

## THE PHYSICIAN IN THE EXECUTION CHAMBER: NO SUCH THING AS THE NORMAL PAIN OF DYING

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### ABSTRACT:

*For capital punishment to be lawful in the United States of America, it must occur without cruelty, a requirement of the traditional reading of the Eighth Amendment. There has never been a consensus on what form of execution is cruel, although some historic practices are shockingly barbaric to modern sensibilities—I think of the “draw and quarter” technique. The family of the murdered victim may fairly argue that the murderous behavior should be the minimum degree of cruelty meted out. But western countries eschew that standard and seek moderate forms, partly to deter by punishment and partly as a forfeit of the murderer’s life for the victim’s life when execution is allowed in that state. Certainly, there is substantial support for continuation of execution in states that allow it. The judges must be respectful of that, but still, they must respect the 8th amendment. At present, the prevalent method of execution in the United States is “lethal injection” using injectable medicines in very high doses that are repurposed to kill the prisoner. Because it is impossible to ask an executed individual about the cruelty experienced during their own death, the state instead relies on the empathy of witnesses to gauge the cruelty of a prisoner’s execution. Lethal injection was expected to be a bloodless execution and aimed to eliminate the visible appearance of cruelty, sometimes through the use of a paralytic. Some judges mistakenly*

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*claim that pain is always associated with death—a legal fiction that is unknown to physicians—justifying the pain of execution and taking false comfort in the error that death by capital punishment cannot be made more pain free. When an execution does not appear outwardly cruel to witnesses, the state has claimed the prisoner’s inward experience must also not be cruel. However, convincing evidence that will be referred within this paper shows that the state’s use of lethal injection medicine to render executions outwardly painless and bloodless is not free from cruelty. The outward appearance of peace during a prisoner’s execution very likely does not accurately reflect the internal agony of lethal injection. The drug cocktail used during lethal injection commonly causes lung congestion that shares the characteristics of death by drowning and is commonly seen on autopsies performed on executed prisoners. Drowning is believed to be a painful death, possibly made more cruel to one who has also been paralyzed.*

*Lethal injection requires prison personnel to successfully start an intravenous line, which is increasingly beyond the capacity of execution teams. In the recent case of the execution of Joe Nathan James by the State of Alabama, the autopsy revealed he had been subjected to tortuous attempts at establishing an intravenous line, including the performance of an unauthorized “cut-down.” The State of Alabama also attempted and failed to establish intravenous access in both Allan Eugene Miller and Kevin Eugen Smith. Both men survived and described a harrowing scene of being strapped to a table while multiple intravenous attempts were made in both arms and legs and finally giving up because the death warrant had expired. As an alternative to lethal injection, the state of Alabama is advancing execution by nitrogen gas, so called “nitrogen hypoxia,” in another attempt to mollify witnesses and bloodlessly kill. At the time of this writing, no state has used nitrogen gas for this purpose. Modern medicines are designed to be ineffective killers. Moreover, lethal injection is incompatible with the oath that binds doctors to be non-maleficent and beneficent. While the state passes laws and protocols to shield complicit doctors and provide exculpatory cover in assisting with lethal injection, lethal injection is not a medical act. Medicine and doctors should have no part in executions. In this paper, I offer a better understanding of how lethal injection is not a pathway to non-cruel execution. I explain what lethal injection does and does not do to the body and why the state of Alabama is considering as an alternative the use of inert gases like ni-*

*trogen. I will discuss why the use of nitrogen gas may fail to cause death without cruelty and should not be the state's replacement for lethal injection. Finally, this paper will explain why the state should not use medicine or the medical profession to carry out capital punishment.*

In the United States, several methods of lawful execution have been utilized, including execution by hanging, firing squad, electrocution, and various versions of the gas chamber.<sup>1</sup> In 1977 Oklahoma State medical examiner Jay Chapman proposed a new method of execution that utilized the tools of medicine and began with the establishment of an intravenous saline drip in the arm of a prisoner.<sup>2</sup> A combination of medications, now repurposed as poisons, were injected in a sequence, and the resulting combination of the injected chemicals caused death.<sup>3</sup>

In this early version of the lethal injection, the first drug injected was sodium thiopental,<sup>4</sup> which is no longer available because of its use in execution.<sup>5</sup> This compound is within the class of drugs known as a barbiturate and was traditionally used at the beginning of a general anesthetic procedure.<sup>6</sup> As an anesthesiologist and intensivist run-

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1. *Methods of Execution*, DEATH PENALTY INFO. CTR., <https://deathpenaltyinfo.org/executions/methods-of-execution> (last visited Mar. 2, 2023) (lethal injection remains the preferred method of execution in all states in the modern era).

2. Max Kutner, *Meet A. Jay Chapman, "Father of the Lethal Injection"*, NEWSWEEK (Apr. 1, 2017, 2:09 PM), <https://www.newsweek.com/jay-chapman-inventor-lethal-injection-arkansas-592506> (Jay Chapman was a forensic pathologist and copied his method of execution from an anesthetic induction).

3. *Overview of Lethal Injection Protocols*, DEATH PENALTY INFO. CTR., <https://deathpenaltyinfo.org/executions/lethal-injection/overview-of-lethal-injection-protocols> (last visited Mar. 2, 2023).

4. *Sodium Thiopental, Use Me To Save lives, Not Cause Death, What Molecule Am I?*, AM. CHEMISTRY SOC'Y (Jan. 4, 2016), <https://www.acs.org/molecule-of-the-week/archive/s/sodium-thiopental.html>.

5. Chris McGreal, *Lethal Injection Drug Production Ends in the US, Sole US Sodium Thiopental Manufacturer, Hospira, Has Ceased Manufacturing the Drug Used in Administering Death Penalties*, THE GUARDIAN (Jan. 23, 2011), <https://www.theguardian.com/world/2011/jan/23/lethal-injection-sodium-thiopental-hospira>.

6. Vedat Çakırtekin et al., *Comparison of the Effects of Thiopental Sodium and Propofol on Haemodynamics, Awareness and Newborns During Caesarean Section*

ning intensive care units, I am familiar with the traditional medical use of these drugs. Anesthesiologists refer to the beginning of a general anesthetic as an induction, and sodium thiopental was the classical induction agent. Once injected, sodium thiopental rapidly produced a state of stupor and unresponsiveness.<sup>7</sup> However, sodium thiopental is not a pain reliever *per se*.<sup>8</sup> Still, when dosed correctly, in most cases, it creates a reduced state of awareness to a sufficient degree that would permit the introduction of other procedures that might be painful.<sup>9</sup> Sodium thiopental buffered the transition from induction to anesthetic maintenance. When injected in large quantities, sodium thiopental, can affect the strength of the heart's contraction. In an extreme case, the blood pressure and strength of circulation can fall to the point of fatality.<sup>10</sup> This characteristic made it useful in state executions and was adapted for executions by administering a massive overdose.

The second injected chemical was pancuronium bromide.<sup>11</sup> This drug causes paralysis of the muscles of movement and the muscles of breathing.<sup>12</sup> If given alone, a state of generalized paralysis would ensue, but there would be no interruption of awareness or the control of pain.<sup>13</sup> An individual paralyzed with pancuronium bromide would be awake and aware but unable to communicate and breathe. If pancu-

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*Under General Anaesthesia*, 43 TURK. J. OF ANAESTHESIOLOGY & REANIMATION 106 (2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4917150/>.

7. *Pentothal Prescribing Information*, DRUGS, <https://www.drugs.com/pro/pentothal.html#:~:text=Pentothal%20> (last updated Apr. 21, 2022).

8. *Id.*

9. *Id.*

10. *Id.*

11. Michael F. Roizen & Thomas W. Feeley, *Drugs Five Years Later: Pancuronium Bromide*, 88(1) ANNALS OF INTERNAL MED. 64 (1978), <https://www.acp-journals.org/doi/pdf/10.7326/0003-4819-88-1-64> (pancuronium bromide is a drug that works by occupying a binding site at the neuromuscular junction thereby blocking the natural chemical, acetylcholine, that would otherwise cause a muscle to contract. This drug is in the same class as the drug curare, also called D-tubocurare, which was the first paralytic used in anesthesia. It has since been replaced by newer agents. It was introduced to anesthesia around 1940. It was discovered in South America and was first used in poison arrows for hunting. It is harvested from the plant *strychnos toxifera*).

12. *Id.*

13. *Id.*

ronium bromide is administered by itself and no other intervention follows, a person would die shortly of asphyxiation because they would be unable to initiate the breath necessary to save their life.<sup>14</sup> Thus, drugs in this class are never given alone because the possibility of chemical paralysis while being awake is recognized and understood as cruel torture in contravention of the Eighth Amendment.<sup>15</sup>

The third injected chemical was potassium chloride.<sup>16</sup> Potassium is a normal chemical element that circulates in the blood and is necessary for muscle contraction—particularly, the heart contraction.<sup>17</sup> The precise blood potassium level needed to maintain normal homeostasis is finely regulated by different body systems.<sup>18</sup> For example, it is the kidney's job to remove excess potassium by adding it to urine. Individuals with kidney failure lose the ability to excrete potassium and require dialysis every few days to remove the accumulation of potassium.<sup>19</sup> Individuals with failing kidney function may adapt and develop extrarenal methods to manage higher than normal levels of potassium but absent dialysis or a working kidney, the eventual result would still be death by elevated potassium.<sup>20</sup> A rapid rise in potassium can overcome the kidney capacity to excrete potassium in healthy individ-

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14. *Id.*

15. Ty L. Bullard et al., *Intraoperative and Anesthesia Awareness*, NAT'L CTR. FOR BIOTECHNOLOGY INFO., <https://www.ncbi.nlm.nih.gov/books/NBK582138/> (last updated Jan. 9, 2023) (e.g., in anesthesia awareness, a patient can experience varying degrees of being aware of current surroundings and circumstance but is unable to move because of chemical paralysis. Though rare, such events are considered extremely serious, and patients have reported terrifying feelings of impending death).

16. *PubChem Compound Summary for CID 4873, Potassium Chloride*, PUBCHEM, <https://pubchem.ncbi.nlm.nih.gov/compound/Potassium-Chloride#section=CAS> (last visited Mar. 2, 2023).

17. P.A. Poole-Wilson, *Potassium and the Heart*, *Clinics in Endocrinology and Metabolism*, 13(2) J. OF CLINICAL ENDOCRINOLOGY & METABOLISM 249 (1984), <https://pubmed.ncbi.nlm.nih.gov/6237811/>.

18. R. H. Sterns et al., *Internal Potassium Balance and the Control of the Plasma Potassium Concentration*, 60(5) MED. (BALT.) 339 (1981), <https://pubmed.ncbi.nlm.nih.gov/6268928/>.

19. C. L. Kunis & A. N. Charney, *Potassium and Renal Failure*, 7(3) COMPREHENSIVE THERAPY 29 (1981), <https://pubmed.ncbi.nlm.nih.gov/7237977/>.

20. Ingrid Hougen et al., *Hyperkalemia and Its Association With Mortality, Cardiovascular Events, Hospitalizations, And Intensive Care Unit Admissions In A Population-Based Retrospective Cohort*, 6(5) KIDNEY INT'L REP. 1309 (2021), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8116905/>.

uals with normal kidneys. The resulting elevated potassium in the bloodstream has a direct effect on the strength of heart. When the potassium level rises beyond a certain point, the heart will stop contracting altogether.<sup>21</sup> If a large quantity of potassium is injected alone, a very elevated level of potassium will stop the heart, and a person will die. Potassium injection is also caustic to veins and in normal clinical practice, is injected in a small quantity at a slower rate than what is used in execution settings.<sup>22</sup> Since potassium is the third drug, the claim is that the sensorium suppression effect of sodium thiopental will blunt any painful sensation from the injected potassium.<sup>23</sup>

In this version of lethal injection, death would occur if any of the three drugs were used as a single agent. The three-drug technique built in killing redundancy. If the first drug did not kill, the second drug should kill. If the first and second drugs failed to kill, the third drug would kill. It is important to note that once the paralytic has been administered, there will be no more movement. An observer would see this paralyzed individual lying peacefully and making no effort to move, regardless of any pain that might now be present.<sup>24</sup> By law, execution cannot be cruel,<sup>25</sup> but an executed individual can never comment on the degree of the cruelty of their own death. In *Baze*, The Supreme Court held that lethal injection is not cruel punishment and further applied an “objectively intolerable” test to determine if a

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21. Angela Wetheron et al., *Fatal Intravenous Injection of Potassium in Hospitalized Patients*, RESEARCHGATE, [https://www.researchgate.net/publication/10736614\\_Fatal\\_Intravenous\\_Injection\\_of\\_Potassium\\_in\\_Hospitalized\\_Patients](https://www.researchgate.net/publication/10736614_Fatal_Intravenous_Injection_of_Potassium_in_Hospitalized_Patients) (last visited Mar. 2, 2023).

22. *Potential Irritant Medications*, MICH. HOSP. MED. SAFETY CONSORTIUM, <https://mi-hms.org/sites/default/files/Medications%20with%20Irritant%20or%20Vesicant%20Properties.pdf> (last visited Mar. 2, 2023).

23. Jong-Taek Park et al., *The Effect of Pretreatment with Thiopental on Reducing Pain Induced by Rocuronium Injection*, 46(6) YONSEI MED. J. 765 (2005), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2810589/> (e.g., this study examined the effect of sodium thiopental to reduce the pain of injection associated with the local anesthetic rocuronium. In this investigation, the endpoint was withdrawal movement and the dose used was lower than used in lethal injection).

24. Roizen & Feeley, *supra* note 12.

25. U.S. Const. amend. VIII (“Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted”).

method of execution violated the Eighth Amendment.<sup>26</sup> The definition of what constitutes objective intolerability is ill defined and the court claims, tautologically, that it cannot be argued that something is objectively intolerable when it is widely tolerated.<sup>27</sup> The only way to gauge cruelty during execution is through the empathy of witnesses.<sup>28</sup> Lethal injection successfully replaced all other prior methods of execution because it was so outwardly painless. Thus, the lethal injection seemingly made the claim that if an execution was outwardly peaceful, it was also inwardly peaceful.<sup>29</sup> The original version of the three-drug technique is no longer possible. Stiff resistance on the part of drug manufacturers and distributors has made procurement of the traditional supply very difficult.<sup>30</sup> Sodium thiopental was manufactured in Italy but was pulled off the market to comply with European Union trade policy that prohibits trade in goods that can be used for torture or execution.<sup>31</sup> It is no longer produced by regular pharmaceutical manufac-

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26. *Baze v. Rees*, 553 U.S. 35, 53, 62-63 (2008).

27. *Id.* at 53.

28. R.M., *Empathy and torture: A lack of the former leads to the latter*, THE ECONOMIST (Apr. 14, 2011), <https://www.economist.com/democracy-in-america/2011/04/14/empathy-and-torture> (e.g., empathy is complex and an uneven human ability. Our capacity to empathize may or may not guard against cruelty). See also Claire Cameron, *There's nothing to prepare you': What it's like to witness an execution*, THE GUARDIAN (Dec. 12, 2020), <https://www.theguardian.com/world/2020/dec/12/death-penalty-us-executions-witness-statements> (witnesses to executions are given no formal instruction on how to consider what they should or should not see in an execution).

29. *Baze v. Rees*, 553 U.S. at 53, 62.

30. Erik Eckholm, *Pfizer Blocks the Use of Its Drugs in Executions*, N.Y. TIMES (May 13, 2016), <https://www.nytimes.com/2016/05/14/us/pfizer-execution-drugs-lethal-injection.html>.

31. Commission Regulation 2016/2134, 2016 J.O. (338) 1, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R2134> (section (6) states, "If a country has not abolished capital punishment for all crimes and confirmed that abolition through an international commitment, the competent authorities should, when examining a request for an export authorization, check whether there is a risk that the end-user in the country of destination would use the exported goods for such punishment. Appropriate conditions and requirements should be imposed to control sales or transfers to third parties by the end-user. If multiple shipments between the same exporter and end-user take place, the competent authorities should be allowed to review the status of the end-user on a periodic basis, for example every six months, rather than every time an export authorization for a shipment is granted, without prejudice to the right of the competent authorities to annul, suspend, modify

turers anywhere in the world because of its association with capital punishment.<sup>32</sup> Unfortunately, safe and effective anesthesia practices ended up suffering the consequences of the drug shortage.<sup>33</sup>

Currently, lethal injection is generally performed as either a single drug technique using pentobarbital (a cousin of sodium thiopental) or a combination of medications that generally include a drug known as midazolam, a benzodiazepine.<sup>34</sup> Midazolam can produce a state of stupor but may not be as intense as pentobarbital.<sup>35</sup> Midazolam also does not have the same negative effect on the strength of contraction of the heart.<sup>36</sup> When midazolam is used as the first drug in a sequence for lethal injection, the prisoner then generally receives a paralyzing drug followed by potassium. However, drug shortages continue to plague states that wish to kill by this method, and consequently, other non-lethal injection methods are being reconsidered and re-utilized.<sup>37</sup>

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or revoke an export authorization in accordance with Article 9(4) of Regulation (EC) No 1236/2005 where warranted.”).

32. Carol J. Williams, *Maker of anesthetic used in executions is discontinuing drug*, L.A. TIMES (Jan. 22, 2011), [https://www.latimes.com/local/la-xpm-2011-jan-22-la-me-execution-drug-20110122-sto-](https://www.latimes.com/local/la-xpm-2011-jan-22-la-me-execution-drug-20110122-sto-ry.html#:~:text=The%20sole%20U.S.%20maker%20of,to%20put%20prisoners%20to%20death)

<ry.html#:~:text=The%20sole%20U.S.%20maker%20of,to%20put%20prisoners%20to%20death> (Hospira manufactured Sodium Thiopental and attempted to move production to a factory in Liscate, Italy, near Milan, Italian authorities demanded assurances that the drug wouldn't end up in the hands of executioners).

33. Asher Orkaby & Sukumar P. Desai, *The Death of Sodium Pentothal: The Rise and Fall of an Anesthetic Turned Lethal*, 76 J. OF THE HIST. OF MED. AND ALLIED SCI. 294 (2021), <https://academic.oup.com/jhmas/article-abstract/76/3/294/6312888?redirectedFrom=fulltext>.

34. *See Id.* at note 4 (e.g., until 2009, most states used a three-drug combination for lethal injections: an anesthetic (usually sodium thiopental, until pentobarbital was introduced at the end of 2010), pancuronium bromide (a paralytic agent, also called Pavulon), and potassium chloride (stops the heart and causes death). Due to drug shortages, states have adopted new lethal-injection methods).

35. *Midazolam vs. Pentobarbital for Pediatric Sedation*, RELIAS MEDIA (June 1, 2001), <https://www.reliasmedia.com/articles/70734-midazolam-vs-pentobarbital-for-pediatric-sedation>.

36. P. W. Lebowitz et al., *Comparative Cardiovascular Effects of Midazolam and Thiopental in Healthy Patients*, 61(9) ANESTHESIA AND ANALGESIA J. 771 (1982), <https://pubmed.ncbi.nlm.nih.gov/7201758/>.

37. Dave Martin, *4 Legal Alternatives to Lethal Injection in the US*, AXIOS, <https://www.axios.com/2017/12/15/4-legal-alternatives-to-lethal-injection-in-the-us>



In every iteration of lethal injection, apart from intravenous misadventure or other failures or delays, the observer confronts a death that appears to be outwardly mild. However, a review of over 200 autopsies performed on executed individuals by lethal injection reveals something different than what has been observed and imagined.<sup>38</sup> In approximately 80% of the cases examined, frothy fluid was observed within the lungs postmortem. This fluid could not have been present in the lungs at the beginning of the execution as an individual with such frothy fluid would experience intense breathing difficulty, and witnesses would easily observe such difficulty.<sup>39</sup> Frothy fluid, known technically as pulmonary edema, was a surprising finding at autopsies after lethal injection.<sup>40</sup> Pulmonary edema was seen both in single-drug pentobarbital executions and in midazolam, paralytic, and potassium executions.<sup>41</sup> Pulmonary edema may not be a direct effect of the injected chemicals but instead a consequence of the chemical formula-

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1513301926 (e.g., methods of execution in the US include electrocution, gas chamber, hanging, and the firing squad).

38. N. Caldwell, A. Chang & , J. Myers, *Gasping for Air: Autopsies Reveal Troubling Effect of Lethal Injection*, NPR (Sept. 21, 2020), <https://www.npr.org/2020/09/21/793177589/gasping-for-air-autopsies-reveal-troubling-effects-of-lethal-injection>. The investigation underlying this article, was based on my findings from analyzing autopsy reports for 43 inmates from eight states. A review of this autopsy cohort allowed me to identify any abnormal findings. Pulmonary edema (often fulminant with froth filling airways) emerged as a consistent and unexpected abnormality in 33 of 43 autopsies (76.74%). Further, pulmonary edema was present in 23 of 28 midazolam executions (82.14%) and 10 out of 15 (66.66%) of pentobarbital executions. Injecting heavy overdoses of either acidic or basic solutions into the bloodstream may be directly toxic to pulmonary capillary endothelial cells. The injury manifests by the sudden escape of edema fluid into normally air-filled lungs, resulting in pulmonary edema. These findings explain why inmates show signs of respiratory distress during executions and the growing concern about the inability to witness the same distress once a paralytic is added. Likewise, in this NPR review of more than 200 autopsies — obtained through public records requests — the findings demonstrated signs of pulmonary edema in 84% of the cases. The findings were similar across the states and, notably, across the different drug protocols used.

39. Michael A. Chen, MD, PhD, *Pulmonary Edema*, PA. MED. (Jan. 9, 2022), <https://www.pennmedicine.org/for-patients-and-visitors/patient-information/conditions-treated-a-to-z/pulmonary-edema>.

40. Joel B. Zivot et al., *Execution by Lethal Injection: Autopsy Findings of Pulmonary Edema*, MEDRXIV (Aug. 17, 2022), <https://www.medrxiv.org/content/10.1101/2022.08.24.22279183v1>.

41. *Id.*

tion that either creates a strong alkali solution in the case of pentobarbital, or a strong acidic solution in the case of midazolam.<sup>42</sup> Strong alkali and acidic solutions are known to be noxious to tissue integrity.<sup>43</sup> In the case of lethal injection, it is possible that large quantities of alkali or acidic solutions destroyed the delicate lung tissue needed to separate air from the blood by flooding blood into the lungs. It is likely that during execution, some prisoners become aware of this frothy fluid, and in these cases, the experience of dying will be more akin to drowning than simply falling off to sleep. Near-drowning deaths are remembered as terrifying and painful. The common finding of pulmonary edema has been presented in evidence in several cases related to lethal injection.<sup>44</sup> For example, in *Baze v. Rees*, Chief Justice Roberts asserts that the Constitution does not demand the avoidance of all risk of pain.<sup>45</sup> After pulmonary edema was shown to occur in lethal injection, instead of ending lethal injection because of potential cruelty, a recent decision by the Tenth Circuit upheld a decision by the district court that ruled Oklahoma's execution protocol was constitutional despite the occurrence of pulmonary edema.<sup>46</sup>

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42. *Id.*

43. A.P. Mentzer, *How Are Acids & Bases Harmful?*, SCIENCING (May 7, 2018), <https://sciencing.com/acids-bases-harmful-6019071.html>.

44. Michael Tarm, *Lawyers: Autopsy Suggests Inmate Suffered During Execution*, KHON2 (Aug. 21, 2020, 2:38 PM), <https://www.khon2.com/news/national/lawyers-autopsy-suggests-inmate-suffered-during-execution/>. (“An inmate suffered ‘extreme pain’ as he received a dose of pentobarbital during just the second federal execution following a 17-year lag, according to court filings by lawyers representing one of the inmates scheduled to be executed. The filings were part of motions to halt the execution of Keith Nelson based on the claim that Wesley Purkey may have felt a sensation akin to drowning while immobilized but conscious. An autopsy performed by a Michigan-based pathologist a week after the 68-year-old Purkey was put to death found evidence of ‘severe bilateral acute pulmonary edema’ and ‘frothy pulmonary edema in trachea and mainstem bronchi.’”).

45. *Baze v. Rees*, 553 U.S. 35 (2008) (because some risk of pain is inherent in even the most humane execution method if only from the prospect of error in following the required procedure, the Constitution does not demand the avoidance of all risks of pain).

46. *Coddington v. Crow*, No. 22-6100 (10th Cir. Oct. 19, 2022).

Recently, a new method of execution proposes the use of inhalation of nitrogen gas.<sup>47</sup> The assumption is that this method would eliminate the need for lethal injection.<sup>48</sup> To date, no state has developed and utilized a technique for execution with nitrogen gas inhalation, but efforts are ongoing.<sup>49</sup> Nitrogen is a gas at room temperature and is an element on the periodic table.<sup>50</sup> Nitrogen is a normal component of the air we breathe, a mixture containing mostly two gases. One gas is oxygen and is present in approximately 20% of the total volume of air. The remaining 80% is nitrogen, and under normal circumstances, individuals can breathe nitrogen gas without any untoward effect.<sup>51</sup> In the body, nitrogen is considered an inert gas. This means it passes in and out of the body without undergoing any chemical change.<sup>52</sup>

Oxygen, on the other hand, is utilized by the body and taken up into the bloodstream.<sup>53</sup> Oxygen is necessary as cellular fuel and is responsible for generating high-energy phosphate bonds used in all cellular metabolic systems.<sup>54</sup> The body needs a constant supply of oxygen; when a person is in an environment without oxygen, the body systems rapidly shut down. If oxygen is not immediately available, a person will die.<sup>55</sup> Normal cellular metabolism also produces a waste

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47. Dana G. Smith, *New Execution Method Touted as More “Humane,” but Evidence Is Lacking*, SCI. AM. (Sept. 23, 2022), <https://www.scientificamerican.com/article/new-execution-method-touted-as-more-humane-but-evidence-is-lacking/>.

48. *Alabama Readies Death Chamber for Nitrogen Hypoxia Executions*, DEATH PENALTY INFO. CTR (June 15, 2021), [https://deathpenaltyinfo.org/news/alabama-readies-death-chamber-for-nitrogen-hypoxia-executions\\_](https://deathpenaltyinfo.org/news/alabama-readies-death-chamber-for-nitrogen-hypoxia-executions_).

49. *Nitrogen Gas for Executions*, THE MARSHALL PROJECT, <https://www.themarshallproject.org/records/1186-nitrogen-gas-for-executions> (last visited Mar. 2, 2023).

50. R. Thomas Sanderson, *nitrogen*, BRITANNICA, <https://www.britannica.com/science/nitrogen> (last visited Mar. 2, 2023).

51. *Id.*

52. Mark Salzwedel, *How Does Nitrogen Enter Our Body?*, SCIENCING (Apr. 24, 2017), <https://sciencing.com/nitrogen-enter-body-5180380.html>.

53. Ilene M. Rosen & Scott Manaker, *Oxygen Delivery and Consumption*, UPTODATE, <https://www.uptodate.com/contents/oxygen-delivery-and-consumption> (last visited Mar. 2, 2023).

54. Maria Ahmad et al., *Biochemistry, Electron Transport Chain*, STATPEARLS, <https://www.ncbi.nlm.nih.gov/books/NBK526105/> (last updated Sept. 5, 2022).

55. Christopher M. Milroy, *Deaths from Environmental Hypoxia and Raised Carbon Dioxide*, 8(1) ACAD. FORENSIC PATHOLOGY 2 (2018), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6474450/>.

product known as carbon dioxide. Carbon dioxide is a gas and in normal respiration, the body exchanges oxygen for carbon dioxide in a very specific fashion.<sup>56</sup> In the body, carbon dioxide acts like an acid; if carbon dioxide accumulates, physiologic systems rapidly begin to fail. When an individual holds their breath, carbon dioxide levels rapidly rise. In the brain, highly sensitive chemical receptors detect this rise in carbon dioxide and send a message to the brain to exhale or take a breath.<sup>57</sup> Breathing lowers blood carbon dioxide level and restores it to a normal range. The body also can detect low levels of oxygen, but oxygen detection is not as sensitive as the detection of elevated levels of carbon dioxide.<sup>58</sup> When we have the urge to take a breath during breath holding, it is generally not due to depleted oxygen but to the rise in carbon dioxide.<sup>59</sup>

If a person breathes pure nitrogen gas, the body is rapidly starved of oxygen, resulting in death. As nitrogen is an odorless, colorless, and inert gas, we might in theory be able to breathe it without distress, at least in the short term.<sup>60</sup> Dying by nitrogen inhalation would not compel a person to hold their breath, and continued breathing would maintain a regular and non-noxious level of carbon dioxide in the blood.<sup>61</sup> Death by inhalation of nitrogen has occurred in industrial set-

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56. Rebecca Dezube, *Exchanging Oxygen and Carbon Dioxide*, MERCK MANUAL (Jan. 2023), <https://www.merckmanuals.com/home/lung-and-airway-disorders/biology-of-the-lungs-and-airways/exchanging-oxygen-and-carbon-dioxide>.

57. Joshua E. Brinkman et al., *Physiology, Respiratory Drive*, STATPEARLS, <https://www.ncbi.nlm.nih.gov/books/NBK482414/> (last updated June 8, 2022).

58. *Id.* (“In healthy individuals, the respiratory center is more sensitive to rising carbon dioxide sensed by central chemoreceptors than decreasing oxygen levels. Oxygen runs the respiratory center only when there is severe hypoxemia.”).

59. *Id.*

60. Angel Arrieta et al., *Hazards of Inert Gases and Oxygen Depletion*, EUR. INDUS. GASES ASS’N (2009), [https://www.linde-gas.com/en/images/Hazards%20of%20inert%20gases%20and%20oxygen%20depletion\\_tcm17-13909.pdf](https://www.linde-gas.com/en/images/Hazards%20of%20inert%20gases%20and%20oxygen%20depletion_tcm17-13909.pdf) (“Inert gases like nitrogen are odorless, colorless and tasteless. They are undetectable and can therefore be a great deal more dangerous than toxic gases such as chlorine, ammonia, or hydrogen sulphide, which can be detected by their odor at very low concentrations.”).

61. Evan Mealins, *Nitrogen hypoxia to execute a human: ‘Bloodless, but it won’t be simple’*, MONTGOMERY ADVERTISER (Nov. 16, 2022), <https://www.montgomeryadvertiser.com/story/news/2022/09/14/nitrogen-hypoxia-what-we-know/69487392007/>.

tings<sup>62</sup> and through voluntary inhalation as a method of suicide.<sup>63</sup> It is impossible to conduct a trial on whether inhalation of nitrogen gas as a method of execution would cause death which would not be cruel. In animal models, nitrogen gas inhalation has been associated with seizures,<sup>64</sup> and the same effect is possible with prisoners.

The use of nitrogen gas presents other significant problems. There is the possibility of harm to individuals near the nitrogen gas that is close enough to inhale. In lethal injection, individuals in the vicinity of the prisoner, including corrections officers or members of the injection team, bear little risk of being harmed by any portion of the lethal injection execution technique. Observers of lethal injection executions can watch safely without risk of harm. Nitrogen gas, on the other hand, can travel wherever gas may go and, depending upon the execution chamber design, poses a threat to everyone in the vicinity, including witnesses.<sup>65</sup>

It remains unclear how a prisoner would be made to cooperate in breathing nitrogen gas. One speculation is that a prisoner would wear a mask that must be tight fitting so as not to leak any gas around the edges as it abuts against the skin of the face. Another nitrogen gas delivery method might involve the use of a hood that would fit over the head of the prisoner and create a seal around the neck or shoulders. In either case, it is more than likely that a prisoner would be unwilling and uncooperative. Therefore, the state may require some form of chemical or physical restraint that would mollify the prisoner and make them unable to refuse.

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62. Ivan Morales et al., *Inert Gas Asphyxiation: A Liquid Nitrogen Accident*, CHEST (Oct. 31, 2017), [https://journal.chestnet.org/article/S0012-3692\(17\)31922-0/fulltext](https://journal.chestnet.org/article/S0012-3692(17)31922-0/fulltext).

63. Brett E. Harding & Barbara C. Wolf, *Case report of suicide by inhalation of nitrogen gas*, 29(3) AM. J. FORENSIC MED. PATHOLOGY 235 (2008), <https://pubmed.ncbi.nlm.nih.gov/18725778/>.

64. Thomas C. Gent et al., *Epileptiform Activity During Inert Gas Euthanasia of Mice*, PLOS ONE (Apr. 19, 2018). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5908136/pdf/pone.0195872.pdf>. (inert gases, including, N<sub>2</sub>, He and Ar cause epileptiform activity in all animals).

65. *Hazards of Nitrogen Asphyxiation in Confined Spaces*, OFF. OF ENV'T, HEALTH, SAFETY & SEC. (2005), [https://ehss.energy.gov/SESA/Files/corporatesafety/safety\\_bulletins/2005-17.pdf](https://ehss.energy.gov/SESA/Files/corporatesafety/safety_bulletins/2005-17.pdf).

65. Morales, *supra* note 63.

Another possible nitrogen gas method would be building an airtight gas chamber to contain the prisoner. The air within the chamber would be replaced by nitrogen gas and vented using a different approach.<sup>66</sup> If using this method, the nitrogen gas would have to be removed at the end of the execution so as not to harm anyone who entered the chamber. Technical challenges of building such a chamber are myriad and raise many possibilities for failure and risk to the execution team and witnesses.<sup>67</sup> Suggested capital punishment techniques using nitrogen would likely face legal challenges over concerns of cruelty.

Execution is a kind of killing, and while every submitted death certificate after execution lists the cause of death as “homicide,” this fails to address how and why that death occurs.<sup>68</sup> The living human body is both sturdy and fragile. It can endure significant illness and trauma. It can also succumb to a seemingly trivial insult. Death can result from many things, but from the legal perspective, death by execution is a bounded concept. In all forms, punishment is a loss of rights because of a breach of law.<sup>69</sup> Indeed, the penalty of capital punishment is the loss of a right to life. The Eighth Amendment of the United States Constitution prohibits cruel and unusual punishment, and societal understanding of the meaning of cruelty has changed over

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66. Josh Cable, *Nitrogen, The Silent Killer*, EHS TODAY (Sept. 20, 2006), <https://www.ehstoday.com/industrial-hygiene/article/21909148/nitrogen-the-silent-killer> (confined spaces fall under OSHA jurisdiction and may need special permitting to be used under OSHA 29 C.F.R. § 1910.146(c)(2)).

67. *Id.*

68. *Possible Solutions to Common Problems in Death Certification*, CTR. DISEASE CONTROL, [https://www.cdc.gov/nchs/nvss/writing-codstatements/death\\_certification\\_problems.htm#:~:text=Causes%20of%20death%20on%20the,the%20reported%20causes%20of%20death](https://www.cdc.gov/nchs/nvss/writing-codstatements/death_certification_problems.htm#:~:text=Causes%20of%20death%20on%20the,the%20reported%20causes%20of%20death) (last updated Nov. 6, 2015). To a degree, a death certificate is a medical opinion and is supposed to include co-existing medical conditions that lead to death. When the signer of a death certificate list the cause of death as “homicide” this is not meant to be a legal conclusion. Coroners and medical examiners may classify death as natural, accident, suicide, homicide, undetermined, and pending.

69. Zachary Hoskins & Antony Duff, *Legal Punishment*, STANFORD ENCYC. OF PHIL., (Dec. 10, 2021), <https://plato.stanford.edu/entries/legal-punishment/#LegPunJus> (“Legal punishment involves the imposition of something that is intended to be both burdensome and reprobative, on a supposed offender for a supposed crime, by a person or body who claims the authority to do so.”).

time.<sup>70</sup> What we regard as cruel is a shifting and moving standard that may not track with the maturation of civil society. It would be wrong to say our taste for violence in punishment is less now than it has been in the past.

We consider dying to be painful. A broad range of painful experiences, from mild to excruciating, may occur when one dies following disease. Science cannot measure pain objectively, and we confront our pain alone. Although the profession of medicine extends far back to antiquity, the ability of medical treatment to interrupt the arc of illness predictably and effectively is relatively recent. The physician has always witnessed illness, but a better understanding of human physiology and therapeutics was necessary to transform medicine into its current usefulness. Broadly, medicine seeks a combination of curing illness and controlling harmful symptoms. It is possible to manage pain absent the curing of illness, and when pain is present at the end of life, the control of painful symptoms is a powerful tool in the hand of the physician. The pain of dying is a murky concept, and it would be wrong to say that modern medical practice can control all painful experiences at the end of life. The use of opioids can block the experience of extreme pain, but that may not be sufficient to prevent the pain of natural death if that pain is metaphysical or intangible.

When dying is a consequence of a concurrent illness, other pain causing factors may be present. Execution is not a natural death and as a result, the pain associated with that circumstance is fundamentally different from the pain associated with death by illness. This point is ignored or not appreciated by the judges who allow lethal injection despite the Eighth Amendment.<sup>71</sup> No formal training exists within current medical education that specifically addresses the question of the pain of dying by execution.<sup>72</sup> It would be wrong to claim that current

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70. *Trop v. Dulles*, 356 U.S. 86, 100–01 (1958). The Court ruled it was unconstitutional to revoke citizenship as a punishment for a crime. *Id.* at 103. With this ruling, the Supreme Court began following the “evolving standards of decency” test. *Id.* at 101. In 1958, Chief Justice Earl Warren wrote that the clause “must draw its meaning from the evolving standards of decency that mark the progress of a maturing society.” *Id.*

71. *Baze v. Rees*, 553 U.S. 35, 47 (2008).

72. Lee Black & Robert M. Sade, *Lethal Injection and Physicians: State Law vs. Medical Ethics*, DEATH PENALTY INFO. CTR, <https://deathpenaltyinfo.org/stories/lethal-injection-and-physicians-state-law-vs-medical-ethics> (last visited Mar. 2, 2022). The American Medical Association Code of Medical Ethics strictly prohibits

treatment available to the dying in traditional medical practice will provide the same reduction in painful symptoms when an execution ends life. The Court claims the existence of something it considers to be the normal pain of dying.<sup>73</sup> This is a deceptive legal fiction as medical practice knows of no such concept. The claim by courts that dying has a quantifiable and predictable amount of associated pain does no more than provide our 21st-century judges with exculpatory cover when executions go awry.<sup>74</sup> In truth, all we know about the pain of death is speculation. Where a death penalty is warranted, we should face this truth. The Court remains unbothered by technical challenges associated with killing as it has asserted that as capital punishment is constitutional, a method must be available to carry it out. Lethal injection should not be that method. Neither should nitrogen gas.

It is this concern for pain, specifically the kind of pain that observers might witness during an execution, that was the basis for a call to physicians by the state to help ameliorate excessive and visible pain during an execution.<sup>75</sup> The trained physician, an expert in pain control, might find it extremely difficult to witness an execution while standing idly by. The relationship here is more complex and nuanced because a physician only has the mandate to intervene in the setting of a doctor-patient relationship.<sup>76</sup> A prisoner, dying by execution, is not simply transformed into a patient by dint of the presence of a doctor. For the doctor in the execution chamber, the presumed obligation to

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physician involvement in execution in any capacity. End of life care is within the scope of traditional medical education, but no pathway exists for commentary from physicians and the pain at the end of life in a medical setting cannot transfer to the execution chamber.

73. *Baze*, 553 U.S. at 47.

74. *Id.*

75. Joan M. LeGraw & Michael A. Grodin, *Health Professionals And Lethal Injection Execution in the United States*, 24 HUM. RTS. Q. 382 (2002). The timeline of lethal injection suggests that it was designed to in essence, impersonate a medical act and replace other methods of execution. To suggest the involvement of physicians was not always contemplated rings false. It seems more likely however, that physician involvement was always intended—the presence of a physician made executions more palatable and appear humane, reassuring the public that the inmate will die with minimal suffering.

76. *Ricks v. Budge*, 64 P.2d 208, 211 (Utah 1937) (a physician, upon undertaking a case, is under a duty, absent and agreement limiting service, of continuing treatment as long as the case requires attention).



reduce the pain of dying confronts another complexity. After the United States Supreme Court decision in *Estelle v. Gamble*,<sup>77</sup> prisoners became the only citizens of the United States with a constitutional right to health care. However, whether the right to healthcare is ever set aside in the time up to, or during execution remains unclear. Death by execution is not simply death by any method. Increasing recognition of botched executions, noted in several states, has led to a suspension of executions as they sort out the issues.<sup>78</sup> What would be the duty of a physician present in the execution chamber while witnessing an execution gone awry? In that case, that physician might have an arguable obligation to revive and resuscitate the prisoner to uphold that prisoner's right to health care. A legal execution fails when the cause of death is cruel and not simply when a prisoner survives.

The modern profession of medicine is a licensable activity, and doctors exchange self-regulation for public protection.<sup>79</sup> The granting of a license to practice of medicine is not given automatically. It is at the discretion of the state medical board. State medical boards regulate the practice of medicine, and the power and scope of medical boards are set through a statutory medical practice act establishing the laws and regulations that dictate the conduct of the boards.<sup>80</sup> Although the

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77. *Estelle v. Gamble*, 429 U.S. 97 (1976). The United States Supreme Court held that “deliberate indifference by prison personnel to a prisoner’s serious illness or injury constitutes cruel and unusual punishment contravening the Eighth Amendment.” *Id.* at 97. This is the seminal case for prisoners’ medical rights. In this case, the Supreme Court of the United States decided that a prisoner must show that there was a deliberate indifference to his or her medical needs or injuries in order to claim an Eighth Amendment violation under 42 U.S.C. § 1983 (1996). *Id.* at 104.

78. *Statements from Governors of California, Pennsylvania, Washington, Colorado, and Oregon Halting Executions*, DEATH PENALTY INFO. CTR, <https://deathpenaltyinfo.org/stories/statements-from-governors-imposing-moratoria-on-executions> (last visited Mar. 2, 2023). In the past few years, the governors of California, Pennsylvania, Washington, Colorado, and Oregon have put a halt to executions in their states because of problems in the death penalty system. Recently in Alabama, a moratorium and internal review of executions were imposed after the occurrences of one prolonged and two failed executions.

79. William D. White, PhD, *Professional Self-Regulation in Medicine*, 16 AM. MED. ASS’N J. OF ETHICS 275 (2014), <https://journalofethics.ama-assn.org/article/professional-self-regulation-medicine/2014-04>.

80. MEDICAL LICENSE DIRECT, A GUIDE TO THE ESSENTIALS OF A MODERN MEDICAL PRACTICE ACT (10th ed. 2003), [https://www.medicallicensedirect.com/files/A\\_Guide\\_to\\_the\\_Essentials\\_of\\_a\\_Modern\\_Medical\\_Practice\\_Act.pdf](https://www.medicallicensedirect.com/files/A_Guide_to_the_Essentials_of_a_Modern_Medical_Practice_Act.pdf).

lawful practice of medicine requires a license, the profession of medicine ascribes to a moral code that may not always align with state interests. A physician in the state is a citizen and therefore is bound by the laws of the state.<sup>81</sup> As a citizen, a physician may act in accordance with state law but violate a moral turpitude rule imposed by a state medical board.<sup>82</sup> The American Medical Association code of ethics objects to physician participation in execution in any capacity.<sup>83</sup> When the state medical board receives a complaint that a physician failed to act in a manner consistent with expected medical practice, the medical board may seek to discipline that physician, up to and including revocation of a license to practice.<sup>84</sup> State medical boards are subservient to the legislature and are not empowered to make laws but instead apply the laws enacted by the legislature.<sup>85</sup> If the state medical board

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81. LOIS SNYDER SULMASY ET AL., AMERICAN COLLEGE OF PHYSICIANS ETHICS MANUAL (7th ed. 2019), <https://www.acpjournals.org/doi/10.7326/m18-2160>. Physicians have ethical and legal obligations, and the two may not be concordant. Physician participation in torture is legal in some countries but is never ethical.

82. Drew Carlson & James N. Thompson, *The Role of State Medical Boards*, 7 AM. MED. ASS'N J. OF ETHICS 311 (2005), <https://journalofethics.ama-assn.org/article/role-state-medical-boards/2005-04>.

83. Tanya Albert Henry, *AMA to Supreme Court: Doctor Participant in Executions Unethical*, AM. MED. ASS'N (Aug. 22, 2018), <https://www.ama-assn.org/delivering-care/ethics/ama-supreme-court-doctor-participation-executions-unethical>. In a five to four decision issued in April 2018, the Supreme Court ruled that Missouri could go forward with Russell Bucklew's execution by using lethal injection. *Bucklew v. Precythe*, 139 S. Ct. 1112 (2019). The Court stated that the death-row inmate did not prove to the court that his medical condition meant that death by lethal gas would be significantly less painful for him than the planned method. *Id.* at 1133–34. The Court's majority said that the Eighth Amendment could be violated if an inmate identified a "feasible, readily implemented" alternative procedure that would "significantly reduce a substantial risk of severe pain," but that Bucklew failed to do those things. *Id.* at 1116. The ruling did not mention that the American Medical Association had submitted a brief, which did not support either party but instead educated the court that medical ethics prohibited the patient's physician expert from offering comparative testimony on the proposed execution methods. In the ruling, the justices did not consider the physician's ethical responsibility to abstain from assisting or furthering a state-sponsored execution.

84. Carlson & Thompson, *supra* note 82.

85. *Guide to Medical Regulation in the United States: Introduction*, FED'N OF STATE MED. BDS., <https://www.fsmb.org/u.s.-medical-regulatory-trends-and-actions>

sanctions a physician that participated in execution, that physician may attempt to reject medical board oversight claiming that no statutory laws were broken.<sup>86</sup>

By creating a medical board through a medical practice act,<sup>87</sup> the legislature acknowledges it is not an expert in regulating and maintaining physician licensure. In an execution, the state may nevertheless demand physician participation even as it conflicts with a medical board code of conduct. In effect, the governor becomes the chief physician of the state *pro tem*, usurping the medical board.<sup>88</sup> When a physician is assisting in an execution, is the physician acting as a physician or is the physician merely using their knowledge in a non-medical fashion? The medical knowledge of a physician is not something that can be set aside after hours. It is in the interest of the public good that physicians act as physicians in whatever circumstance they confront. Once donned, the white coat is never truly removed for the entirety of a career. A physician may choose to retire and relinquish a license to practice. Under those circumstances, they may retain some medical knowledge but, as an unlicensed person, the physician is now a citizen only and is held to citizens' rules. The state does not seek unlicensed former physicians or retired physicians.<sup>89</sup> Instead, it demands

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/guide-to-medical-regulation-in-the-united-states/introduction/ (last visited Mar. 2, 2023).

86. *See generally* N.C. Dep't of Corr. v. N.C. Med. Bd., 675 S.E.2d 641 (N.C. 2009).

87. Carlson & Thompson, *supra* note 82.

88. In *N.C. Dep't of Corr. v. N.C. Med. Bd.*, this was a decision on the extent of the Medical Board's disciplinary authority over licensees who participate in administration of the death penalty. 675 S.E.2d 641. The court held that "N.C.G.S. § 15-190, by its plain language, envisions physician participation in executions in some professional capacity. Defendant's Position Statement exceeds its authority under Chapter 90 of the North Carolina General Statutes because the Statement directly contravenes the specific requirement of physician presence found in N.C.G.S. § 15-190. Because plaintiffs have standing, a genuine controversy exists, the issue is ripe for decision, and the trial court did not impermissibly decide questions of fact or fail to allow additional presentation of evidence; and because the Position Statement is an invalid exercise of defendant's statutory powers, the Supreme Court of North Carolina affirmed the decision of the trial court." *Id.* at 651.

89. *Can a Board of Medicine Discipline a Doctor for Participating in State Sanctioned Execution*, MEDICAL JUSTICE (June 27, 2014), <https://medicaljustice.com/can-board-medicine-discipline-doctor-participating-state-sanctioned-execution/>.

licensed physicians, the purpose of which is to project credibility and seriousness in the conduct of execution.

Lethal injection is not a medical act and, consequently, does not concern the practice of medicine. State medical boards, however, have the essential responsibility of licensing and regulating physician practice.<sup>90</sup> When the state interferes with the conduct of the medical board and demands physicians to act outside of their ethical duties, the public loses. It remains the state's prerogative to punish with execution. Still, the profession of medicine and the public should demand the state stay away from the medical profession and insist that it stop trying to repurpose medical practice as an arm of punishment. The core purpose of medicine is now and has always been to reduce suffering and to heal.

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90. Carlson & Thompson, *supra* note 82.