



The role of anaesthesiologists in lethal injection: a call to action

Elizabeth Kim, Richard J Levy

In 2006, Michael Angelo Morales, a California death-row inmate, was scheduled to be executed by lethal injection.¹ Morales challenged the state's lethal injection protocol in court, arguing that administration of pharmaceutical drugs without oversight by personnel with medical expertise or training would violate his Eighth Amendment rights.² The basis of his claim was that the protocol created foreseeable and undue risk of excessive pain, given the potential for consciousness during drug administration.² The California protocol called for an injection of a three-drug cocktail: thiopental, a barbiturate intended to render the inmate unconscious; pancuronium, a neuromuscular blocking drug that induces paralysis and causes cessation of breathing; and potassium chloride, to induce cardiac arrest.³ Morales argued that the potential for consciousness during the administration of pancuronium and potassium chloride constituted cruel and unusual punishment.²

After reviewing the records from 13 previous California executions, the court found evidence that raised doubt about the drug protocol.² Eyewitnesses had noted that, in six of these executions, inmates continued to breathe after administration of thiopental, raising a concern of consciousness during injection of pancuronium and potassium chloride.² Therefore, the court ordered the state to amend the lethal injection protocol to avoid the risk of violating Morales' constitutional rights.² The judge offered two options: to either inject barbiturates only or to appoint an anaesthesiologist to monitor Morales' level of consciousness throughout the execution.² The state chose to appoint an anaesthesiologist.

In response to the ruling, the California Medical Association, American Medical Association (AMA), and American Society of Anesthesiologists (ASA) voiced their opposition, citing the ruling as a violation of their codes of medical ethics and professional conduct.¹ The AMA opposed physician participation in executions at the time and has since reaffirmed its position.⁴ The ASA was in agreement with the AMA's opinion and strongly discouraged anaesthesiologists from participating in lethal injection.⁵ Thus, the court's ruling in this case was in direct conflict with AMA and ASA policy. In 2010, the American Board of Anesthesiology (ABA) incorporated the AMA Code of Medical Ethics opinion on capital punishment into its professional standing policy.⁶ The ABA now has an even more aggressive stance, threatening to revoke certification from any diplomate who participates in an execution by lethal injection.⁶

Following the court's ruling in 2006, the state retained the services of two ABA board-certified anaesthesiologists for the execution.⁷ However, Morales expressed concern

that, if the anaesthesiologists simply monitored his level of consciousness, then they could not intervene or act if he regained consciousness or experienced pain.⁷ The court stressed that the anaesthesiologists would be expected to do their "duties...in accordance with current medical professional standards" and directed them to ensure unconsciousness by taking "all medically appropriate steps—either alone or in conjunction with the injection team".⁷ In other words, the anaesthesiologists would be expected to instruct the team to administer subsequent doses of thiopental or inject the drug themselves.

In the hours before Morales' scheduled execution on Feb 20, 2006, according to the court case documents,⁸ it became apparent that there had been a serious miscommunication between parties. Despite the court's directive, the anaesthesiologists had been told that they would only function in an observational capacity during the execution. Upon learning that they would be required to take an active role, the anaesthesiologists promptly withdrew from the process, citing that these expectations were a breach of their medical ethics code. During the next several hours, the state argued to proceed with the execution, using thiopental as a single drug. The court approved; however, it reiterated its mandate for the drug to be injected only by appropriately trained personnel who were licensed to administer such intravenous medications. Since this requirement could not be fulfilled, the court issued a stay of execution.

The Morales case highlights an uncomfortable intersection between law and medicine at the crossroads of lethal injection and the practice of anaesthesiology. Since its adoption as a method of execution in the USA, lethal injection has been the source of a sharp divide between the two disciplines.⁹ Various medical associations and regulatory bodies have generally been steadfast and unified in their position that capital punishment and the practice of medicine are distinct and separate processes, and that physicians should not participate in lethal injection. The ABA explicitly states that anaesthesiologists are "healers, not executioners", and the ASA maintains that, although components of lethal injection might appear to "mimic certain technical aspects of the practice of anaesthesia, capital punishment...is not the practice of medicine".^{5,6} Thus, medical societies have disassociated themselves from the issue of lethal injection as a method of execution.

Judge Jeremy Fogel¹⁰ stated that his decision in the Morales case was made in the context of a research letter published in *The Lancet*.¹¹ Written from an anaesthesiologist's point of view, the investigators equated lethal

Lancet 2020; 395: 749–54

Published Online
January 31, 2020
[https://doi.org/10.1016/S0140-6736\(19\)32986-1](https://doi.org/10.1016/S0140-6736(19)32986-1)

Washington University School of Medicine, St Louis, MO, USA (E Kim BS); and Department of Anesthesiology, Columbia University Irving Medical Center, Manhattan, NY, USA (R J Levy MD)

Correspondence to:
Dr Richard J Levy, Department of Anesthesiology, Columbia University Irving Medical Center, Manhattan, NY 10032, USA
rl2740@cumc.columbia.edu

injection with induction of general anaesthesia, and stated that the role of thiopental in lethal injection was to induce anaesthesia, which implied that consciousness during execution was analogous to awareness under anaesthesia.¹¹ The investigators also identified lack of anaesthesia training in personnel involved in US state lethal injection protocols, the absence of monitoring for depth of anaesthesia during injection, and post-mortem blood thiopental levels obtained from executed inmates that were deemed to be consistent with awareness in 43% of individuals assessed.¹¹ Although the investigators' pharmacokinetic interpretations have subsequently been challenged, the authors' language and conclusions clearly influenced the court's decision.¹⁰

The mandate for an anaesthesiologist to supervise the execution in the Morales case was the first of its kind.¹ The decision was provocative and controversial because it explicitly called for a physician, specifically an anaesthesiologist, to participate in an execution. Following the cue of the research letter,¹¹ the ruling overtly equated components of lethal injection with the technical aspects of the practice of anaesthesia and drew unambiguous parallels between lethal injection and clinical anaesthesiology.⁸ The court was cognizant of the distinction between these processes; however, made no attempt to separate them because they were concerned about the risk of consciousness during lethal injection. Judge Fogel acknowledged that "an execution is not a medical procedure, and its purpose is not to keep the inmate alive but rather to end the inmate's life...the Court agrees...that the Constitution does not necessarily require the attendance and participation of a medical professional. However, the need for a person with medical training would appear to be inversely related to the reliability and transparency of the means for ensuring that the inmate is properly anesthetized".⁸

In the past decade, the pharmaceutical industry has further complicated the lethal injection conundrum, creating a new set of challenges by ceasing to produce some drugs and restricting the distribution of others.^{9,12} Their actions have led to a number of botched executions, forcing states to establish new exploratory lethal injection protocols.¹² The lack of engagement by the medical community has prompted many legal scholars to conclude that medicine has dismantled the death penalty.⁹ However, the ASA correctly says that although the technical aspects of lethal injection do appear to mimic the practice of anaesthesia, capital punishment is not the practice of medicine.⁵ These processes must be viewed as separate and distinct, and lethal injection should be completely dissociated from the practice of clinical anaesthesia. Nevertheless, does dissociation absolve the medical community, and anaesthesiologists in particular, from engaging with the issue? Do anaesthesiologists have a responsibility in helping to solve the US death penalty crisis?

Most medical personnel believe that physicians have no obligation to engage with the matter, are not stakeholders, and should have no role in capital punishment.¹³ However, the relatedness between lethal injection and the practice of anaesthesiology should not be ignored, and their intertwined history cannot simply be dismissed. Two physicians (a forensic pathologist and an anaesthesiologist) helped to create the original lethal injection protocol.¹⁹ Many medical professionals are either unaware of or have chosen to ignore this fact. However, legal experts knowledgeable of the origins of lethal injection, view the refusal of medical professionals to help solve the crisis as an abdication of responsibility.

In 1976, the death penalty was reinstated in the USA following a 4-year moratorium.⁹ Soon after, many states began searching for a more humane method of execution—that would be more civilised, visually tolerable, and less expensive than other methods (ie, hanging, lethal gas, electrocution, and firing squad).^{9,12} Later that year, Bill Dawson, the Oklahoma State Senator, and Bill Wiseman, the Oklahoma House Representative, consulted with the Chief Medical Examiner of Oklahoma, A Jay Chapman, to determine how medications could be used in executions.^{9,12} Chapman proposed a protocol that called for intravenous administration of a barbiturate with a paralytic drug.^{9,12} He was forthcoming about his lack of expertise in the area but consulted with a toxicologist in the medical examiner's office regarding dosages of the drugs necessary to ensure a lack of awareness.¹⁴ Dawson also contacted the Chairman of the Department of Anesthesiology at the University of Oklahoma, Stanley Deutsch.⁹ Deutsch independently recommended using an ultra-short acting barbiturate, such as sodium thiopental, and a long-acting paralytic, such as pancuronium.⁹ Deutsch reviewed Chapman's proposal, and ultimately, in May, 1977, Oklahoma officially adopted lethal injection as a method of capital punishment.⁹ Notably, Deutsch's recommendations probably served as a blueprint for Oklahoma's lethal injection statute.¹⁹ In 1978, the protocol was modified by Chapman to include potassium chloride, to ensure cardiac arrest,¹² which established the three-drug protocol. The first execution in the USA by lethal injection was in Texas in 1982.^{9,12} Soon after, many states followed suit, legalising lethal injection as a method of execution, modelling their procedures after the Oklahoma protocol.^{9,12} Lethal injection is now the predominant method of execution in the USA and as of December, 2019, 1333 prisoners have been executed using this technique.¹⁵ 29 USA states, the US military, and the US Government use lethal injection as a method of execution, whereas four states are under a governor-imposed moratorium.¹⁵

In the early 2000s, Hospira, the only manufacturer of thiopental in the USA, began to face some challenges with producing the drug in their North Carolina plant.^{16,17} The company chose to move their production to an Italian production facility. However, the regulatory climate within the European Union was tightening as

efforts to restrict the export of drugs with the potential for use in capital punishment began to have an effect.^{16,17} In early 2011, Hospira announced that it would cease production of thiopental entirely.^{12,18} The decision to remove thiopental from the US market was largely based on Hospira's calculation that they could not prevent diversion of the drug within the USA as a lethal injection drug and did not want to be held liable for this diversion.¹⁸ Recognising that many US states would seek to use alternative barbiturates for lethal injection, in July, 2011, the Danish pharmaceutical company Lundbeck announced it would ban the sale and distribution of its pentobarbital to any prison in a US state that carried out the death penalty.¹⁹ The combination of these actions substantially restricted the availability of barbiturates for lethal injection in the USA and served as a catalyst for the death penalty crisis.

In response to the shortages, several states began searching for alternative barbiturate sources, often using middle men to illegally import thiopental from pharmaceutical companies in the UK and India.^{17,20} The US Drug Enforcement Administration subsequently raided several prisons and confiscated these caches of thiopental on the basis of federal trade regulation violations.^{17,20} Several states then began using local compounding pharmacies to obtain pentobarbital, capitalising on the limited oversight of such pharmacies by federal regulatory agencies.^{12,17,20} However, compounded drugs, such as pentobarbital, are notably inconsistent with regard to potency and might contain contaminants as a consequence of the lack of regulation.²¹ Many states also began to acquire drugs for lethal injection in secrecy via a variety of questionable means.¹⁵ In an effort to conceal such dubious behaviour, 13 states enacted secrecy laws to prevent disclosure of the source of their execution drugs and shield the identity of participating physicians and pharmacists.^{15,21} With substantial challenges in the ability of prisons to obtain conventional barbiturates for execution, many states were forced to develop second-generation lethal injection protocols.¹⁷ These newer protocols included drugs such as midazolam or hydromorphone combined with pentobarbital.^{15,17} Some states have also proposed the use of secobarbital, amobarbital, methohexital, phenobarbital, propofol, or etomidate.²¹

In 2014, because of the inability to readily obtain barbiturates, Oklahoma amended its three-drug protocol, replacing thiopental and pentobarbital with midazolam.^{15,22} On April 29, 2014, Oklahoma planned to execute Clayton Lockett by lethal injection using the midazolam protocol.^{15,20} However, the procedure went horribly wrong.^{15,20} The official executive summary stated that a paramedic struggled to place an intravenous catheter into one of Lockett's veins.²³ Johnny Zellmer, a family medicine physician who was present to assess the inmate's level of consciousness and to pronounce his death, attempted to secure vascular access.^{20,23} Zellmer tried to place a peripheral intravenous catheter into

Lockett's external jugular vein and a central venous catheter into his subclavian vein, but he was unsuccessful.²³ Next, Zellmer attempted to cannulate Lockett's right femoral vein with a standard intravenous catheter.²³ He observed good flashback of blood into the catheter and believed that he had successfully cannulated the vessel. Unfortunately, the short catheter either became dislodged or was never actually in the lumen of the vein. Unaware of this, the execution team proceeded to inject Lockett with midazolam. Zellmer assessed the inmate at various time intervals and determined that Lockett was unconscious 10 min later. Vecuronium, a paralytic, and potassium chloride were injected next. Lockett then began to move and vocalise; he was not unconscious. The physician checked the intravenous insertion site and recognised that the injectate had infiltrated into the soft tissue of Lockett's groin.^{21,23} As Zellmer and the paramedic scrambled to try to place another intravenous catheter, Lockett's heart rate gradually slowed, and he died several minutes later from a bradycardic arrest.^{15,23}

An autopsy revealed high concentrations of midazolam in Lockett's groin area, indicating that the drugs were not injected intravenously.²³ Toxicological analysis however, showed midazolam, vecuronium, and potassium in Lockett's blood, confirming some systemic absorption.²³ Thus, Lockett probably died from potassium-induced cardiac arrest.²³ It is still unclear whether or not Lockett was conscious in his final moments. In response to Lockett's botched execution, several Oklahoma death row inmates filed a law suit arguing that the use of midazolam would violate their Eighth Amendment rights.²² The case, *Glossip v Gross*,²² was ultimately heard by the US Supreme Court, but the court ruled that the petitioners did not establish that injection of midazolam would create the risk of severe pain.

The combination of untested second-generation lethal injection protocols along with the lack of medical expertise and involvement has set the stage for the capital punishment crisis in the USA. As such, in the past decade, there has been a rise in the number of botched executions, defined as executions in which unanticipated problems are encountered because of the execution team's lack of expertise and ability, resulting in unnecessary pain or discomfort.^{15,21,24} In the past 120 years, about 2.6% of approximately 8000 non-lethal injection executions in the USA were botched.^{15,21,24} As of December, 2019, the rate of botched execution by lethal injection exceeds 7%,^{15,21,24} and thus, the USA is in the midst of a death penalty crisis.

Therefore, a solution is needed. There is no doubt that physician participation in capital punishment presents an uncomfortable ethical dilemma to the medical community, and the mandate for such involvement challenges medicine's professional code of ethics.¹³ Despite this dilemma, physician involvement is a quandary that the medical profession must address.¹³ It is no longer acceptable to simply take the position of

physician non-participation in lethal injection. Physicians had a central role in the advent of lethal injection, and thus have an obligation to engage with the issue.

Some have drawn parallels between physician participation in lethal injection and the role of physicians in assisted patient dying. Euthanasia, the act of administering medications with the intent to end a patient's life, is legal in the Netherlands, Belgium, Luxembourg, Colombia, and Canada, whereas physician-assisted suicide, the process of aiding and enabling a patient to end their own life, is legal in Switzerland, California, Colorado, Montana, Oregon, Vermont, Washington, and Hawaii.²⁵ General practitioners carry out the majority of cases of euthanasia, most commonly administering an intravenous drug cocktail containing some combination of barbiturates, paralytic drugs, benzodiazepines, and opioids, with or without potassium chloride.²⁵⁻²⁷ Thus, euthanasia and lethal injection share many key attributes.

Notably, complication rates with euthanasia are on par with those encountered with execution of an inmate by lethal injection.²⁷ It is suggested that the incidence of complications with assisted dying are even higher due to voluntary under-reporting, and there is a concern that these problems add to the suffering of the patient.²⁸ Similar to lethal injection, the most common complications associated with euthanasia include difficulty in achieving intravenous access and failure to induce coma or unconsciousness.²⁷ Because of these challenges, medical scholars have stressed the need to obtain adequate knowledge, technical expertise, and thorough training for physicians who choose to do euthanasia.^{27,28}

We believe that these prerequisites also apply to the practice of lethal injection. Anaesthesiologists are the most appropriate specialists to take the lead in solving the lethal injection crisis, given that they possess the most relevant medical knowledge and necessary technical skill set. Some argue that anaesthesiologists have a moral obligation to help resolve the problem considering the historical role a former physician within the specialty played in the advent of lethal injection. However, we recognise that others might not be compelled by this argument and might not view the contributions of one anaesthesiologist as representative of the entire specialty. The solution, however, is simple and requires binary decision-making. Either, physicians have a moral responsibility to participate in lethal injection, to ensure the process is humane to prevent violation of the constitutional rights of the condemned, or the practice of lethal injection should be abandoned in its entirety. The US legal system is in crisis and we have a moral imperative to act.

What is the rationale for action? Although we understand that some might not agree with our position, we view the use of untested second-generation lethal injection protocols in combination with a lack of adequate medical expertise, as unethical. The spike in the rates of unanticipated problems and complications encountered

during executions by lethal injection reflects the general lack of competence and training on the part of the execution teams. Such behaviour, if observed in the clinical realm, would prompt obligatory reporting, as dictated by the AMA Code of Medical Ethics to safeguard the welfare of patients and the trust of the public.²⁹ Although we recognise that prisoners, condemned to die by lethal injection, are not patients, per se, we believe that we have a responsibility to speak out on their behalf and a duty to act given the flaws of the approach and potential for inhumane treatment.

If the first option of anaesthesiologists participating in lethal injection is decided upon, the Royal Dutch Medical Association (KNMG) and Royal Dutch Pharmacists Association (KNMP) Guidelines for the Practice of Euthanasia and Physician-Assisted Suicide could serve as a blueprint to ensure that execution by lethal injection is a humane process.³⁰ The guidelines were established by a multidisciplinary group of nine expert physicians and pharmacists. The expert panel was chaired by an anaesthesiologist and included an intensive care anaesthesiologist. The draft guidelines were reviewed by stakeholders at an invitational conference at which participating representatives of the Netherlands Society of Anaesthesiologists had a role. Anaesthesiologists were therefore integral to the implementation of the Dutch guidelines. In its guidelines, the KNMG and KNMP carefully consider the choice of medications and dosages, the procedure, and the resources needed. Their guidelines offer a practical, applicable, safe, and effective method for the practice of euthanasia and explicitly reserve judgment on the decision to euthanise.

Likewise, the anaesthesiologist's role in lethal injection is not to consider the ethical or moral arguments regarding capital punishment, nor is it to deliberate on the decision to execute an inmate. If anaesthesiologists were to actively participate in lethal injection, their role would be to establish guidelines for the lethal injection of the condemned, which would entail convening a panel of experts to draft a new and rigorous protocol. Such a protocol would necessarily include detailed information on location, equipment, personnel, drugs to be used, and alternative approaches to address anticipated problems. Furthermore, regulatory oversight would need to be established, and procedures for training members of the execution team and ensuring that personnel are appropriately qualified and have the requisite expertise would need to be clearly defined. Quality assurance processes and quality improvement strategies would also need to be put in place. The guidelines would also have to safeguard the process by which prisons obtain lethal injection drugs, making it transparent to regulators and the public, and requiring that all sources of such pharmaceutical drugs be approved by the US Food and Drug Administration and registered entities. This solution would require an overhaul of the current system under the direction of anaesthesiologists and would

involve much more of a commitment than simply jotting down three drug names on a note pad.⁹ Unfortunately, the ethical challenges of this approach would probably cause a deep divide within the specialty, and it is doubtful that anaesthesiologists would ever agree on this option as a solution.

It seems more likely that anaesthesiologists would opt for the second solution: abolition of lethal injection as a method of capital punishment. The Morales case and the mandate for an anaesthesiologist to participate in an execution should serve as a clarion call for the field. Although no one can force an anaesthesiologist to take part in lethal injection, we should recognise that the death penalty crisis is a threat to the specialty. Removal of thiopental from the market is a clear example of how the use of anaesthetic drugs for capital punishment can directly affect the clinical practice of anaesthesia. Hospira's decision to stop manufacturing thiopental forced the anaesthesia field to turn to alternative intravenous induction drugs. In 2011, when thiopental was removed from the market, we were fortunate to have propofol in our practice. Although no inmate has been executed with propofol to date, Missouri and other states have proposed to incorporate this drug into their lethal injection protocols.¹⁵ If propofol were to suffer the same fate as thiopental, our day-to-day practice would be crippled. Thus, anaesthesiologists are indirect stakeholders in this crisis.

Anaesthesiologists have previously voiced opposition to lethal injection, capital punishment, and physician participation in executions; however, the US death penalty crisis persists.^{13,31} Anaesthesiologists must formally and decisively make a case to end lethal injection as a method of capital punishment, by engaging law makers and legal scholars, and partnering with them on the issue. Ideally, the ABA and the ASA should coordinate these efforts. Such coordination would necessitate a change in their policy from the stance that no physician or anaesthesiologist would participate in an execution to an abolitionist position on lethal injection. As Deborah W Denno, a legal scholar, implied, wittingly or unwittingly, medicine has, indeed, dismantled the death penalty.⁹ It is time for anaesthesiologists to engage fully, take the lead, and abolish the practice of lethal injection. Taking action is the only way to end the US death penalty crisis.

Contributors

EK and RJL drafted the Viewpoint and critically revised it for intellectual content.

Declaration of interests

RJL is supported by the US National Institutes of Health/National Institute of Neurological Disorders and Stroke (R01NS112706), outside the submitted work. EK declares no competing interests.

References

- Gawande A. When law and ethics collide—why physicians participate in executions. *N Engl J Med* 2006; **354**: 1221–29.
- Michael Angelo Morales v Roderick Q Hickman, Number C 06 219 JF. District Court, Northern District of California, CA, USA. Feb 14, 2006.
- Schwarzenegger A, Tilton JE. State of California lethal injection protocol review. <https://files.deathpenaltyinfo.org/legacy/files/pdf/CALethInject.pdf> (accessed Aug 6, 2019).
- American Medical Association. Code of medical ethics opinion 9.73. <https://www.ama-assn.org/delivering-care/ethics/capital-punishment> (accessed Aug 6, 2019).
- American Society of Anesthesiologists. Statement on physician nonparticipation in legally authorized executions. <https://www.asahq.org/standards-and-guidelines/statement-on-physician-nonparticipation-in-legally-authorized-executions> (accessed Aug 6, 2019).
- Andrews JJ. Commentary on anesthesiologists and capital punishment. 2014. <http://www.theaba.org/PDFs/BOI/CapitalPunishmentCommentary> (accessed Aug 6, 2019).
- Michael Angelo Morales v Roderick Q Hickman. Number CV 06 00926 JF (9th Circuit, CA, USA). Feb 20, 2006.
- Michael Angelo Morales v James E Tilton. Number CV 06 219 JF. District Court, Northern District of California, CA, USA. Dec 15, 2006.
- Denno DW. The lethal injection quandary: how medicine has dismantled the death penalty. *Fordham Law Rev* 2007; **76**: 49–128.
- Fogel J. In the eye of the storm: a judge's experience in lethal-injection litigation. *Fordham Urban Law J* 2008; **35**: 735–61.
- Koniaris LG, Zimmers TA, Lubarsky DA, Sheldon JP. Inadequate anaesthesia in lethal injection for execution. *Lancet* 2005; **365**: 1412–14.
- Kas K, Yim R, Traore S, et al. Lethal drugs in capital punishment in USA: history, present, and future perspectives. *Res Social Adm Pharm* 2016; **12**: 1026–34.
- Truog RD, Cohen IG, Rockoff MA. Physicians, medical ethics, and execution by lethal injection. *JAMA* 2014; **311**: 2375–76.
- Sanburn J. Creator of lethal injection: "I don't see anything that is more humane". May 15, 2014. <https://time.com/101143/lethal-injection-creator-jay-chapman-botched-executions/> (accessed Aug 6, 2019).
- Death Penalty Information Center. State by state lethal injection protocols. <https://deathpenaltyinfo.org/state-lethal-injection> (accessed Aug 6, 2019).
- Meyers N, Cook V. FDA and the importation and release of lethal injection drugs. *J Law Biosci* 2014; **1**: 209–14.
- Malcolm DR, Romanelli F. The emergence of second-generation lethal injection protocols: a brief history and review. *Pharmacotherapy* 2017; **37**: 1249–57.
- Hospira statement regarding pentothal™ (sodium thiopental) market exit. <https://files.deathpenaltyinfo.org/legacy/documents/HospiraJan2011.pdf> (accessed Aug 7, 2019).
- Lundbeck. Lundbeck overhauls pentobarbital distribution program to restrict misuse. <https://investor.lundbeck.com/news-releases/news-release-details/lundbeck-overhauls-pentobarbital-distribution-program-restrict> (accessed Aug 7, 2019).
- Stern JE. The cruel and unusual execution of Clayton Lockett. June 2015. <https://www.theatlantic.com/magazine/archive/2015/06/execution-clayton-lockett/392069/> (accessed Aug 6, 2019).
- Riley S. Navigating the new era of assisted suicide and execution drugs. *J Law Biosci* 2017; **4**: 424–34.
- Glossip et al v Gross et al. Supreme Court of the United States, Washington, DC, USA. June 29, 2015.
- Oklahoma Department of Public Safety. The execution of Clayton D. Lockett. <https://files.deathpenaltyinfo.org/legacy/documents/lockettinvestigationreport.pdf> (accessed Aug 7, 2019).
- Sarat A. Gruesome spectacles: botched executions and America's death penalty. Stanford, CA: Stanford University Press, 2014.
- Dierickx S, Onwuteaka-Philipsen B, Penders Y, et al. Commonalities and differences in legal euthanasia and physician-assisted suicide in three countries: a population-level comparison. *Int J Public Health* 2019; published online July 11. DOI:10.1007/s00038-019-01281-6.
- Rietjens JA, van der Maas PJ, Onwuteaka-Philipsen BD, van Delden JJ, van der Heide A. Two decades of research on euthanasia from the Netherlands. What have we learnt and what questions remain? *J Bioeth Inq* 2009; **6**: 271–83.
- Groenewoud JH, van der Heide A, Onwuteaka-Philipsen BD, Willems DL, van der Maas PJ, van der Wal G. Clinical problems with the performance of euthanasia and physician-assisted suicide in The Netherlands. *N Engl J Med* 2000; **342**: 551–56.

- 28 Nuland SB. Physician-assisted suicide and euthanasia in practice. *N Engl J Med* 2000; **342**: 583–84.
- 29 American Medical Association. Reporting incompetent or unethical behaviours by colleagues: code of medical ethics opinion 9.4.2. <https://www.ama-assn.org/delivering-care/ethics/reporting-incompetent-or-unethical-behaviors-colleagues> (accessed Oct 15, 2019).
- 30 KNMG, KNMP. Guidelines for the practice of euthanasia and physician-assisted suicide. August 2012. <https://www.knmp.nl/downloads/guidelines-for-the-practice-of-euthanasia.pdf> (accessed Oct 15, 2019).
- 31 Heath MJ. Revisiting physician involvement in capital punishment: medical and nonmedical aspects of lethal injection. *Mayo Clin Proc* 2008; **83**: 115–16.

© 2020 Elsevier Ltd. All rights reserved.

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.