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Virtual Autopsies—The New Kid on the Block in Death Investigations

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VIRTUAL AUTOPSIES—THE NEW KID ON THE BLOCK IN DEATH INVESTIGATIONS

Samuel D. Hodge, Jr. and Lauren Williams***

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Those who have dissected or inspected many bodies have at least learnt to doubt; while others who are ignorant of anatomy and do not take he trouble to attend it are in no doubt at all.

—*Giovanni Battista Morgagni*

Jacob Rosen was a talented athlete and star of his Little League baseball team.¹ He came to bat in the sixth inning of the championship game with one out. The opposing player was a hard-throwing pitcher whom Jacob

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¹ The following story is a hypothetical written by the Authors to illustrate a possible scenario where there can be a conflict of interest between understanding the cause of a death and also following religious rituals. It is loosely based off a similar death that occurred in 2002 in Marietta, Georgia. *See Boy Struck in Chest With Baseball Dies*, ABC NEWS (Jan. 6, 2006), <https://abcnews.go.com/GMA/story?id=126084&page=1#:~:text=May%2022%2C%202002%20%2D%2D%20Seven,the%20wrong%20moment%2C%20killing%20him>.

had successfully faced on several previous occasions. Jacob dug in at the plate and fouled off the first pitch. His coach then gave the bunt sign, so the youngster squared around but missed the ball, which continued forward, striking him in the chest. Jacob immediately fell to the ground and laid motionless. A physician who was watching the game ran to the child's side and administered CPR. This emergency measure was unsuccessful, so Jacob was transported to the hospital, where he was pronounced dead.

The attending physician told Jacob's parents that the child most likely died from commotio cordis, a rare condition that is caused by a blunt impact to the chest, which leads to cardiac arrest. The parents were devastated and numbly left the hospital to make funeral arrangements. Their Orthodox Jewish faith mandated that they bury their son immediately after his death.²

The Rosens drove to the funeral home. When the mortician called the hospital to take possession of the body, she was told that Jacob had been picked up by the medical examiner for an autopsy to ascertain the cause of death. The parents wailed in horror upon hearing the news. The death was a tragic accident, and no one was going to be prosecuted. More importantly, this post-mortem examination would cause an unnecessary delay in their son's burial, and the dissection was against their religious beliefs. This position is based upon the Talmud, which notes that the mandate of a burial shortly after death is premised upon the prohibition against desecrating corpses.³ This scripture also bars any form of disfigurement of a corpse. In other words, this tenet precludes an autopsy.⁴

The dilemma presented above calls into play two competing interests—the power of the state to ascertain the cause of sudden or unexpected death and an individual's rights, freedoms, and religious beliefs. This Article will explore the autopsy procedure and those circumstances when an autopsy is deemed necessary, but an objection is registered by the next of kin. It will also discuss whether a virtual autopsy is a viable twenty-first-century solution to a necropsy.⁵ Just like the standard post-mortem examination, a virtual autopsy uses non-invasive imaging technology to evaluate the injuries, the manner and reason of death, and to ascertain the identity of the victim. However, it has a favorable use when objections are raised over traditional and invasive dissections based on legal, ethical, or religious grounds.⁶

² Zalman Goldstein, *Basic Laws of a Jewish Funeral*, CHABAD, https://www.chabad.org/library/article_cdo/aid/367836/jewish/Basic-Laws-of-a-Jewish-Funeral.htm (last visited May 2, 2021).

³ Rabbi Abner Weiss, *Autopsies and Jewish Law: An Orthodox Perspective*, MYJEWISHLARNING, <https://www.myjewishlearning.com/article/autopsies-and-jewish-law/> (last visited May 5, 2021).

⁴ *Id.*

⁵ A necropsy is another term for an autopsy. The terms are used interchangeably throughout this Article.

⁶ Ivana Kruzic et al., *Virtual Autopsy in Legal Medicine: Literature Review and Example of Application on the Mummified Remains*, 11 MED., L., & SOC'Y 67, 69 (2018).

I. THE AUTOPSY?

When a person dies suddenly or unexpectedly, or murder is suspected, family members and law enforcement officials often have many questions.⁷ Why did the person die? Was the death caused by sinister means, or was it related to a disease process? These queries are an important part of current medical thought but were just as valid centuries ago when the medical profession scarcely resembled its present configuration.⁸ Autopsy is derived from the Greek “to see with one’s own eyes.”⁹ Numerous civilizations believed it was blasphemous to disfigure the human form because the deceased would need it following death.¹⁰ Post-mortem examinations were often forbidden because of religious reasons.¹¹ These objections resulted in delaying medical advancements and hindering progress in pathology for many years.¹²

The word “autopsy” is used interchangeably with post-mortem, and is Latin for “after-death.”¹³ An autopsy procedure refers to the dissection of a body that is done to assist in ascertaining the cause of death or in examining the ravages of diseases.¹⁴ Some historians claim that the first recorded autopsy can be traced back to 44 B.C. and involved the murder of Gaius Julius Caesar.¹⁵ Following his assassination, the emperor’s body was returned to his home and examined by his physician, who proclaimed that Caesar died from 23 stab wounds.¹⁶ These findings were then reported to the Roman population in a public announcement at the forum and memorialized, thereby becoming the first public record of an autopsy.¹⁷ This pronouncement also became the first documented account by a physician acting as an expert in a murder investigation, and the event was credited for providing the word “forensic”—a derivative of “forum.”¹⁸

Autopsies did not become an accepted practice until the 1800s, when the procedure was advanced by medical examiners and coroners.¹⁹ Karl

⁷ *Forensic Autopsy*, MD DEP’T OF HEALTH, <https://health.maryland.gov/ocme/Pages/Forensic-Autopsy.aspx#:~:text=A%20forensic%20autopsy%20is%20a,or%20contributed%20to%20the%20death> (last visited May 5, 2021).

⁸ Lester S. King & Marjorie C. Meehan, *A History of Anatomy—A Review*, 73 AM. J. PATH. 514, 514 (1973), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1904067>.

⁹ *Autopsy*, VOCABULARY, <https://www.vocabulary.com/dictionary/autopsy> (last visited May 5, 2021).

¹⁰ *Id.*

¹¹ See King & Meehan, *supra* note 8, at 520–22.

¹² See generally *id.*

¹³ *Autopsy*, *supra* note 9.

¹⁴ *Id.*

¹⁵ See Natasha Sheldon, *The Earliest Recorded Autopsy in History Was Performed on This Roman Emperor*, HIST. COLLECTION (Jun. 6, 2017), <https://historycollection.com/julius-caesar-complicit-death-re-examining-earliest-autopsy-history/>.

¹⁶ *Id.*

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ *History of the Autopsy*, MOPEC, <https://www.mopec.com/history-of-the-autopsy/> (last visited May 5, 2021).

Rokitansky of Vienna is credited for developing the modern-day autopsy, having supervised about 70,000 post-mortem examinations during his career.²⁰ Rokitansky was the first scientist to systematically inspect every part of the body using a standardized and comprehensive approach.²¹ However, his main rival, Rudolf Ludwig Karl Virchow, used a microscope to fully scrutinize each organ.²² This practice permitted Dr. Virchow to demonstrate that cellular pathology was the foundation for understanding disease.²³

The benefits of an autopsy are not disputed. They permit the evaluation of new diagnostic tools, surgical procedures, devices, and medications. Autopsies make it possible to identify contagious viruses, inherited diseases, and environmental containments and further the interests of society by advancing the areas of public health and epidemiology.²⁴ Additionally, necropsies enlarge the understanding of medicine and allow for the documentation of the health of society. Forensically, they can establish the cause, manner, and time of death.²⁵ Generally, manner-of-death determinations should be objective and not be based upon helping the prosecution, circumventing publicity, advancing a political position, or advocating a personal agenda.²⁶ Nevertheless, autopsies are subjective in nature, and medical examiners can construe similar evidence differently.²⁷ Therefore, it is little wonder that “[n]o medical procedure is more frequently involved in litigation than the autopsy.”²⁸

II. TYPES OF AUTOPSIES

An autopsy is a surgical procedure performed upon a body after a person’s demise. The dissection will be conducted by a skilled physician who has a medical specialty in pathology since ascertaining the reason for death will mandate extensive knowledge of disease and injury.²⁹ The most common reasons necropsies are performed include:

- Assault: 97.1% of deaths associated with assault were autopsied;
- Legal intervention: 89.7%;

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.*

²⁴ Richard Conran et al., *Medicolegal Issues and the Autopsy*, MEDSCAPE, <https://emedicine.medscape.com/article/1975045-overview> (Aug. 5, 2019).

²⁵ *Id.*

²⁶ RANDY HANZLICK ET AL., A GUIDE FOR MANNER OF DEATH CLASSIFICATIONS 6 (2002).

²⁷ *Id.* at 4–5.

²⁸ Cyril H. Wecht, *Utilizing the Pathologist to Prove Injury*, 2 ANN. 2000 ATLA CLE 2915, 2918 (2000).

²⁹ *Autopsy*, BIOLOGY DICTIONARY, <https://biologydictionary.net/autopsy/> (Sep. 8, 2017).

- Undetermined events: 80.8%;
- Accidental poisoning: 79%;
- Accidental drowning or submersion: 74.3%;
- Accidental discharge of firearms: 67.6%;
- Accidental exposure to smoke, fire, and flames: 59.9%;
- Pregnancy, childbirth, and deaths that occur within six weeks of childbirth: 54.5%; and
- Water, air, space, and other unspecified transport accidents: 50.9%³⁰

The number of autopsies decreases with older people because they tend to die from diseases rather than from external reasons.³¹ The volume of post-mortem examinations is also potentially affected by hospital accreditation mandates, state laws and regulations about which deaths should be investigated, and unascertainable infant mortality.³²

People are frequently overcome with emotion, questions, resentment, and bereavement following the passing of a family member.³³ An autopsy is a rational way to help them understand what happened from a medical perspective and can be done in a variety of ways, based upon the required degree of inspection.³⁴ A complete autopsy is “anatomically unrestricted with the inclusion of all body cavities and the brain.”³⁵ Slightly more restrictive is the limited necropsy, which usually omits the brain.³⁶ A restricted autopsy focuses on a specific body cavity or organ, while a needle-only autopsy is the most minimal type of autopsy because tissues are tested with a biopsy needle without opening the body cavities.³⁷

A. *The Clinical Autopsy*

Over the years, two major forms of post-mortems have emerged: (1) clinical autopsy and (2) forensic autopsy. A clinical autopsy, also known as a pathological or hospital autopsy, is undertaken to ascertain the illness which caused the death when ante-mortem attempts are inadequate.³⁸ In fact, this

³⁰ Samuel D. Hodge, Jr., *An Attorney's Guide to An Autopsy: A Medical-Legal Overview*, 59 U. LOUISVILLE L. REV. 23, 29 (2020).

³¹ *Id.*

³² DONNA L. HOYERT, CTNS. FOR DISEASE CONTROL, THE CHANGING PROFILE OF AUTOPSIED DEATHS IN THE UNITED STATES, 1972–2007 6 (2011), <https://www.cdc.gov/nchs/data/databriefs/db67.pdf>.

³³ Hodge, *supra* note 30, at 30.

³⁴ *Id.*

³⁵ Louis P. Dehner, *The Medical Autopsy: Past, Present, and Dubious Future*, 107 Mo. MED. 94, 97 (2010), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6188261/>.

³⁶ *Id.*

³⁷ *Id.*

³⁸ RB Kotabagi et al., *Clinical Autopsy vs Medicolegal Autopsy*, 61 MED. J. ARMED FORCES INDIA 258, 258 (2011), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4925615/pdf/main.pdf>.

procedure is considered the gold standard for quality control in clinical medicine.³⁹ The clinical autopsy is performed even when the cause of death is established, but there remains a desire to understand more about an illness or disease to improve the medical understanding of the malady.⁴⁰ For example, this form of autopsy can provide vital knowledge about genetic or infectious diseases for surviving family members.⁴¹

The clinical autopsy presents a correlation between clinical diagnoses and symptoms; measures the usefulness of therapy while examining the scope and degree of disease processes; and informs physicians.⁴² The examination, however, can only proceed with the approval of the next of kin.⁴³ The examiner is further forbidden from removing any body part without the consent of the proper representative of the decedent.⁴⁴

The medical autopsy has fallen into disfavor except in academic institutions. Nevertheless, even in an academic setting, the number of post-mortem examinations has steadily declined over the past fifty years.⁴⁵ In the United States, autopsies occur in only 7% to 9% of deaths—down from 25% to 35% from the 1960s and 50% in the 1940s and 1950s.⁴⁶ This decrease has been ascribed to many rationalizations but relatives refusing an autopsy request is by far the most significant.⁴⁷ Post-mortem examinations also disclose medical mistakes, causing worry among doctors and hospital administrators.⁴⁸ Most insurance plans do not provide reimbursement for the procedures resulting in the families having to absorb the cost of the necropsy.⁴⁹

B. *The Forensic Autopsy*

A forensic autopsy, also known as a “medico-legal” autopsy, is conducted to answer questions about a death in which suspicious circumstance suggest the presence of foul play. Unlike a medical autopsy, where the cause of death is generally known, very little information is known about the victim in a forensic autopsy—often including the victim’s own

³⁹ See Dominic Wichmann et al., *Virtual Autopsy as an Alternative to Traditional Medical Autopsy in the Intensive Care Unit*, 156 ANNALS OF INTERNAL MED. 123, 123 (2012) <https://doi-org.libproxy.temple.edu/10.7326/0003-4819-156-2-201201170-00008>.

⁴⁰ *Id.*

⁴¹ See Melissa Conrad Stöppler, *Autopsy (Post Mortem Examination, Necropsy)*, MEDICINET (Aug. 25, 2020), <https://www.medicinenet.com/autopsy/article.htm>.

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Id.*

⁴⁵ Dehner, *supra* note 35, at 95, 97.

⁴⁶ *Id.* at 95.

⁴⁷ Wichmann et al., *supra* note 39, at 123.

⁴⁸ Maryn McKenna, *Virtues of the Virtual Autopsy*, SCIENTIFIC AM. (Nov. 1, 2012), <https://www.scientificamerican.com/article/virtues-of-the-virtual-autopsy/>.

⁴⁹ *Id.*

name.⁵⁰ Therefore, the information pursued during a forensic autopsy may include the deceased's identity; reason, manner, and time of death; events behind the demise; and associated matters such as the collection of trace evidence and additional information about the crime scene.⁵¹ By collecting this information, the forensic autopsy helps law enforcement agencies determine if a crime occurred, and if so, it helps them solve that crime.⁵²

The forensic autopsy is a classic example of the police powers of the state, and the report offers two types of information: (1) the pathologist's anatomical and physiological findings on the body's condition and (2) the medical examiner's conclusions as to the cause of death.⁵³ On many occasions, autopsy specimens and the results of the forensic procedure are critical evidence in the prosecution of a crime.⁵⁴ This evidence is mandated not only in criminal proceedings but may also be required in many different civil matters.⁵⁵ In these cases, without an established cause of death, it may be difficult to link a person's actions to the death and attach liability.⁵⁶ The medico-legal examination supplies this causal connection using the systematic dissection of the victim to differentiate naturally occurring diseases from traumatic injuries.⁵⁷ This evidence is the cornerstone of the forensic autopsy and allows the medical examiner to opine as to what caused the death and how the individual's demise happened through the application of different scientific methods.⁵⁸

Most people think of a forensic autopsy as only applying to criminal investigations, but they were not created mainly for prosecutorial applications.⁵⁹ Coroners and medical examiners are statutorily permitted to investigate unnatural or sudden deaths and are authorized to conduct autopsies in a variety of circumstances, only one of which is when a death is a suspected homicide.⁶⁰ They are equally helpful in civil matters to determine whether to file a wrongful death and survivor's action, and insurance carriers may use the medical examiner's findings to ascertain if a claim should be covered under a policy.⁶¹ The findings may also fulfill society's need to determine the reason for a person's death, particularly with those matters that have

⁵⁰ *Forensic Autopsy--A Body of Clues*, OFFICER (Aug. 27, 2007), <https://www.officer.com/investigations/article/10249533/forensic-autopsya-body-of-clues>.

⁵¹ *Autopsy Services*, FORENSICDX, <https://www.forensicdx.com/services/autopsy-services/#:~:text=Clinical%20Autopsy,scientific%20knowledge%20of%20the%20condition> (last visited May 20, 2021).

⁵² *Id.*

⁵³ *See* *Waeschle v. Dragovic*, 576 F.3d 539, 548 (6th Cir. 2009); *see also* *People v. Dungo*, 286 P.3d 442, 449 (Cal. 2012).

⁵⁴ MICHAEL J. PANELLA & SAMUEL D. HODGE, JR., *THE FORENSIC AUTOPSY FOR LAWYERS* 1 (2013).

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *State v. Maxwell*, 9 N.E.3d 930, 951 (Ohio 2014).

⁶⁰ *See, e.g.,* *People v. Dungo*, 286 P.3d 442, 450 (Cal. 2012).

⁶¹ *Id.*

generated extensive publicity.⁶² The conclusions may even provide much-needed answers to families who are unsure about a person's sudden demise.⁶³ Other societal benefits include evaluating new diagnostic tests, assessing novel therapeutic interventions, and examining environmental and occupational diseases.⁶⁴

Autopsy data is also valuable in creating valid mortality statistics. Information taken from death certificates in the absence of a post-mortem autopsy has frequently been found to be erroneous.⁶⁵ New medical information on existing diseases that is gleaned from autopsy-founded research is unmistakably advantageous for society in general. As is demonstrated by COVID-19, which first surfaced in 2019, new illnesses continue to appear, which can only be completely explored by necropsy.⁶⁶

C. *When Does the Medical Examiner Become Involved?*

When there is a death, a doctor must complete a death certificate prior to dispatching the corpse to the funeral home.⁶⁷ If the deceased expired from natural causes under the care of a family physician, the doctor could fill out the death certificate.⁶⁸ However, the medical examiner must launch an investigation and complete the death certificate if the person was not under the care of a health care professional or the death appeared to be from unnatural causes.⁶⁹

Medical examiners are physicians and, most often, pathologists by training.⁷⁰ Some medical examiners, however, are family practitioners or

⁶² *Id.*

⁶³ *Id.*

⁶⁴ Stöppler, *supra* note 41.

⁶⁵ *Id.*

⁶⁶ *See id.*

⁶⁷ *See, e. g., Forensic Autopsy, supra* note 7.

⁶⁸ *Id.*

⁶⁹ *Id.* In most jurisdictions, autopsies may be mandated if there is a belief that the death presents an important public health concern, if an individual unaccountably dies while not under medical supervision, who was being attended to by a physician for less than 24 hours, or if a decedent dies from trauma, such as in a car accident. Stöppler, *supra* note 41.

⁷⁰ *What is the Difference Between a Medical Examiner and a Forensic Pathologist?*, MED. UNIV. OF THE AMERICAS, <https://www.mua.edu/news/what-is-the-difference-between-a-medical-examiner-and-a-forensic-pathologist> (last visited May 3, 2021). New Jersey provides an example of the statutory qualifications for a medical examiner:

Each county medical examiner, intercounty medical examiner, assistant county medical examiner, and assistant intercounty medical examiner shall: be a licensed physician of recognized ability and in good standing in the State; be a graduate of a regularly chartered and legally constituted medical school or college or osteopathic medical school or college; and possess such minimum training and experience requirements as are established by the Chief State Medical Examiner. Either: the county medical examiner or intercounty medical examiner, as the case may be; or the assistant county medical examiner or intercounty medical examiner, as the case may be, shall additionally be certified in forensic pathology by the American Board of Pathology or the American Osteopathic Board of Pathology.

N.J. STAT. ANN. § 26:6B-9(f) (West 2018).

have other specialties, especially if being a medical examiner is not a full-time occupation.⁷¹ The medical examiner is generally authorized to overrule the wishes of family members or legal guardians who withhold consent for an autopsy.⁷² Nevertheless, in matters where the cause of death turns out to be apparent after an initial review, the medical examiner can decide to turn down the case and permit the next of kin to take custody of the corpse.⁷³ Each jurisdiction determines its standards for what types of circumstances require investigation into the death, and professional and continuing medical education qualifications are needed for those undertaking these investigations.⁷⁴

An example of the power granted to a medical examiner to conduct an autopsy is provided in the laws of Minnesota, where it is noted that the medical examiner may, in their sole discretion, order a necropsy when such a procedure would serve the public interest.⁷⁵ According to Minnesota law, the autopsy shall be performed without unnecessary delay and usually includes:

the removal, retention, testing, or use of organs, parts of organs, fluids or tissues, at the discretion of the coroner or medical examiner, when removal, retention, testing, or use may be useful in determining or confirming the cause of death, mechanism of death, manner of death, identification of the deceased, presence of disease or injury, or preservation of evidence.⁷⁶

Coroners, on the other hand, have been around for hundreds of years, with the term originally denoting a “Crown,” meaning a person whose occupation was to determine taxes to be paid to the King or Crown upon death.⁷⁷ Today, coroners are authorized to inquire into the cause and manner of death and typically complete the death certificate.⁷⁸ Despite this authority, many are simply elected officials and have no formal medical or pathological training.⁷⁹ However, some coroners are appointed, and they may additionally serve as law enforcement officials or prosecuting attorneys, depending on the relevant state statute.⁸⁰ If a coroner is not a trained pathologist, they must

⁷¹ RON M. ARYEL & MICHAEL M. WAGNER, *Coroners and Medical Examiners*, in HANDBOOK OF BIOSURVEILLANCE, 179, 179 (2006), <https://www.sciencedirect.com/topics/medicine-and-dentistry/medical-examiner>.

⁷² *Id.*

⁷³ *Id.*

⁷⁴ *Coroner/Medical Examiner Laws, by State*, CTRS FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/php/publications/topic/coroner.html> (Oct. 26, 2016).

⁷⁵ MINN. STAT. § 390.11 (2020).

⁷⁶ *Id.*

⁷⁷ Regional Medical Examiner’s Office, *What is the Difference Between a Medical Examiner and a Coroner?*, WASHOE CNTY., NEV., https://www.washoecounty.us/coroner/faq/difference_between_medical_examiner_and_coroner.php (last visited May 3, 2021).

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.* Alabama law provides a sample of the qualifications for a coroner:

secure the services of such a specialist, usually by contract, to conduct an autopsy and provide the medical expertise necessary to support the coroner's conclusions about a death.⁸¹ Coroners are considered "public officers" and operate in a quasi-judicial manner.⁸² However, despite this classification, coroners lack the power to file charges against a suspect.⁸³

D. Determining the Manner of Death

There are five official manners of death: (1) natural, (2) accidental, (3) suicide, (4) homicide, and (5) unknown.⁸⁴ Categorizing a death is usually self-evident, but there are times where the cause of death is problematic, such as when a person is shot but dies months later from a staphylococcus infection at the wound location.⁸⁵

The cause of death indicates the medical reason the person's heart stopped beating. Usually, this term signifies both a scientific means of death—the terminal "physiologic, metabolic, or anatomic alteration" which caused the individual's demise—as well as the latent disease or injury, known as the proximate cause.⁸⁶ For example, if cardiac ischemia persists too long, the heart tissue dies from a lack of blood supply, and coronary artery disease is frequent listed as the cause of death.⁸⁷ However, these conclusions can be attacked because their subjectivity and the number of links in the sequence of causation need to be identified.⁸⁸

III. THE DISSECTION

Autopsies started being performed with regularity in the

No person shall be eligible to hold the office of coroner unless he or she meets the following qualifications: (1) Is a citizen of the United States. (2) Is a resident in the county in which he or she seeks the office of coroner for at least one year prior to his or her qualifying for election to the office and remains a resident of the county during his or her term of office. (3) Is a registered voter. (4) Has attained the age of 25 years prior to the date of the general primary election in the year that he or she qualifies for election to the office. (5) Has obtained a high school diploma or its recognized equivalent. (6) Has not been convicted of a felony offense or any offense involving moral turpitude contrary to the laws of Alabama, or any other state, or the United States. (7) Has successfully completed the next scheduled training course no longer than 180 days after his or her election or appointment, unless an affidavit affirms that the requirement of this subdivision has been met at the time of qualifying for the office.

ALA. CODE §11-5-33 (2006).

⁸¹ Regional Medical Examiner's Office, *supra* note 77.

⁸² 98 AM. JUR. PROOF OF FACTS 3D *Autopsies* § 3 (2021).

⁸³ *Id.*

⁸⁴ Todd T. Smith, *Forensic Autopsies in Missouri: Navigating the Road from the Morgue to the Courtroom*, 76 J. MO. B. 16, 17 (2020).

⁸⁵ Hodge, *supra* note 30, at 31.

⁸⁶ *Id.*

⁸⁷ *Id.* *Silent Ischemia*, TEXAS HEART INSTITUTE, <https://www.texasheart.org/heart-health/heart-information-center/topics/silent-ischemia/#:~:text=Cardiac%20ischemia%20happens%20when%20an,lead%20to%20heart%20tissue%20death> (last visited May 3, 2021).

⁸⁸ Hodge, *supra* note 30, at 31.

eighteenth century, and this detailed analysis of the human body grew out of “the practice of dissection and the study of anatomy.”⁸⁹ Today’s methods are different, but the essential focus of a post-mortem examination—conducting a detailed inspection of the exterior body and internal organs— continues to be the same.⁹⁰ Forensic obduction is a highly specialized and very destructive procedure that involves opening each body cavity and removing organs.⁹¹ As for the actual examination, the internal and external inspection is performed by a forensic pathologist who has been specially educated to spot trauma patterns, gather evidence, and explore the circumstances surrounding the death.⁹²

It is not surprising that those familiar with the mechanics of an autopsy are reluctant to consent to this unpleasant procedure. The techniques of the necropsy may differ based upon the detail and focus of the examination.⁹³ However, most autopsies involve chest, abdomen, and brain examinations.⁹⁴ The initial phase involves an external examination of the body in which identifying marks such as tattoos, scars, and hair color are noted.⁹⁵ The person’s height and weight will also be recorded, and multiple pictures are taken at different angles for further analysis.⁹⁶ Special attention is devoted to the decedent’s clothes, searching for trace evidence to link the person to a location or suspect.⁹⁷ X-rays are occasionally taken to search for bone abnormalities and the presence of bullets or foreign bodies.⁹⁸

The initial phase is followed by an internal dissection of the corpse, which usually proceeds in a set manner and necessitates the removal of the body’s organs for study.⁹⁹ The first step is to place a wooden block under the back of the corpse.¹⁰⁰ This block forces the chest forward and causes the arms and neck to swing back, allowing easier access to the thoracic cavity.¹⁰¹ A Y or T incision is made from the shoulders to mid-chest, followed by a straight line down to the pubic area.¹⁰² These cuts yield little blood because the heart has ceased beating.¹⁰³ The tissues and muscles are then removed, allowing

⁸⁹ Samuel D. Hodge, Jr. & Nicole M. Saitta, *Behind the Closed Doors of the Coroner’s Office—The Medical/Legal Secrets Involving an Autopsy*, 32 TEMP. J. SCI. TECH. & ENVTL. L. 1, 3 (2013).

⁹⁰ *Id.*

⁹¹ See *About: Autopsy*, DBEDIA, <https://dbpedia.org/page/Autopsy> (last visited May 3, 2021).

⁹² *Forensic Autopsy*, *supra* note 7.

⁹³ Hodge & Saitta, *supra* note 89, at 4.

⁹⁴ *Id.* at 4–5.

⁹⁵ See *id.* at 4.

⁹⁶ See *id.*

⁹⁷ See *id.*

⁹⁸ See Nicholas Gerbis, *What Exactly Do They Do During an Autopsy?*, LIVE SCI. (Aug. 26, 2010), <https://www.livescience.com/32789-forensic-pathologist-perform-autopsy-csi-effect.html>.

⁹⁹ Hodge, *supra* note 30, at 39.

¹⁰⁰ *Id.* at 40.

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ Gerbis, *supra* note 98.

the chest flap to be withdrawn.¹⁰⁴ The rib cage is then removed by a saw or a rib cutter, allowing access to the internal organs.¹⁰⁵

Organ inspection begins with the removal of the kidneys.¹⁰⁶ This sequence continues methodically with the dissection, extraction, and examination of other body parts.¹⁰⁷ Removing organs occurs in one of two ways: (1) the Virchow method—which individually removes and dissects each organ, or (2) the von Zenker method—which removes an entire organ block before dissecting specific body parts.¹⁰⁸ Regardless of the method employed, significant care is employed to identify, document, and safeguard any discovered irregularities or abnormalities, like diseases.¹⁰⁹ Hollow organs, like the stomach and colon, have their contents emptied and examined and may be further evaluated by a laboratory.¹¹⁰ Specimens may be prepared so that they can be viewed for microscopic analysis.¹¹¹

Next, the head and neck regions are examined.¹¹² This requires the diener to slice the skin from behind one ear, across the forehead, to the remaining ear, and around.¹¹³ The scalp is retracted from the skull in two parts.¹¹⁴ The front flap is pulled down over the face and the rear flap is extended over the back of the neck.¹¹⁵ The top of the skull is removed with an electric saw, exposing the dura and brain.¹¹⁶ A detailed examination of these structures and surrounding tissues follows.¹¹⁷

After examining the brain region, the spinal cord is detached and the muscles, soft tissues, airways, and vascular structures of the neck are examined.¹¹⁸ The upper airway, pharynx, and esophagus are also removed for analysis, and if there is undeterminable neck trauma, the back of the neck will be dissected.¹¹⁹

Samples of tissue and fluids from specific organs are also collected as clinically indicated, such as bile from the gall bladder, vitreous humor from the eyes, red blood samples, and bone marrow from the ribs or pelvis.¹²⁰ This inspection aids the pathologist in identifying signs of trauma or other

¹⁰⁴ Hodge, *supra* note 30, at 40.

¹⁰⁵ *Id.*

¹⁰⁶ *Id.* at 41.

¹⁰⁷ *See id.*

¹⁰⁸ Hodge & Saitta, *supra* note 89, at 5.

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

¹¹¹ *See* Hodge, *supra* note 30, at 41.

¹¹² *Id.*

¹¹³ *Id.* at 42.

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ *Id.*

¹¹⁷ *See id.*

¹¹⁸ Hodge & Saitta, *supra* note 89, at 5–6.

¹¹⁹ *Id.* at 6.

¹²⁰ *Id.*

indications of the person's cause of death.¹²¹ Once the autopsy is completed, the organs are returned to the body, and the open areas are stitched closed.¹²² Despite the complexity of the process and extensive sampling throughout, a post-mortem examination takes about two or three hours to complete.¹²³

After the procedure, the pathologist will generate an autopsy report that will usually contain a description of the external and internal examinations; a gross and microscopic assessment of the organs; a list of the irregularities uncovered; an opinion as to which abnormality caused the person's demise; and a toxicology report.¹²⁴ The external inspection and accounts of the organs are usually logged at the time of the autopsy.¹²⁵ However, the remaining items are generally documented after the tissue samples have undergone microscopic inspection and the toxicology tests are finalized.¹²⁶

There are several formats used to write an autopsy report. Depending on who conducts the autopsy, the report may be detailed and lengthy or abridged and focused.¹²⁷ Several national organizations, such as the National Association of Medical Examiners and the College of American Pathologists, and autopsy textbooks have published guidelines recommending a standardized form for autopsy reports.¹²⁸

IV. OBJECTIONS TO THE AUTOPSY ON RELIGIOUS GROUNDS

There are many conflicting interests in deciding whether to perform an autopsy, including the aims of the healthcare provider, the desires of the family, and the welfare of society.¹²⁹ These factors must be considered and will affect the circumstances within which the solicitation for an autopsy is made.¹³⁰ The authorization to perform the autopsy will depend on various laws and whether the examination is required for a legal purpose or a medical reason.¹³¹

Generally, approval for necropsy is regulated by two bodies of law: (1) state statute and (2) common law. Statutes usually specify the circumstances under which autopsies are required and when consent will be

¹²¹ *Id.*

¹²² Hodge, *supra* note 30, at 42.

¹²³ *Id.*

¹²⁴ See, e.g., 98 AM. JUR. PROOF OF FACTS 3D *Autopsies* § 2 (2020).

¹²⁵ *Id.*

¹²⁶ *Id.*

¹²⁷ See, e.g., Mark Koponen, *The Autopsy Report*, MEDSCAPE, <https://emedicine.medscape.com/article/1718019-overview> (Mar. 14, 2019).

¹²⁸ *Id.*

¹²⁹ See Harold Sanchez, *Autopsy Request Process*, MEDSCAPE, <https://emedicine.medscape.com/article/1730552-overview> (July 16, 2019).

¹³⁰ See *id.*

¹³¹ See Susan Schmidt, *Consent for Autopsy*, 250 JAMA 1161, 1161 (1983).

required for discretionary post-mortem examinations.¹³² In matters involving consent, “the right to possession of a body for the purpose of burial belongs to the surviving spouse” or, if a spouse does not exist, “the next of kin.”¹³³ This means that spouses, adult children, and parents decide whether to authorize a post-mortem dissection.¹³⁴ However, the state can override the consent requirement in matters involving unexplained deaths or if a state law addresses the particular situation, such as mandating an autopsy when a child suddenly dies.¹³⁵

Post-mortem examinations can only be performed with the permission of the next of kin unless there is evidence to suggest a suspicious death calling into play the government’s jurisdiction.¹³⁶ Several states have statutes that require hospitals and their physicians to obtain consent before undertaking a post-mortem examination.¹³⁷ Some states have also made conducting an unauthorized autopsy a crime.¹³⁸ For instance, as one Oklahoma statute provides: “Every person who makes or procures to be made any dissection of the body of a human being, except by authority of law, or in pursuance of a permission given by the deceased, is guilty of a misdemeanor.”¹³⁹

The power of a medical examiner to undertake medico-legal investigations is provided by statute.¹⁴⁰ These rules assist in avoiding disputes that may arise when the next of kin opposes a forensic post-mortem examination.¹⁴¹ However, the specific language of the laws differs and may be subject to various constructions.¹⁴² Nevertheless, medical examiners generally enjoy immunity as long as their activities are considered discretionary, are within the ambit of the authority contained in the law, and are conducted in good faith.¹⁴³ As noted in *Green v. Kearney*: “[a] medical examiner is a public officer, and is entitled to governmental immunity if sued in his official capacity.”¹⁴⁴

Difficult issues arise when consent must be provided for an autopsy and either the next of kin cannot all agree, or there is an objection to the

¹³² See CLAIRE C. Obade, PATIENT CARE DECISION-MAKING: A LEGAL GUIDE FOR PROVIDERS, § 18:1 (2019).

¹³³ *McRae v. Booth*, 938 So. 2d 432, 433 (Ala. Civ. App. 2006) (quoting *Cottingham v. McKee*, 821 So. 2d 169, 171 (Ala. 2001)).

¹³⁴ PANELLA & HODGE, *supra* note 54, at 328.

¹³⁵ *Id.*

¹³⁶ Hodge & Saitta, *supra* note 89, at 10.

¹³⁷ *Id.* at 10–11.

¹³⁸ *Id.* at 11.

¹³⁹ OKLA. STAT. ANN. tit. 21, § 1155 (West 2020).

¹⁴⁰ See Michael Panella, *Death Investigation Liability of Medical Examiners and Coroners: Proposed Recommendations to Mitigate Legal Risks*, 32 J. LEGAL MED. 449, 450 (2011)

¹⁴¹ *See id.*

¹⁴² Hodge & Saitta, *supra* note 89, at 13.

¹⁴³ *Id.*

¹⁴⁴ *Green v. Kearney*, 690 S.E.2d 755, 761 (N.C. Ct. App. 2010).

dissection. In matters where a child must provide consent for a parent's autopsy, some courts have held that the permission of one child is sufficient, while others have found that all of the surviving children must consent.¹⁴⁵ In *Rakow v. State*, New York law provided that the power to consent to an autopsy exists "[w]henever and so far as the husband, wife or next of kin of the deceased, being charged by law with the duty of burial . . . may authorize dissection for the sole purpose of ascertaining the cause of death"¹⁴⁶ Under this rule, when the next of kin are the decedent's children, no one child has a greater obligation or right concerning the disposition of the body.¹⁴⁷ Since the children were not estranged from their deceased father nor unable to consent to the autopsy, the court ruled that all five surviving children must consent to the autopsy.¹⁴⁸

Surviving family members may not want the deceased to be subject to any additional medical intervention or be reluctant to allow the body to be marred. For some people, however, religious considerations may be the overriding factor. Few religions impose an outright ban, but some have strong customs that place significant weight on the inviolability of human remains, and anything other than ceremonial cleansing is considered a desecration.¹⁴⁹ Those from more westernized or diverse populations generally have weaker ties with traditions, customs, and outlooks surrounding death and thus are not as likely to voice religious objections to autopsy.¹⁵⁰ Less diverse cultures are more structured in their beliefs and traditions concerning death, and therefore more often register a religious objection to the dissection.¹⁵¹ Judaism and Islam are two faiths that fall into this category.¹⁵² Other religions tend to approach the topic differently. For example, Christian Scientists criticize the practice even if they do not explicitly object to necropsies, while Hindus will allow the procedure but believe that all body parts must be returned to the corpse.¹⁵³

Overall, most religions and cultures find necropsy an acceptable practice based upon either the person's beliefs or special circumstances. Several religions, however, object to a post-mortem examination because the bodily disruption violates the sacredness of keeping the deceased's remains complete, even though the process may not be strictly forbidden.¹⁵⁴ Rather,

¹⁴⁵ See, e.g., *Rakow v. State*, 854 N.Y.S.2d 844, 852 (Ct. Cl. N.Y. 2007) (requiring consent of all five living children); see also TEX. CODE CRIM. PRO. art. 49.33 (authorizing consent to be given by at least one person when more than one member of a class, like surviving children, exists).

¹⁴⁶ 854 N.Y.S.2d at 850 (quoting N.Y. PUB. HEALTH LAW § 4210(3) (McKinney 2002)).

¹⁴⁷ *Id.*

¹⁴⁸ See *id.* at 851–52.

¹⁴⁹ Sanchez, *supra* note 129.

¹⁵⁰ See, e.g., Kaitlin D. Weaver, *Religions and the Autopsy*, MEDSCAPE, <https://medicine.medscape.com/article/1705993-overview> (May 17, 2020).

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ *Id.*

metamorphosis has occurred in interpreting these doctrines that have changed over time. For example, the sayings of Prophet Muhammad are offered in support of not allowing an autopsy when he said: “[T]o break the bone of a dead person is like breaking the bone of a living person.”¹⁵⁵

When a conflict arises between the powers of the medical examiner and the wishes of the family on the performance of an autopsy, the death investigator’s authority usually takes precedent if the nature of the death is suspicious.¹⁵⁶ The most forcible argument that can be advanced to prevent autopsy is premised upon statutes in those jurisdictions that limit the power of the medical examiner to perform post-mortem examinations in the face of a religious objection.¹⁵⁷ If such an objection is made, these laws tend to require the autopsy to be held in abeyance for forty-eight hours.¹⁵⁸ This delay allows the next of kin to file a lawsuit for the court to determine if a necropsy is appropriate.¹⁵⁹ Rhode Island provides an example:

Whenever, in the opinion of a medical examiner, there is a compelling public necessity . . . to perform an autopsy or dissection, and a member of the deceased’s immediate family or, in the absence of a member of the deceased’s immediate family, a friend objects that the autopsy or dissection is contrary to the religious beliefs of the deceased or there is an obvious reason to believe, based on written information or records provided the medical examiner, that the autopsy or dissection is contrary to the religious beliefs of the deceased, then no dissection or autopsy shall be performed until forty-eight (48) hours after notice of the dissection or autopsy is given by the medical examiner to the objecting party, or, if there is no objecting party, to any party that the court may name. During that forty-eight (48) hour period, the objecting party or the party named by the court may institute action in the superior court to determine the propriety of the dissection or autopsy, but the court may dispense with the waiting period upon ex parte motion if it determines that the delay may prejudice the accuracy of the autopsy or dissection.¹⁶⁰

At least seven states have enacted statutes that offer religious protections against autopsies: California, Maryland, New Jersey, New York,

¹⁵⁵ *Id.*

¹⁵⁶ *See Sanchez, supra* note 129.

¹⁵⁷ PANELLA & HODGE, *supra* note 54, at 225.

¹⁵⁸ *Id.*

¹⁵⁹ *See id.*

¹⁶⁰ 23 R.I. GEN. LAWS ANN. § 23-4-4.1(d) (West 2020).

Ohio, Rhode Island, and Minnesota.¹⁶¹ In other jurisdictions, religious freedom laws can attract the displeasure of those who believe in the separation of church and state.¹⁶²

Some states use a “compelling public necessity” standard to allow the autopsy to proceed if a religious objection is asserted.¹⁶³ This phrase has been interpreted by the courts to widely empower medical examiners and coroners to go forward with their investigations and autopsies.¹⁶⁴ New York law offers an illustration:

Notwithstanding any other provision of law, in the absence of a compelling public necessity, no dissection or autopsy shall be performed over the objection of a surviving relative or friend of the deceased that such procedure is contrary to the religious belief of the decedent, or, if there is otherwise reason to believe that a dissection or autopsy is contrary to the decedent’s religious beliefs.¹⁶⁵

This statute goes on to note that “[a]ll dissection or autopsies performed pursuant to this section shall be least intrusive procedure consistent with the compelling state interest as defined herein.”¹⁶⁶ On the other hand, several cases in which religious objections have been voiced over the performance of an autopsy have hindered or stymied death investigations, even those of a suspicious nature.¹⁶⁷

The following court cases highlight some of the issues that arise when religious objections to autopsy lead to lawsuits. In the Maryland case of *Snyder v. Holy Cross Hospital*, an 18-year-old boy in good health died suddenly at home and with no explanation.¹⁶⁸ The boy’s father was an Orthodox Jew and stated his faith prohibited dissection of his son’s body.¹⁶⁹ Because there was no obvious cause of death and the decedent was young, the medical examiner wanted to perform an autopsy to determine what had triggered the young man’s premature demise.¹⁷⁰ The father filed for injunctive relief to prevent the examination, which was denied.¹⁷¹ The court found that the medical examiner was required to take charge of the body and determine

¹⁶¹ Jake Grovum, *Religious Freedom, States’ Interests Clash Over Autopsies*, PEW CHARITABLE TRS. (Jun. 29, 2015), <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2015/6/29/religious-freedom-states-interests-clash-over-autopsies>.

¹⁶² *See id.*

¹⁶³ Weaver, *supra* note 150.

¹⁶⁴ *See Notes From a Plaintiff’s Attorney: Avoiding Liability Involving Autopsies*, MED. JUST. (Jan. 23, 2015), <https://medicaljustice.com/notes-plaintiffs-attorney-avoiding-liability-involving-autopsies/>.

¹⁶⁵ N.Y. PUB. HEALTH LAW § 4210–c (1) (McKinney 2002).

¹⁶⁶ *Id.* § 4210–c (3).

¹⁶⁷ Weaver, *supra* note 150.

¹⁶⁸ *Snyder v. Holy Cross Hospital*, 352 A.2d 334, 335 (Md. Ct. Spec. App. 1976).

¹⁶⁹ *Id.*

¹⁷⁰ *Id.* at 336.

¹⁷¹ *Id.* at 335.

the cause of death in furtherance of the state's duty to "safeguard the peace, health, and good order of the community," and since the cause of death could not be determined without an autopsy, the state's interest in finding out what caused his death outweighed the father's freedom of religion argument.¹⁷²

Those claiming a religious objection to the autopsy of a loved one must meet a burden of proof that they subscribe to that religion's beliefs and are not simply articulating a personal preference under the auspices of religious preclusion.¹⁷³ In the 2009 Texas case of *Sanchez v. Sanghian*, a 54-year-old man with a history of mental illness was found dead with empty pill bottles nearby.¹⁷⁴ Despite many pieces of corroborating information suggesting suicide as the cause of death—including a crime scene investigation, an eyewitness who had allegedly seen the decedent take some pills, and medical records indicating a mental illness—the medical examiner sought possession of the body for an autopsy.¹⁷⁵ The wife of the decedent objected, saying "that an autopsy would violate the canons of Orthodox Judaism."¹⁷⁶ She further noted that to conduct the autopsy given the religious objection would be a violation of the Texas Civil Practice and Remedies Code, which provides that the government may only burden a person's free exercise of religion if it can demonstrate a compelling state interest and the action sought is the least restrictive way to satisfy that interest.¹⁷⁷ The Court of Appeals found the wife failed to provide enough evidence to demonstrate that she and her husband did, in fact, adhere to a strict Orthodox Jewish faith and that her objections were not rooted in mere personal preference, stating:

The evidence actually before the court, however, reveals only that Yahya and Afsaneh Saghian consulted with Rabbi Grossman on several occasions and that Yahya Saghian attended events and classes sponsored by a Jewish organization. None of the rabbis testified that Afsaneh and Yahya Saghian were observant Orthodox Jews who personally adhered to the belief of bodily resurrection and were opposed to an autopsy on the grounds set forth by Rabbis Block and Walker.¹⁷⁸

Without evidence that the Saghians were more observant and subscribed personally to religious beliefs precluding autopsy, the court found the plaintiff's argument too weak to defeat the medical examiner's interest in

¹⁷² *Id.* at 343.

¹⁷³ See *Wisconsin v. Yoder*, 406 U.S. 205, 215 (1972) (finding that to have the protection of the Religion Clauses of the Constitution, the "claims must be rooted in religious belief").

¹⁷⁴ No. 01-07-00951-CV, 2009 Tex. App. LEXIS 7944, at *1–2 (Tex. Ct. App. Oct. 8, 2009).

¹⁷⁵ *Id.* at *2–3.

¹⁷⁶ *Id.* at *3.

¹⁷⁷ *Id.* at *3–4.

¹⁷⁸ *Id.* at *29.

proceeding with the autopsy.¹⁷⁹

The Supreme Court of Vermont considered the issue in *State v. Chambers*, where a baby died during a home birth.¹⁸⁰ The medical examiner was unable to determine a cause of death by examining the baby and wished to perform an autopsy, as was his right under the Vermont Constitution.¹⁸¹ The father, however, claimed that his church's tenets opposed autopsy.¹⁸² So, the father buried the baby before the autopsy was performed, without a burial permit, and was accused of violating Vermont state law in so doing.¹⁸³ He argued that his subsequent conviction violated his rights to the free exercise of religion.¹⁸⁴ The Supreme Court of Vermont relied on the standard set by the United States Supreme Court in *Washington v. Yoder*, which held that "a state may impinge upon the practice of a sincere religious belief only if the state's interest is of 'sufficient magnitude to override the interest claiming protection under the Free Exercise Clause.'"¹⁸⁵ Applying this test, the Vermont Supreme Court found that the father failed to provide evidence that the tenets of his church objected to an autopsy, and rather his convictions were personal and not ones that could be ascribed to an organized religious group.¹⁸⁶

The father also argued that his daughter's death should not warrant an autopsy because it was attended by a "recognized practitioner of a well-established church," which was listed as an excusatory factor in Vermont's statute on autopsies.¹⁸⁷ He claimed this because the birth was attended by a midwife, who was also a member of the father's church.¹⁸⁸ Nevertheless, the court found that this factor alone does not excuse the performance of an autopsy when other considerations surrounding the baby's death rendered it appropriate for autopsy at the discretion of the medical examiner, who is charged with the investigation of deaths that occur in "any unusual, unnatural or suspicious manner, or in circumstances involving a hazard to public health, welfare or safety."¹⁸⁹

In the 1999 Texas matter of *Kickapoo Traditional Tribe v. Chacon*, a justice of the peace ordered an autopsy on a woman who died suddenly and unexpectedly.¹⁹⁰ Though the woman was a known inhalant abuser, no signs of spray paint were found on the body, and the decedent's distraught mother

¹⁷⁹ *Id.* at *30.

¹⁸⁰ 477 A.2d 110, 111 (Vt. 1984).

¹⁸¹ *Id.* at 111.

¹⁸² *Id.* at 111–12.

¹⁸³ *Id.* at 111–12.

¹⁸⁴ *Id.* at 112.

¹⁸⁵ *Id.* (quoting *Washington v. Yoder*, 406 U.S. 205, 214 (1972)).

¹⁸⁶ *Id.*

¹⁸⁷ *Id.* at 113.

¹⁸⁸ *Id.*

¹⁸⁹ *Id.*

¹⁹⁰ 46 F. Supp. 2d 644, 646 (W.D. Tex. 1999).

was insistent that someone had killed her.¹⁹¹ The court found in favor of the state's wishes to exhume and autopsy the body.¹⁹² In this case, the Kickapoo Tribe, of which the decedent was a member, pointed to the Native American Graves Protection and Repatriation Act of 1990, which protects Native American burial sites from excavation, but the court rejected the argument, finding it did not apply in this case.¹⁹³ The court also found that the Tribe's belief that a deceased member must be buried before noon on the day following death, though a valid religious belief deserving of respect, did not supersede the interest of the decedent's mother and the state in determining the cause of death under the Texas Rules of Civil Procedure stating:

[T]he intrusion caused by application of article 49 equally affects those of other faiths, as well as the recently bereaved who profess no faith at all but would still be deeply disturbed by the autopsy or disinterment of a loved one. The Tribe has presented absolutely no evidence that Chacon's decision to order an autopsy was motivated by the decedent's or her family members' adherence to the Tribe's particular religious beliefs. Rather, it was based on Chacon's perception, right or wrong, that there was insufficient evidence upon which she could determine cause of death.¹⁹⁴

Importantly, the court noted in dicta that respect for Native American religious beliefs might be appropriate for codification in Texas law, as it already existed in other states.¹⁹⁵ Wishing not to denigrate Native American beliefs and religious traditions, the court suggested that, while the creation of a statute might make sense, without one "nothing prevents state and local authorities from acting with care and sensitivity to the wishes of family members of the deceased. In fact, a civilized society demands it."¹⁹⁶

V. VIRTUAL AUTOPSIES

Forensic science has made tremendous strides in a variety of areas, such as in DNA identification, crime scene investigative techniques, and toxicology. Forensic pathology, however, has not risen to the challenge and still employs the time-old tradition of a dissection to glean forensic clues as to the cause, time, and manner of death which is then summarized in a written report.¹⁹⁷ This process of inspection, dissection, and analysis of the major organs with identification of macroscopic pathologies and injuries has

¹⁹¹ *Id.*

¹⁹² *Id.*

¹⁹³ *Id.* at 649, 651.

¹⁹⁴ *Id.* at 651–52, 654.

¹⁹⁵ *Id.* at 654–55.

¹⁹⁶ *Id.*

¹⁹⁷ See Stephan A. Bolliger et al., *Virtual Autopsy Using Imaging: Bridging Radiologic and Forensic Sciences. A Review of the Virtopsy and Similar Projects*, 18 EUR. RADIOL. 273, 273 (2008).

remained essentially unchanged over the last century.¹⁹⁸

The job of medical examiners and forensic pathologists could be made easier using a virtual approach, according to a study that showed how scanning a decedent's body can augment traditional autopsy practices that detail trauma associated with certain accidental deaths.¹⁹⁹ With the invention of computed tomography ("CT") and magnetic resonance imaging ("MRI") technologies, new applications in forensic pathology have slowly emerged. This conservative approach to forensic pathology is surprising given that prosecutors and defense counsel are often excited to use new methods.²⁰⁰ Nevertheless, diagnostic imaging is gaining a foothold in forensics investigations, with digital autopsies generating excitement as an adjunct or substitute for traditional post-mortem dissections.²⁰¹ While digital autopsy technology is being assessed, technology like cross-sectional imaging of corpses, CT/MRI imaging units, and three-dimensional ("3D") body reconstructions are offering adjunctive support in forensic inspections of skeletons, foreign bodies, teeth, and gaseous findings, and various facilities have employed CT/MRI post-mortem investigations on a broad basis.²⁰²

A. *Virtopsy*

The groundwork for the digital autopsy was laid in 2004, when the "Virtual Mummy" was created at the British Museum.²⁰³ Soon thereafter, the term "Virtopsy" was coined as a combination of the words "virtual" and "autopsy."²⁰⁴ The word was the creation of Professor Richard Dirnhofer from Bern University, and the technology was developed in Switzerland, where it has been accepted as a reliable and admissible test in forensic cases.²⁰⁵ The procedure utilizes imaging techniques that are employed in diagnostic medicine, such as X-rays, CT, photogrammetry with 3D surface scanning, and MRI, to conduct an autopsy and to ascertain the cause and manner of death.²⁰⁶

A virtual autopsy is said to be able to diagnostically scan a body and

¹⁹⁸ See Vito Cirielli et al., *Virtual Autopsy as a Screening Test Before Traditional Autopsy: The Verona Experience on 25 Cases*, 9 J. PATHOL. INFORM. 28, 28 (2018), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6106125/>.

¹⁹⁹ See Kathy Hardy, CT Autopsy, RADIOLOGY TODAY (Jan. 28, 2008), <https://www.radiologytoday.net/archive/rt01282008p20.shtml>.

²⁰⁰ Bolliger et al., *supra* note 197, at 273–74.

²⁰¹ Cirielli et al., *supra* note 198, at 28.

²⁰² *Id.*

²⁰³ See Shalu Rai et al., *Image Guided Virtual Autopsy: An Adjunct with Radiographic and Computed Tomography Modalities - An Important Tool in Forensic Identification*, 29 J. INDIAN ACAD. OF ORAL MED. & RADIOL. 368, 369 (2017).

²⁰⁴ Kruzic et al., *supra* note 6, at 68.

²⁰⁵ *Id.* at 68, 72.

²⁰⁶ *Id.* at 68.

achieve more precise results than conventional necropsy.²⁰⁷ It can create 3D images by applying the principles of triangulation as compared to the classic visual inspection of the corpse.²⁰⁸ Virtopsy is touted as the twenty-first-century alternative autopsy because it is less time-intensive, provides better diagnosis, and respects religious beliefs.²⁰⁹ Some even say that it could eventually become a forensic pathologist's chief diagnostic aid.²¹⁰

B. How the Process Works

A virtual autopsy starts by scanning the body with 3D photogrammetry and projector that casts an outline over the body's exterior.²¹¹ After a CT scan and up to 3,500 X-ray slices, markers tactically placed on the body are then lined up to form a 3D image that reveals the bones and internal organs.²¹² The significant advantage of CT scanning is the ability to find and visualize fractures, foreign objects, and buildups of fluids and gases. The scan plays a unique role in after-death ballistic analysis since it permits a determination of injuries, in addition to bullet paths within and external to the body.²¹³

This scanning is followed by an MRI of the body, which visualizes the soft tissue and ascertains if the heart, brain, or abdominal organs are damaged.²¹⁴ The MRI is useful in cases where CT has inherent weaknesses, such as in the examination of soft tissues and organs. MRIs can also more clearly recognize different pathologies and soft tissue trauma.²¹⁵

The MRI procedure can be supplemented with a robotic arm that can retrieve tissue samples with a biopsy needle at exact locations with the aid of a computer. Since CT and X-ray imaging will reveal the presence of any foreign objects, such as bullet pieces or the tip of a knife, these materials can be retrieved with precision and ease.²¹⁶ CT angiography can even be used to inject a contrast agent into a blood vessel to check for leaks or abnormal

²⁰⁷ See K. B. Tejaswi & E. Aarte Hari Periya, *Virtopsy (Virtual Autopsy): A New Phase in Forensic Investigation*, 5 J. FORENSIC DENTAL SCI. 146, 146, 147 (2013).

²⁰⁸ See Ademir Franco do Rosario, Jr. et al., *Virtual Autopsy in Forensic Sciences and Its Application in the Forensic Odontology*, 27 REV. ODONTO CIENC. 5, 6 (2012); Kruzic et al., *supra* note 6, at 68.

²⁰⁹ Tejaswi & Periya, *supra* note 207, at 146.

²¹⁰ See Anders Persson, *Virtual Autopsies Guide Postmortem Investigation*, DIAGNOSTIC IMAGING (Mar. 1, 2007), <https://www.diagnosticimaging.com/view/virtual-autopsies-guide-postmortem-investigation>.

²¹¹ See Mark Honigsbaum, *Virtual Autopsy: Does it Spell the End of the Scalpel?*, GUARDIAN (Feb. 23, 2013), <https://www.theguardian.com/science/2013/feb/23/virtual-autopsy-virtopsy-forensic-science>. 3D Photogrammetry is the ability of obtaining 3D information from photographs. The procedure involves taking overlapping images of an object, structure, or space, and transforming them into 2D or 3D digital models. See *What Is Photogrammetry?*, AUTODESK, <https://www.autodesk.com/solutions/photogrammetry-software#:~:text=Photogrammetry%20is%20the%20art%20and,2D%20or%03D%20digital%20mode> (last visited May 3, 2021).

²¹² Honigsbaum, *supra* note 211.

²¹³ Kruzic, et. al., *supra* note 6, at 69.

²¹⁴ Honigsbaum, *supra* note 211.

²¹⁵ Kruzic et al., *supra* note 6, at 69.

²¹⁶ Honigsbaum, *supra* note 211.

lesions that might not be detected during a conventional autopsy.²¹⁷

C. Adoption

Subjecting a corpse to diagnostic imaging is not new. Radiography has been a part of forensic probes for over a century.²¹⁸ However, sophisticated methods such as post-mortem CT and MRI testing have only recently achieved approval among forensic scientists.²¹⁹ These imaging approaches are commonly employed in some parts of the world. For example, Melbourne, Australia, has used post-mortem CT scanning in medical/legal death investigations since 2005.²²⁰ The use of CT scanning technology to supplement forensic autopsies is routine in Europe, Japan, and Australia.²²¹ The United Kingdom uses virtual autopsy technology in conjunction with traditional dissections in the majority of cases involving suspicious deaths, and Italy permits the prosecutor to authorize its use as a supplement to an autopsy.²²² On the other hand, other nations, such as the United States, have been much more cautious in using these post-mortem techniques in their routine practices.²²³ But since 2004, the United States military has taken X-rays and CT scans on the bodies of every deceased servicemember where the military has exclusive jurisdiction.²²⁴

The New Mexico Office of Medical Investigators (“OMI”), the centralized medical examiner’s office in the state, has embraced virtual autopsies and created the Radiology-Pathology Center for Forensic Imaging (Center”) in conjunction with the University of New Mexico School of Medicine.²²⁵ The Center uses its in-house CT and MRI facilities to assist forensic education and research and the clinical practice of the OMI.²²⁶ Additionally, the Center is supported by several research awards from the National Institute of Justice and has received smaller grants from other sources.²²⁷ The use of these advanced imaging modalities permits forensic pathologists to be more responsive to the state’s varied cultural and religious groups, some of whom have opposition to autopsy.²²⁸

²¹⁷ *Id.*

²¹⁸ See Summer J. Decker et al., *Forensic Radiology: A Primer*, 26 ACAD. RADIOL. 820, 820 (2019), <https://pubmed.ncbi.nlm.nih.gov/31005405/>.

²¹⁹ *Id.*

²²⁰ *Id.*

²²¹ See Danielle Weiss et al., *Using Advanced Imaging Technologies to Enhance Autopsy Practices*, NAT’L INST. OF JUST. (Dec. 9, 2017), <https://nij.ojp.gov/topics/articles/using-advanced-imaging-technologies-enhance-autopsy-practices>.

²²² Kruzic et al., *supra* note 6, at 73.

²²³ Decker et al., *supra* note 218 at 820, 827.

²²⁴ McKenna, *supra* note 48, at 30.

²²⁵ See *Radiology-Pathology Center for Forensic Imaging (CFI)*, UNIV. N.M. SCH. OF MED., <https://hsc.unm.edu/cfi/> (last visited May 3, 2021).

²²⁶ *Id.*

²²⁷ See *CFI Research Program*, UNIV. N.M. SCH. OF MED., <https://hsc.unm.edu/cfi/research/> (last visited May 3, 2021).

²²⁸ *Id.*

D. Accuracy

As for accuracy, a 2012 study of intensive care patients in Germany matched the diagnoses established before death with the findings of both traditional and virtual autopsy in forty-seven patients and with just Virtopsy in another one hundred and fifteen whose next of kin declined to authorize autopsies.²²⁹ Virtual autopsies corroborated 88% of diagnoses while the patients were alive, a statistic not much different than the 93% rate for standard post-mortem inspections.²³⁰ While Virtopsy is susceptible to missing myocardial infarctions and blood clots in the lung and major blood vessels, standard necropsies were also imperfect; they missed significant fractures, fluid around the heart, and collapsed lungs.²³¹

E. Advantages

Virtual autopsies have several benefits over traditional ways of conducting a forensic death investigation. A corpse cannot be reassembled once an invasive dissection has been performed, thereby precluding other forensic pathologists from starting a completely distinct analysis.²³² Virtual autopsies, by comparison, can be done as frequently as needed. The utilization of whole-body imaging for comprehensive systemic inspections can also diminish the overall procedure time.²³³

A post-mortem examination based upon imaging should also satisfy the religious worries maintained by the deceased's family because no desecration of the body takes place.²³⁴ It also allows for retrieving data that is not reliant upon an examination by a pathologist, permits saved information to be standardized, and lets any number of experts to become involved in the case from any part of the world.²³⁵ Traditionally, it is difficult to identify skeletonized, putrefied, or mutilated bodies, but virtual autopsies can offer identification data and permit analyses of injuries.²³⁶ An unintended benefit is its use in court. Virtopsy eliminates the need to show gruesome images to the jurors, family, and judges, and, instead, 3D representations can be presented as evidence.²³⁷

F. Disadvantages

Not all scientists and forensic investigators embrace this digital technology as reliable as traditional autopsies, especially in disease-related

²²⁹ McKenna, *supra* note 48, at 32.

²³⁰ *Id.*

²³¹ *Id.*

²³² Persson, *supra* note 210.

²³³ *Id.*

²³⁴ *Id.*

²³⁵ Kruzic et al., *supra* note 6, at 68–69.

²³⁶ *Id.* at 69.

²³⁷ *Id.* at 70.

deaths. For example, research reviews from the United Kingdom and the Netherlands concluded that virtual autopsies varied in reliability, based upon whether the reason of death was trauma-related or from an infectious or chronic disease and whether the corpse belonged to an infant, child, or adult.²³⁸ Some forensic pathologists also point out the inadequacies of what a Virtopsy can determine, such as ascertaining when and where a person died.²³⁹ Conducting a Virtopsy also requires specialized skill and training to make accurate deductions about the results.²⁴⁰

Virtopsy is also a lengthy procedure because of the need to take images by both CT and MRI modalities, thereby resulting in a two- or three-day turnaround.²⁴¹ Additionally, some are troubled that it may lead to incorrect diagnoses since the procedure is fairly new and has not yet been fully tested with the necessary scientific rigor.²⁴² Another concern is that merging information from multiple techniques will cause some diminishment in precision, and relying on imaging by itself may result in omissions.²⁴³ Since there is no direct contact with the body, the pathologist's senses of such things as smell, texture, and color are limited.²⁴⁴

Sally Aiken, M.D., the Medical Examiner in Spokane, Washington, and the President of the National Association of Medical Examiners, noted that virtual autopsy has not gained general acceptance in the United States and is evolving and being studied.²⁴⁵ She is not aware of any national organization of pathologists in this country that has issued guidelines or position statements on the use of virtual autopsies.²⁴⁶ Dr. Aiken believes that there are some interesting applications for the technique, but the equipment is currently too expensive to acquire and maintain in the offices of most medical examiners.²⁴⁷

Dr. Aiken went on to note that she does believe that digital imaging has a place in forensics. She makes great use of Lodox—a full-body X-ray system that allows imaging of a corpse.²⁴⁸ This type of equipment is used by many offices and assists the forensic pathologist in necropsies by diminishing the time necessary to examine a body and providing rapid detection of foreign

²³⁸ McKenna, *supra* note 48, at 30, 32.

²³⁹ See Helga George, *Examining the Pros and Cons of Digital Autopsies*, CRIMESCENEINVESTIGATOREDU.ORG (Dec. 30, 2013), <https://www.crimesceneinvestigatoredu.org/2013/12/examining-the-pros-and-cons-of-digital-autopsies/>.

²⁴⁰ See [Answered] *What Is 'Virtual Autopsy'? Discuss Various Advantages and Disadvantages of Virtual Autopsy*, FORUM IAS, <https://blog.forumias.com/answeredwhat-is-virtual-autopsy-discuss-various-advantages-and-disadvantages-of-virtual-autopsy/> (last visited May 3, 2021).

²⁴¹ *Id.*

²⁴² *See id.*

²⁴³ *Id.*

²⁴⁴ Rosario et al., *supra* note 208, at 7.

²⁴⁵ Telephone Interview with Sally Aiken, M.D. (Jan. 30, 2020).

²⁴⁶ *Id.*

²⁴⁷ *Id.*

²⁴⁸ *Id.*

objects such as bullet fragments which is beneficial in criminal examinations.²⁴⁹ Lodox—or a comparable system—is particularly helpful in matters that require expedited burial for religious reasons or in situations with mass fatalities.²⁵⁰ The scanning takes about six seconds to complete, and the units are designed for post-mortem work, so it is relatively easy to place the body on the examination table for purposes of the scan.²⁵¹

Dr. Aiken provided an example where Lodox was helpful when an objection was registered to an autopsy based on religious grounds. A young man's body was discovered, and it was believed that he had committed suicide.²⁵² It was necessary to determine his cause of death, but the decedent's mother objected.²⁵³ The medical examiner completed her forensics report without having to perform a dissection by using a thorough external examination of the body, a toxicology screening, and a full Lodox body scan.²⁵⁴ Dr. Aiken went on to note that a Virtopsy would be useful in demonstrating soft tissue or ligament injuries and air emboli, but it could not detect residues from a bullet wound or patterns of injury that can only be gleaned from an external examination of the body.²⁵⁵

VI. CONCLUSION

When a person dies suddenly or unexpectedly, is found dead, or is murdered, family members and law enforcement officials have many questions.²⁵⁶ These questions are usually solved through a medical or forensic autopsy. The benefits of a necropsy are not disputed. They permit the evaluation of new diagnostic tools, surgical procedures, devices, and medications. The identification of contagious viruses, inherited diseases, and environmental contaminants is possible, and those revelations advance the areas of public health and epidemiology that further the interests of society.²⁵⁷

Autopsies also enlarge the understanding of medicine and allow for the documentation of the health of society. Forensically, they can establish the cause, manner, and time of death.²⁵⁸ These types of death determinations should be objective and not be based upon helping the prosecution, circumventing publicity, advancing a political position, or advocating a personal agenda.²⁵⁹ Nevertheless, they are subjective in nature, and medical

²⁴⁹ *Id.*

²⁵⁰ See *Uncover Forensic Radiology*, LODOX 1, <http://lodox.com/assets/files/MKT-19-0045-B-eXero-dr-Brochure.pdf> (last visited May 3, 2021).

²⁵¹ *See id.*

²⁵² Interview with Sally Aiken, M.D., *supra* note 245.

²⁵³ *Id.*

²⁵⁴ *Id.*

²⁵⁵ *Id.*

²⁵⁶ *See supra* Part I.

²⁵⁷ Conran et al., *supra* note 24.

²⁵⁸ *Id.*

²⁵⁹ HANZLICK ET AL., *supra* note 26, at 6.

examiners can construe similar evidence differently.²⁶⁰ Therefore, it is little wonder that no medical procedure is as prevalent in litigation as the autopsy.²⁶¹

Virtual autopsies have been proposed as an adjunct or replacement for a traditional post-mortem examination. Despite its many benefits over the classic autopsy, virtual autopsies remain underrepresented in forensic and legal literature. This makes it difficult to measure the extent that the procedure may be applied in practice and whether it will gain general acceptance in medical or legal circles.²⁶² Medical examiner offices have evolved in many areas of the world where pre-autopsy post-mortem cross-sectional imaging is a regular practice.²⁶³ However, a review of the literature shows that post-mortem CT has much wider use in forensic radiology than MRI.²⁶⁴ From a practical point of view, the major impediment to its everyday use in autopsies is related to the costs of the procurement, installation, and upkeep of dedicated CT and MRI modalities in forensic facilities.²⁶⁵

Approximately 2.6 million individuals die annually in the United States, and about 500,000 of them undergo post-mortem examinations.²⁶⁶ However, the country has a scarcity of board-certified forensic pathologists.²⁶⁷ There are only about 500 full-time forensic pathologists when it is estimated that 1,000 physicians with these credentials are desirable to provide the proper coverage.²⁶⁸ Needless to say, there is a huge necessity to create and utilize advanced techniques that could not only augment necropsies diagnostically but also help ameliorate this deficit and decrease workloads.²⁶⁹ Virtual autopsies may provide a solution, but only time will tell if the necessary funds will be allocated for this post-mortem procedure that is much more palatable than the classic autopsy.

²⁶⁰ *Id.* at 5.

²⁶¹ Wecht, *supra* note 28, at 2918.

²⁶² See Kruzic, *supra* note 6, at 68, 71–73.

²⁶³ See T. D. Ruder et al., *Essentials of Forensic Post-Mortem MR Imaging in Adults*, BR. J. RADIOL., 2014, at 1.

²⁶⁴ *Id.*

²⁶⁵ See Laura Filigrana et al., *A Practical Guide to Virtual Autopsy: Why, When and How*, 40 SEMINARS IN ULTRASOUND, CT, & MRI 56, 56–57 (2019), <https://www.sciencedirect.com.libproxy.temple.edu/science/article/pii/S0887217118300945>.

²⁶⁶ See Danielle Weiss et al., *Using Advanced Imaging Technologies to Enhance Autopsy Practices*, 279 NAT'L INST. OF JUST. J., 26, 28 (2018), <https://www.ncjrs.gov/pdffiles1/nij/250698.pdf>.

²⁶⁷ *Id.* at 28–29.

²⁶⁸ *Id.*

²⁶⁹ *Id.*