).
Q. You see there's an entry at 7:57 p.m.?
A. Yes.
Q. And that's when the first code is given?
A. I believe so, yes.

Q. And that indicates that the nitrogen gas has been turned on?
A. It indicates that the nitrogen gas is about to be turned on. Not necessarily it's turned on at that time, but it's about to be.
Q. And you see there's another entry at 8:07 p.m. that says "consciousness assessment conducted"?
A. Yes.
Q. That was approximately ten minutes after the code indicating the nitrogen gas will be turned on?
A. I'm sorry?
Q. That was ten minutes after the first code was given?
A. Yes.
Q. So in other words, roughly ten minutes after the nitrogen gas would be turned on?
A. Roughly ten minutes after I was given the indication that the nitrogen gas would be active.
Q. And not too long before you performed the consciousness check is when you saw Mr. Smith raise his upper body off the gurney?
A. Yes. Not too long before -- not exactly sure the time frame, but before the check was given.
Q. So assuming the log is correct, and you performed the consciousness assessment approximately ten minutes after the gas started flowing, Mr. Smith raised his upper body towards the end of that ten-minute period. Fair?

A. Sorry?
Q. Sure. Assuming the log is correct, and you performed your consciousness check ten minutes after the nitrogen gas started flowing, Mr. Smith raised his upper body towards the end of that ten-minute period. Fair?
A. I would say yes.
Q. And you saw Mr. Smith move his chest one more time after that?
A. I can't recall all without refreshment on it.
Q. Would it refresh your memory to take a look at prior deposition testimony?
A. Yes.
Q. Do you recall giving a deposition in a matter brought by Miller in 2024?
A. Yes.
Q. And if you could please take a look at page 205, lines 10 through 14.
A. I'm sorry?
Q. Page 205, lines 10 through 14.
A. Okay.
Q. Does that refresh your memory?
A. Yes.
Q. So I'll reask my question. You saw Mr. Smith move his chest one more time after that?
A. I believe I saw him -- I mean, if that's what I testified

to, then, yes.
Q. And so just to be clear for the record, did you observe Mr. Smith raise his chest one more time after that?
A. He raised his chest, or did he -- his chest raise as far as like a breath, or as far as, like, did he lift his chest off of the gurney? What are we referring to here?
Q. Did you see Mr. Smith raise his chest once again?
A. I seen his chest rise, yes, as far as like a breath.
Q. Now, you didn't notice that Mr. Smith was holding his breath at any point in time during his execution?
A. No.
Q. You testified on direct regarding the pulse oximeter in Mr. Smith's execution. Do you recall that testimony?
A. I'm sorry?
Q. You testified during your direct examination regarding the pulse oximeter in Mr. Smith's execution?
A. Uh-huh (positive response).
Q. You didn't take any notes of the pulse oximeter during Mr. Smith's execution, did you?
A. No.
Q. In fact, you've never taken any type of real-time notes during an execution by nitrogen hypoxia?
A. No.
Q. You were the team captain for Mr. Miller's execution?
A. Yes.

Q. And you observed Mr. Miller moving his legs off the gurney?
A. I'm sorry?
Q. You observed Mr. Miller moving his legs off the gurney?
A. I can't recall at this time, at this present time.
Q. Do you recall giving a deposition in August of 2025 in a matter brought by Mr. Boyd?
A. I believe so, yes. I don't know the exact date.
Q. Would it refresh your memory to look at prior testimony?
A. Yes.
Q. Take a look, please, at page 48. And I would direct you to your testimony beginning at line 18, through to the next page, 49, at line four, if you could read that to yourself, please.
A. What numbers, again? I'm sorry.
Q. Page 48, beginning at line 18 --
A. Uh-huh (positive response).
Q. -- through to page 49, line four.
A. Okay. All right.
Q. Does that refresh your memory?
A. Yes.
Q. Did you observe Mr. Miller moving his legs off the gurney during his execution?
A. Yes. I testified to it then.
Q. And you saw that maybe minutes after the nitrogen gas began flowing?
A. I don't know the exact time frame, ma'am.

Q. Again, just sticking with your deposition that you have in front of you, do you recall being asked -- and I'm at page 49, line five -- and this question I'm reading is just context.
A. Okay.
Q. Question: "After how much time -- how much time between you receiving notice that the nitrogen gas was going to be administered lapsed before you observed Mr. Miller's legs raising from the gurney?" And your answer: "I'm not exactly sure." And then the next question at line 13, question: "You have no memory of any type of time elapsing before you noticed Mr. Miller's legs raising from the gurney?" Answer: "No. I wouldn't say seconds. Maybe minutes."
Do you see that?
A. Yes.
Q. And were you being truthful and accurate when you said that you would not say seconds, but it was maybe minutes?
A. Yes, I was being truthful.
Q. You were the team captain for Mr. Grayson's execution?
A. Yes, ma'am.
Q. And I think you testified to this on your direct, that Mr. Grayson was giving the middle finger at the start of the execution?
A. Yes.
Q. And he continued to give the middle finger for a small amount of time after the nitrogen gas began to flow?

A. Yes.
Q. And your best estimate is that a few minutes passed from when the nitrogen gas started to flow to when Mr. Grayson appeared to become unconscious?
A. I'm sorry?
Q. Your best estimate is that it was a few minutes between when the nitrogen gas started to flow and when Mr. Grayson appeared to become unconscious?
A. I believe it maybe was a couple of minutes after that when the -- the pulse oxes started registering again. Maybe a couple of minutes. So sometime in that time frame, two minutes or so.
Q. And just to be clear, so that -- a few minutes after the nitrogen gas started to flow is when Mr. Grayson appeared to become unconscious?
A. I mean, two to three minutes, a few minutes, yes, something around there.
Q. You were the team captain for Mr. Frazier's execution?
A. Yes.
Q. And you saw Mr. Frazier tense his arms up against the restraints?
A. At what point? Just -- whenever the -- well, could you rephrase your question for me? I'm sorry.
Q. You saw Mr. Frazier tense up against the arm restraints a few minutes after the nitrogen gas started to flow; true?
A. I don't exactly remember the time frame. I know that the

oxygen level in his body started declining pretty quickly, but I'm not sure exactly of the time frame right off the top of my head of when he tensed up, when his arms tensed up against the restraints.

Q. You saw Mr. Frazier's arm tense up against the restraints after the gas started to flow?

A. Yes, the gas was flowing at that point.

Q. And is it your best estimate that that occurred a few minutes after you received word that the gas was going to start flowing?

A. I'm not exactly sure of the time frame after the fact.

Q. Do you have your August 22nd, 2025, Boyd deposition in front of you? I believe you do.

A. What was the date again?

Q. August 22nd, 2025. And if you could please turn to page 69.

A. All right.

Q. At line six, you were asked: "So what were we referring to as to what took place for a few minutes?" Your answer was: "After a few minutes, I noticed that his arms began to tense up against the restraints, almost like -- like a last fight for oxygen or, you know, a fight for his body."

A. I'm sorry. I think I have the wrong one. Hang on a second. I'm looking at the wrong one.

You said page 69; correct?

Q. Yes, sir. At line six on that page, you were asked: "So

what are we referring to as to what took place for a few minutes?" And you answered: "After a few minutes, I noticed that his arms began to tense up against the restraints almost like -- like a fight for oxygen or, you know, a last fight for his body. It kind of tensed up against the restraints, and then they just slowly fell back into the arm rests." Do you see that?

A. Yes.

Q. Did I read that correctly?

A. Yes.

Q. And were you being truthful and accurate when you gave that testimony?

A. Yes.

Q. I understand that you were in the control room during Mr. West's execution?

A. Correct.

Q. At some point in time after the gas began flowing, you heard a noise coming from Mr. West?

A. Yes.

Q. You heard him make a noise that you described as a small squeal like a pig?

A. Right.

Q. And you heard that noise a while into the execution; right?

A. I'm sorry?

Q. You heard this noise a while into the execution. Fair?

A. It was into the execution after the nitrogen started flowing. I don't know exact time frame of it.
Q. It was a good while into the execution?
A. I mean, I can't -- I can't -- I don't recall exactly of the time frame.
Q. Warden McKenzie, you've never been trained to determine the difference between voluntary and involuntary movements; right?
A. No.
Q. And you've never consulted a medical professional about how to determine whether movements are voluntary or involuntary?
A. No.

MS. WIESNER: At this time, Your Honor, I have no further questions for Warden McKenzie, subject to further discovery on the pulse oximeter issue.

THE COURT: All right.

MS. WIESNER: And for the record, we would preserve our objections to any testimony that he did give with respect to the observations of the pulse oximeter.

THE COURT: All right. Those objections are preserved.

Any redirect?

MS. KENNY: Yes, Your Honor, briefly.

REDIRECT EXAMINATION

BY MS. KENNY:
Q. Warden McKenzie, if you could please hold on to that Boyd deposition --

A. Uh-huh (positive response).
Q. -- that you were just asked about. And you were asked about page 69, referring to a few minutes when you saw Mr. Smith's arms tense up against the restraints, et cetera, that provision. Do you recall that?
A. This is on the Boyd deposition?
Q. Yes. The Boyd deposition that you were just testifying about.
A. Yes. Uh-huh (positive response).
Q. On page 69.
A. Yes.
Q. Okay. So if you could take a minute and read to yourself that provision, and then page 70, which was the follow-on questions to that exact same line of questioning, if you could just take a minute and read that.
A. Uh-huh (positive response).
Q. Okay. So you can put that aside.
So when counsel followed up and asked you why you thought that was an involuntary movement in the deposition, what was your response, just generally? Don't read it to us, but what was your response? Why did you think it was unconscious?
A. Because his oxygen level saturation was so low at that point, that I don't feel like any movement would have been kind of voluntary, because he was -- he was pretty much out of it at that point if you look at his oxygen level.

Q. What was his oxygen level at that point?
A. I believe somewhere in the teens.
Q. All right. Putting that aside, you were also asked questions on direct examination about Smith losing consciousness, and you were asked several questions about -- trying to get you to commit that that was over several minutes; correct?
A. Correct.
Q. If I were to show you your affidavit that you gave in the Miller litigation in July of 2024, would that refresh your recollection about when consciousness was lost?
A. Yes, ma'am.
Q. Or, in your opinion, when it was lost. Directing your attention to paragraph five on the last page, and if you could direct your attention down to the sentence, "Smith appeared to take another deep inhale," and read through that area quietly to yourself.
A. Yes, ma'am.
Q. When you prepared this affidavit, was it much closer in time to the Smith execution?
A. Yes.
Q. Was it fresher in your memory?
A. Yes.
Q. And when did you believe that he lost consciousness in relation to the deep exhale?

A. Right in that time frame, probably simultaneously or a couple of seconds after the fact. It just was very quickly.
Q. When you did a consciousness check in the Smith nitrogen hypoxia execution, that was not part of the protocol; correct?
A. No.
Q. Why did you do it?
A. Because at the time, I received an indication to -- the indication that gave us to do -- do the consciousness check.
Q. So that would have come from Warden Raybon through the person who radios it?
A. Correct.
Q. Do you do what Warden Raybon tells you to do during executions?
A. Yes.

MS. KENNY: No further questions.

THE COURT: Any recross?

MS. WIESNER: No, Your Honor.

THE COURT: All right. You can step down. Thank you.

The defense will call its next witness.

MS. SIMPSON: Your Honor, if I may make one brief housekeeping matter. About an hour ago, counsel for the defendants learned from a press release from the Governor's Office that Commissioner Hamm is retiring effective April 30th. Pursuant to Rule 25(d), Greg Lovelace is going to be the next commissioner of the Department of Corrections, and we would note

that he would need to be substituted as the defendant in this case. We're happy to file an appropriate motion with the Court, or if the Court would like to take notice that he is, apparently, the next named commissioner of the Department of Corrections, according to the Governor's office.

THE COURT: All right.

MS. SIMPSON: Thank you.

THE COURT: Thank you. That's effective Friday, the 1st?

MS. SIMPSON: Yes, Your Honor. Commissioner Hamm's last day will be the 30th. Commissioner Lovelace will begin on May 1st.

THE COURT: All right.

MS. KENNY: And we call as our next witness Warden Fitzgerald Clemons.

FITZGERALD CLEMONS

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. KENNY:

Q. Good afternoon. Please state your name for the record.

A. Warden I Fitzgerald Arnez Clemons.

Q. And would you spell your first name, Fitzgerald?

A. F-I-T-Z-G-E-R-A-L-D.

Q. And Clemons?
A. C-L-E-M-O-N-S.
Q. Thank you. And Warden Clemons, you stated you're a Warden I?
A. Yes, ma'am.
Q. With the -- what warden are you? I?
A. Warden I.
Q. I get that mixed up. With the Alabama Department of Corrections?
A. Yes.
Q. And how long have you been a Warden I?
A. I've been a Warden I since November 16th, 2025.
Q. Make sure you speak into that microphone so your voice carries well.
A. I said November 16th, 2025.
Q. How long have you been with the Alabama Department of Corrections?
A. I've been with the department since 2014.
Q. What did you do prior to that?
A. Prior to that, I was working with the Department of Youth Services.
Q. Do you have any military background?
A. Yes. I was a military police for 11 years.
Q. In which service?
A. Army.

Q. Are you a member of the execution team?
A. I am.
Q. What role do you play currently for the execution team?
A. Currently I play as the chief security -- as captain of security.
Q. So is that what we colloquially call the team captain?
A. Yes.
Q. How long have you been on the execution team?
A. I've been on the execution team since right around 2024.
Q. Have you been involved in all seven of the nitrogen hypoxia executions?
A. I have not.
Q. Were you involved in the Kenny Smith execution?
A. No, ma'am.
Q. What about the Alan Miller execution in September of 2024?
A. Yes.
Q. And in what way were you involved in that execution?
A. At that time, I was in the viewing room.
Q. So it would be fair to say you didn't have a big role in that particular execution?
A. No, ma'am.
Q. And then turning to the Carey Grayson execution in November of 2024, did your role change?
A. Yes, it did.
Q. And what role did you assume at that point?

A. At that point, I was inside the chamber, assisting Warden McKenzie.
Q. And would it be accurate to say that that was -- you were sort of in training at that point?
A. Yes, I was.
Q. And did you continue in training for the Frazier and Hunt executions?
A. Yes, in training.
Q. And were you in the execution chamber for those two executions as well?
A. Yes.
Q. And then in September of '25, did you perform the role of team captain for the Geoffrey West execution?
A. Yes.
Q. And then the same for Anthony Boyd --
A. Yes.
Q. -- in October of '25?
A. Yes, ma'am.
Q. Okay. Thanks for that rundown.
When you are acting in a role as a team captain or in any role on the execution team, do you know precisely when the nitrogen begins to flow?
A. I do not.
Q. Do you know approximately when it begins to flow?
A. Approximately when the code is given for it.

Q. And how is that code transmitted to the members of the execution team?
A. Via radio.
Q. When you are the execution team captain, what is your role once the nitrogen starts to flow?
A. My role would be to observe the pulse ox, the movement of the body, and the time frame.
Q. Now, when you say "observe the pulse ox," are your eyes on the pulse ox 100 percent of the time?
A. No, they're not.
Q. Can anyone else on the execution team see the pulse oximeter readout?
A. No, ma'am.
Q. Just the team captain?
A. Just the team captain.
Q. How close are you to the pulse oximeter readout as the team captain?
A. It's -- I have a direct line of sight to it. It's right to my right, to the left of the inmate. Probably about three inches, three to five inches from it.
Q. Why does -- from your perspective as the team captain, why do -- does ADOC use the pulse oximeters?
A. To ensure that the nitrogen is actually flowing into the inmate's body.
Q. Let's start with the Carey Grayson execution in November of

2024. You stated you were in the chamber with Warden McKenzie; correct?
A. Yes.
Q. And what assistance, if any, did you give Warden McKenzie during that execution?
A. During that time frame, I assisted him with the fitting of the mask of Inmate Grayson.
Q. Would you characterize Inmate Grayson as cooperative?
A. No, he was not.
Q. Describe his conduct.
A. All right. He was very uncooperative. You know, he gave us the double finger. He also made a statement that he wished that the execution did not go well. That we failed on it. He also cussed us out, told all of us, Fuck you. Fuck you all. He was just very uncooperative during the process.
Q. Did he attempt to fight the execution in any way?
A. No. He did while we was doing the mask, while he had the mask on, he did do some aggravated movement with his jaw to try to get the fitting of the mask to move.
Q. Was he successful?
A. No, he was not.
Q. Was there a good fit?
A. It was a good fit.
Q. You mentioned his double birds or whatever phrase you used. So he had his middle finger was up?

A. Yes, his middle finger was up. As the process went through, he became limp, and his hands did relax.
Q. Do you recall when his hands went limp?
A. I do not recall the actual time frame of it, but I know as the process went on, he did go -- his arms did go limp during that process.
Q. Did you notice anything else about his hands?
A. Like he did do some aggravated movements at first, but, like I say, as the process went on, he did go limp.
Q. Have you noticed -- any of the hypoxic executions, have you noticed an inmate turn, like, a blue color?
A. Yes, ma'am. I think it was Inmate West. He did turn a bluish color.
Q. And we'll talk about that in a minute.
So let's turn to the Frazier execution. What role were you playing in that execution?
A. In Frazier, it was the same role. Actually just assisting Warden McKenzie inside the chamber.
Q. Compare his level of cooperativeness to Grayson's before him.
A. Totally different. He was very cooperative. He didn't give us any issues. Nothing at all. Just a very cooperative inmate at that time.
Q. You mentioned that Grayson had the shooting the birds with his hands. Did Frazier have any hand movements?

A. Frazier did -- during the process, he did, like, do a rotation of both his left and right wrist. That was pretty much the only movement we had from him.
Q. And did that rotation continue throughout the entire execution?
A. No.
Q. When did it stop?
A. I would say approximately about probably two to three minutes into it.
Q. Did you see either Grayson or Frazier's legs raise?
A. Grayson's legs did do an aggravated movement. His was the movement we had had before. At all times, he's the most aggravated one we saw.
Q. Of leg movement?
A. Of leg movement, yes.
Q. Okay. Did Frazier's legs move as well?
A. He did move, but not as much as Grayson.
Q. Now, turning to the Hunt execution, what was your role in the Hunt execution?
A. In the Hunt, I was same role.
Q. Assisting Warden McKenzie?
A. Yes.
Q. Training?
A. Yes, ma'am.
Q. Was he cooperative?

A. Yes, he was.
Q. Did you see his legs raise?
A. He did, but, like I said, you know, it wasn't as exaggerated as Grayson. He didn't have too much movement at all.
Q. And then what about West? What, if anything, changed for that execution?
A. No change for West. He was cooperative also.
Q. What role were you for that execution?
A. West, I was actually the team captain at that time.
Q. So was it then your responsibility to observe the pulse oximeters?
A. It was.
Q. And what did you observe on the West execution?
A. On West, you know, when we first started, you know, we had an actual reading. Then when the actual procedure started, we didn't have a reading. Then I think about two minutes, approximately about two minutes into it, we had a reading. I think it showed probably around about 75 percent. It blacked out, and then after that time, we didn't have no more readings from him.
Q. So am I hearing correctly that it just flashed on one time?
A. One time.
Q. What, if anything, did you observe about West's breathing?
A. He did have some agonal breathing. He was a heavy fellow, but, you know, just agonal breathing on him.

Q. I think you mentioned earlier that he turned blue?
A. Yes.
Q. Now turning to the Boyd execution, what was your role?
A. At Boyd, my role, I was the team captain.
Q. Was he cooperative?
A. He was.
Q. What did you observe about the pulse oximeter in the Boyd execution?
A. I can't really remember. Let me see. I'm trying to think about Boyd. I can't really remember about Boyd.
Q. Let me ask this: Was the pulse oximeter working on the Boyd execution?
A. Yes, it was working on Boyd.
Q. And did it drop?
A. It did. I think with Boyd it was right around probably about 30 seconds in, it bottomed out to right around about 30 percent.
Q. And did you observe any particular movements in regard to Boyd?
A. No, ma'am. He didn't have any really aggravated movement, but he did tense up.
Q. More aggravated movements, using your word, of Grayson and the leg movements of -- well, let me back up. So you said Grayson had the more aggravated movements?
A. Yes.

Q. Did any of the other executions, did you observe any bigger movements?
A. No, ma'am. Grayson was our biggest movement we had had.
Q. You were in the chamber for five of the nitrogen executions; is that correct?
A. Yes.
Q. During those five executions, did you ever hear any of those five inmates cry out in pain?
A. No, ma'am.
Q. Any of them state they were in pain?
A. No, ma'am.
Q. Did you observe anything that indicated to you that they were in pain?
A. No, ma'am.
Q. Have you seen people in pain before?
A. I have.
Q. Are you an athlete?
A. I'm a former athlete at this age now.
Q. But did you see a lot of athletes on the field in pain?
A. Yes.
Q. Do you feel like you recognize the signs of pain?
A. Yes.
MR. CLINE: Objection, Your Honor. I think this is calling for undisclosed expert opinion.
THE COURT: Overruled. He can answer that question.

Q. And have you seen any of those signs of pain in the five executions that you've been in the chamber for via nitrogen hypoxia?
A. No, ma'am.
Q. Have you had the opportunity -- might be an unusual word to use, but have you had the opportunity to be strapped to the execution gurney as an inmate would be strapped on that gurney for an execution?
A. Yes.
Q. And did that include the chest plate?
A. Yes.
Q. Was it exactly like they would be strapped to the gurney in an execution?
A. Yes, ma'am.
Q. Who strapped you? If it was someone other than Warden McKenzie, do not state their name.
A. It was Warden McKenzie.
Q. So when Warden McKenzie strapped you to the gurney, did he do it to the tightness of executions?
A. We went to the point that we wanted to get it tighter than the actual execution.
Q. So when you did that, did it restrict your breathing in any way?
A. No, ma'am.
Q. Did you attempt to take deep breaths?

A. Yes.
Q. Did it restrict your ability to take a deep breath?
A. No, ma'am.
Q. As a team captain, and in the three prior executions while you were in the chamber, have you witnessed anyone having issues with breathing because of that chest plate?
A. No, ma'am.
Q. You testified that you were a former military policeman; correct?
A. Yes.
Q. In that role, did you carry a firearm daily?
A. I did.
Q. Are you otherwise familiar with firearms?
A. Yes.
Q. Based upon what?
A. I'm a trainer with Alabama Department of Corrections.
Q. You say that you're familiar with the size and setup of the execution chamber as it currently exists at Holman?
A. Yes.
Q. And based upon your experience with firearms and your knowledge of the chamber, do you believe it would be safe to do an execution by firing squad in the chamber as it currently exists?
MR. CLINE: Objection, Your Honor. Calls for an undisclosed expert opinion, asking his opinion on whether the

existing conditions would be safe or not.

THE COURT: I'll allow him to answer whether he thinks firing in the size of that space currently would be considered safe. With that modification, I'm going to allow it.

Q. You may answer the question.

A. No, ma'am, it would not be safe.

Q. Why not?

A. You have to look into the close proximity of firing to the inmate, the backdrop situation, the nitrogen being in the back side of it. It would be just an unsafe area to do it.

MS. KENNY: No further questions. Thank you.

THE COURT: Cross-examination.

CROSS-EXAMINATION

BY MR. CLINE:

Q. Good afternoon, Warden.

A. Good afternoon.

Q. For the West and Boyd executions, you were the captain of the execution team; correct?

A. Yes.

Q. And on direct, you were asked some questions about the pulse oximeter readings. Are the pulse oximeters attached to the ears of the inmates?

A. Yes.

Q. Did you take any notes of the pulse oximeter readings during Mr. West's execution?

A. No.
Q. Did you take any notes of the pulse oximeter during Mr. Boyd's execution?
A. No.
Q. Did you take any notes at all during the West and Boyd executions?
A. No.
Q. Now, you're not a physician; right?
A. I am not.
Q. And no medical training in lung physiology?
A. No.
Q. Have you had any medical training or how to interpret the numbers reported on pulse oximeters?
A. No.
Q. Haven't been trained in how accurate pulse oximeters are below a certain blood oxygen level?
A. No, sir.
Q. You testified about witnessing some agonal breathing during Mr. West's execution. You haven't had any medical training on what agonal breathing looks like; correct?
A. No, sir.
Q. You've never been trained on how to distinguish between voluntary and involuntary movements? Is that fair?
A. Yes, that's fair.
Q. And you've never consulted a medical expert on how to

distinguish between a voluntary and an involuntary movement; correct?

A. No.

MR. CLINE: Your Honor, I have no further questions for this witness, again, subject to further discovery on the pulse ox issue. And also, for the record, we preserve our objection to testimony related to pulse oximeters.

THE COURT: Yes. Your objections are noted and preserved.

Any redirect?

MS. KENNY: No.

THE COURT: All right. You can step down. Thank you.

MS. KENNY: And may he and Warden McKenzie be released?

THE COURT: Is that all right with plaintiff's counsel?

MR. CLINE: Subject to the pulse ox.

THE COURT: Certainly. But for today and the remainder, yes, they're released. All right.

Defendant will call its next witness.

MS. SIMPSON: Your Honor, our final witness is Dr. Antognini. We do anticipate that his examination will be fairly lengthy because all of his prior testimony has been excluded, and the Daubert motion is still live. We are happy to begin and push through at the Court's preference, or hold this for tomorrow morning, whichever the Court desires.

THE COURT: Does the plaintiff have any preference?

MS. SHARPE: We are happy to get through as much testimony today as possible, so however the Court would like to go.

THE COURT: It is 4:41. Why don't we see how -- where we hit our first natural breaking point in his testimony, and we'll stop there.

MS. SIMPSON: Yes, Your Honor. In that case, the defendants call Dr. Antognini.

THE COURT: Does anybody need to take a comfort break before we start his testimony?

MS. SIMPSON: I would like a very brief recess.

THE COURT: Let's take a ten-minute recess.

(Recess was taken at 4:41 p.m. until 4:53 p.m., at which time the proceedings reconvened, as follows:)

THE COURT: Okay.

MS. SIMPSON: Your Honor, at this time the defendants call Dr. Antognini.

JOSEPH ANTOGNINI

The witness, having first been duly sworn to speak the truth, the whole truth and nothing but the truth, testified as follows:

DIRECT EXAMINATION

BY MS. SIMPSON:

Q. Sir, could you please spell your name for the record.

A. My name is Joseph Antognini. It's spelled J-O-S-E-P-H,

A-N-T-O-G-N-I-N-I.
Q. Thank you. And what is your occupation?
A. I'm a medical doctor.
Q. What is your medical speciality?
A. Anesthesiology.
Q. Do you have an anesthesiology subspecialty?
A. I have -- when I was at UC Davis, part of my practice as an anesthesiologist was to be -- to do what's called neuroanesthesia, which is basically the practice of anesthesia applied to patients who are having neurological surgery of some sort, such as brain surgery or spine surgery, things of that nature.
Q. Is there any special knowledge and experience required in neuroanesthesia?
A. You have to have a very good understanding of the nervous system, neuroanatomy, neurophysiology; understanding, for example, the electroencephalogram; understanding what nerve pathways are present in the body, the neurotransmitters that are used and so forth. So it's a pretty rich and deep area of knowledge that you need to know to be in that speciality or to practice that subspecialty.
Q. Doctor, are you presently employed?
A. I am.
Q. And what do you do?
A. I currently do two jobs, basically. I work to do clinical

research, and then I also work as the chief scientific officer for a small preclinical pharmaceutical company where we're trying to develop new anesthetics.

Q. And what did you do previously?

A. The bulk of my career was at the University of California at Davis. I was on faculty there. I started out as an assistant professor and then rose through the ranks and became a professor. My title at that time was professor of anesthesiology and pain medicine, and also a professor in the section of neurobiology, physiology, and behavior. I also towards the end of my career took on some administrative work and became the director of perioperative services at UC Davis Health Center or Health System.

Q. Do you have any clinical experience?

A. Yes, I certainly do. I did a lot of clinical work in the operating room at UC Davis and in private practice as well.

Q. From about when to when?

A. I finished my residency in 1987. I was in private practice for about four years at a hospital in Sacramento. And then I went back to the University of California Davis where, as I said, I was in the academic series. And then I -- did that in 1991, and then I retired from UC Davis in 2016.

Q. Let's talk about your education. Where did you go to college?

A. UC Berkeley.

Q. And when did you graduate?
A. 1980.
Q. And how about medical school?
A. The University of Southern California, and I graduated in 1984.
Q. Where did you do your internship?
A. At UC Davis in Sacramento.
Q. And how about your residency?
A. Same place.
Q. Do you have any other postgraduate degrees?
A. I have a master's in business administration, an MBA.
Q. And where and when were you licensed as a physician?
A. I have had a license to practice medicine in California continuously for about 40 years. I think 1985 is when I first got the license. And I'm also licensed in the state of Georgia for the last maybe year and a half or so, two years. I'm not sure when, but about that.
Q. Why Georgia?
A. Well, I'm thinking about -- my wife and I are thinking about moving, thinking about Georgia in terms of getting potential work there, but I don't think that it's going to -- probably not be Georgia. Not that I have any complaints about Georgia at all, but I was thinking about other work that I might pursue there.
Q. Are you board certified?

A. Yes.
Q. In what?
A. Anesthesiology.
Q. And when did you become board certified?
A. 1989.
Q. Now, what do you need to know to become an anesthesiologist?
A. Well, there's certainly a lot. There is, obviously, the clinical experience that you obtain -- we obtain in terms of what we would do in the operating room. We also have to do rotations in the intensive care unit, pain clinic, and so forth. And we have to take care of a lot of different patients, different types of patients and different types of surgeries.

There's also a body of knowledge that we need to know that's outlined for us, what we need to know, and we actually have examinations that are done. It's varied over the years how often you take that exam. When I was training, we had the examination every year, but currently I think they're taking examinations more often. They test you, basically, every so often to make sure that you are building up that fount of knowledge that you need.

And that covers a wide variety of different things, but the foundation or the foundations, I should say, of our specialty are physiology, especially respiratory physiology, and cardiovascular physiology. Neurophysiology. Of course, then pharmacology as well, because we give a lot of drugs to patients

in the operating room and in the ICU and so forth. So you need to have a really very thorough understanding of those areas.
Q. And just to be clear, this testing you're describing, this isn't like the bar exam, one and done. This is every so often, you get retested?
A. That is correct. You have to basically have a progression and sort of -- if you start to fall off, if you start to not achieve a certain level as you're going through the training, you can get into some disciplinary issues. So it's not an examination where if you fail it, you're out necessarily, but you do have to show progress in it and you have to -- again, you take that every so often.
Q. Is there a list of topics on which you're tested?
A. Yes, there is.
Q. Can you give me some topic areas.
A. Well, as I said, there are areas related to respiratory physiology, so we have to understand the anatomy of the lungs and the respiratory system, the innervation of it, how it works, control of breathing, the control of breathing in terms of the anatomic sites, in terms of abnormalities such as if there are abnormalities in carbon dioxide or if there's abnormalities in oxygen, and so we have to know that. We have to understand how our drugs affect respiratory physiology.
We have to -- as far as cardiovascular physiology, we have to understand how the heart works and the heart functions, blood

flow, circulatory flow, things that affect blood pressure, control of blood pressure, effects of drugs on the heart. Not just the normal heart, but also patients that have heart disease, congestive heart failure, all the things that patients can have. So just to make sure there's an understanding.

You know, why do we need to know that? It's because in our practice, the first patient of the day might be a young, healthy athlete who's going to have a knee arthroscopy. Very healthy, no medical problems at all. Your next patient might be an 80-year-old man with congestive heart failure, and so you need to know how that congestive heart failure affects that person. Is it compensated? Is it not? You know, what effects will the drugs have on the heart failure? And then the third patient you might have will be somebody with respiratory disease of some sort. They could have COPD or emphysema or asthma. They could have pneumonia, ARDS. You know, sometime we will get patients from the intensive care unit that need surgery, and these are critically ill patients that can have lung disease. They can be on ventilators in the ICU, and they're brought over, and we have to know how to ventilate them and manage their ventilation, things of that nature.

So it's not as if we have patients that are healthy and, you know, it's very easy to do. Sometimes we get some very, very sick, ill patients in the operating room.

Q. Do you need to know about pre-op and post-op care?

A. Yes. We have to make sure that patients preoperatively are optimized, I guess would be the best word. Taking that 80-year-old man example, we're not going to cure his congestive heart failure, but we may suggest or do things to try to optimize his heart function. So we have to know about patients preoperatively and be able to manage them preoperatively in that regard.

Sometimes we will make suggestions to the treating physician, such as the intensive care doctor, or their -- or whoever their treating physician is to -- a suggestion where we think something should be done to optimize a particular aspect of their physiology or, you know, what's happening with them. Certainly postoperatively, we have to be able to manage these patients as well.

So we can have patients, as I say, that are very sick, that come to us, and, again, some of these patients are very ill. They may have some really bad lung disease going on or lung function. And on top of that, they're having surgery. Some of these surgeries are major surgeries. So we have to be able to manage those patients and manage their -- in this case respiratory illness, whatever that might be, in addition to having to manage them during the operation. So it is quite complex sometimes.

Those patients will then go into the -- sometimes back to the intensive care unit. Sometimes they'll go back into what's

called the PACU or the post-anesthesia care unit, and that functions like an intensive care unit. So we have to manage the patients there. We have to adjust their ventilatory settings. We have to look at arterial blood gases and things of that nature. Of course, we do that in the operating room anyway.

In fact, in the operating room, with the anesthesia machines that we now have, they're very high tech just like everything else in society that's gone, you know, much more tech. We have some very high-tech ventilators and anesthesia machines. So they're mostly computerized now, so you can get a lot of information. We get -- for example, related to the pulmonary system, we can get very detailed pulmonary information that we have to interpret.

For example, there's something called the flow volume loop, which is basically looking at the flow of gas that's going through the respiratory system into the lungs compared to the amount of volume that's going in. That type of information is very critical sometimes to be able to manage the patient. And so we have to adjust the ventilator. The ventilators are very high tech these days, so we have to make adjustments to the ventilator to be able to manage the patient. And we are there constantly doing that, so we are constantly managing and looking at their respiratory function and, of course, other functions as well such as their cardiovascular function.

Q. Let me turn there for just a second, Doctor. You said managed ventilator. Have you ever personally managed a ventilator?
A. Oh, yes. Many times.
Q. How many times?
A. Thousands. I mean, you have to understand -- so probably maybe around -- I'm just ball parking this -- 80 percent of patients that go to the operating room are going to have a general anesthetic. That means that you're going to have to manage their airway and their respiratory system in some way, and that's often going to be with the use of a ventilator. You're going to have to put them on a ventilator. You have to put the breathing tube in that you might have heard -- remember that from a couple of -- yesterday. But we have to put the breathing tube in and put them on the ventilator and manage their ventilation. So we do that.

And unlike the intensive care unit where most of that care under -- obviously, it's under the direction of a physician, an ICU physician, most of that care is managed by the nurses, and the nurses are very, very good. But in the operating room, we are the ones doing all that management. We are there looking at the patient, managing their respiratory function and their cardiovascular function on a minute-by-minute basis, especially, especially when they're very critically ill. We're very focused on that.

Q. Have you ever personally intubated a patient?
A. Many times. Thousands, yes.
Q. Have you ever performed a bronchoscopy?
A. Yes. Bronchoscopy is pretty common. Yes.
Q. So would you agree that you need to have a thorough understanding of human anatomy and physiology to be a board certified anesthesiologist?
A. Yes.
Q. Does one need to be familiar with the ventilators and assisted breathing systems to be board certified?
A. Yes.
Q. And I guess more generally, does one need to be familiar with the respiratory system to be board certified?
A. Not familiar. You need to be very intimately -- you need to know it intimately to be able to understand the things that you're doing. So it's very important that people have a good understanding of the respiratory system and respiratory physiology.
Q. I'd like to focus a little more specifically on respiratory physiology. What sort of education or training have you received on the respiratory system?
A. Well, again, that comes through my training in my residency, which is going to be both hands-on training where you would, obviously, be taking care of patients and being instructed by your attending physician; of course, then you do book learning,

as you might call it, where you read about these things. Then, as we've discussed, you are tested on those things.

Then you have to maintain that knowledge. And especially for me it was very important -- one of the reasons -- one of the main reasons why I went into the specialty is I love physiology. I love pharmacology. And so this was just a natural specialty for me to be able to practice what I love.

After I trained and became board certified, I didn't stop learning about physiology. I kept on -- respiratory physiology. I kept learning more and more and reinforcing concepts, again, as our clinical expertise as a field developed in terms of new modes of ventilation and so forth, I learned about new ways of ventilating patients.

I also had the clinical opportunities, I guess, at UC Davis to do some very unusual types of procedures that involved the respiratory system. Just as an example, there are conditions -- so I mentioned the endotracheal tube, which is basically a plastic tube that goes into the wind pipe. We have something called the double lumen tube, and that actually is a tube that has two lumens, not just one.

Q. I'm sorry, Doctor. What's a lumen?

A. Lumen, that's just basically -- it's a hole, basically, like a tube.

So you have a tube with a single endotracheal tube or single lumen, and then you have basically a tube that's two tubes

together, so you have two tubes, and they split. One side goes to one lung and the other side goes to the other lung, and you can actually preferentially ventilate lungs. So basically what you do is that you would -- there are certain types of procedures where you want to ventilate only one lung, and the other lung is unventilated.

Now, think about that. You're not basically using half of your respiratory system when you do that. I mean, obviously, to be able to do that type of procedure, you have to have a very good understanding of respiratory physiology. It's unquestioned that you need to know that. Not only do you need to know the anatomy in terms of placing that tube correctly -- because if you don't place it correctly, that's going to be a problem -- but you have to understand how to manage it because there are things -- complications can occur if you don't have a thorough understanding of respiratory physiology when you do that. And I've done quite a few cases with the double lumen tube as an example.

Q. Doctor, this is going to be a little elementary here, but have you studied oxygen transport and saturation?

A. Yes. That's, again, part of the physiology, respiratory physiology, where we have to learn about how oxygen is picked up in the lungs. As I like to tell people, and you've heard this before, the good air comes in, the bad air goes out; right? You bring in oxygen, and you exhale carbon dioxide. Obviously,

you're exhaling other things and so forth, but you have to understand how that oxygen is going to be transported or flows into the lungs, how it diffuses across the alveolar membrane, gets into the blood, into the hemoglobin that's there, and then transported to the body and how that oxygen is going to come off that hemoglobin in the tissue. And then that -- those red blood cells or that blood is going to return to the heart and then to the lungs to repeat the process. So that's very important in terms of understanding oxygen transport and all that.

Q. Have you received education or training on carbon dioxide transport and hypercarbia?

A. Yes. Basically, the same thing in terms of what you need to understand because the circulatory flow, the blood flow, among other things, has two primary jobs. And that is to deliver oxygen and nutrients to the tissues, and then pick up carbon dioxide and then remove that and send it to the lungs eventually so that it can be exhaled. There are a lot of other things that the cardiovascular system does, but that's the primary thing is for the movement of oxygen and nutrients such as glucose, and then the removal of waste products such as carbon dioxide.

Q. Have you received education or training on hypoxemia and hyperoxemia?

A. Yes. So I have, of course -- as I said earlier, we have patients that have lung disease, and they can become hypoxic. We have to be able to manage that, and there's a variety of

different ways in which we can do that, again, as I talked about earlier, with adjusting the ventilator and having to increase the inspired oxygen.

Also we have patients that sometimes we do purposely increase the oxygen to achieve a high amount of oxygen in the blood, so we are managing that from time to time. We're managing the oxygen all the time, but sometimes there are special cases where we want to increase the oxygen as much as we can.

Q. Have you received any education or training on how the respiratory system is controlled neurologically?

A. Yes. That's part of, obviously, things that we learn in medical school, but it's reinforced in the anesthesiology training because you need to understand how the respiratory system essentially drives or is driven to be able to do what it does. So there are control centers that will sense carbon dioxide, oxygen, acidosis, and things of that nature to help guide how much breathing there should be. So that's very important.

And one of the reasons why that's so important is that all of the anesthetics that we use -- I'm not sure I should say -- never say always, but pretty much almost all the drugs that we use depress the respiratory system. In fact, of course, we all hear about these overdoses from different drugs. Most of those are because it causes depression of the respiratory system. So

we have to understand how those drugs do that, where they act, and how we can prevent that.

Q. Doctor, who writes the questions for the board certification examination?

A. So that's usually going to be people that have -- in the field, usually academics but not always, that have gained a sufficient knowledge and are chosen to do that. I have done that. You meet basically -- I can't remember, it might have been maybe twice a year, but you have to prepare questions for those examinations.

Q. And have you ever written questions for the examination?

A. Yes, I have.

Q. What topic areas did you write on?

A. Well, the topic areas -- all the topic areas, which is a huge long list. What they do is they basically will assign topic areas randomly, more or less, to each question writer. So when I was doing it, what they would do is they would say, okay Dr. Antognini, here are the topic outlines that you need to write a question on. So they'll just say, for example, respiratory system anatomy. Something like that. Or myocardial contractility effective drugs or something like that.

So I have written questions on pain; on, as I recall, liver, hepatology, effects of drugs there; also on the respiratory system. I had to write questions on the respiratory system in terms of making sure that the people taking an exam had a good

understanding of the respiratory system. So I definitely did question writing on the respiratory system.

Q. Doctor, you mentioned the PACU. Just to be clear, have you ever worked in a PACU?

A. Many times, yes. That's part of what we do as anesthesiologists. You take your patients to the PACU and manage your patients there. Also at UC Davis, it wasn't just when we had our individual patients that we would take them to the PACU, we actually had people who were the clinical manager of the day, so to speak, for the PACU. I did that sometimes as well. So if there was a problem with a patient, might not have been my patient in the operating room, but if there's a problem with the patient, then they could ask me to take care of that patient.

Q. Changing topics slightly, have you ever been involved in the treatment of a patient with a chest wound?

A. Yes, I have.

Q. How about a gunshot wound?

A. Yes. Many times. Sacramento -- UC Davis Medical Center is a Level I trauma center for inland northern California, so huge area, capture area, and there's a lot of trauma. A lot of penetrating trauma as we call it, the knife and gun club basically. So we manage a lot of gunshot wounds, including gunshot wounds to the chest and so forth.

Q. Have you ever had a patient who was severely hypoxic?

A. Yes.
Q. Is that frequent or infrequent?
A. Doesn't happen very often, but it does happen. Some of the patients that we get that are critically ill, as I said, they can be very, very hypoxic.
Q. Have you ever had occasion to deliver to a patient gas with virtually no oxygen in it?
A. There has been --

The answer is yes. So this predates the current anesthesia machines. I don't want to scare anybody that might be having surgery soon, but in the old days, the anesthesia machines didn't have what's called -- did not have what's called the fail-safe mechanism. What that means, that it was possible to deliver 100 percent nitrous oxide -- not nitrogen but nitrous oxide -- without any oxygen. And there was a technique that you could use, and I did, where you actually deliver basically 100 percent nitrous oxide for a very short period of time during the induction of anesthesia. But you have to, of course -- you can't do that for very long. Maybe a minute or two. And there are reasons why you would want to do that in terms of the uptake of the gas. But now you can't do that. There's a fail-safe mechanism in the machine so that the minimum oxygen concentration you can deliver is 25 percent.

Q. Would you say that it is important to have a thorough understanding of hypoxia as an anesthesiologist?

A. Absolutely. So, again, I'm not trying -- anesthesia has gotten very safe in the 40 years that I've been in practice, but there's no question that we had some really bad outcomes many years ago, many decades ago. Things have really improved. I want to reassure everyone about that.

But, again, it was possible for somebody -- for example, this tube placement that I talk about. That has to go into the wind pipe. And if you are not -- if it's a difficult intubation, sometimes you can get fooled, and it goes into the esophagus, the food pipe. And when I was in training, we didn't have pulse oximeters and we didn't have what are called capnographers, which measures the CO2. So you had to rely on your clinical training, listen to the lungs, and also to look at the skin color to know if you're in or not. And if you're not in, and you're not sure what's going on, you have to look for signs of hypoxia, which would be cyanosis; it could be drops in the blood pressure and so forth.

So certainly when I was in training, you had to know how to recognize hypoxia because it was, unfortunately, a potential outcome of some of the things that you do as an anesthesiologist. It's gotten better these days because we have better monitors, the pulse oximeter, for example, and the capnography that I said where we can actually measure the carbon dioxide coming out of the lungs. We also are able to measure other gases coming out of the lungs. We're able to measure

oxygen going in and out, which is an important thing to know because it -- not to get into too many details, but you're able to learn a lot about oxygen consumption from some of these values.

So in any case, things have changed a lot. But to answer your question -- I'm sorry, I am getting a little bit verbose here -- yes, we have to know about hypoxia.

Q. Doctor, what is your area of scientific research?

A. I have been focused on anesthetic mechanisms, where anesthetics work, on what part of the body or the central nervous system do they work. And also because of my recent work with this startup company, we're developing new anesthetics, would be called I guess the physiochemical properties of potential new anesthetics. So we have to know the structure of these compounds and how they might affect the central nervous system. So we're actually doing studies where we're measuring the electroencephalogram, and I have to evaluate that.

But my career has been focused primarily on anesthetic mechanisms and where the drugs work, and especially whether it's in the brain or the spinal cord. So I had to know and I learned a lot about neurophysiology of the spinal cord and of the brain, neuroanatomy, because a lot of the research that I did we had to do neuropathology, basically, where we had to -- just as an example, we had to -- I would put electrodes in certain parts of the central nervous system, sometimes in the brain, sometimes in

the thalamus, sometimes in the what's called the reticular formation, in the brain stem, in the spinal cord, and record neuronal function basically at those various levels. So you have to know neuroanatomy to be able to do that.

And, of course, I also am interested -- when you think about what do anesthetics do, well, they make people unconscious and animals, and they prevent movement. That's a very basic thing that has to happen. These anesthetics have to not only just make somebody unconscious, but prevent movement. Well, that raises an obvious question: Why do people move or why do animals move in response to a noxious stimulus? You have to understand the neuroanatomy of that. You have to understand the pain system. So I developed a very deep understanding of that.

The other thing is the movement that occurs is, as it turns out -- a lot of that is mediated at the spinal cord level. So a lot of complex movements can occur based solely on the circuitry basically in the neurons in the spinal cord and not in the brain.

Q. Have you done studies in which animals have had their brains disconnected or removed?

A. Yes.

Q. Does your research include pain pathways?

A. Yes.

Q. And can you explain how complex movements can be generated from subcortical structures.

A. Well, the spinal cord, actually, as I said, has very complex circuitry. And there is a region -- subcortical region in the central nervous system that's called basically the locomotor region. Essentially, when we want to walk or we want to do, you know, maybe raise up a glass or something like that, it's not as if our cerebral cortex is saying, okay, activate this muscle and relax that muscle. It's almost like it just sends a signal, raise up your arm, and the circuitry to do that is actually in the spinal cord.

The best example of that is with walking where it's basically, the signal is sent essentially to walk, and your legs will walk. This has been shown classically with what's called the spinal animal where you can take -- and this goes back to the times of Sherrington, Charles Sherrington, spinalizing an animal. And you put them on -- after they recover -- so they're paralyzed, but you put them on a treadmill. And if the lesion of the spinal cord is such that they can still move their forearms -- forelegs, I should say, and hind -- forelimbs, but their hind limbs are paralyzed, you can put them on a treadmill, and the hind limbs will start to walk. So the spinal cord is severed, so there's no communication between the brain and those hind limbs, but the hind limbs are moving and walking on that treadmill.

MS. SHARPE: Your Honor, objection. I move to strike the previous answer and question on the basis that we really are

moving now into the realm of expert testimony and not qualifications, and Dr. Antognini is now offering opinions that have not been disclosed in this case.

MS. SIMPSON: We can move on, Your Honor.

THE COURT: All right. I will strike that response. Go ahead.

Q. (Ms. Simpson, continuing:) Dr. Antognini, have you ever done studies using hyperbaric chambers?

A. Yes.

Q. Do you need to understand gas laws and physics to use hyperbaric chambers?

A. Yes.

Q. Have you ever conducted research using FMRI?

A. Yes.

Q. Have you ever done studies where you made someone unconscious to determine responses to painful noxious stimuli?

A. Yes.

Q. Did you submit an expert report in this case?

A. I did.

Q. Attached to that expert report, is there a list of your publications?

A. Yes.

Q. I represent to you that it is Defendants' Exhibit 1, which has been admitted. Doctor, again, I guess I'll ask the question. How many publications do you have on your record?

A. Well, counting everything, including my abstracts and my -- other publications and book chapters and so forth, it's over 200.
Q. You mentioned earlier that you are a professor. Where all have you taught?
A. I have taught at UC Davis. I have taught undergraduate students. I've taught graduate students and medical students and residents and postgraduate people. I've also -- that was, again, at UC Davis.
I've also taught at Los Medanos College, which is a community college in northern California in the Bay Area. That teaching primarily was in human physiology.
Q. You mentioned UC Davis. Do you have tenure at any institution where you have taught?
A. I don't have now. I'm retired. I did at the time, before I retired, but not now.
Q. And what are some subject areas that you've taught?
A. As part of human physiology, it would, of course, include cardiovascular physiology, respiratory physiology, endocrinology, renal physiology. I mean, pretty much physiology of the whole body. And then sometimes you have to talk about the anatomy as well because they sort of go hand in hand.
Q. Doctor, bear with me one second here. I'm putting up on the display here Defendants' 1. Doctor, is this your expert report?
A. Yes, it looks like it is, yes.

Q. Does it contain your CV?
A. It does or should, I guess.
Q. Do you continue to hold all the opinions expressed in your expert report?
A. Yes, I do.
Q. I'm also going to show you Defendants' 2. Doctor, what is this document?
A. This is the supplemental declaration that I submitted after reviewing, I think, the expert reports from the plaintiffs.
Q. Do you continue to hold all the opinions expressed in your supplemental report?
A. Yes.
Q. Doctor, have you testified in Alabama before?
A. I have.
Q. And where have you testified in Alabama?
A. Here in Montgomery in the district court here. I don't think anywhere else in Alabama, as I recall.
Q. Have you testified in a nitrogen hypoxia case?
A. In Alabama?
Q. Yes.
A. Yes, I have.
Q. How about anywhere else?
A. In Louisiana.
Q. Okay. Did you testify as a lay or expert witness in those cases?

A. Expert witnesses.

MS. SIMPSON: Your Honor, defendants would tender Dr. Antognini as an expert witness in the field of general medicine and anesthesiology with knowledge of respiratory physiology and would move to have him qualified as such.

MS. SHARPE: Your Honor, we maintain our objections based on Dr. Antognini's qualifications and the reliability of his opinions with respect to nitrogen hypoxia executions as set forth in our Daubert motion. I understand you're reserving on those.

We also object to Dr. Antognini being qualified in, quote, general medicine. The fact that Dr. Antognini is an anesthesiologist does not qualify him to opine in all areas of medicine. I can cite you case law on that point if it would be helpful. The only area in which he is certified, board certified, is in anesthesiology. And at the close of our cross-examination, Your Honor, we also intend to move on Dr. Antognini's qualifications to opine in the areas of pathology and firing squad.

THE COURT: All right. I'm going to conditionally accept him as an expert, subject to my ultimate ruling after he completes his testimony.

MS. SIMPSON: Thank you, Your Honor. At this time we would move into our direct examination, or we can hold it for morning.

THE COURT: This feels like a natural place to stop for the day, so we will reconvene.

The Court has a couple of conflicts for tomorrow's schedule. We will be able to start at 10:00. I have a sentencing I have to do at 2:00, so we will go -- let's plan to go from 10:00 until 1:30. If we're not complete -- if we're not done by 1:30, we will reconvene after my 2:00 sentencing, which should last no longer than an hour at most. So I will try to line up perhaps a lunch break starting at 1:30 so that it will not delay these proceedings too much. So we will start back here at 10:00.

I will do the sentencing in a different courtroom, so you can leave your things in here.

MS. SHARPE: One other housekeeping matter. As I mentioned to Ms. Simpson, we've asked for a representation, given her announcement that Commissioner Hamm is retiring sort of in the middle of this case right after he gave testimony yesterday, that that has nothing to do with this lawsuit or the nitrogen hypoxia execution. So I understand that she's going to look into it and report back.

MS. SIMPSON: Yes, Your Honor. I don't have that information right now. This is, of course, news to us as well, but I have sent an inquiry to general counsel to find out about that.

THE COURT: All right. Very good.

I'll see you in the morning. Have a good evening.

(Proceedings concluded at 5:37 p.m.)

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COURT REPORTER'S CERTIFICATE

I certify that the foregoing is a correct transcript from the record of the proceedings in the above-entitled matter.

This 4th day of May, 2026.

/s/ Patricia G. Starkie
Registered Diplomate Reporter
Certified Realtime Reporter
Official Court Reporter

Exhibit H

THE UNITED STATES DISTRICT COURT

FOR THE MIDDLE DISTRICT OF ALABAMA

NORTHERN DIVISION

JEFFERY LEE,

Plaintiff,

Vs. CASE NO.: 2:25cv680-ECM

GREG LOVELACE, et al.,

Defendants.

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BENCH TRIAL

VOLUME III

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BEFORE THE HONORABLE EMILY C. MARKS, UNITED STATES DISTRICT JUDGE, at Montgomery, Alabama, on Wednesday, April 29, 2026, commencing at 10:00 a.m.

APPEARANCES

FOR THE PLAINTIFF: Ms. Paige Hester Sharpe
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Proceedings reported stenographically;

transcript produced by computer

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(The following proceedings were heard before the Honorable Emily C. Marks, United States District Judge, at Montgomery, Alabama, on Wednesday, April 29, 2026, commencing at 10:00 a.m.:)

(Call to Order of the Court)

THE COURT: Good morning. We are here for day three of our two-day trial. I hope everyone had a nice evening and we are ready to get started. Any matters that we need to take up?

MS. SIMPSON: Just briefly, Your Honor. Of course, we learned yesterday that Commissioner Hamm will be retiring at the end of the week. Counsel had asked whether that had anything to do with this case. I have conformation from general counsel for DOC that his retirement is not at all related to this matter.

THE COURT: All right. Thank you.

Go ahead. We will resume testimony with Dr. Antognini.

MS. SIMPSON: Thank you, Your Honor.

THE COURT: And, Dr. Antognini, you're still under oath.

THE WITNESS: Yes. Thank you.

JOSEPH ANTOGNINI

The witness, having previously been duly sworn to speak the truth, the whole truth and nothing but the truth, further testified as follows:

FURTHER DIRECT EXAMINATION

BY MS. SIMPSON:

Q. Good morning, Dr. Antognini.

A. Good morning.

Q. So yesterday you testified that you submitted an expert report in this case; correct?

A. Yes, that's correct.

Q. Did you render an opinion in this case?

A. I did.

Q. And is that opinion held to a reasonable degree of medical certainty?

A. It is.

Q. What is your opinion in this case?

A. The nitrogen hypoxia protocol as it's written and implemented I believe will cause a rapid onset of unconsciousness and then eventually will cause the heart to stop and then will result in death. And I believe that it will occur with minimal to no suffering or discomfort or pain.

Q. Let's talk about the hypoxia system for a minute. Are you familiar with ADOC's nitrogen hypoxia system and how it works?
A. Yes.
Q. Could you give us a brief overview.
A. Yes. So the system is set up in a way to deliver either air or nitrogen, and it's going to come in through a tube that basically -- tubes that basically are pipes from the tanks that will go into the room, I guess the control room, and then eventually it's going to go to a flow meter that will be able to deliver the air or the nitrogen.

That flow meter has a tube that goes into the chamber, and there it's attached to a mask, the respiratory mask that we -- or respirator mask that we have been discussing. And that mask is going to fit very tightly onto the face, and it's going to be virtually airtight, so there's not going to be any, really, opportunity for there to be a leak.

There are two valves on this mask. One is an inlet valve, and the other is an exit valve or exhalation valve. So all the excess gas that is flowing into the mask can either be breathed in, or it can be exhaled or -- not exhaled, but it can just pass through and go out the exhalation valve or the exit valve.

And then at some point the air is switched to nitrogen, and then very quickly nitrogen will enter into the tube -- tubes or pipes, and then into the mask, and then the oxygen will be -- the air will be displaced, and then eventually the oxygen level

or concentration in the mask will plummet very quickly.
Q. Are you familiar with ADOC's nitrogen hypoxia execution protocol?
A. Yes.
Q. Have you ever worn the mask used in executions in Alabama?
A. I have worn the mask.
Q. Did you wear it with breathing air or with nitrogen?
A. Just breathing air.
Q. What flow rate did you use? Not giving me a number, but generally, what flow rate did you use?
A. It was a very high number. It was the number that they use for -- by my understanding, the amount that they use during the execution process or for the air part before the execution begins.
Q. Can you describe the experience of breathing in the mask at that flow rate.
A. It was easy to breathe. I didn't have any problems. I actually was able to hyperventilate, to take big breaths. That did not cause any problems for me. It was pretty easy to breathe.
And that's the way these masks are designed. The system is designed to be used in a workplace setting, so it has to be able to accommodate people who are not just sitting down, but they have to -- these are people that are working and doing manual labor, so it has to be able to manage that in terms of the

increased breathing that they might have.
Q. Did you experience any pain?
A. I did not.
Q. Doctor, what is an inert gas?
A. This is a gas that is basically not going to be metabolized or chemically altered. By that I mean in our bodies.
So, for example, nitrogen is an inert gas. We breathe it in. It's part of the air. It doesn't get metabolized or changed in our bodies. We inhale it and we can exhale it, so it's basically inert. It doesn't do anything to us, and we don't do anything to it.
Q. You said nitrogen. Can you give us some other examples of inert gases?
A. Helium, some of the noble gases like that, argon and so forth.
Q. Can the human body detect nitrogen?
A. No, it cannot.
Q. And why do you say that?
A. Well, we just don't have any receptors for that because we evolved, essentially, in a nitrogen rich atmosphere. Our atmosphere has about 21 percent oxygen and about 79 percent nitrogen, so if there was a problem with us sensing nitrogen, that would be an issue.
So evolution, through the evolutionary process, we have basically become immune to that nitrogen in terms of it having

any effect on us or us being able to smell it or anything like that.
Q. So to be clear, we can't smell nitrogen?
A. No.
Q. Can we taste it?
A. No.
Q. If we're in a nitrogen enriched environment normally, how does nitrogen kill?
A. That would be where it's basically the displacement of oxygen. We need oxygen to survive. So if you are in an environment where there is little to no oxygen, you're not going to get that oxygen, and so that will cause your -- our brain cells, for example, to start shutting down, essentially. They need oxygen to function, among other substances. And if they don't have that oxygen, then they will basically stop functioning, and that's why people would lose consciousness from nitrogen.
Q. So to be clear, in a nitrogen hypoxia execution, is it the presence of nitrogen that kills or the absence of oxygen that kills?
A. It's the absence of oxygen.
Q. Doctor, are you familiar with hydrogen cyanide?
A. Yes.
Q. What is it?
A. It is a, basically, cyanide, which would be a carbon and a

nitrogen. It's an ion. And then hydrogen, which is the cation or the proton, and basically they're chemically linked. But it is a poison. It basically disrupts the use of oxygen in our mitochondria. It prevents oxygen from being able to be used, and so it can kill in that way.

Q. Has hydrogen cyanide ever been used in this country as a method of execution?

MS. SHARPE: Objection, Your Honor.

THE COURT: What's the basis of the objection?

MS. SHARPE: Dr. Antognini has not disclosed any opinions about cyanide in his expert materials. He has no opinions on them whatsoever in his reports. These are undisclosed expert opinions, and he should not be allowed to testify on them.

MS. SIMPSON: Dr. Antognini is a scientist. I'm just asking if he knows about hydrogen cyanide and how it functions in the body. He testifies that he has a thorough knowledge of pharmacology, human anatomy, respiratory physiology.

But I can leave this line of questioning, Your Honor.

THE COURT: I would leave it. Sustained. Go ahead.

Q. Doctor, you said earlier that you have opinions about the hypoxia protocol in Alabama. Do you have an opinion on whether there is pain associated with the protocol?

A. Yes.

Q. And what is that opinion?

A. I believe that the protocol will not cause pain.
Q. Would you anticipate the inmate experiencing anxiety?
A. I would expect that to occur in any execution setting, but, yes, anxiety I would expect to occur.
Q. You have, obviously, been in the operating room before. Yes?
A. Yes.
Q. Have you ever been around anxious patients?
A. Yes.
Q. If you have a patient who is anxious, what sort of signs or symptoms does that patient exhibit?
A. Well, it can vary, of course, but they are often sort of fidgety or moving around. They can be hyperventilating. They can get sort of cool, clammy skin. They can have increased heart rate. And they can basically -- you can sort of sense that they're -- just in terms of their talking and so forth, that they're anxious.

Not all patients are like that. Some patients appear outside to be fairly calm, but they say, yes, I'm very anxious. But from an observation perspective, as I said, you can see them fidgeting, their heart rate is increased, breathing faster sometimes, things like that.
Q. Doctor, based upon your training and experience, would you expect someone breathing, just regular breathing air, under ADOC's protocol to experience a sense of suffocation?

A. No.
Q. What happens if an inmate holds his breath? Would your opinion change?
A. Well, when we -- we as in humans -- hold our breath, it eventually becomes uncomfortable. We do get that urge to breathe. And we've all -- I presume all of us have done that at one point in our lives. But yeah, I mean, eventually, if you hold your breath, you're going to be very, very anxious and have that urge to breathe.
Q. Dr. Bastarache claimed in her report that it would take many minutes for an inmate to lose consciousness under ADOC's protocol. Do you agree or disagree?
A. I disagree with that.
Q. And why?
A. Well, I think that she, as I understand it, established her opinion, essentially, on a few factors. Number one, she did use some of the data that I had put into my report about how quickly the nitrogen displaces oxygen. And then she talked about how that action, actually, that displacement or to breathe in that higher concentration of nitrogen gas has to occur in the lungs, and then eventually that means that the oxygen, as it's decreasing in the lungs, is going to cause a decrease in oxygen in the blood and eventually -- it's the blood that goes to the brain, so the brain begins to see a lower amount of oxygen in the brain.

So she does, essentially, an additive analysis where she says it takes about -- I'm not sure the exact figures that she used, but recollection is around maybe 30 seconds or so for the nitrogen in the mask to go down to less than I think she said 3 percent. And then she adds on to that that under normal breathing, a young person might take around 35 seconds for the gas in the lungs to be replaced, basically, by the nitrogen in the mask. It's a little bit longer in someone who's older.

And then she talked about this time of 60 seconds that it takes for a -- and the example that she used of a red blood cell that goes from the lungs, up into the brain, and then returns back into the heart. So she adds those together.

I don't agree with that analysis because the time during which there is this deep decrease in oxygen in the mask as the nitrogen is flowing in, the inmate is breathing unless they're holding their breath, you know, and that -- nothing can be done about that. But if they're breathing normally, then that oxygen in their lungs is decreasing during that 30-second period when the mask is beginning to fill with the nitrogen. And also because the oxygen is decreasing during that time in the lungs, then the amount that's getting into the blood is decreasing. So they're not additive. These things are occurring -- there's a lag period, basically, but they're not -- it's not as if, after 30 seconds, that's when the nitrogen starts to be replaced in the lungs -- I'm sorry. The oxygen begins to be replaced in the

lungs.

And then finally, I just want to focus on that 60-second part. I think that is confusing where she says that it's going to take 60 seconds for this red blood cell to return or the blood to return. That's just not accurate. The reason why is because -- she wants you to think that that blood is, again, you know, maybe taking ten seconds to get up to the brain, and then it's returning to pick up less oxygen; but when you think about that blood starting out that's getting less oxygen and that she says is traveling up, there's more blood behind it. You know, our circulatory system is set up in a way that blood is continuing to flow.

So while the blood -- that first part -- that section of blood or that red blood cell that she talks about is coming down, going up to the brain and then coming back down, there's blood behind it that is -- has less oxygen in it. It's picking up less oxygen from the lungs and then getting into the brain. So it's this additive addition that she does of these separate steps, but they're happening all at the same time.

Q. Dr. Bastarache testified that in sort of an ideal situation, you might have two minutes and 18 seconds to loss of consciousness. Do you think that number is too high or too low?

A. That's too high.

Q. What's your estimation to loss of consciousness?

A. My estimation is on the order of around probably 60 to 70

seconds. I said that the amount of time that it takes to get to less than I think 5 percent or so, which is the level that would not sustain consciousness, I think that takes about 30 seconds. I'd have to look at that chart that she referred to. And then 30 to 40 seconds after that, I believe, based on the studies that I've cited, I would expect the person to lose consciousness.

Q. And when you're giving that estimate of time, is that time from when the nitrogen in the mask reaches a certain level or time from when the nitrogen begins to flow?

A. The time that the nitrogen begins to flow.

Q. Dr. Schwartzstein compared ADOC's hypoxia protocol to smothering. Do you agree or disagree?

A. I disagree. Smothering is a term -- you could think of, you know, smothering somebody with a pillow. Asphyxiation, probably I have in the past thought that -- asphyxiation might be a bit pejorative as well, but I think that is probably a little bit more accurate a way from a medical perspective to say that.

But smothering is a term that we use when we think about putting a pillow over someone's head or something like that, and that is not what is happening in this setting.

Q. Changing topics a bit. Doctor, are you familiar with Louisiana's nitrogen hypoxia system?

A. I am.

Q. How are you familiar with it?

A. I was retained as an expert witness in that litigation, and I went to the correctional facility there to evaluate that system as well.
Q. Is that correctional facility Angola?
A. I think it's -- I'm not sure they call it Angola anymore, but I think that's where it is, yeah.
Q. When you say litigation, is that the Hoffman case?
A. Yes.
Q. Have you read Louisiana's hypoxia protocol?
A. I have.
Q. How does it compare to ADOC's?
A. They're very similar. I did not do a word-to-word comparison, but they're very similar.
Q. Have you ever observed testing of Louisiana's hypoxia system?
A. I have.
Q. During your deposition, you provided us with a list of files, documents that you considered. Do you remember that?
A. Yes.
Q. Among those was a video. Do you recall that video?
A. I do.
Q. How did you obtain that video?
A. That was done during the evaluation when I was there.
Q. By there, where were you?
A. I'm sorry. In the execution chamber in Louisiana. And I do

not recall who made the video. I'm pretty sure it wasn't me, because I think the video was sent to me, and I wouldn't have any reason to -- you know, if I had it on my own. So I think somebody else must have made the video, and it was sent to me. And as I said, I was there when that video was made.

Q. So you were present for the events depicted in that video?

A. Yes.

Q. Does the video -- have you reviewed the video lately?

A. No. I saw it at the deposition, but not since then.

Q. And when was your deposition, do you recall?

A. March 19th, approximately, sometime mid-March, I think.

Q. So a little over a month ago.

A. Yes.

Q. Do the events depicted in the video fairly and accurately reflect what occurred at the time?

A. Yes.

MS. SIMPSON: Your Honor, at this time, we would move Defendants' Exhibit 56 into evidence.

THE COURT: Any objection?

MS. SHARPE: No objection, Your Honor.

THE COURT: It's admitted.

MS. SIMPSON: Thank you. And this is not a highly confidential video. We would like to play it for the witness, Your Honor. May we publish it?

THE COURT: Any objection?

MS. SHARPE: No objection.

THE COURT: All right. You may.

Q. Doctor, I'm going to ask you to please watch this video.

(Video published.)

Q. So, Doctor, what is this video depicting?

A. Just to orient everybody, so there's -- you can see that there's a mannequin there, and the mask is placed on the mannequin. And there is an oxygen monitor.

And if I may ask that you put that back up, and just don't play it, but I can point out just a couple of things, if I may.

You can see that there's a plastic tube -- there are two yellow oxygen monitors there, one by the side that's on the far left, and then there's one that has a plastic tube that goes up into the mask. And one of the things that I was retained to do as well is I wanted to make sure -- and they as well wanted to make sure -- that there would not be a problem in terms of the nitrogen flowing out of the mask and potentially causing harm to any personnel. So I placed -- we placed -- I'm not sure who did this, but there's another oxygen monitor placed on the left side there. And it basically shows -- at the very beginning, you can hear someone say swap, and that means that's when they turned the nitrogen on. And then at about ten seconds, I believe, you can see that the oxygen in the mask starts to decrease. And then you see a very rapid drop in the oxygen level in that mask over that time.

You may also have noticed that the oxygen monitor on the far left, which is basically sampling the air right around where that oxygen monitor is located, that starts to decrease a little bit. It goes down to about 19.5. If you go to the very end of this video -- so it starts at 20.9. And if you just go to the very end, please, it's now at 19.8. So it's gone down a little bit. So there is some residual nitrogen, basically, around the mask. If we had -- if we had placed that oxygen monitor on the far left closer to the mask, probably we would have gotten even lower. So there is a potential risk for people that might be around that mask, but it's not great.

In any case, the decrease here that you see primarily I want to focus on is in the mask, and there's a rapid decrease in the oxygen there. And you can see it right now, it's at 0.8 at the end of the video.

Q. Doctor, is an atmosphere with 0.8 percent oxygen supportive of human life?

A. No.

Q. Based upon your training and experience, what would you expect to happen to a person exposed to an atmosphere of 0.8 percent oxygen?

A. They would become unconscious very quickly from that, and if it's sustained, they would die.

Q. Now, you said that there is some leakage of nitrogen based upon that second oxygen meter. Is that accurate?

A. It's not leakage. It's not leakage -- well, let me just make sure. I want to clarify a couple of things.

You see that opaque plastic tube that goes from the monitor into the mask? You can see that it has to go underneath that seal. So there is a bit of an artificial leak there.

Q. And that was my question. Does the mask have a perfect seal?

A. It doesn't. In this setting, it doesn't, but that's not the reason -- I want to make sure we're clear. That's not the reason why you might see the oxygen drop on the left side. Remember, all that nitrogen -- even before the nitrogen starts, if it's just air, so if you look at the mask, right to the left of the nose of that mannequin, you see sort of a white disk with a black dot in the middle. That is the inlet valve. It's basically just a piece of rubber. And so what happens is that that is where the gas is flowing into the mask. And on the left side of that mask you see a black object that looks like -- correct. It looks like a disk, looking from the side. That's the exhalation valve, basically, and all that excess gas that's coming into that mask flows out of that. So when the nitrogen starts, there's a lot of nitrogen gas that's flowing out of that. So there is nitrogen around the -- that area of the head, and it's actually flowing down, and that's why you see that decrease there on the far left.

So what that means, just in practical terms, if you were

leaning over and putting your face by that exhalation valve, there's a potential that you could become unconscious as well because all that nitrogen is flowing out.

Q. Doctor, is the mask Louisiana uses comparable in type and form to the one that Alabama uses?

A. Yes.

Q. Doctor, there have been some claims made of witnesses in this litigation and other litigation of movement being observed during hypoxia executions. Do you recall that?

A. Yes, I do.

Q. Considering your training and expertise and your research, are you surprised?

A. I am not surprised, no.

Q. Why not?

A. First, because it's unclear, at least to me, when the nitrogen starts. It's hard to know when some of these movements -- or if some of these movements are just spontaneous movement even before the nitrogen starts.

But even after the nitrogen starts and the inmate becomes unconscious, there can be a lot of movement associated with the decreased oxygen. So the brain and spinal cord are not getting enough oxygen, and the neurons in the brain and spinal cord, especially below the cortex and in the brain stem and so forth, those neurons can't function properly, so they start to fire off. And that causes twitching or can cause twitching motions,

and it can cause some of the muscles to -- or the motor neurons to start to fire in a sort of consistent pattern, so you can get very slow movements, leg raising and things like that. I'm not surprised that those observations have been made.

Q. Is unconscious movement common when a person is dying?

A. Yes. You can see people who are unconscious, and they will be moving.

Q. Have you ever seen a patient die?

A. I have.

Q. Based upon your training, knowledge, experience, is unconscious movement common during death by an inert gas asphyxiation?

A. Based on my review and understanding, yes, it is common.

Q. Should we correlate movement during these executions with pain?

A. No.

Q. Why not?

A. Because, as I said, these movements can occur from the firing of these neurons, irrespective of what's going on in the brain. So there are many classic examples of that where the central nervous system of mammals, and not just mammals but amphibians as well, the spinal cord is very capable of generating complex movements. The brain stem as well.

So we think about these movements, that there has to be some type of conscious process to cause that, but these types of

movements have been well documented in both human and animal settings in the absence -- of a brain with little to no brain function.

Q. And actually, Doctor, I'd like to direct your attention to an article that Dr. Williams talked about yesterday. This is Plaintiff's 88, the van Rijn article. Are you familiar with this article?

A. Yes, I am.

MS. SHARPE: Objection, Your Honor.

THE COURT: What's the objection?

MS. SHARPE: Dr. Antognini has offered no opinions on this article in his expert reports. This is an undisclosed expert opinion. He had the opportunity, if he wanted to, to respond to Dr. Williams' opinions on this, which were disclosed in his expert report. He did not do so. This is undisclosed expert testimony that should not be permitted.

THE COURT: What's your response?

MS. SIMPSON: This is a response to the testimony that was given yesterday.

THE COURT: So is it rebuttal testimony?

MS. KENNY: It's rebuttal.

MS. SHARPE: Your Honor, he has never testified about this article or offered opinions. He served a rebuttal report. Dr. Williams disclosed this article in his report. Dr. Antognini did not rebut it at the time. He should not be

permitted now to offer new opinions on it.

THE COURT: Is this not a new opinion?

MS. SIMPSON: I would say it's an opinion simply based in rebuttal from the testimony that was given yesterday.

MS. SHARPE: Your Honor, he had an opportunity in his rebuttal report to respond to it. Dr. Williams disclosed this article in his opening report. Dr. Williams does not have this article in his reliance materials. He's never given an opinion on it.

THE COURT: I'm going to permit him to testify on rebuttal, subject to a motion to strike after I hear the testimony.

MS. SIMPSON: Thank you, Your Honor.

Q. Dr. Antognini, have you read this article?

A. Yes, I have.

Q. Is there a discussion in this article about lab rats?

A. Yes.

Q. What happened to the lab rats?

A. So if you go to page -- I think it's maybe the prior page, maybe page 3 or 4 -- page 3 -- let's try page 2. Maybe that's where our -- okay. Little bit higher up.

There we go. The first paragraph of results. After the animals had been decapitated, you can see that the -- it says, in all animals -- that's sort of in the middle of that paragraph -- in all animals, this low amplitude EEG activity is

interlarded with the repetitive smaller artifacts which coincided with chewing movements of the animal's mouth.

So this is -- the animal has been decapitated, and its mouth is chewing. And that lasted for about 15 seconds.

And then the headless body -- it says, in observing the headless body of the rats, a repetitive synchronous jerking of the hind legs is visible, lasting for about one minute.

So I don't know whether I can render an opinion or not. I'm just reading what that paper says. It essentially says you decapitate the rat, the head's been removed, and it's jerking and twitching for a minute. So obviously, it can't be conscious movement.

Q. Thank you, Doctor.

MS. SHARPE: Your Honor, I would move to strike any testimony on the van Rijn study by Dr. Antognini. That article is in evidence. We do not need Dr. Williams to simply read from it, and he did offer an undisclosed expert opinion with respect to what the rats were exhibiting. Dr. Antognini produced 200 articles, 200 files to us after his deposition. This article has never been an article on which he's relied.

THE COURT: What's your response?

MS. SIMPSON: Dr. Antognini simply read a paragraph in the article, Your Honor. He did not render an expert opinion. He simply read a paragraph in the article.

THE COURT: The objection is overruled. I'm going to

permit the testimony. Go ahead.

MS. SIMPSON: Thank you, Your Honor.

Q. Doctor, what is decorticate movement?

A. That is a movement where you have what's called decortication, which means that the -- basically, the cortex of the brain has been rendered nonfunctional, and that can --

Q. Help me out here. What's the cortex?

A. I'm sorry. Yes. The cortex is the outer layer of the brain, basically. That's where all the action occurs in terms of processing of information and sensory stimuli and so forth. So in a decortication, what that means is that the cortex has been rendered nonfunctional, either from trauma or from some type of injury like hypoxic injury or some type of drug injury of some sort, things like that.

Q. We heard a brief discussion yesterday of something called the Lazarus response. Are you familiar with that?

MS. SHARPE: Objection, Your Honor.

THE COURT: What's your objection?

MS. SHARPE: Dr. Antognini has offered no opinions on a Lazarus response. It is an undisclosed expert opinion on which he should not be allowed to testify at this time.

MS. SIMPSON: It's going to a description of different kinds of unconscious movement, Your Honor, but I can move on.

THE COURT: All right. I want to go back. Dr. Antognini -- Sustained.

I want to go back to Dr. Antognini's discussion of the article. At one point during his testimony he said, I'm not offering an opinion, but then ultimately offered an opinion about the movement being unconscious. I'm going to strike that last opinion.

MS. SIMPSON: Yes, Your Honor. Thank you.

Q. Doctor, based on your training and experience, can brain dead humans exhibit movement?

A. Yes.

Q. Have you ever observed this?

A. I don't think I have personally observed this, as I recall. I don't think I've personally observed it.

Q. How do you know that to be an accurate statement, then, that brain dead humans can exhibit movement?

A. Just review of papers that I've seen relative to the research that I did.

Q. Can unconscious people ever produce noise?

A. Well, they certainly can in terms of their breathing, and sometimes the breathing can be very irregular or obstructed, so they can definitely make noise.

Q. Doctor, are you familiar with something called agonal breathing?

A. I am.

Q. What is agonal breathing?

A. It is basically a breathing pattern that occurs at the very

end of life. It essentially represents periods where you might have periods of what is called apnea, A-P-N-E-A, which basically means you're not breathing, and then you can have some breathing patterns occur or breaths being taken, and they can be irregular. And then you can have periods where, again, you're not breathing, and then you can have some of these breaths occurring, and some of them can be big. Often they're not big. They're small. Could be gasping.

Q. Doctor, Dr. Bastarache opined about inmate consciousness based upon media reports, lay witness reports. Do you recall that testimony?

A. Yes.

Q. Would you do likewise?

A. I am a little bit wary of taking media reports, because I'm not sure that they are accurately describing what's occurring. I'm not doubting that they might be seeing something, but some of the words that I have seen used to describe some of these movements or whatever is occurring seem a little bit pejorative, I guess. So I have to be very careful about what I read in the media related to these executions in terms of forming my opinion.

Q. Doctor, what is pulmonary edema?

A. Pulmonary edema is the collection of fluid and to some extent blood in the lungs. So normally the lungs are very sort of airy and spongy like. And if you get fluid in there, they

can get very boggy and heavy, and that's a result, as I said, of fluid building up. There can be a variety of causes of that.
Q. Based upon your training and experience, does the presence of pulmonary edema always indicate pain?
A. No.
Q. Why is that?
A. Well, pulmonary edema, obviously, in an awake person can cause shortness of breath, air hunger and things like that. But often people who have pulmonary edema can be unconscious, and so they are not going to be experiencing that sensation.
Q. Doctor, what is dyspnea?
A. That is a medical term just describing having uncomfortable breathing, essentially; that you just don't feel like your breathing is comfortable. You're having problems with breathing.
Q. Is it a common or an uncommon phenomenon in your experience?
A. I don't see a lot of patients or in the past in terms of coming to the operating room. Most of the patients are pretty healthy. As I said yesterday, a lot of patients are sick. But certainly I have seen patients that have had dyspnea.
Q. And in what context have you seen patients with dyspnea?
A. Well, it could be somebody who is actually, as I said, very sick coming to the operating room, and they're having problems breathing, so they're feeling very short of breath. I've certainly seen that a lot in the intensive care unit. We as

anesthesiologists -- and this is, I think, true at most hospitals, maybe not all -- when a patient in the hospital, maybe in the intensive care unit or in the ward or whatever, they need to be -- have their airway managed, and often that means having to place an endotracheal tube, we have to go evaluate them. Many times we'll just say, yeah, this patient needs to be intubated. Sometimes we'll have a discussion with the physician about whether this patient needs to be intubated or not, and sometimes we'll demur and say we don't think that this patient needs to be intubated. Of course, many of these patients are dyspneic, and we are evaluating them and helping to care for them. So I have experience in that area.

Q. If you have a patient who is dyspneic, is that a condition that you can treat without a pulmonologist present?

A. Yes.

Q. Doctor, based upon your training and experience and what you know of ADOC's hypoxia protocol, would you expect an inmate being executed via nitrogen hypoxia to experience dyspnea?

A. In general, no. There's always a small possibility that somebody could experience some shortness of breath with it. Mild I would think. But in general, I would not expect it to be a common occurrence.

Q. Would you expect an inmate under those circumstances to experience pain from dyspnea?

A. No, I don't think they would experience pain.

Q. Were you here for Dr. Schwartzstein's testimony -- excuse me -- Dr. Antognini?
A. Yes, I was.
Q. Did you hear him testify that dyspnea is an extreme pain because the person fears dying?
A. I did hear that, yes.
Q. How do you respond, given the execution setting?
A. Well, I don't deny that there are patients who are severely short of breath. Again, these are awake patients. And they do have high anxiety because of the breathing issue. But I don't think that's going to occur, as I said, in the execution setting.
I'm sorry. I may have gone off a little bit, so if you could repeat your question. I want to make sure I answer it to its fullness.
Q. Given the fact that these are inmates about to be executed, and Dr. Schwartzstein's testimony that dyspnea can be so severe because the person fears that he is dying while he is suffering from dyspnea, how do you respond given that this is an execution setting?
A. Right. So it's an execution setting. I imagine no matter what the setting, somebody's going to be very anxious. So it's going to occur no matter what, in my opinion, I would think.
Q. Doctor, over the last two days, we have heard testimony about unconscious pain. Can you experience pain if you're

unconscious?

MS. SHARPE: Objection, Your Honor.

THE COURT: What's the basis of the objection?

MS. SHARPE: Dr. Antognini has not disclosed an opinion on the question of whether an inmate can suffer -- or a person can suffer pain during unconsciousness. This was an opinion that was fully disclosed in Dr. Schwartzstein's expert report. Dr. Antognini served rebuttal to that report. He did not disclose an opinion with respect to pain during unconsciousness.

THE COURT: What's your response?

MS. SIMPSON: Dr. Antognini is a trained physician. He has produced his list of references; his publications. He is qualified to talk about pain. It's certainly something that he deals with in the operating room and in the PACU setting as an anesthesiologist. He has general familiarity with pain. This is also rebuttal testimony as to what has been given by their experts over the last two days.

MS. SHARPE: Your Honor, whether or not he's qualified, he has not disclosed this opinion previously, and he should not be allowed to testify to it now. He did not offer it in rebuttal to Dr. Schwartzstein's expert report when he had that opportunity.

THE COURT: He didn't.

MS. SIMPSON: Very well, Your Honor. I'll move on.

Q. Doctor, are you familiar with the use of nitrogen or other

inert gases in suicide or accidental death?
A. Yes.
Q. How are you familiar with them?
A. As part of my -- certainly even before I began doing expert witness work in this setting, I was aware of inert gas deaths just as part of the training that medical students and residents and so forth get. So we're all aware of the tragic circumstances of some industrial accidents, so to speak. But I certainly also am familiar with the suicides that have occurred with inert gases and how that has become more common, I guess, for people to do.
Q. And generally what sort of sources do we have for information on this topic?
A. Well, we have reports in the literature of people who have committed suicide using inert gases, and we have the reports in the industrial hygiene area, which is what we call that, just basically workplace accidents.
Q. How does -- based upon your research, how does an inert gas suicide work generally?
A. Well, there is a method or way in which the person either wears a mask, or they can put a bag over their head and secure it tightly and use a tube that goes into the mask or into the bag. Then they will turn on the inert gas. Sometimes they will actually fill the bag with the gas first before they put it over their head, and presumably, they hold their breath while they're

securing it. That's the general mechanism.
Q. Doctor, in your expert report in paragraph 30, you mentioned a Dr. Philip Nitschke. Do you recall that?
A. Yes.
Q. Who is he?
A. He is a physician. I believe he originally trained in Australia, and then he became a proponent of basically, I think, a peaceful death as he terms it. But just helping people commit suicide. He has authored some materials to help people through that process. Currently he advocates for the use of nitrogen hypoxia or -- I'm not sure that's the term that he uses, but to use nitrogen for someone to have -- to commit suicide.
Q. Have you ever met him?
A. I have, yes.
Q. Under what circumstances?
A. The first case in this state for the nitrogen hypoxia was with Kenny Smith, and he was an expert witness on behalf of Mr. Smith.
Q. Are you familiar with a publication called The Peaceful Pill Handbook?
A. Yes, I am.
Q. Are you familiar with something called the Sarco euthanasia capsule?
A. Yes.
Q. I'd like to go over some of your sources with you now. If

you would please turn to defendant 17. It's tab 17 in your binder.
A. I don't know if I have a binder here. I have a binder, but I'm not sure if it's the one I'm supposed to have.
Q. I beg your pardon. I have a binder for you.
MS. SIMPSON: May I approach, Your Honor?
THE COURT: You may.
MS. SIMPSON: The Court should have a binder.
THE COURT: I do.
MS. SIMPSON: And from this point, Your Honor, the exhibits have been preadmitted.
THE COURT: All right. Go ahead.
MS. SIMPSON: Thank you.
Q. Doctor, do you recognize this document?
A. Yes. This is -- I do.
Q. What is this document?
A. This is a chapter out of an anesthesia equipment textbook, basically, relating to breathing systems.
Q. And did this chapter inform your expert opinion in this case?
A. Yes, it did.
Q. How so?
A. Well, I wanted to be able to sort of document what type of system this mask is that's used in the nitrogen hypoxia protocol. It is not specifically mentioned in this chapter, but

the type of system it is, essentially, the way it works, is very similar to some of the systems that are described in this chapter. And I wanted to be able to show that the buildup of carbon dioxide in the mask, the nitrogen hypoxia mask, would not occur.

But also I just -- it's important to understand that, again, these are masks that are used in industrial settings, so you wouldn't want to have carbon dioxide building up in that mask while people are working, so it has to be designed in a way to prevent that.

Q. Thank you. If you would please turn to Defendants' 18.

A. Yes.

Q. And I believe this one has been mentioned before, but, Doctor, what is this article?

A. This is a paper that was published by Luft and others, and it describes the latency of hypoxia at different altitudes or simulated altitudes to find out what happens to people when they get exposed to these very high altitude-like conditions and what happens to their consciousness and other behaviors.

Q. Is this the pilot study we heard about earlier this week?

A. Yes, it is.

Q. Okay. If you would please turn with me to page 122.

A. Yes.

Q. What did the authors conclude about hypoxia high altitude and rapid decompression?

A. Basically, that there can be rapid -- there can be rapid loss of consciousness if they're exposed to this very low concentration -- or I should say low partial pressure of oxygen.

And if I just may clarify because sometimes we will say concentration, and sometimes it's partial pressure. The concentration of oxygen in the air right now is 21 percent, but if you go up very high, it's still 21 percent, it's just that the overall amount of air up there is so low, that that 21 percent represents a very low partial pressure of oxygen. So hopefully, if I use those terms interchangeably, I'm clear about why I'm using them.

Q. Did the authors' conclusions about rapid decompression at altitude affect your opinion in this case?

A. Yes, it did.

Q. How so?

A. Well, they showed that the decompression, the loss of oxygen, partial pressure, resulted in loss of consciousness after about -- in this case probably in the order of five, six, seven seconds. And then once they got to that point, then people would start to lose consciousness.

Q. You heard Dr. Schwartzstein's testimony, and he criticized your reliance on this study because it was small and involved relatively healthy young pilots. Do you recall that?

A. Yes, I do.

Q. What is your response, if any?

A. Well, the studies like this, of course, you have to be very careful in terms of exposing people to what obviously is a very dangerous situation. You're taking people down to the point where they lose consciousness. So you're not going to have a large number of subjects in any of these studies because it's just not going to be safe to do that. And because the response is pretty consistent, probably it's not important to study a lot of subjects.

And so in science we talk about the variability. And if there is a lot of variability, then you do need larger numbers of subjects. But when the response is very consistent, you don't need a large number of subjects, especially, as I say, in a dangerous condition like this.

Q. Would you consider exposing volunteers to execution conditions with nitrogen in Alabama's system to be dangerous?

A. Volunteers?

Q. Yes.

A. Yes. That would be very dangerous.

Q. Let's go to Defendants' 19, please. Doctor, do you recognize this document here?

A. Yes, I do.

Q. What is this article?

A. This is a paper published by Ernsting, who did a lot of work in this area, along the same lines of trying to understand how hypoxia affects cerebral function. And he exposed some subjects

to very low oxygen levels or partial pressures to see what happens to them in terms of their functioning, and he found that the exposure to nitrogen very quickly, on the order of around I think it was 15 to 20 seconds, produced loss of consciousness.
Q. And do you recall how many participants were in this study offhand?
A. I believe it was three. I'm not sure, but I think it was around three. That's my recollection.
Q. That's a fairly small number for a study; correct?
A. Yes, it is. But again, like I said, these are dangerous conditions.
Q. And if you look on page 295 of the study, do you see the results section here?
A. I do.
Q. And what did Ernsting observe in terms of loss of consciousness from his participants?
A. So he observed that at around 15 -- let me just go to the bottom of that paragraph. The onset of symptoms was around 12 to 14 seconds. But in the middle of the paragraph, he writes that in the experiments with nitrogen at around 15 to 16 seconds, there was general clouding of consciousness and impairment of vision. And then I believe elsewhere he writes about some of these subjects actually -- or they did lose consciousness and then also had convulsions, as I recall.
Q. Doctor, how, if at all, does this study, in your opinion,

translate into the nitrogen hypoxia context?
A. Well, again, it shows that the rapid uptake of nitrogen or more nitrogen and the displacement or loss of oxygen in the air will cause a rapid onset of unconsciousness.
Q. And knowing that the study only had three participants, does that in any way concern you in terms of relying upon it?
A. No, it does not.
Q. Why not?
A. Well, again, these are consistent findings, and it's not just one single study that has found this. It's been other studies. Again, small numbers of subjects, but other studies have very similar findings. So it would be unethical, certainly, in current times, I think, to expose people to conditions that would cause them to become unconscious.
Q. Doctor, would you please turn to Defendants' 20.
A. Yes.
Q. All right. What is this document?
A. This is a white paper, basically, that describes the hazards of oxygen deficiency from a variety of different causes. It's been published by the Fermilab.
Q. Let me stop you there one second, Doctor. What is a white paper?
A. Well, generally speaking, it's going to be a document that's been produced by a group of experts in an area to describe a particular -- usually a technical topic. Basically a review of

the literature and the context and so forth, and then recommendations in terms of what should be done in that -- for that particular problem or whatever they're looking at.
Q. Did you review this document in connection with your expert report?
A. Yes, I did.
Q. And I guess more specifically, how did this document, this white paper, inform your opinion?
A. Well, essentially, the conclusion here, the overall conclusion, is that humans exposed to an oxygen deficient environment can lose consciousness very quickly. And they reviewed other work -- they put together sort of a way of approaching this in terms of understanding it that is that as the oxygen concentration is decreasing, you get increasing amounts of symptoms and different symptoms until you -- if you are breathing basically 100 percent nitrogen or whatever inert gas you're talking about, you could lose consciousness very quickly.
Q. Doctor, I would like to direct your attention to page 22, table one. It's also there on your screen if you would prefer that.
A. Yes, I see that.
Q. What is this table showing?
A. This shows the thresholds in terms of what type of symptoms you would expect to find in healthy individuals at sea level in

terms of the volume percent or the concentration of oxygen.
So you see at 17 percent, you might see reduced night vision, accelerated heartbeat, and then dizziness at 16 percent and so forth, until you can have loss of consciousness and inability to move, spasmodic breathing, convulsive movements, and then finally death in five to eight minutes.
Q. Is this the only place that you've seen these sort of numbers, data?
A. No, it is not.
Q. Where else have you seen it?
A. I've seen that in textbooks. Other papers have had similar types of tables. So it's a well accepted idea, I guess. I'm not sure that's the best word, but I know I've been labeled as being sort of an outlier in this, but this -- the effects of low oxygen and the danger of low oxygen have been described for decades if not more. And it's just very clear that these things can occur. So there are a lot of people out there, like these authors and many others, who say that it is very dangerous to be in an oxygen low -- or oxygen deprived environment.
Q. I would like to direct your attention specifically to that last entry there where, At 6 percent oxygen. Do you see that?
A. Yes.
Q. What happens at 6 percent oxygen? What are the effects?
A. As listed here, you can have spasmatic breathing and convulsive movements and then eventually death.

Q. Again, do you recall how low Louisiana's mask test got?
A. .8 percent
Q. Thank you. And let's go on to pages 25 and 26, please.
A. Okay.
Q. All right. So looking here at 25, and then 26 is the figure on the next page. Do you see that?
A. Yes, I do.
Q. Okay. What is this figure showing?
A. On the X axis on the bottom, you have the concentration of oxygen. So normally, of course, at the far right, it's at about 21 percent or so. At the far left, it's zero percent oxygen. The time on the Y axis, you have the time to unconsciousness. And that's in a sort of a logrhymithic scale. By that I mean if you look at the numbers at the top, we're talking about hours of time, whereas if you look at the numbers on the bottom, we're talking about seconds of time.
Q. So to be clear, are those equal intervals on that left-hand axis?
A. No, they're not.
Q. Thank you.
A. And the authors here have accumulated data from various sources to show the time to unconsciousness if you are exposed to a certain concentration of oxygen. So, for example, if you look at the very top there, there's a triangle there, a black triangle. And they are having that on that sort of hyperbolic

curve that you see there.

What that means, at 10 percent oxygen, if you look at the bottom, approximately, it would take over two hours -- probably three, three hours or so, if not more, to lose consciousness. So it takes a long time if you're at 10 percent.

But as you decrease the oxygen, and you get down into the level of, say, around 7 percent, if you look at the 7 percent there, which is two over from the five, and you draw a line straight up, it looks like it takes about 45 seconds for unconsciousness to occur. So that one there that you see right above the 30, that's one minute. So at about 7 percent, you can maintain consciousness for about 45 seconds. Then if you go below 5 percent or at 5 percent, consciousness can only be maintained for about 20 seconds.

Q. Thank you, Doctor.

Let's go to Defendants' 21. And what is this document?

A. This is a paper that was published by Hudnall and others, looking at a review of some incidents of deaths occurring from airline respirators, I think mostly in industrial settings.

Q. And to be clear, was this original research from these individuals, or was it more of a review of the literature?

A. It was a review of the reports from OSHA.

So I would call this a research paper in the sense that they looked at these reports, and they categorized these reports. They have a methods section, for example, and they describe the

results -- I'm sorry -- the cases that occurred and then come to some conclusions. So these are not -- these authors, obviously, did not go out and observe these deaths, but these reports had occurred, and they accumulated these reports and then described what had happened to these individuals.

Q. And did this study inform your opinion in this case?

A. Yes, it did.

Q. How so?

A. Well, again, these are cases where individuals were working with the type of respiratory mask that is used in this protocol, and there were usually, unfortunately, times when the -- either the individual plugged their airline into a nitrogen line, or there was a mix up somehow and the nitrogen tank was attached to the airline. So when they plugged their hose basically into the air line, it was actually nitrogen coming out and not air. So they had the mask on, they got nitrogen, and they died very quickly.

Q. I would like to direct your attention to the bottom of that first page there, please, that very last paragraph. Do you see that, Doctor?

A. Yes, I do.

Q. What did Hudnall, et al., have to say about what drives breathlessness primarily?

A. So this is going to be primarily the carbon dioxide level in the blood rather than the level of oxygen, at least certainly --

I don't dispute that we can have -- during -- a large range of oxygen as we decrease oxygen. We may not be able to sense that, but certainly when you get to very low concentrations of oxygen, people will start breathing faster. They may or may not have any shortness of breath with that, but they certainly can sense that they are breathing faster. But these authors are essentially saying that the sensation of breathlessness is primarily from the buildup of carbon dioxide when it occurs and not from oxygen deprivation.

Q. And based on your training and experience, do you agree or disagree?

A. I agree with that. Again, I'm not disputing that some people can have a sense of breathlessness if they have a low oxygen level, but the -- sort of the window of where that can occur is very close to when they would lose consciousness, especially in this setting. So that certainly could occur.

Q. And by this setting, do you mean an industrial accident or execution?

A. In an execution. Well, I guess in either one, I suppose, but in an execution the time between when they could start developing symptoms from hypoxia in terms of their breath sensation, it's going to very rapidly go into unconsciousness, and they're not going to be able to sense that.

Q. Doctor, let's turn to Defendants' 22, please. Do you recognize this?

A. Yes.
Q. Thank you. Do you recognize this article?
A. I do, yes.
Q. And can you explain this article.
A. This was a case report of a suicide by inhalation of nitrogen gas.
Q. Did this article inform your opinion in this case?
A. Yes, it did.
Q. And how so?
A. Well, this was an unfortunate individual who committed suicide by the use of nitrogen tank. You can actually see on the second page, there's a figure there or two figures. So that's the individual that has died. And he used a -- basically a milk carton container or -- for milk cartons, and he covered it with plastic, and then he put his head in there. I guess he must have cut out a hole so he could put his head in there, and he covered that with plastic. Then he had the nitrogen tank turned on or had the nitrogen tank there, as you can see, and the tube is going into that apparatus. Then he turned that on, presumably, and he was found dead.
Q. Thank you, Doctor. Dealing with inert gas suicides, let's turn to Defendants' 23, please.
A. Yes.
Q. Do you recognize this article?
A. I do.

Q. What is this document?
A. This is a paper that was published looking at two suicides by helium inhalation. As it says in the title, a prefilled environment. This is an observation of that. Essentially, the individuals committed suicide using helium to do that. And the description of what occurred is in the paper.
Q. I would like to turn to page 157, which should be the second page there. And I guess just a question here. This paper -- who is this paper by, first of all?
A. The author is Russell Ogden.
Q. Was Mr. Ogden present for these suicides?
A. It looks like he was, based on the way he describes what occurred.
Q. Okay. Looking at pages 157 and 158, what do we know about the decedents in these suicides?
A. Well, these were individuals who had some medical issues and decided that they didn't want to continue to live, especially -- I think one of them was to the point where she was still functional -- I think they were both fairly functional, but the trajectory was not good, they thought, so they were going to commit suicide.
Q. So let's start with just case one on page 158 here. How did this decedent kill herself?
A. So she took -- she was able to buy helium. And then she had a bag, and that bag she was able to put around her head,

basically, and there was a way to tie it. Then she had a tube that went into the bag, and she was able to turn on the helium to displace the air. I don't recall -- I think she may have actually prefilled the bag, I'm not a hundred percent sure, I'd have to look, but basically that's essentially what she did.
Q. Okay. And looking here at the next page, page 159, does Mr. Ogden say how quickly she lost consciousness?
A. In about ten seconds. That's on the first paragraph, about in the middle he writes, unconsciousness occurred in 10 seconds.
Q. Does he give any description of the dying process?
A. He talks about there, you can see that the lips turned blue, and she rested back into a -- went backwards into a resting position, and her skin turned pale. And then the observations shown there, which was that there was loss of consciousness at ten seconds. As I say, after about three breaths, became accelerated, the heart rate accelerated as well with the drop of the oxygen saturation. That's the SPO2. At about two minutes, the breathing had stopped. Then there was gasping, terminal gasping or that agonal breathing that I discussed earlier that occurred. But this patient or this subject did not at any point have any extension or contraction of the arms or legs.
Q. And how about the second decedent? What do we know about how quickly she lost consciousness?
A. And that's going to be, I think, moving to the next page. You have a description of what happened there. That occurred in

about 12 seconds. That's the second paragraph where the individual started taking the first breath, and -- this is the individual that had the prefilled hood. Started taking her first breath. Once the hood was in place, there was loss of consciousness at about 12 seconds, then increased respirations, and then there were at around 40 seconds reflexes in the right arm and both legs. So obviously, there was movement as he describes there, a single slow contraction of the elbow of the right arm, and the extension reflex in the legs that lasted for about 15 to 20 seconds.

Q. Thank you, Doctor. And looking in that next paragraph where it says, at 1:44 -- do you see that sentence?

A. Yes.

Q. Could you just read that, just the first part of that sentence before the parentheses.

A. At 1:44 there was a loud gurgling expiratory breath, possibly due to carbon dioxide escaping.

Q. Would that have been agonal breathing?

A. Possibly, although he does note that this individual had some sparkling wine earlier, so it might just be that gas coming up. But the agonal breathing I think is going to be described more towards the end of that paragraph where you see -- or the middle to the end. You see very faint gasps occurring, then you see some muscle twitching, and then a hardly audible snort. Then faint oral gasping. That's at the very bottom of that

paragraph. And then further faint sinus snorts in the times that are given there.
Q. Doctor, how if at all does this study from Mr. Ogden inform your opinion about Alabama's nitrogen hypoxia protocol?
A. Well, again, the types of breathing patterns that have been described in the executions are very similar to what has been described in these two suicides.
Q. Let's move on to Defendants' 24, please. Do you recognize this document?
A. Yes, I do.
Q. Who are you authors?
A. This is Russell Ogden, again, and then William Hamilton, who was an anesthesiologist, a very famous anesthesiologist at UC San Francisco. And then Dr. Charles Whitcher, who was also a famous anesthesiologist that was at Stanford. Both Hamilton and Whitcher are now dead.
Q. Did you review this article in connection with your expert report?
A. Yes, I did.
Q. Did it inform your opinion?
A. Yes.
Q. And how so?
A. Well, along the similar lines of the first report, you see this is a report of four individuals who developed -- or I should say wanted to commit suicide, and they used in this case

helium to do that.
Q. Let me stop you right there one second, Doctor. Was Mr. Ogden able to view these suicides?
A. He did not. He was not present. He did this by videotape. It was a videotaped suicide, so he and Hamilton and Whitcher reviewed the videotapes.
Q. Go on to page 177 here, page 2 -- I'm sorry -- all right. Doctor, I'd like to direct your attention to table three on page 177. Do you see that?
A. Yes, I do.
Q. What is table three showing?
A. This is the summary of findings that relate to what happened during these suicides. So there are four individuals there. You can see what is listed there in terms of the estimated time to loss of consciousness, intermittent, gross extremity movements, time to cessation of breathing, and then terminal gasps or breaths. And that's given by the time in number.
So just to walk through what they're describing here, in case one, the estimated time to loss of consciousness was 36 seconds. There was intermittent, gross extremity movements that occurred at one minute and then finished at two minutes.
Q. And what is gross extremity movement?
A. Well, it basically describes movements that are not slight. We use that term in terms of the movements that we see in an experiment, if we're testing for anesthetics, this very -- we

talk about gross purposeful movements. So these are not slight movements. They're actually movements that are very obvious to see. And of course, they're of the extremities, so it's going to be of the arms or the legs.

Then they list the time to cessation of breathing, which is around three minutes, but there are terminal gasps and breaths that start at three minutes and five seconds and end at six minutes and 30 seconds, and there were a total of eight of those types of breaths.

And so you can just continue to take a look or go down that table that describes what happened with each of the individuals. Now, subject to -- or case number four was somebody who had a mask that wasn't fitting properly, and that person took quite a long time to die. They became unconscious pretty quickly, but it took them quite a while to die, probably because of the poor fitting mask.

Q. To be clear, do you know anything about the masks used in these suicides?

A. Yes. They're described or shown, basically, in the previous page. Figure one, you can see that mask. That's sort of a typical hospital mask that we might use. It's not tight fitting at all.

Q. And do you know anything about whether these individuals who committed suicide had help fitting their masks?

A. I don't think they -- I would have to review this. I don't

think that they did. I think they had to do it themselves.
Q. So let's turn to page 178, please. Look here under the conclusions section. What did the authors determine about when these individuals lost consciousness?
A. Well, they, again, say that the loss of consciousness occurred very quickly. They put it at basically between 36 to 55 seconds. And that difference between what has been described from the Clayton and Clayton reference probably has to do with the fact that they didn't have a tight fitting mask. So it may not be exactly the same as what has been described in Clayton and Clayton.
Q. Did the authors document any attempts at self-rescue from the four suicides?
A. No, they did not.
Q. Did they document anything that you would consider, based on your training and experience, to be symptomatic of pain?
A. No. No. No, I don't see that here.
Q. There have been some references from media reports and discussed yesterday about synchronous leg lifting among people executed by Alabama's protocol. Do you recall that?
A. Yes, I do.
Q. Have you ever observed synchronous leg lifting in an unconscious person?
A. I don't think that -- I've seen movements, of course, of extremities, but I'm not sure I've seen the synchronous movement

of the legs in an unconscious person.
Q. Would you consider, based on your training and experience, synchronous leg lifting to be a sign of pain?
A. No, not necessarily.
Q. Why not?
A. Because patients who are in pain, they squirm. I guess that's not a medical term, but you can think about somebody just -- they're fidgety and they're moving around, except, of course, if it's -- you know, they're not going to be moving their -- whatever is causing their pain. If it's their left arm that's broken, they may not be moving their left arm, but they will fidget and move around. That's the type of movement that you would see basically.
Q. Okay. Doctor, let's go on to Defendants' 25. Do you recognize this document?
A. Yes, I do.
Q. And did this document influence your opinion in this case?
A. Yes.
Q. How so?
A. Well, this is another study looking at the effects of acute hypoxia. This is a simulated -- as it says, simulated high-altitude air drop scenario. And these are individuals that were exposed to decompression to simulate what would happen if you were in an airplane and, all the sudden, the pressure was lost in the airplane. They were looking at what happens to

people's cognitive function, among other things.
Q. And what did they find?
A. They found that there was a fairly rapid drop in the oxygen, and that the -- in some cases the -- I think at least one individual lost consciousness. I believe that's going to be in the results section on page 1445. About one-third down the paragraph, subject two lost consciousness after exposure to the oxygen environment.
Q. Subject two recovered; right?
A. Yes.
Q. Let's move on now to Defendants' 26. And, again, what is this document?
A. This describes the breathlessness that can occur during exercise, basically, on a bicycle, more or less, a stationary bicycle.
Q. How, if at all, did this inform your opinion?
A. Well, this is a study I cited, because I wanted to make sure that there was a good understanding around breathlessness and people that are having to undergo some type of exercise or something to cause them to have to breathe faster. And they, among other things, did testing essentially or asking the subjects how much shortness of breath did they have. And you can see that in people who are on a bicycle, and they're really pushing themselves, you know, they can get short of breath.
But the point I'm trying to make with this is that even if

you do have shortness of breath resulting from nitrogen hypoxia, it's not going to be any different, really, than what you would expect to have on an exercise bike.
Q. And by shortness of breath, are you talking about dyspnea?
A. Yes.
Q. Doctor, I would like to go now to -- this is Defendants' 42. This is, obviously, a very long document. I have given an excerpt of this document to counsel for their reference here, but I will -- I'm not going through this entire document.
Did you review this document, Doctor?
A. Yes, I did.
Q. Did it inform your opinion?
A. Yes.
Q. I would like to go to page 27, please. You should have an excerpt in your binder. Do you see page 27?
A. Yes, I do.
Q. Okay. What did the guidelines -- first of all, what is this document?
A. This is the Guidelines for Euthanasia of Animals that has been produced by the American Veterinary Medical Association. This is the 2020 edition of that.
Q. To be clear, does this document say anything about ending human lives?
A. It does not.
Q. So looking at page 27 and 28, who do the guidelines say

about using nitrogen to euthanize animals just in general?
A. Well, in general they say that in some animals, you shouldn't be using it. In other animals, it seems to be okay. But generally speaking, it has to do with some animals have an aversive reaction, I guess, to low oxygen environments.
So as an example, there are some animals that are burrowing, you know, like gophers and things like that that go into the ground, and they have to be very careful about staying in an environment where the oxygen can get low. So they have developed that sensation, but that's not true for most mammals that are above ground.
Q. Looking there on that second paragraph down the page that begins, Rats are sensitive.
A. Yes.
Q. Can you use nitrogen to euthanize a rat?
A. Well, you could.
Q. Should you use nitrogen to --
A. I'm not seeing, according to what they're saying, that you really shouldn't do that.
Q. Looking down at the next paragraph, the one that begins, In contrast.
A. Yes.
Q. Can you ethically, I suppose, use nitrogen to euthanize turkeys or chickens?
A. Seems to be okay for turkeys and chickens. Yes.

Q. And if you go to the next page, looking at the first full paragraph there that says hypoxia produced. Do you see that, Doctor?
A. Yes, I do.
Q. All right. What's the effect of nitrogen, or I guess in this case argon, on swine?
A. It says that it appears nitrogen and argon appears to reduce but not eliminate the aversive response to pigs. Pigs seem like they can sense an exposure to something that is low in oxygen. So it's a little bit aversive to pigs.
Q. Finally, going down the next paragraph, the one that says mink. Do you see that?
A. Yes.
Q. How about mink? How do they react to nitrogen?
A. They also will be aversive; that is, that the low oxygen concentration causes a problem for them.
Q. So in other words, different species react differently to the presence of low oxygen?
A. That is correct. Yes.
Q. Should we draw any conclusions about the effect of nitrogen gas on humans from the veterinary medical guidelines?
A. No, I don't think so. The guidelines explicitly state that this should not be applied to anything other than what is described here, the animals that have been tested and they've reviewed.

Q. I'd like to move on now to Defendants' 43, please. Have you seen this document before, Doctor?
A. Yes, I have.
Q. And what is this generally?
A. This is a document that was produced by OSHA. And it has to do, as we've been discussing, with the incidence of people who have been injured or I should say died as a result of some type of industrial accident where they're wearing an airline respirator and then either plugged into -- well, plugged into the wrong gas source in one way or another.
Q. And when you say airline respirator, what is that?
A. That is basically the type of respirator that has been used for the Alabama protocol, but it's a respirator mask that is made to function in a way that you can work in an environment where there might be dust or abrasive material in the air, there might be paint, something like that, and you want to have a mask that is very tight fitting so that you don't breathe in whatever it is in the environment. So these are called here airline respirators, and, again, you have to have that high flow of the air into the mask so that the worker can breathe.
Q. Doctor, will you please go with me to page 2.
A. Yes.
Q. Does OSHA say how quickly unconsciousness can occur when plugging your airline respirator into the wrong line?
A. So on the left-hand side, the third paragraph down right

before the case history, you see that they describe that unconsciousness, if it's exposure to 0 percent oxygen atmosphere, can occur in about 12 seconds. And they reference the Hudnall paper that I talked about earlier.

So, again, there are multiple individuals over decades from different scientific -- or technical backgrounds who have described how dangerous it is when people hook up these masks into a nitrogen -- or an inert gas pipe, or they walk into an inert gas environment.

Q. Thank you, Doctor. And let's go now to Defendants' 44. So what are we looking at here?

MS. SHARPE: Objection, Your Honor.

THE COURT: What's the objection?

MS. SHARPE: Neither Defendants' Exhibit 44 nor Defendants' Exhibit 45 are in Dr. Antognini's reliance materials. They have not been disclosed by him previously as documents on which he is relying for his opinions, and he should not be permitted to testify about them now.

THE COURT: Is that correct?

MS. SIMPSON: I know he has discussed these in other cases. We can move on, Your Honor.

THE COURT: All right. You had indicated these were previously admitted.

MS. SIMPSON: They were previously admitted, yes, Your Honor, by agreement.

THE COURT: So they're admitted, but -- you don't have a problem with their admission, you just don't want him to testify; is that correct?

MS. SHARPE: Correct, Your Honor.

THE COURT: All right. Go ahead.

MS. SIMPSON: Thank you.

Q. Doctor, have you seen this article before? It's Plaintiff's 29.

A. Yes, I have.

Q. Did you consider it as any part of your opinion in this case or your rebuttal opinion in this case?

A. I have read the paper. Quite frankly, I am not sure it was one of the ones -- I would have to look at my report to see if I cited it. I don't recall. But I am very familiar with it. But it does not look like one that I cited in my original report. I might have cited it in my supplemental report, if I may just take a look at that.

Breath to Death. Yes, I did cite it. So I am familiar with it, and I did cite it in my rebuttal report, it looks like.

Q. All right. Thank you. Let's go to page 1311, which is that final page there. If you look at the conclusions section here, do you see the conclusion in the top left corner?

A. Yes, I do.

Q. Can you read that final sentence there, please. I'm sorry. The next to last sentence, the one beginning with ultimately.

A. "Ultimately, the use of nitrogen asphyxiation for execution or assisted suicide rests on a profound misrepresentation of human physiology."
Q. And would you continue with the next sentence.
A. "Far from being humane, painless, or peaceful, it provokes dyspnea, panic, suffering, and an unnecessarily violent death."
Q. Do you agree?
A. I do not agree with that.
Q. Why not?
A. Well, based on, as I said, the work that I've cited and my training and education and knowledge, I think that the use of nitrogen or some other inert gas in the setting of an execution or suicide would produce -- would not produce a painful death or some of these other, especially, for example, suffering. I think that especially the way that the execution protocol is set up and the system, it is such a rapid decline in the oxygen concentration, that any distress or suffering or whatever you might want to call it is going to be very, very brief if at all present because of the rapid onset of unconsciousness.
MS. SHARPE: Your Honor -- I withdraw. Pardon me.
THE COURT: All right. Go ahead.
Q. Doctor, I'm showing you Plaintiff's 72, an article by Moosavi, et al. Did you consider this in your supplemental report?
A. I don't think I did. I don't see it listed there.

Q. That's fine. We can move on.
So, Doctor, to be clear, could you ever participate in an execution in a medical capacity?
A. Could I -- I'm sorry. Repeat that.
Q. Could you ever participate in an execution in a medical capacity?
A. I would not do it. I mean, theoretically, I could, I guess, but I would never do that.
Q. Why not?
A. I just don't -- I don't want to participate in an execution to that extent, and I don't -- obviously, there are ethical guidelines around that, but I don't want to personally participate in an execution.
Q. So Mr. Lee has named firing squad as his alternative method of execution. Are you aware of that?
A. Yes.
Q. Are you familiar with how a firing squad execution is theoretically carried out?
A. I am.
Q. Have you ever witnessed one?
A. No.
Q. Based upon your training and experience, including your knowledge of human anatomy and physiology, do you believe that an execution by firing squad could or would be painful?
A. It could be, and I think to a high degree of probability, it

would be painful. Yes.
Q. Why do you say that?
A. Well, as I think I hopefully got across yesterday, I certainly have experience with patients who have had gunshot wounds, and they are painful. And when you look at the destructive capacity of these bullets, it's clear that the injuries that occur, the tissue that is damaged, is going to cause pain because of the transmission of the -- those impulses, basically, from that damaged tissue up into the brain before the inmate or the person dies -- I'm sorry -- loses consciousness.
Q. Doctor, did you consider any of the reports from the South Carolina botched firing squad execution in your report?
A. I did discuss the report that Arden had made.
Q. I would like to look at that just briefly. Did you read this report?
A. Yes, I did.
Q. Did you read and understand the damage to Mr. Mahdi that Dr. Arden described?
A. Yes, I did.
Q. Based upon your knowledge, experience, training as a physician, would you consider the damage described to have been painful?
A. Yes.
Q. Why?
A. Well, just based, again, on the fact that the tissue that

was damaged in this execution in the chest area, that's a significant amount of damage. And I would expect that to cause pain sensations to be transmitted or impulses to be transmitted up to the brain, and those would be perceived as painful.
Q. Looking at the bottom of page 2, are you there with me?
A. Yes, I am.
Q. Maceration of the left liver lobe. What does that mean?
A. So that is going to be where the -- the liver -- for those of you, for example, that may eat liver from time to time, and you get liver from the store where it's sliced, but you can see that it's -- the consistency of it, it's sort of a homogeneous -- it looks homogeneous, essentially, type of tissue. And maceration basically means a sort of term that would be used to -- it's ground up or broken apart in pieces. So instead of being homogeneous in this case, from the bullet or bullets the tissue has been disrupted. It's no longer homogeneous and has rough edges to it and has been mashed up, basically.
Q. Based upon, again, your training and experience, would you expect maceration of the liver to be a painful experience?
A. The liver -- it's not so much the liver itself, it's the tissues around it. I'm not sure actually that the liver has much in the way of innervation. But some of these tissues and organs -- the outside, basically, the covering of it, can have some pain fibers. Certainly people can have pain, for example,

if the gallbladder and the bile ducts are damaged. Obviously, people who have had gallstones, that can cause pain. So that damage to those bile ducts, which is in the liver itself, could cause pain.

Q. Based upon your knowledge, again, of human anatomy and physiology and of Alabama's hypoxia protocol, do you believe that firing squad will significantly reduce a risk of pain that hypoxia produces?

A. I do not think it would reduce the risk of pain because, as I said, I believe that the nitrogen hypoxia protocol doesn't really cause any pain. And because I believe and opine that the firing squad does cause pain, I would expect there to be more pain with firing squad than with nitrogen hypoxia.

Q. Doctor, I would like to turn briefly back to your supplemental declaration. That's Defendants' 2.

A. Okay. Yes.

Q. I'm sorry. Wrong page. I'm sorry. Page 7.

A. Yes.

Q. All right. What is your opinion as to Dr. Schwartzstein's findings concerning dyspnea in this setting?

A. Well, first off, what he wrote and opined relates to an experience with patients, hospitalized patients, and he cites those. But these were patients that were in the hospital for a long time. The average was 2.6 days and the minimum was one day and the maximum was 12 days. So I think it's not appropriate to

apply the experience of people who have dyspnea for days to a setting where we're talking about, in my opinion, essentially seconds that somebody might experience something with nitrogen hypoxia. So I just don't think -- it really is an apples-to-oranges comparison, in my opinion.

Q. Doctor, as an anesthesiologist, are you familiar with different states of human consciousness?

A. Absolutely. Yes.

Q. Would you say consciousness is a continuum or like a black and white state?

A. It's a continuum.

Q. Are you familiar, again, as an anesthesiologist, as to whether people can feel pain at various points along that continuum?

A. I am familiar with that, yes. That's something that we have to be aware of, absolutely, and certainly part of what I've done in my research. Yes.

Q. Is it important as an anesthesiologist to know when your patients are in pain?

A. Yes.

Q. Is that something you try to make note of in the PACU or anywhere else?

A. Yes.

Q. Doctor, have you reviewed the complaint Mr. Lee filed in this litigation?

A. I did, yes.
Q. Have you reviewed his amended complaint?
A. I think so. I'm not sure, actually. I'm not sure.
Q. Have you ever met Mr. Lee?
A. No, not until this hearing.
Q. Have you review any of his medical records?
A. I did.
Q. And what medical records are those?
A. They were provided to me by your office, and I don't -- there was a lot of medical records there.
Q. But did you review all of them?
A. I did.
Q. So based upon everything you have reviewed, your training, your experience, and your knowledge of Mr. Lee's individualized medical records, what is your opinion as to what, if any, pain and discomfort Mr. Lee is likely to experience during a hypoxia execution?
A. It is my opinion to a medical certainty, reasonable degree of medical certainty and scientific certainty, that he would not experience significant pain or suffering. I believe he actually will not experience any pain or suffering would be minimal.
Q. Did you see anything in his individualized reports that would give you concern, greater concern that he would experience pain?
A. No.

Q. Thank you, Your Honor. No further questions at this time.

THE COURT: All right. It is 11:48. Let's take a break until 12 o'clock, and then we'll resume with cross-examination.

(Recess was taken at 11:49 a.m. until 12:03 p.m., at which time the proceedings reconvened, as follows:)

THE COURT: Cross-examination. And just a reminder, we will need to take a hard break at 1:30. You can take a lunch. I will conduct a sentencing, and then we will return back.

MS. SHARPE: Yes, Your Honor. Thank you.

I have binders for both the Court and the witness. May I approach?

THE COURT: Go ahead.

CROSS-EXAMINATION

BY MS. SHARPE:

Q. Good afternoon, Dr. Antognini.

A. Good afternoon.

Q. We've met before; correct? I took your deposition a few weeks ago?

A. Yes, we did.

Q. And you recall that during your deposition, I showed you a number of articles from the medical literature to see if you agreed with their description of dyspnea and air hunger?

A. I do recall that, yes.

Q. And we, in fact, were able to agree on a number of those

descriptions; correct?
A. As I recall, yes.
Q. So I just want to walk through some of those descriptions now to confirm the points on which we agree.
You agree with me that dyspnea causes suffering?
A. It can, yes.
Q. You agree with me that generally speaking, dyspnea is a particularly traumatic experience in contrast with pain, which has been a major source of concern in the ICU?
A. There certainly are people that believe that, yes. Dyspnea can be distressing to people, similar to pain. Yes.
Q. And just so I heard you correctly, you agree with that?
A. Yes.
Q. You agree with me that dyspnea can be far worse than pain in that it is consistently associated with the fear of dying?
A. I can agree -- I agree to that to a certain extent, yes, that if someone's really dyspneic, they can have that sensation. Yes.
Q. And you agree with me that dyspnea can range from moderate in nature to severe?
A. Yes.
Q. You agree with me that air hunger is the most severe form of dyspnea?
A. I'm not sure if that's -- I agree with that. It certainly can be a very -- it can be severe.

Q. Your testimony is that air hunger can be severe?
A. It can be, yes.
Q. And you agree with me that air hunger is the conscious perception of the need for more air and is typically described by subjects as, quote, not getting enough air?
A. Yes, I agree with that.
Q. You agree with me that air hunger can cause distress?
A. Yes.
Q. Air hunger can cause terror?
A. I suppose in some cases, yes.
Q. Air hunger can cause panic?
A. Yes.
Q. You agree with me that air hunger is one of the strongest and most unpleasant forms of dyspnea?
A. It can be, yes. I would agree in some cases, that could be true.
Q. You agree with me that in general, dyspnea ranks among the most distressing experiences that human beings can endure?
A. It certainly is going to be among them, yes. Absolutely.
Q. So putting this together, you agree with me that if an inmate is experiencing air hunger and dyspnea during an execution by nitrogen hypoxia, he is experiencing one of the most distressing experiences that a human being can endure?
A. I will just say that you have to qualify that with the amount of air hunger. We know that air hunger and dyspnea can

be rated, so just to have a little bit of air hunger doesn't mean it's the most distressing thing that you could experience. If it's severe, I suppose that's true, but not if it's mild, for example.
Q. Your testimony is that there can be mild air hunger?
A. Yes.
Q. One basis for your opinion that nitrogen hypoxia does not cause air hunger is that air hunger happens with hypercapnia but not hypoxia; correct?
A. Generally you'll see it more with hypercapnia, but it can occur with hypoxia at certain levels. If you maintain those low levels of oxygen that maintain consciousness, you certainly can have people with air hunger as Dr. Schwartzstein said earlier.
Q. And you've never conducted a study on hypoxia; is that correct?
A. I have not that I recall.
Q. You've never published a paper on inhalation of pure nitrogen gas?
A. No.
Q. You've never conducted a study on dyspnea or air hunger; correct?
A. No.
Q. You've never published on hypoxia; correct?
A. Well, my very first publication was hypoxia in an anesthetized patient. Just one single patient. So technically,

I have published, but that was in an anesthetized patient, not an awake patient.
Q. You've never published on dyspnea or air hunger; correct?
A. No.
Q. That's correct?
A. I'm sorry. I'm just chuckling a little bit because we had this problem with the deposition where, is that correct, and I say no. Yes, that is correct.
MS. SHARPE: Court's indulgence, Your Honor.
THE COURT: Sure.
Q. You've never published any peer-reviewed articles in pulmonary medicine; correct?
A. That is correct. Yes. I have not done that.
Q. You're familiar with the American Thoracic Society?
A. Yes.
Q. And you're familiar with the American Journal of Respiratory and Critical Care Medicine?
A. Yes.
Q. You agree that ATS is a well-respected organization?
A. Yes, I agree with that.
Q. And you agree that the American Journal of Respiratory and Critical Care Medicine is a leading peer-reviewed journal focusing on research in pulmonary, critical care, and sleep medicine?
A. Yes.

Q. You have never been asked to take part in a consensus statement by the American Thoracic Society; correct?
A. That is correct.
Q. You're familiar with the European Respiratory Society or the ERS?
A. Yes.
Q. And you've never written a position paper on dyspnea for a medical society; correct?
A. That is correct.
Q. You've never been on a writing committee like ERS with respect to dyspnea; correct?
A. Yes. That's correct.
Q. Never been on a writing committee like ERS with respect to hypoxia; correct?
A. Yes. That's correct.
Q. And you agree with me that there could be a period during which extreme hypoxia and air hunger could occur during a nitrogen hypoxia execution; correct?
A. Yes, there could be a few seconds where that might occur. Yes.
Q. In the execution setting, nitrogen hypoxia involves the forced inhalation of nitrogen?
A. Yes.
Q. In other words, the nitrogen displaces the oxygen that the person would otherwise be breathing?

A. Yes, that's correct.
Q. And you're familiar with the textbook Knight's Forensic Pathology by Pekka Saukko and Bernard Knight; correct?
A. Yes, I am.
Q. And you relied on that textbook in part for your opinions in this case?
A. Yes, I did.
Q. You rely in part on that book in your expert report; correct?
A. Yes.
Q. You consider Knight's Forensic Pathology to be an authoritative source; correct?
A. Yes, I do.
Q. You recall that Knight's Forensic Pathology provides a definition of terms that includes the term suffocation?
A. Yes, I do.
Q. And you recall that Knight's Forensic Pathology defines suffocation as, quote, a general term used to indicate death from deprivation of oxygen, either from a lack of the gas in a breathable environment or from obstruction of the external air passages.
A. Yes, I agree with that.
Q. And you agree with me that nitrogen hypoxia falls under this definition of suffocation in Knight's Forensic Pathology; correct?

A. Yes.
Q. Now, you've relied for your opinions on case reports of industrial accidents for your opinion that nitrogen hypoxia does not cause pain or distress; correct?
A. Yes.
Q. In your practice as an anesthesiologist, you've never relied on OSHA case reports for developing opinions or diagnosing patients; correct?
A. I don't recall if I've ever used that, so -- I might have at some point, but I don't recall that.
Q. Let me ask the question again. In your practice as an anesthesiologist, you never relied on OSHA case reports for developing opinions or diagnosing patients; correct?
A. I'm only thinking here because in the hospital we have pipelines for different medical gases, and we have problems, unfortunately, where those can get mixed up. I don't know whether, in sort of studying that, I had to rely on OSHA reports or not. So I think that would probably be -- that certainly isn't related to maybe diagnosing a patient. I mean, I guess it could be if you have -- we, unfortunately, had an incident at our hospital where there was a mix-up. Luckily, I think no one's died from that. But, again, I don't remember the details of that. So I just don't recall. It would not have been very often if I did rely on them.
Q. You recall that you gave your deposition on March 13th,

2026, under oath?
A. Yes.
MS. SHARPE: Your Honor, may I approach?
THE COURT: You may.
Q. Dr. Antognini, I would direct your attention to page 271 at lines four to eight. And the question at line four: In your practice as an anesthesiologist, did you ever rely on OSHA case reports for developing opinions or diagnosing patients? Answer: No, not that I can recall.
Do you see that?
A. Yes.
Q. Were you being truthful and accurate when you testified under oath on March 13th, 2026?
A. Yes, I was.
Q. In the case reports of industrial accidents that you cite, the victims did not know that they would be receiving a high concentration of nitrogen gas; correct?
A. Yes, that's correct.
Q. And you would agree that a person could have a different physiological reaction if they know that they will be receiving a high concentration of nitrogen gas; correct?
A. Yes, that would be correct. They're going to be anxious, of course, so, yes, that would be correct.
Q. In the case reports of industrial accidents on which you rely, there is no indication of whether the workers actually

experience distress or panic before dying; correct?
A. Partially correct. I would just qualify that I think -- and I can't recall, but I think some of those reports were ones where someone went into an oxygen-poor environment, collapsed, and then there was another worker who saw that, and there was no description of that collapsed worker yelling or screaming. I mean, I suppose it could have occurred, but there was no reported signs or symptoms of that person suffering or having pain. So I guess I would say that.
Q. Let me ask you the question one more time. In the case reports of industrial accidents on which you rely, there is no indication of whether the workers actually experienced distress or panic before dying; correct?
A. Yes, that's correct. I would say, no, there's no evidence there.
Q. In the work-related deaths, because they were unobserved, we don't know what exactly happened; correct?
A. That's correct.
Q. And because they were unobserved, there's no way you can tell at what point the workers become unconscious vis-a-vis their exposure to nitrogen; correct?
A. Yes, that's correct.
Q. You can't tell from the reports whether the workers struggled in any way; correct?
A. That is correct.

Q. You can't tell whether they tried to pull off their masks; correct?
A. That is correct, yes.
Q. These case reports don't report on whether the workers suffered in any way; correct?
A. Yes, that's correct.
Q. You also cite to a handful of case reports of suicide by helium gas for your opinion that nitrogen gas does not cause pain and suffering; correct?
A. Yes.
Q. And these case reports of suicide by helium gas are by a Russell Ogden?
A. He was the single author in one paper and then was a co-author on the other paper.
Q. And to your knowledge, Mr. Ogden does not have any clinical training in medicine; correct?
A. No, he does not, as far as I know.
Q. And you don't know whether subjects in the Ogden papers on which you rely were rebreathing carbon dioxide; correct?
A. I don't know that, but certainly the ones that had the bags over their heads, they're going to be rebreathing carbon dioxide for sure.
Q. And you agree that if they were rebreathing carbon dioxide, that could accelerate hypoxia; correct?
A. A little bit, by a few seconds, but I don't think more than

that.
Q. In some of the case reports of suicide, the individuals fully exhaled before placing a bag or mask over their heads; correct?
A. I'm sorry. Could you repeat that?
Q. In some of the case reports of suicide, the individuals fully exhaled before placing a bag or mask over their heads; correct?
A. Yes.
Q. Inmates executed by nitrogen hypoxia are not told to fully exhale before the mask is placed over their face; correct?
A. That is correct. As far as I know, that is correct.
Q. Inmates are not given any instructions in terms of inhaling or exhaling as far as you're aware; correct?
A. That is correct.
Q. And you would agree with me that suicides differ from executions because they are voluntary and not forced; correct?
A. Yes, that is correct.
Q. You understand that inmates who are executed by nitrogen hypoxia don't practice the execution beforehand; correct?
A. Yes, that's correct, as far as I know.
Q. You're familiar with the fact that individuals in some of these case reports of suicide have had severe underlying medical problems; correct?
A. Yes, that's correct.

Q. You would agree with me that individuals with severe underlying medical problems could have a different physiological response to hypoxia?
A. Yes, that's true. They could.
Q. And you've reviewed the medical records of Jeffery Lee, the plaintiff in this case?
A. Yes, I did.
Q. And based on your review of Mr. Lee's medical records, he does not have any severe medical problems; correct?
A. Based on my review, yes, he does not.
Q. You rely on aviation studies for your opinion that breathing gases with low oxygen will rapidly cause unconsciousness; correct?
A. Yes.
Q. These studies have small numbers of individuals?
A. That is correct.
Q. You're aware that these studies involve pilots with specific training in mitigating the effects of low partial pressures of inspired oxygen and any associated discomfort?
A. That is I think true to some extent. Most but not all of the papers, yes, they are -- not all of these papers -- I'm sorry. Not all the subjects are pilots. I believe, for example, in some of them, the authors are subjects as well. But most of them are going to be pilots, yes.
MS. SHARPE: Your Honor, I'm going to move to strike

that response, because I don't think the witness understood my question. If I may ask it again.

THE COURT: I'm not going to strike it, but I'll let you reask it.

MS. SHARPE: Thank you.

Q. In the studies involving pilots with specific -- I'm sorry. In the studies involving pilots, they have specific training in mitigating the effects of low partial pressures of inspired oxygen and any associated discomfort; correct?

A. Yes.

Q. These studies did not specifically measure degrees of dyspnea in any of the subjects; correct?

A. That is correct. Yes.

Q. And you agree with me that barometric pressure directly affects hypoxia?

A. Yes.

Q. Another way of saying that is oxygen saturation in the blood will decrease at higher altitude; correct?

A. Yes.

Q. And these pilot studies on which you were relying were examining hypoxia at high altitudes; correct?

A. Yes.

Q. And you're aware that the altitude level of Atmore, Alabama, where Holman Correctional Facility is located is not high altitude; correct?

A. That is correct.
Q. You testified on direct about a white paper written by a Miller and Mazur?
A. Yes, I did.
Q. And the title of the paper is Oxygen Deficiency Hazards Associated with Liquefied Gas Systems, Development of the Program of Controls; correct?
A. Yes.
Q. And if you look in your binder to pull that up, that's actually at Defendants' Exhibit 20.
A. Yes, I have it here.
Q. And this white paper is dated January 1983; correct?
A. Yes.
Q. This is a paper that studied the effects of liquefied gas; correct?
A. Yes.
Q. Nitrogen is not mentioned anywhere in the paper; correct?
A. I do not recall whether it is or not, but -- it may not be. I don't recall if it's mentioned or not.
Q. And if I represent to you that nitrogen is not mentioned anywhere in the paper, you would have no basis to dispute that; correct?
A. No. Unless I read it word for word, I have no basis to dispute that.
Q. And the Miller and Mazur white paper is not a clinical

study; correct?
A. That's correct.
Q. You have no idea what methodology the authors used to collect the data referenced in the paper; correct?
A. Well, I do know their methodology. They reviewed the work of others, primarily, and that's how they developed this white paper. So that's -- it's not a research study where actually they did the research themselves on subjects. They reviewed the work of others.
Q. Let me ask the question again, Doctor. You have no idea what methodology the authors used to collect the data referred to in the paper; correct?
A. Well, I just said methodology. They reviewed papers. That's my recollection of what they did here. So -- I mean, that's the method that they used. I'm not sure -- I mean, obviously, if you write a paper where you're looking at a white paper, you're looking at references, you have a method of looking at that. So it may not be a full research method where you're doing a research study, so -- I mean, it's not as if there's no methodology here at all.
MS. SHARPE: Court's indulgence.
(Brief pause in the proceedings.)
MS. SHARPE: Your Honor, may I approach?
THE COURT: You may.
A. And I apologize if this is not a good time to mention this,

but you asked the question about nitrogen. It is mentioned in the white paper. If I may correct my earlier statement.
Q. You can correct it on redirect if your counsel wants to ask you about it.
A. I'm sorry. Very good.
Q. Dr. Antognini, you gave testimony under oath in the case of Anthony Boyd on September 5th, 2025. Do you recall that?
A. Yes.
Q. And I apologize for the size of this print, but if I could direct you to the transcript of that testimony at page 162.
A. Yes. I'm there.
Q. And I am going to read from lines 24 to 25 of 162 down to line 1 of 163.
Question: Do you have any idea how they -- what methodology they were used to collect the data referred to in the report?
Answer: No, I don't.
Do you see that?
A. Yes.
Q. And were you being truthful and honest when you testified under oath in the Boyd hearing on September 5th, 2025?
A. Yes, I was.
Q. You don't know how reliable the work of Miller and Mazur was in their report; correct?
A. Well, again, I don't know what you -- that's sort of a squishy term to say reliable. Again, they reviewed the work of

others and references that they provide there. So it's not original research, but that's pretty common to review the work of others. So reliability is not an all-or-none phenomenon.

Q. Dr. Antognini, if I could refer you to, again, your testimony under oath in the Boyd hearing, page 163, lines two to four.

A. Uh-huh (positive response). Yes.

Q. Question: And you don't know how reliable their work was in that report?

Answer: Well, no, I don't. I didn't test it in that regard.

Were you being truthful and honest when you gave this testimony under oath in the Boyd hearing?

A. I was, but I'm sorry, if we could go back to the original question. There was a time difference between when I looked at that in the Boyd case and when you just asked me that question in terms of reviewing that paper. So I have a better understanding of what they did, at least at this time. So what I said then, I've looked at that paper again, so I have a more informed answer to your question as I sit here today.

Q. Are you more familiar as well with the qualifications of Miller and Mazur?

A. That I don't recall.

Q. I want to turn to the executions by nitrogen gas that the State of Alabama has conducted to date. And if you could pull

up Plaintiff's Exhibit 97.
A. Yes, I have it here.
Q. And this is a spreadsheet that contains the names of inmates executed by nitrogen hypoxia in Alabama?
A. Yes.
Q. This spreadsheet was sent to you with the names, and you put in the times that are reflected in here yourself; correct?
A. Yes, I think that's true. At the time of the deposition when we talked about this, and as I sit here today, I really don't recall if the spreadsheet was sent to me and I worked on it, or I developed the spreadsheet myself from what was sent to me. Those details I don't recall as I sit here.
Q. Regardless, to the best of your knowledge, the spreadsheet that is here is an accurate reflection of the times that are documented for the codes that are given in the nitrogen hypoxia executions?
A. Yes. To the best of my knowledge, yes.
Q. And the spreadsheet contains columns for the first code, and then there is a parenthetical for the start time; correct?
A. Yes.
Q. And your understanding is that the first code is when the direction is given for the nitrogen to start flowing?
A. Yes.
Q. And the second code is five minutes after the EKG has been flat?

A. Yes.
Q. And the second code is given for the nitrogen to stop; correct?
A. That's my understanding, yes.
Q. And then there's a column that says time between codes. Do you see that?
A. Yes.
Q. And the time between codes is the time between the first code being given for the nitrogen to start and the second code being for the nitrogen to stop; correct?
A. Yes.
Q. And you would agree with me that the time period of these executions, in particular the time period between these two codes, has varied in length; right?
A. Yes.
Q. The shortest time between the codes was 16 minutes for Alan Miller and Carey Grayson, and the longest was 32 minutes for Anthony Boyd; correct?
A. Yes.
Q. You cannot say with any reasonable degree of medical certainty that there is no variability in the time to loss of consciousness in executions by nitrogen hypoxia; correct?
A. Could you repeat that slowly?
Q. Certainly. You cannot say with any reasonable degree of medical certainty that there is no variability in the time to

loss of consciousness in executions by nitrogen hypoxia; correct?
A. That is correct. That is correct.
Q. Your opinion is that assuming no breath holding, it takes less than a minute after the nitrogen begins flowing for an inmate to lose consciousness?
A. Could you repeat that? Did you say if there's no breath holding?
Q. I can reask it.
A. Yes, please.
Q. Your opinion is that assuming no breath holding, it takes less than a minute after the nitrogen begins flowing for an inmate to lose consciousness?
A. That's not -- it's not less than a minute. It's about a minute, probably little bit more than a minute, based on my -- what I had written in my report where it's essentially around 30 to 35 seconds, filling the mask, and then another 35 to 40 seconds to the loss of consciousness. So that's a little bit more than a minute, but it's pretty close to it.
Q. You agree with me that the only execution to date for which you have opined that the inmate held his breath was that of Kenny Smith; correct?
A. That is the only one that I am aware of where that might have happened. Yes.
Q. You did not observe Mr. Smith's execution; correct?

A. I did not.
Q. You have no personal knowledge of whether Mr. Smith held his breath or not; correct?
A. That is correct.
Q. You have no personal knowledge of, if Mr. Smith did hold his breath, for how long he held it; correct?
A. That is correct.
Q. And you cannot tell the precise moment when any individual inmate became unconscious during execution by nitrogen hypoxia; correct?
A. That is correct.
Q. You can't say to a reasonable degree of medical certainty when any inmate's movements were no longer voluntary; correct?
A. That is correct.
Q. You can't say to a reasonable degree of medical certainty at what point any inmate's breathing became agonal?
A. That is correct.
Q. You can't tell us with a reasonable degree of medical certainty whether any individual inmate felt any pain during his execution?
A. That is correct.
Q. And there have been seven executions by nitrogen hypoxia to date in Alabama; correct?
A. That is correct. To my knowledge, that is correct.
Q. You have not attended any of them; correct?

A. I have not. That is correct.
Q. But you have attended an execution by lethal injection; correct?
A. That is correct.
Q. That was an execution in Oklahoma in 2022?
A. Yes.
Q. And you attended that execution as an expert witness on behalf of the State of Oklahoma?
A. Yes.
Q. And you relied on your firsthand observations of that execution in a subsequent lethal injection case; correct?
A. That is correct.
Q. You think that attending an execution by nitrogen hypoxia would be helpful to your opinions as to when an inmate loses consciousness; correct?
A. It would be helpful, yes, that is correct.
Q. And you believe that attending an execution by nitrogen hypoxia would be helpful to your opinions as to whether an inmate experiences any suffering during the execution; correct?
A. Yes, that's correct.
Q. Yet you will not attend an execution by nitrogen hypoxia; correct?
A. I will not attend any more executions of any kind, including nitrogen hypoxia.
Q. You do not know the actual flow rate of nitrogen that was

used during any of the executions that Alabama has conducted; correct?
A. That is correct.
Q. And you've never been present for any of these executions to see the flow meter from any of the executions; correct?
A. That is correct.
Q. You've never been given any information or readout from the flow meter showing what the flow rate was during any execution; correct?
A. That is correct.
Q. And you have no way of knowing now the flow rate of any nitrogen hypoxia execution that Alabama has conducted; correct?
A. Yes, that's correct.
Q. But you would agree with me that it's important to know the flow rate of nitrogen gas to understand whether an inmate would suffer during a nitrogen hypoxia execution; correct?
A. Yes.
Q. You've never seen any data from the pulse oximeters that Alabama uses during executions by nitrogen hypoxia; correct?
A. That is not correct. I have seen data. And if I can elaborate, or I'm not sure you want me to -- do you have a follow-up question? But I have seen data.
Q. Is this data that was produced within the past week or so by the defendants in this case?
A. Yes.

Q. Prior to seeing that data, had you seen any data from pulse oximeters that Alabama uses during nitrogen hypoxia executions?
A. Just by the reports of witnesses as we heard yesterday. That's the only -- if you want to call that data, that's basically all I've seen.
Q. Just to confirm, before seeing the data that you saw within the past week or so, you've never seen any readouts or reports from the actual pulse oximeter devices that Alabama uses during nitrogen hypoxia executions; correct?
A. That is correct. Yes.
Q. Setting aside the data that you saw most recently, you would agree with me that data from pulse oximeters would be informative to you in forming your opinions as to these nitrogen hypoxia executions?
A. They would, yes.
Q. And it's fair to say, then, that setting aside this more recent production of pulse oximeter data, that you're missing several pieces of information -- firsthand observations, flow meter data, pulse oximeter data -- that would be informative to your opinions; correct?
A. Yes, that's correct.
Q. You agree that pulse oximeters become less reliable as you get into lower oxygen saturations?
A. Yes, that is correct.
Q. You agree that movement of the body where the pulse oximeter

is located degrades pulse oximeter performance?
(Brief pause in the proceedings.)
A. Repeat the question.
Q. You agree that the movement of the body where the pulse oximeter is located degrades pulse oximeter performance?
A. I agree.
Q. You agree that erroneously high or low readings or no readings at all are much more frequent when a person is moving?
A. Yes, I agree.
Q. You agree that if the pulse oximeter is placed on an inmate's ear, and he's struggling or moving his head during an execution, there's a higher probability the pulse oximeter will not read correctly?
A. Yes, I agree.
Q. And during nitrogen hypoxia executions in Alabama, the pulse oximeter is, in fact, placed on the inmate's ears; correct?
A. Yes, that's my understanding.
Q. You agree that pulse oximeters placed on the ear are generally less accurate than those placed on the finger; correct?
A. Generally speaking, yes, that's correct.
Q. And you agree that ear oximeters are less accurate than finger oximeters because ears typically have less pulsatility than fingers; correct?
A. Yes, that's correct.

Q. You agree that in clinical use, ear oximeters are used for very limited circumstances, as in critically ill patients with extensive burns on their extremities, patients who are being administered powerful vasoconstrictor medications that decrease blood flow to the fingers, or the presence of severe peripheral vascular disease; is that correct?
A. Yes, that's correct. Those are generally the medical conditions where you would want to use an earlobe as opposed to a finger. Yes.
Q. And you agree that dark skin pigmentation degrades the accuracy of ear oximeters; correct?
A. Yes, that's correct. Degrades is not the term that we normally would use, but, yeah, it does affect the performance and accuracy.
Q. Let me just ask the question again. You agree that dark skin pigmentation degrades the accuracy of ear oximeters; correct?
A. Yes, I agree with that.
Q. To your knowledge, all pulse oximeters will be affected by the pigmentation of the skin; correct?
A. To my knowledge, yes, that's correct.
Q. And you've been testifying as an expert on behalf of states and the federal government in method of execution cases for more than ten years now; correct?
A. Yes.

Q. You've been paid close to half a million dollars for your work?
A. That's about right over the -- over ten years that I've been doing this.
Q. And in every execution case in which you've served as an expert, you've served as an expert in support of the government's execution method; correct?
A. Yes, that's correct.
Q. You've offered expert testimony previously on execution by nitrogen hypoxia?
A. Yes, I have.
Q. You've offered expert testimony on execution by firing squad?
A. As part of my expert witness testimony in those cases, yes, I did provide some expert opinions about the firing squad.
Q. You've offered expert testimony on execution by lethal injection?
A. Yes.
Q. And you would agree with me that those are fundamentally different execution methods?
A. Yes, they are.
Q. You're board certified in anesthesiology, Dr. Antognini?
A. Yes.
Q. Anesthesiology is your only board certification; correct?
A. Yes, that's correct.

Q. You do not have a subspecialty certification in anesthesiology critical care medicine; correct?
A. That is correct.
Q. You last practiced anesthesiology in the fall of 2019?
A. Yes, that's about right, I think. It was right before the pandemic, as I recall.
Q. From 2012 through the time that you stopped practicing anesthesiology in 2019, you spent only 10 to 15 percent of your time with patients; correct?
A. Yes, that's correct.
Q. And the last time you taught was in 2022; correct?
A. Yes, that's correct.
Q. Your research is focused on anesthesia mechanisms?
A. Yes, that's correct.
Q. And this case does not involve administering anesthesia agents; right?
A. That is correct.
Q. Nitrogen is not an anesthetic gas at normal pressures; correct?
A. Yes, that's correct.
Q. Physicians do not use nitrogen to put someone under anesthesiology; correct?
A. That is correct.
Q. You're not a pulmonologist, Doctor?
A. I am not.

Q. You're not a pathologist?
A. No.
Q. You're not a forensic pathologist; correct?
A. No.
Q. That's correct?
A. Yes, that's correct.
Q. And you're not board certified in pulmonary disease; correct?
A. That is correct.
Q. You're not board certified in critical care medicine; correct?
A. That is correct.
Q. You're not board certified in pathology; correct?
A. Yes, that's correct.
Q. And you're not board certified in forensic pathology; correct?
A. That is correct.
Q. You've never published any peer-reviewed articles in pulmonary medicine; correct?
A. No, I have not.
Q. And you have not published any peer-reviewed articles in the area of pathology; correct?
A. That is correct.
Q. You've never performed an autopsy; correct?
A. I have not.

Q. And you've only been present at a handful of autopsies?
A. That is correct.
Q. Once when you were an intern, one or two as a medical student, and only one as a practicing anesthesiologist; correct?
A. That is correct, yes.
Q. It was not a regular part of your practice as an anesthesiologist to review autopsy reports; correct?
A. That is correct.
Q. And you're aware that four of the inmates executed in Alabama by nitrogen hypoxia have had autopsies performed; correct?
A. Yes, that's correct. That's my understanding, yes.
Q. You have reviewed all four autopsy reports?
A. Yes, I did.
Q. And you're aware that all four autopsy reports documented signs of pulmonary edema found in each of the inmates?
A. Yes, that's correct.
Q. And it's possible that a sudden severe rise in blood pressure can be explained by a sudden extreme level of physiological stress; correct?
A. Yes, that's correct.
Q. You're offering opinions in this case on firing squad as an alternative method of execution?
A. Yes, I am. To rebut Dr. Williams, but, yes, I am.
Q. You offer opinions on firing squad in your expert report as

well as your rebuttal report; correct?
A. I did in the -- I'm sorry. Are you asking if I did in both? Could you repeat that? I'm sorry.
Q. Yes, Dr. Antognini. You've offered opinions on firing squad as an alternative method of execution in your initial report as well as your rebuttal report; correct?
A. I'll take -- I don't recall. I know it was in the original report. If I could just quickly review my supplemental report. I don't remember doing that, but I very well could have, if you don't mind me looking very quickly at my supplemental report.
Yes, I do. I see that at the very end. Yes. So it was both reports.
Q. Thank you. You have never conducted any studies related to gunshot injuries; correct?
A. That is correct.
Q. You have no publications related to gunshot injuries; correct?
A. That is correct.
Q. You have no studies or publications on firearms; correct?
A. That is correct.
Q. You've never taught a firearms course; correct?
A. That is correct.
Q. And in fact, you don't consider yourself an expert on firearm usage; correct?
A. That is correct.

Q. And you aren't an expert in ballistics; correct?
A. That is correct.
Q. You testified on direct that you have treated people who have been injured by gunshot wounds many times; is that correct?
A. Yes, that's correct.
Q. And that was in your capacity as an anesthesiologist; correct?
A. Yes, that's correct.
Q. You've never treated somebody who has been shot in the first minute of time after they have been shot; correct?
A. That is correct.
Q. You've never talked to somebody who was shot in the chest about the pain they felt or didn't feel in the first minute after they were shot; correct?
A. That is correct.
Q. You've never attended an execution by firing squad; correct?
A. That is correct.
Q. You've never been shot yourself; correct?
A. I have not.
Q. You're relying in part for your opinions on the execution by firing squad of Mikal Mahdi?
A. Yes, that's correct.
Q. You were not present for that execution; correct?
A. That is correct.
Q. And that execution was done by the State of South Carolina;

correct?
A. That is correct.
Q. You have not viewed a video of that execution; correct?
A. I have not.
Q. And you would agree with me that the experience that Mr. Mahdi had with respect to his execution is not typical of firing squad executions; correct?
A. That is correct. Based on what I've reviewed, that is correct, yes.
Q. Mr. Mahdi appeared to be alive for a lot longer than what you have read about with respect to other firing squad executions; correct?
A. Yes, that's correct.
Q. You don't have any opinions about the nitrogen hypoxia protocol used by Utah; correct?
A. I'm sorry? The nitrogen hypoxia used by Utah?
Q. Yes.
MS. SIMPSON: Objection, Your Honor. Utah does not have a nitrogen hypoxia protocol.
MS. SHARPE: I'm sorry.
THE COURT: Restate your question.
Q. You're not offering any opinions about the firing squad protocol used by the State of Utah; correct?
A. That is correct.
Q. And you don't rely on that protocol in your reports;

correct?
A. That is correct.
Q. Now, you do offer the opinion that during an execution by firing squad, there will be eight to ten seconds of consciousness after bullet entry; correct?
A. Yes, that's correct.
Q. You do not cite anything in your reports to support this opinion; correct?
A. That is correct.
Q. And I asked you for a citation at deposition, and you said you cited articles for this proposition before but didn't cite one in this case; correct?
A. That is correct.
Q. And you couldn't give me the names of any studies or authors on which you were relying for that opinion of eight to ten seconds to loss of consciousness; correct?
A. That is correct.
MS. SHARPE: Your Honor, I move to exclude the opinion of Dr. Antognini that during an execution by firing squad, there will be eight to ten seconds of consciousness based on his lack of support for that opinion.
MS. SIMPSON: Your Honor, we would simply posit that Dr. Antognini is a physician, has been for decades, has had training in the human body, in the effect of mechanical trauma upon the human body, has certainly dealt with patients who have

suffered trauma. That would be -- we believe he has sufficient training and experience to opine on what is likely to happen after a human body experiences significant trauma to the chest.

MS. SHARPE: Your Honor, Dr. Antognini testified that he was relying on studies and literature for that opinion. He did not provide citations to those studies or medical literature. And for the same reason that Your Honor excluded Dr. Schwartzstein's reliance on the Huang study, which was not cited in his reliance materials, we submit that the Court should exclude Dr. Antognini's opinions for which he does not have support.

MS. SIMPSON: Your Honor, we would say it goes to the weight and not the admissibility.

THE COURT: I agree. The motion is granted.

Q. (Ms. Sharpe, continuing:) Dr. Antognini, you also offer the opinion that the emotions that an inmate would experience when being executed by nitrogen hypoxia are the same emotions an inmate would experience when being executed by firing squad; correct?

A. Yes, that's correct.

Q. And in your opinion, it's the same emotions that the inmate would experience when being executed by any method of execution?

A. Yes. That's what I believe. That's my opinion, yes.

Q. And you did not provide any citations in your reports in support of this opinion; correct?

A. I did not.
Q. And I asked you about this at deposition, and you said you were relying on published literature, but you couldn't identify the studies or authors; correct?
A. I don't recall that, but I have no reason to dispute that, so I think that's correct.
MS. SHARPE: Your Honor, based on the fact that Dr. Antognini said he was relying in his report on studies in medical literature but did not provide those citations to studies in medical literature, we move to exclude his opinion that the emotions an inmate would experience when being executed by nitrogen hypoxia are the same that an inmate would experience when being executed by firing squad or any method of execution.
MS. SIMPSON: Your Honor, we would say it simply goes to a commonsense proposition. It's documented as far back as the 1938 article that is in evidence about the firing squad that an inmate experiencing any method of execution is likely to experience anxiety, terror, dread. These are all things that their expert says are likely to be experienced with dyspnea as well. We think it's a commonsense proposition that Dr. Antognini has asserted.
THE COURT: Well, if it's common sense, then you don't need an expert to testify; is that correct?
MS. SIMPSON: I mean, an expert can testify in this case that it's a commonsense proposition.

THE COURT: Well, if he has said he's based his opinion on materials that he has not provided, wouldn't you agree with me that the testimony is due to be stricken?

MS. SIMPSON: We would respectfully disagree, Your Honor, on this point.

THE COURT: You would disagree that he has not provided the materials?

MS. SIMPSON: No, Your Honor. We would agree that he has not specifically cited materials as to this point.

THE COURT: All right. The motion is granted.

Q. (Ms. Sharpe, continuing:) Dr. Antognini, you offer the opinion that obese people generally become hypoxic more quickly than nonobese people when subjected to nonphysiological conditions; correct?

A. Yes.

Q. And you do not provide any citation in support of this opinion in your reports; correct?

A. That is correct.

Q. And I asked you about this at your deposition, and you could not provide a citation to any sources; correct?

A. I did not provide any citations. That is correct.

MS. SHARPE: Your Honor, we move to strike Dr. Antognini's opinion that obese people generally become hypoxic more quickly as opposed to nonobese people when subjected to nonphysiological conditions for the reason that he

did not provide support in the medical literature studies, either in his report or in deposition.

MS. SIMPSON: Your Honor, the witness is a trained anesthesiologist. His training covers a range of people, including obese people. We would argue about by the very nature of his training and experience, he has experience with hypoxic people and the conditions under which people become hypoxic.

He doesn't necessarily have to cite a source for every opinion he offers as a trained anesthesiologist. He testified that he is familiar with hypoxia, with dealing with patients who are undergoing hypoxia during surgery and postsurgery, and we would argue that the witness has sufficient experience because of his medical training and experience to opine as to this point.

THE COURT: Isn't this within his purview as an anesthesiologist?

MS. SHARPE: Your Honor, he said he relied on materials in the literature, and he never provided a citation to those materials.

MS. SIMPSON: Your Honor, we would still argue that this goes to just his basic training and experience as an anesthesiologist. He's a board certified anesthesiologist, and he testified as to his -- a part of his training yesterday, last night, that he's trained in hypoxia, he's trained to deal with hypoxic patients, he has dealt with patients for decades.

THE COURT: All right. With the understanding that he is -- his opinion as to the physiology of what happens with obese patients versus nonobese patients in a hypoxic environment, I will permit the testimony to the extent that it is based on his experience. I will strike it to the extent that it's based on materials he has not provided. You will need to parse out for me at which point he testified that his opinion was solely based on materials and, if so, I would strike it to that extent.

MS. SHARPE: Thank you, Your Honor. Could I request that we take a very brief recess? Five or ten minutes? I understand we have a hard stop at 1:30.

THE COURT: Yes. All right. We'll take a ten-minute recess.

(Recess was taken at 12:59 p.m. until 1:09 p.m., at which time the proceedings reconvened, as follows:)

MS. SHARPE: Your Honor, I don't have any further questions.

THE COURT: All right. Any redirect?

MS. SIMPSON: Your Honor, just -- if we're going to move the -- moving the witness's opinions, permission to briefly voir dire him.

THE COURT: Yes. Go ahead.

VOIR DIRE EXAMINATION

BY MS. SIMPSON:

Q. Dr. Antognini, prior to your -- well, at the time of your deposition, were you asked to bring documents you relied upon to that deposition?
A. Yes, I was asked to do that. Yes.
Q. And did you do that?
A. I did supply a lot of documents, yes.
Q. By a lot, do you remember about 150 documents perhaps?
A. I thought it was closer to 200, but maybe 150, 170. I don't remember off the top of my head, but around that, yes.
Q. And were those given to counsel for Mr. Lee?
A. Yes.
Q. Did those documents form the basis of your opinion?
A. Yes.
Q. Among those documents, is there an article by a Scott Weingart and Richard Levitan called Preoxygenation and Prevention of Desaturation During Emergency Airway Management?
A. Yes.
Q. Does that article have anything mentioning obese patients?
A. As I recall, it does, yes.
Q. And did you rely on that article in forming your expert opinion in this case?
A. Yes, I did.
MS. SIMPSON: Your Honor, I have a brief redirect. May I?
THE COURT: All right. Go ahead.

REDIRECT EXAMINATION

BY MS. SIMPSON:

Q. Doctor, you said on cross-examination that dyspnea can be distressing. Do you recall that?

A. Yes.

Q. Is it always distressing?

A. No, it -- again, it depends on the amount. Obviously, if someone is really dyspneic, that can be stressful, but just mild dyspnea is not necessarily stressful.

Q. In your medical opinion, does the nitrogen hypoxia protocol used in Alabama inevitably cause air hunger?

A. No, it does not inevitably do that, no, in my opinion.

Q. Is it likely to cause air hunger?

A. Maybe to a small extent it could, but it's not like 100 or 90, 80 percent going to do it and make it severe. But, it -- you know, it's not likely to be severe, at least in my opinion, but it could certainly make somebody have a little bit of air hunger.

Q. By a little bit, can you estimate how long that might last?

A. On the order of probably 10 to 20 seconds perhaps.

Q. Doctor, you were asked some questions about OSHA reports and your reliance upon them. Do you remember that?

A. Yes.

Q. Why did you look at OSHA reports in this case?

A. Because, again, the information that we have about what

happens to people who inhale inert gases comes, to a large extent, from these tragic accidents that occur in the workplace setting, and that's going to be described in these OSHA reports. So I think that was a very important body of information or data that I needed to look at.

Q. As a physician, do you tend to look for the best data sources?

A. I do. Sometimes, you know, it's not just published manuscripts, it's data generated by other individuals.

Q. In the Ogden articles that we looked at, did you see any evidence of attempted self-rescue?

A. I did not.

Q. If you, Doctor, were to put on a respirator and began experiencing breathlessness and a sense of doom, what would you do?

A. I would remove it.

MS. SHARPE: Objection, Your Honor. Speculative testimony.

THE COURT: Overruled. He can answer.

Q. Doctor, let me turn here to Miller and Mazur, Defendants' 20, again. You were asked some questions about this; correct?

A. Yes.

Q. If you would go with me, please, to page 3.

A. Yes.

Q. There is a paragraph that begins, "At Fermilab."

A. Yes.
Q. Would you please read the first two sentences.
A. "At Fermilab large quantities of liquefied gases are employed in high-energy physics research. Those most commonly used are liquid nitrogen, liquid helium, and liquid argon."
Q. So is it fair to say that this white paper does potentially concern the risks of using nitrogen in the workplace?
A. Yes, it does. And, in fact, even though they say liquid nitrogen, you use the acronym LN2. And you can see that LN2 is mentioned elsewhere. So they do mention it multiple times, or several times at least.
Q. You were asked how reliable you believe the author's methods were. Do you recall that?
A. Yes.
Q. Do you know with certainty how reliable any study is if you're not actually part of it?
A. Well, you don't know for sure. I mean, obviously, there can be fraudulent papers and so forth, and sometimes you may not -- you may have a problem with the way the study is conducted or whatever, so you can't say with 100 percent certainty that any paper is reliable, I guess. But you just have to judge the paper on what you see, I guess. I don't know.
Q. As a scientist, looking at this white paper, do you see any indicia of nonreliability?
A. No, I do not.

Q. Let me go with you briefly to Plaintiff's 97, the spreadsheet here. Just wanted to clarify. What does the second code signify, Doctor?
A. My understanding is that is the time at which the EKG has been flatlined for at least five minutes; or if it's at 15 minutes after the nitrogen started -- as you can see, none of those times -- I'm sorry -- all of those times between the first code and the second code are greater than 15 minutes, which means that the time indicates when the ECG became flatlined plus five minutes.
Q. Looking at the first four entries there for Mr. Smith, Mr. Miller, Mr. Grayson, and Mr. Frazier, the time between the codes in all those cases was less than 20 minutes; correct?
A. Yes, that's correct.
Q. So would it be fair to say that the EKG flatlined in less than 15 minutes?
A. Yes, that's correct.
Q. Doctor, you've read the Alabama execution protocol?
A. Yes, I have.
Q. Are you aware of the flow rate that is listed in the protocol?
A. Yes.
Q. Do you have any reason to believe that that flow rate was not used in any of the prior executions?
A. I have no reason to believe that. Yes, that's correct.

Q. You were asked about some pulse oximeter data; correct?
A. Yes.
Q. Is it fair to say as a scientist or a clinician that there is always more information or data that could inform your opinion?
A. Absolutely. Yes, that's true.
Q. In your opinion, what is more useful, the real-time observation of data or spot checked data taken every 30 seconds?
A. It would be the real-time observation of data.
Q. Did you consider in your report the observations of the team captains, Wardens McKenzie and Frazier?
A. Yes, I did.
Q. You were asked about whether you have attended executions. Yes?
A. Yes, that's correct.
Q. Do you know if Dr. Schwartzstein or Dr. Bastarache has attended a hypoxia execution?
A. I'm not aware if they have. I don't -- I don't know, but I don't think so.
Q. Go briefly back to Defendants' 47, the Arden report. Doctor, if you would look, please, in the middle under synopsis of pertinent facts.
A. Yes.
Q. Do you see the AP's reporting of the description of the

execution, the italicized portion?
A. Yes, I see it there.
Q. Okay. In the first two paragraphs, looking at that as a clinician, do any of the things described there suggest pain to you?
MS. SHARPE: Objection, Your Honor. This is outside -- well, objection, Your Honor.
THE COURT: What's the basis?
MS. SHARPE: This is outside the scope of my cross-examination.
MS. SIMPSON: The witness was asked about his reliance upon this report, Your Honor, and to inform his opinion as to firing squad and whether it was painful.
MS. SHARPE: I did not ask any questions about the Arden report. I did not --
MS. SIMPSON: It also goes to his opinion that there were eight to ten seconds of pain. Witness reports, lay witness reports from the hypoxia executions were certainly used as a basis for Mr. Lee's experts' reports. I'm simply asking him about one portion of an AP report about a firing squad execution.
MS. SHARPE: Your Honor, they're now attempting to bolster an opinion that has been stricken based on the fact that the expert did not previously disclose citations for that. I think that's improper.

THE COURT: Which exhibit are you talking about?

MS. SIMPSON: 47, Your Honor, Defendants' 47. That's the Arden report.

MS. SHARPE: And, Your Honor, I would just note that Exhibit 47, which is the Arden report of the South Carolina execution, has been admitted for only a limited purpose and not for the truth of the matters asserted within the report. And I think that counsel's also trying to elicit testimony that would suggest that the facts are, in fact, true.

MS. SIMPSON: Your Honor, we're just saying that the witness relied on this report; that they helped inform his decision. We would ask Your Honor to reconsider your ruling as to Exhibit 47, and also to reconsider your adverse rulings, considering those relevant portions of Dr. Antognini's testimony a few minutes ago.

THE COURT: I'm going to sustain the objection. Go ahead.

MS. SIMPSON: One moment, Your Honor.

(Brief pause in the proceedings)

MS. SIMPSON: Your Honor, just for the record, we would ask you to reconsider your ruling about the eight- to ten-seconds firing squad pain finding. You know, we were not given opportunity to voir dire the witness before Your Honor ruled on this. He does have the data before him. He testified that he relied upon the Arden report. It's listed among his

materials. The Arden report gives an eye witness account as to what happened there. And if we're going to give credence to eye witness accounts like Ms. Clifton and everyone else that Mr. Lee has relied upon, there's nothing here showing that this particular report is any more or less reliable than any of theirs.

MS. SHARPE: Your Honor, I just cross-examined Dr. Antognini about his eight- to ten-second opinion, and he did not point to the Arden report in support of an eight- to ten-second loss of consciousness. He has at multiple points had an opportunity to provide the basis for that opinion, and he has not done so. We ask that Your Honor stand by the ruling previously and that the testimony remain stricken.

THE COURT: I'm going to give the defense an opportunity to rehabilitate him by asking voir dire questions. Go ahead.

VOIR DIRE EXAMINATION

BY MS. SIMPSON:

Q. Dr. Antognini, what is the basis for your conclusion that a person executed by firing squad will experience eight to ten seconds of pain? What did you rely upon?

A. There are several studies that have been published that looked at the heart stopping in a variety of different ways, including people who have had ventricular fibrillation occur during a procedure where they're awake, and then the heart goes

into ventricular fibrillation and they lose consciousness, which is around -- in the range of ten seconds or so.

There are reports, both in the popular press but also in medical reports, of people who suffer what is called commotio cordis, which is a condition where you get struck in the chest with, like, a baseball or something like that. And those individuals can maintain consciousness for about eight to ten seconds.

There was a very famous -- you might remember this, several years ago of a football -- I think in the NFL, a football player who was hit in the chest, and he -- at the end of the play, he stood up, and he sort of wobbled a bit and then collapsed, and he had this commotio cordis. That's been documented in animal studies.

So those are some of the studies that I relied upon that inform me about how long does it take for someone to lose consciousness when the heart stops.

Q. Were any of those studies included among the documents you provided to plaintiff's counsel prior to your deposition?

A. I really don't remember. I'm sorry. I don't know.

Q. Is information about -- well, strike that.

MS. SIMPSON: Nothing further, Your Honor.

THE COURT: All right.

MS. SHARPE: Your Honor, I think Dr. Antognini's testimony only reconfirms our position. He just said that he's

relying on multiple studies, reports in the popular press, animal studies. None of these have been disclosed in his opinions or identified, even sitting here today, so, again, we would move to strike his testimony and opinions with regard to the eight to ten seconds loss of consciousness.

THE COURT: Have any of those studies been provided?

THE WITNESS: I would have to -- pardon me. May I say?

MS. SIMPSON: Unless the witness has specific knowledge of that, I do not.

THE WITNESS: Of the 150 papers I submitted, I don't recall if that's one of them or not. I'm sorry. I just don't recall.

THE COURT: All right. My ruling will stand.

MS. SIMPSON: Thank you, Your Honor. Nothing further.

THE COURT: All right. Any recross?

MS. SHARPE: No, Your Honor.

THE COURT: All right. You can step down, Dr. Antognini. Thank you.

Does the defense have any more witnesses?

MS. SIMPSON: No, Your Honor. The defense rests.

THE COURT: Do I have any motions?

MS. SIMPSON: I'm sorry. We did have the one question, though. Exhibits 46 and 47 -- 46 is the Mahdi report. 47 is the Arden report. We would move Your Honor to admit those into evidence.

THE COURT: Any objection? Oh, 46 is the Mahdi autopsy, and the Arden report is 47?

MS. SIMPSON: Yes, Your Honor.

MS. SHARPE: Your Honor, we have no objection for the limited purpose to which the Court previously allowed them to be admitted and not for the truth of the matter asserted.

THE COURT: For which exhibit? Both?

MS. SHARPE: For both exhibits.

THE COURT: All right. They are admitted for the limited purpose.

MS. SIMPSON: Thank you, Your Honor.

MS. SHARPE: Your Honor, I think there also -- and I apologize. I'm looking for the exhibit numbers. There were two other exhibits that the Court conditionally admitted. It was the Nitschke tweet and the Nitschke deposition exhibit. We will get you those exhibit numbers.

MS. SIMPSON: 58 and 59.

MS. SHARPE: 58 and 59. Thank you, counselor.

Those were admitted for the limited purpose, I believe, of bolstering Dr. Antognini's testimony and opinions. No testimony was actually offered on either exhibit, so we ask that the Court reconsider its decision on those exhibits and exclude them.

MS. SIMPSON: Your Honor, again, those go to support the Daubert challenge that Your Honor has not yet ruled upon.

We think Dr. Antognini today certainly did testify that he is familiar with Dr. Nitschke. He's familiar with his work. We are simply trying to show that Dr. Antognini is not, in fact, an island of one, as plaintiff's counsel would have, but rather that he has an opinion that is supported by other clinicians.

MS. SHARPE: Your Honor, counsel had an opportunity to ask Dr. Antognini about his reliance on either documents or how they supported him, and they did not do so. I believe that they --

THE COURT: Well, they're not being offered to -- they're being offered for the purpose of responding to the argument that there is no one who supports his opinion, and I have admitted them for that limited purpose.

MS. SHARPE: Understood, Your Honor. But there's no testimony or evidence that's been offered on how they support his opinions or what opinions precisely that they do support. I think that they needed to elicit that testimony in order to bring them within that realm.

THE COURT: All right. I'm not revisiting that ruling. It will stand.

MS. SIMPSON: Thank you, Your Honor.

THE COURT: All right. Do I have any motions?

MS. SHARPE: Your Honor, I would ask if we could address that point after the lunch break.

THE COURT: After the lunch break? Sure. Yes.

Let me ask this. Do you anticipate any rebuttal witnesses?

MS. SHARPE: No, Your Honor, not on behalf of the plaintiff.

MS. SIMPSON: No, Your Honor.

THE COURT: All right. Very good. We will take up any motions and housekeeping matters after your lunch break.

Again, I have a sentencing that begins at 2:00. I expect it to last less than hour, so let's plan to reconvene at 3:00.

MS. SHARPE: Your Honor, one additional question. When we were before Your Honor for the pretrial conference, we agreed that formal final closings would come after any additional evidence on the pulse oximeters, but you contemplated interim shorter closings. Will you still entertain those this afternoon?

THE COURT: Yes. Yes. I would certainly be happy to hear from you on closing arguments based on what we have heard. I will leave the evidence portion of the trial open for us to determine what we need to come back on, if anything, on the pulse oximeter issue.

MS. SIMPSON: Your Honor, may Dr. Antognini be excused to go catch a flight?

THE COURT: I assume there's no objection to that?

MS. SHARPE: No objection.

THE COURT: Yes. That's fine. Thank you, Dr. Antognini.

All right. Anything further? All right. I will see you after lunch. Thank you.

(Recess from 1:29 p.m. until 3:02 p.m., at which time the proceedings reconvened, as follows:)

THE COURT: I wanted to -- before you get started with your closings, I wanted to clarify. Before the break we discussed Exhibits 46 and 47, and Lee's counsel represented that they had been admitted for the limited purpose of supporting Dr. Antognini's opinions. I agree with that on Exhibit 47. My recollection is that we have not -- Exhibit Number 46, which is the Mahdi autopsy report, has not been offered or admitted, and that I had ruled that it would not come into evidence. So I wanted to clarify that with you-all.

You had represented they both came in for a limited purpose -- you-all being -- I'm pointing at Lee's attorneys, for the record. Is that true? Am I missing where that was offered and admitted?

MS. KENNY: We discussed them, those particular exhibits --

THE COURT: We have.

MS. SHARPE: Yes, Your Honor. And I apologize if we are mistaken on that. We would defer to the Court and agree with your interpretation.

MS. SIMPSON: Obviously, we would like it in for a limited purpose, but whatever the Court decides. We just need to remove it from the thumb drive we just gave your deputy.

THE COURT: All right. My recollection is that the report, which is Exhibit 47, was admitted for the limited purpose because it was a report upon which Dr. Antognini relied for his opinions. I do not see in my records that 46 was admitted.

MS. SIMPSON: I believe that's correct, Your Honor.

THE COURT: Okay.

MS. SHARPE: Thank you, Your Honor.

THE COURT: And if it is on the thumb drive, we'll just make a note.

MS. SIMPSON: We don't mind moving it now if that's your preference.

THE COURT: Why don't we go ahead and do it while we're thinking about it.

MS. KENNY: I've got to re-sign the -- okay.

THE COURT: How long do you-all need for your closings?

MS. SHARPE: I believe mine is going to be 12 or 13 minutes.

MS. KENNY: I can do that length, Your Honor.

THE COURT: All right. I'll say 15 minutes for both sides. We'll time you, but if you need additional, we don't have a jury here and we've got some time, so if you need a

little additional time. I just want both of you to have an equal amount of time available to you.

MS. SIMPSON: Thank you, Your Honor.

THE COURT: You don't have to use it all, but it's available to you.

MS. SHARPE: And before turning to that, we do have a motion.

THE COURT: All right.

MS. SHARPE: Plaintiff moves for judgment under Federal Rule of Civil Procedure 52(c). The undisputed evidence shows that Alabama's nitrogen hypoxia method of execution violates the Eighth Amendment. Dr. Antognini just testified that he cannot say to a reasonable degree of medical certainty that inmates executed by nitrogen hypoxia do not experience pain. On the other side, three experts for the plaintiff have testified to a reasonable degree of medical certainty that inmates being executed by nitrogen hypoxia will experience severe air hunger.

Dr. Antognini also conceded that an inmate could suffer air hunger for 10 to 20 seconds. All of the experts agree that air hunger is suffering.

The other part of the test, is there a reasonable, feasible alternative that is less painful? The evidence establishes that there is. Commissioner Hamm and Deputy Commissioner Williams both testified that firing squad is feasible. The evidence shows that Utah's firing squad protocol

causes no pain whatsoever. That's unrebutted by the State's expert. I submit that plaintiff has proven his case, and we ask for judgment.

THE COURT: All right. What's your response?

MS. SIMPSON: Your Honor, defendants would submit that the plaintiff has not satisfied *Bucklew* in any sense. That, in fact, we do have disputed testimony over the painfulness and the efficacy of both firing squad and nitrogen hypoxia. It is defendants' position that even if there is any pain associated with nitrogen hypoxia, that it is not -- there's no evidence showing that it is superadded to anything naturally occurring in the method. As for firing squad, we have testimony from DOC employees that it is not feasible, readily available, and significantly safer. And we would encourage the Court to deny the motion.

THE COURT: Anything further?

MS. SHARPE: Nothing further from plaintiff. Yes, Your Honor.

THE COURT: All right. In light also of the fact that we are leaving the evidence open, I'm denying the motion without prejudice for leave to refile at a future date once the evidence is closed. On this record so far, I think there's enough for us to move forward, so the motion is denied.

MS. SHARPE: Thank you, Your Honor.

MR. THOMPSON: Your Honor, we would also move under

Rule 52, based -- and understanding the context of your most recent ruling, that on the issue of whether there is a feasible and readily available alternative, that given the revelation during cross-examination of Dr. Williams' testimony, we ask that you either find him not credible or exclude his testimony on some other ground. And then on that basis find that under *Bucklew*, Mr. Lee cannot meet his burden by a preponderance of the evidence.

And if Your Honor is not willing to do so at this time, the State would ask to be heard with written submissions in fuller detail on the effect of Dr. Williams' relationship with Mr. Mahdi's family and their attorney.

THE COURT: Tell me again, what is the basis for the motion to exclude Dr. Williams?

MR. THOMPSON: The basis for the motion to exclude would be twofold. Either the undisclosed -- you know, the undisclosed bias in the State's inability to properly prepare to cross-examine. And then under Daubert, the fact that Dr. Williams' relationship with the Mahdi family and his anticipated role in any action against the State has resulted in -- has so infected the methodology of his opinion in this case as to make it wholly unreliable under Daubert. And that you exclude his testimony on that basis, which would fatally undermine Mr. Lee's ability to prove a viable and readily available alternative to nitrogen hypoxia, which would result in

dismissal of his claim.

THE COURT: What's your response?

MS. SHARPE: Your Honor, with respect to Dr. Williams, he had no obligation to disclose his involvement in a litigation that has not yet been filed, in which he has not yet offered a report, in which he has not yet testified, in which there may never be an actual lawsuit. There is just no basis whatsoever for that statement.

In addition, the defendants had an opportunity to take the deposition of Dr. Williams. They declined to do so. The deadline for filing Daubert motions has come and long gone. They had a full opportunity to cross-examine Dr. Williams during the trial itself. He was not limited in what he could respond to. He answered all of their questions. There's no basis for them to now seek to exclude him, and Your Honor has already ruled on that issue.

And for all of the reasons that I just stated in our argument for motion under Federal Rule 52, we otherwise oppose their Rule 52 motion.

THE COURT: Anything further?

MR. THOMPSON: Your Honor, the basis for -- Your Honor, I think that Dr. Williams testified on cross-examination that he had been advised by Mr. King, the Mahdi family attorney, that he needs to keep his public comments circumspect. And that, I think, illustrates exactly the -- I guess sort of methodological

flaws with his analysis; that his report in this case is being colored by his anticipated testimony or potential involvement in future litigation involving the Mahdi family. And that, you know, if he's being circumspect in his public statements, that that hesitation would naturally infect and affect any conclusions that he has reached in this case, not only this case, but also in the Boyd case, in which he also testified.

THE COURT: Well, Mr. Williams was subject to cross-examination. You are certainly free to argue what weight the Court should give his testimony based on his revelation during the trial.

I don't particularly fault the State for not deposing him on that issue because it was unknown to them at the time they made the decision whether to depose Dr. Williams, but you had an opportunity to cross-examine him. And if you want to in post-hearing submissions make any argument, you're certainly free to do so, but I'm not going to strike his testimony. So that motion is denied.

Likewise, your Rule 52 motion is denied as well. This case needs to proceed.

MR. THOMPSON: Thank you, Your Honor.

THE COURT: Are you all ready for closings?

MS. SHARPE: Yes, Your Honor.

THE COURT: All right. Go ahead.

MS. SHARPE: May I proceed?

THE COURT: Go right ahead.

MS. SHARPE: As the plaintiff, we have two burdens: To show a substantial risk of superadded pain, and to show that there is a feasible alternative that can be readily implemented.

So let's start with that first question and what's been shown in this case. The evidence has shown there is a substantial risk of superadded pain. We presented three experts who testified consistently that the evidence shows that inmates suffer during nitrogen hypoxia executions. On the other side, Your Honor, you just heard Dr. Antognini testify that he cannot say to a reasonable degree of medical certainty that these inmates do not experience pain.

And consider that for a moment. The whole premise of Dr. Antognini's opinion is that nitrogen hypoxia executions do not cause pain. But when I asked him directly, are you saying to a reasonable degree of medical certainty that these inmates have actually not experienced pain, he answered no. He couldn't say that.

So let's talk about the type of suffering that's on the line here. It's called air hunger. Now, air hunger may not be traditional physical pain, but it is suffering; suffering that affects the entire body. It causes profound distress and physical sensations, and these are sensations that are worse than severe pain. Air hunger evokes the primal urge to breathe.

And Dr. Antognini's concessions today not only

undermine defendants' case, they support ours. He agrees that absolutely dyspnea ranks among the most distressing experiences that human beings can suffer. He agrees that for a dyspneic person, dyspnea can be far worse than pain. He agrees that nitrogen hypoxia falls under the definition of suffocation.

In *Baze v. Rees*, the Supreme Court described conscious suffocation as, quote, a constitutionally unacceptable risk. That's 553 U.S. 35 at 53.

So air hunger, the worst form of dyspnea, is profound, unconstitutional suffering.

The remaining question for the first part of the test is whether inmates who are executed by nitrogen gas are likely to experience air hunger. Again, the undisputed evidence is that they are.

Now, Dr. Antognini said on direct that air hunger won't appear without hypercapnia. That's elevated levels of carbon dioxide. But then he testified on cross-examination that hypoxia, that low levels of oxygen, can cause dyspnea even in the absence of hypercapnia. And he agreed that inmates can suffer air hunger for 10 to 20 seconds.

Now, we submit that our evidence has shown that the period of suffering is longer, but, again, either way, think about that for a moment. The defendants' expert has conceded that inmates can experience profound suffering for 10 to 20 seconds during a nitrogen hypoxia execution. Eye witness

observations not only corroborate that suffering but also show that it happens for much longer than 10 to 20 seconds.

And then we had the testimony of Dr. Julie Bastarache, a pulmonologist who on a daily basis treats patients who suffer from dyspnea and who reviewed these eye witness accounts and the underlying physiology. She concludes that in each of the nitrogen hypoxia executions that have taken place, inmates consciously suffered air hunger for several minutes, not seconds. Minutes that, again, the experts here agree would be the worst suffering that humans can endure; that is far worse than pain.

And Dr. Schwartzstein testified that even after loss of consciousness, the suffering continues. The European Respiratory Society, in their consensus statement, agrees. That consensus statement is in evidence at Plaintiff's Exhibit 55.

So I submit, Your Honor, that the evidence supports plaintiff's case with respect to the first part of the test without dispute.

The second part of the test is a requirement under *Baze* and *Glossip* that a plaintiff identify an alternative method of execution. An alternative method that, quote, Would significantly reduce a substantial risk of severe pain and that the State has refused to adopt without a legitimate penological reason. That's *Bucklew*, 587 U.S., 119 at 134.

Let me first dispense with any feasibility argument.

Firing squad is clearly feasible. Both Commissioner Hamm and Deputy Commissioner Williams have testified, ADOC can modify the structures at Holman Correctional Facility to create a firing squad area. ADOC can purchase the necessary equipment. ADOC can train the shooters. ADOC will be able to get volunteers to perform the executions.

Nor is the lack of an authorizing statute relevant. The Supreme Court has said, quote, A prisoner may point to a well established protocol in another state as a potentially viable method of execution. That, again, is *Bucklew*, 587 U.S., 119 at 140.

Firing squad is an approved method of execution in five states.

So what about the risk of suffering with firing squad? Well, on the one hand we have nitrogen hypoxia, where there is a risk of the worst suffering imaginable, regardless of how an inmate experiences it, and then with firing squad we have a method of execution where there is evidence that there would be no pain or suffering.

Dr. Williams, the only firearms expert in this case, testified that the inmate will very likely feel no suffering whatsoever when executed by firing squad. He testified that because of the way that your brain processes noxious stimuli, and because of the neural stunning that occurs when four or five bullets penetrate the heart point blank, it will take several

seconds, if not minutes, for the inmate's brain to even realize that there's been a traumatic event. By that time, the inmate is deeply unconscious and dead soon thereafter.

The record is clear, Your Honor. Execution by firing squad is feasible and readily available, and it causes dramatically less suffering than execution by nitrogen hypoxia.

I want to spend a moment now discussing the legal standard that applies here. As the plaintiff, we recognize that we bear the burden of proof, and we recognize as well that we are bringing a facial challenge to a method of execution. So I want to talk a little bit about the particular framework that applies to a facial challenge.

The Supreme Court's most recent description of the facial challenge standard comes from the *Rahimi* case, which this Court knows and cited to in its decision in Boyd. The *Rahimi* case stated, among other things, that a plaintiff bringing a facial challenge must show, quote, No set of circumstances under which the act would be valid. That's 602 U.S., 680 at 693.

Now, *Rahimi* didn't articulate some new standard. Instead, that language was a reiteration of the no set of circumstances language that the Court articulated in *United States versus Salerno*, a 1987 case at 481 U.S. 739.

And I want to spend a moment deconstructing that language. Because read literally, the language could mean that whenever a party can come up with a situation where the statute

or rule or process is constitutional, the entire thing is held valid; that is, if 99 times out of a hundred there will be an unconstitutional result, and one time there will not be, then the rule survives full stop, even when you know that 99 times out of a hundred, there will be an unconstitutional result.

That makes no logical sense; indeed, several courts explaining the language of *Salerno*, including the Eleventh Circuit, have rejected a literal interpretation of the no set of circumstances language.

The controlling case in this circuit is *Club Madonna v. City of Miami Beach*, 42 F.4th 1231, an Eleventh Circuit case from 2022. That case involved a federal challenge to a state law on the basis of federal preemption. The Eleventh Circuit carefully analyzed the *Salerno* language and declined to read it literally. It said the no set of circumstances language, quote, Would reject a conflict preemption claim in a facial challenge whenever a defendant can conjure up just one hypothetical scenario in which implementation of the state law would not directly interfere with federal law. That's 42 F.4th at 1256.

That can't be the law, the Eleventh Circuit said. Instead, the Court, reviewing how the Supreme Court and how other circuits actually evaluate facial challenges, said the relevant question is, quote, Whether the statute fails the relevant constitutional test. 42 F.4th at 1256.

So, then, what about this no set of circumstances

language from both *Salerno* and *Rahimi*? It is, as the Eleventh Circuit explained, quote, A description of the outcome of a facial challenge in which a statute fails to satisfy the appropriate constitutional framework. That's 42 F.4th at 1256.

So the question is, actually, rather straightforward. We go back to the constitutional test, which here is whether there is a substantial likelihood of superadded pain and whether there is a feasible alternative method of execution. Not what conceivably might happen in a hypothetical world. Not even what could happen once in a while. It's what's substantially likely to happen.

That, I respectfully submit, Your Honor, is how to think about the facial challenge standard in accordance with how the appellate courts actually apply the legal framework. And I submit that under this framework, we have proven that there is a substantial risk of superadded pain with execution by nitrogen hypoxia that can be alleviated by execution by firing squad, which will result in no pain.

I look forward to representing a more comprehensive closing argument when the record in this case is closed.

THE COURT: All right. Thank you.

MS. SIMPSON: May it please the Court.

Jeffery Lee faces an exceedingly high burden as to his Eighth Amendment method of execution challenge. He must prove by a preponderance of the evidence that he is very likely to

experience severe pain over and above death itself if he is executed via ADOC's nitrogen hypoxia protocol.

Which, by the way, is the method he chose, sight unseen, knowing nothing about it other than nitrogen hypoxia.

This standard is so high that no inmate has ever met it before the Supreme Court. Not one. No state's method of execution has ever been held unconstitutional by the high court. The Supreme Court has considered nitrogen hypoxia in preliminary injunction or stay of execution postures on multiple occasions now, both from Alabama and Louisiana, and has not stayed a single execution.

As the Supreme Court discussed in *Bucklew*, at the time of the framing, cruel and unusual punishments were those in which terror, pain, or disgrace were superadded to the penalty of death. That's 587 U.S. 130.

The most common method of execution at the time of the Eighth Amendment's adoption was hanging, which, as the Supreme Court wrote, was no guarantee of a quick and painless death. While hanging could result in prolonged suffocation, mechanical suffocation, even, it was not intended to be painful.

In the wake of *Baze*, *Glossip*, and *Bucklew*, to prevail in a method of execution challenge, the inmate must show, quoting here, That the State's chosen method of execution cruelly superadds pain to the death sentence. And he must show a feasible and readily implemented alternative method of

execution that would significantly reduce a substantial risk of severe pain that the State has refused it adopt without a legitimate penological reason. That's *Bucklew* at 134.

Now, the Court has recognized in *Baze* and *Glossip* that the Eighth Amendment does not demand the avoidance of all risk of pain in carrying out executions, and nor does the Eighth Amendment come into play unless the risk of pain associated with the State's method is substantial when compared to a known and available alternative.

As to this proposed alternative, the inmate must show it is feasible and readily implemented, and he must offer a substantially detailed protocol so as to allow the State to carry it out relatively easily and reasonably quickly. And then he must show that it significantly reduces a substantial risk of severe pain. As the *Bucklew* court said, a minor reduction of risk is insufficient. The difference must be clear and considerable. And also the State may have legitimate penological reasons for declining to switch methods of execution, such as preserving the dignity of the proceedings.

Mr. Lee has not and cannot make the necessary showing. First, there is a risk of pain inherent in every method of execution. The distinction is that ADOC is not trying to superadd pain. ADOC's nitrogen hypoxia protocol results in rapid loss of consciousness. The videos of ADOC's system and Louisiana's system, which are Defendants' 55 and 56, show that

less than 20 seconds after nitrogen reaches the mask, the concentration of oxygen within the mask is lethally low. Not zero percent, but below 6 percent where life-threatening danger is imminent.

Dr. Antognini opined that within approximately 30 to 45 seconds, that is, around a minute after nitrogen first hits that mask, assuming the inmate is not holding his breath, he will be unconscious and he will be dead in a matter of minutes thereafter.

We know from OSHA and from the U.S. Chemical Safety and Hazard Investigation Board -- that's Defendants' 43 through 45 -- how insidious inert gases can be in the workplace. For instance, looking at page 2 of Defendants' 43, or also on page 6 of Defendants' 45, we see a case study of a contractor who accidentally plugged his respirator line into the nitrogen instead of into the breathing air, and he asphyxiated. If he had been in pain, if he had been suffering from dyspnea, if he had noticed something was wrong, surely this man would have ripped his mask off his head. He didn't. He succumbed. He died before he realized there was a problem.

OSHA reports citing Hudnall, et al., found that unconsciousness can occur in about 12 seconds in a zero percent oxygen environment, with death occurring in minutes.

And we know from the Ogden studies, Defendants' 23 and 24, that individuals who commit suicide with inert gases, which

include helium, argon, nitrogen, rapidly lose consciousness in low oxygen environments and then exhibit reflex movements and agonal breathing for some time before they finally die. Again, if these people were in severe pain following the first breaths of inert gas, surely they would have stopped. Surely they would have done something. Surely there would have been some sign of pain or severe distress. Ogden and then Ogden, et al., report nothing like that.

And this is what we see in Alabama. Yes, we see movements. We see movement at the beginning of executions, such as Mr. Frazier when he rotated his wrists or Mr. Grayson when he flipped an obscene gesture. And we see movement later in the executions. We've seen arms twitch. We've seen legs lift. We've seen breathing, gasping type breathing. But these reflect what we see documented in the Ogden studies.

If inmates don't hold their breath, then they rapidly pass out. And in a matter of minutes they are dead, having never reawakened.

As for the contention that nitrogen causes panic or psychological terror, Mr. Lee has not shown that it does so above and beyond other methods of execution.

First, as to suffocation, there was mentions of suffocation. That's from *Baze v. Rees*, and that is a very different context. In the *Baze* context, the issue was a paralytic -- if the inmate was not properly given thiopental, he

could suffer suffocation when the paralytic paralyzed his diaphragm. That's not what we're dealing with here.

But turning back to hypoxia, we expect to see anxiety from any inmate facing imminent death. Look at the description of the EKG taken during the 1938 firing squad execution of John Deering. That's Defendants' 48. Mr. Deering seemed outwardly calm, according to the reports, but his heart rate jumped from 72 to something well above normal. Said 180 in the report. I believe Dr. Williams thought that may have been too high, but it was very high. And then it fluttered wildly before he gave his final statement.

Anxiety, even severe anxiety, panic, terror before an execution does not constitute cruel and unusual punishment. And Mr. Lee cannot show that he would have any greater fear from knowing that he is about to die via nitrogen hypoxia, just breathing nitrogen -- which, again, is colorless, odorless, and tasteless -- than from knowing that he, like Mr. Deering, is about to be shot in the chest with multiple high-velocity rounds in which he can only hope the marksmen hit the spot.

Assuming arguendo that inmates experience dyspnea in the few seconds before they lose consciousness, if dyspnea creates a sense of dread and doom, then so too must the knowledge that the inmate is about to die. He is facing his own mortality.

Now, Dr. Schwartzstein suggested that patients can

experience dyspnea or associated suffering even when they are unconscious. But while the brain may still be registering sensations and processing them, the patient is unconscious. He is not experiencing negative stimuli in the moment. Dr. Williams, in fact, testified there is no pain while someone is unconscious. So which is it? Is there pain? Is there not pain? Defendants would suggest there is no pain when an inmate is unconscious.

Dr. Schwartzstein also testified that inmates could suffer greater dyspnea because the restraints used to hold them to the gurney might impede their breathing. Well, putting aside the fact that ADOC has incredibly valid penological reasons to restrain inmates about to be executed, Dr. Schwartzstein has not been restrained himself. He cannot testify as to the actual effect.

But we had witnesses who could. James Houts and Wardens McKenzie and Clemons all testified that they had been restrained to the gurney under execution conditions in terms of tightness, and that their breathing was not impeded.

Dr. Bastarache testified that inmates move long before her theoretical two minute and 18 second point at which they should potentially lose consciousness, but she's never witnessed a nitrogen hypoxia execution. She based her testimony on the testimony of lay witnesses. And as this Court saw in her discussion of Gladys Bautista's article, Dr. Bastarache only

accepted the witness's interpretation of events if she agreed with it. Ms. Bautista testified that the inmate lost consciousness long before Dr. Bastarache thought he did.

Now, Dr. Antognini has served as an expert witness in four prior hypoxia challenges in this state and one in Louisiana. He is a board certified anesthesiologist, which means he is required to be knowledgeable in fields such as human anatomy and physiology, physics, the respiratory system, and the cardiovascular system. Indeed, he has taught on the subjects of anesthesiology and physiology, including respiratory physiology. And perhaps above and beyond some anesthesiologists, he was a question writer for the board exam. He has to be knowledgeable about the topic areas covered, including respiration. He is familiar with ventilators, intubation, oxygen transport, and, yes, hypoxia.

There is no reason that he should not be qualified as an expert now to opine on the effects of ADOC's nitrogen hypoxia protocol on the human body, and Dr. Antognini believes to a medical and scientific certainty that ADOC's protocol will cause unconsciousness within 35 to 40 seconds, maybe less, once the oxygen in the mask dips below 10 percent. He opines that death will occur within about 15 minutes on average. He further opines the mask does not cause significant leakage or cause carbon dioxide to build up within it for rebreathing. And he opines the protocol does not cause significant suffering or

pain.

Now, Mr. Lee has attempted to paint Dr. Antognini as an island of one, directing the Court to a cluster of articles written about nitrogen hypoxia in recent years. But beyond the fact that many of his exhibits are editorials, written by the same group of authors in different permutations, some of whom are, in fact, on the editorial boards of the journals in which their opinion pieces appear and some of whom are avowedly opposed to the death penalty, he overlooks the existence of Exit International and Dr. Philip Nitschke.

Dr. Nitschke is also a medical doctor and has a Ph.D. in laser physics. He is one of the authors of The Peaceful Pill Handbook, which for decades has provided information to individuals who wish to end their life by safe, hopefully painless, methods. And one method that he has espoused and continues to espouse in that handbook is inert gas suicide.

He feels so strongly about this that he testified for Kenneth Smith in 2024 here in the Middle District, and he developed the Sarco Pod, which is a device that when the person intending to commit suicide wishes to do so, they climb inside, push the button, and the capsule fills with nitrogen.

As he describes in The Peaceful Pill Handbook, he was a witness to the first and so far only use of a Sarco Pod, and the decedent died quickly. She was 64 years old, lost consciousness a little over a minute after nitrogen began filling the pod, had

some involuntary muscle contractions, and her death occurred after about seven minutes.

Now, admittedly, ADOC's executions tend to show more movement and a longer time to death, as the protocol calls for either 15 minutes of nitrogen or five after flatline, but there are notable differences. The Sarco user, again, was very ill, and most ADOC inmates are in better health.

Dr. Nitschke is avowedly opposed to the death penalty. His tweet, which is before the Court in a limited capacity, says as much. But he also makes clear that he firmly believes that nitrogen hypoxia, not as a method of execution but as a euthanasia measure, is not cruel or otherwise unusual.

So while Mr. Lee can point to medical professionals who oppose the use of nitrogen hypoxia, their opinion is not universal in the medical community.

Now, Mr. Lee has to name an alternative. Firing squad. That does not satisfy *Bucklew*. It is not feasible and readily available to ADOC.

Yes, Mr. Lee has pointed to the Utah and the Army protocols, but this is not as simple as simply taking Mr. Lee out behind the prison and shooting him with rifles. The Court heard testimony that the chamber is not currently suitable for a firing squad execution.

You know, the inmates did testify that perhaps the chamber could be retrofitted at some point. They don't know

what that would take. But the Court has seen the chamber. The Court has seen the dimensions of the chamber. The Court has seen the layout of the chamber. And if the chamber could be modified at all, it would take significant changes to prepare it to be a safe place to carry out a firing squad execution. The witnesses did testify, I remember Warden McKenzie especially, that it's too small.

Finally, ADOC would need to study available firing squad protocols, do its own research, decide on a protocol. And as the history of nitrogen hypoxia in Alabama shows well, as soon as ADOC announced a protocol, the inmates who elected it would come up with reasons why it was insufficient.

It took ADOC five and a half years to get the first hypoxia execution completed from the time that the method was made legal. There is no guarantee that firing squad would be any faster.

Firing squad is not significantly safer. Aside from the risk of anxiety, hypoxia is virtually painless if the inmate breathes normally. With firing squad, the inmate, yes, may die within seconds if the bullets hit accurately. The Mahdi execution in South Carolina upon which Dr. Antognini relied is proof that sometimes these things can go horribly wrong.

Mr. Lee wants the Court to believe that being shot in the chest by multiple rounds significantly reduces a severe risk of pain. This Court should find that Mr. Lee has failed to

prove his Eighth Amendment claim and grant judgment to defendants. Thank you.

THE COURT: All right. Thank you. All right.

I will take everything under advisement and get an opinion out after the evidence is closed, which brings me to the next question. Have you all conferred about how long you need, if at all, for the presentation of additional evidence?

MS. SHARPE: We have not yet conferred with opposing counsel in that regard. We have reached out to experts who are actively working on the issue. I would suggest, Your Honor, that we provide you with a status report, or we could have a telephone conference if that would be a preference early next week, and we can check in. And that would also give us an opportunity, I think, to speak further with counsel for defendants.

The one other suggestion which I wanted to make to the Court is we would be prepared and propose for plaintiff, at least, to revisit the posttrial briefing that we discussed at the pretrial conference. We would like to go ahead and submit proposed findings of fact and conclusions of law based on the record that's been developed to date and would be prepared to do so by Monday, if that would be agreeable with the Court.

MS. SIMPSON: It's currently scheduled for Friday, Your Honor. We certainly would not object to moving that to Monday if that's agreeable.

THE COURT: Yes. I actually had a very large note to myself to tell you just that.

MS. SHARPE: We have that same note, Your Honor.

THE COURT: So I did not forget. So, yes, I will bump the deadline for proposed findings of fact and conclusions of law to Monday.

As to follow-up about dates, would a telephone conference on Tuesday, the 5th, be enough time for you-all to at least have an update?

MS. SHARPE: Yes, Your Honor.

THE COURT: All right. Let's set a telephone conference for 1:30 on Tuesday, May 5th. Is that -- do you have a conflict?

MS. KENNY: Could we have a moment?

(Brief pause in the proceedings.)

MS. SIMPSON: Yes, Your Honor, that will work. I beg your pardon.

THE COURT: All right.

MS. SIMPSON: If I may put one more thing on the record, Your Honor.

THE COURT: All right.

MS. SIMPSON: So we did hear back late yesterday from the manufacturer of the pulse oximeters as to how they got the data down. That email has been given to counsel for Mr. Lee and counsel for the other hypoxia plaintiffs.

THE COURT: All right. Very good.

So proposed findings of fact and conclusions of law are now going to be due Monday, May 4th, and we will have a telephone conference on Tuesday, May 5th, at 1:30 to discuss when and how to reopen -- or keep evidence open for the pulse oximeter information. All right? Very good.

Thank you all very much. Have a safe trip to all of you. Good to see you.

(Proceedings concluded at 3:43 p.m.)

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COURT REPORTER'S CERTIFICATE

I certify that the foregoing is a correct transcript from the record of the proceedings in the above-entitled matter.

This 4th day of May, 2026.

/s/ Patricia G. Starkie
Registered Diplomate Reporter
Certified Realtime Reporter
Official Court Reporter