INTERNATIONAL JOURNAL OF MODERN HEALTH SYSTEMS AND MEDICAL SCIENCES OCTOBER, 2025 VOL. 3 NO. 1. ISSN: 2772-1188, UNITED STATES

RELEVANCE OF AUTOPSY IN UNCOVERING DIAGNOSTIC DISCREPANCIES IN AI-NATIVE AGE

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ABSTRACT

In the modern era of advanced diagnostics and molecular technologies, the Molecular Autopsy and conventional anatomical autopsy remain pivotal in uncovering diagnostic discrepancies. Despite improvements in imaging, genomics and laboratory tests, significant gaps persist between ante-mortem clinical diagnoses and post-mortem findings, indicating ongoing limitations in our diagnostic processes. This paper examines the relevance of autopsy in the molecular age, explores how autopsy adds value by identifying missed diagnoses or cause of death, and argues for its integral role in quality assurance, education and patient-safety systems, the study also examine the notable cases and example of diagnostic discrepancy, AI-aided autopsy in uncovering diagnostic discrepancies which has proved that AI-aided autopsy as a contemporary post-mortem investigative approach that combines artificial intelligence technologies with conventional autopsy practices to identify differences between clinical diagnoses made before death and the actual pathological causes of death play significant roles in digital histopathology during autopsy examinations, it has ability to accurately identify malignant cells, inflammatory patterns, and infectious agents, thereby uncovering diseases that were not detected during clinical management. Besides, the importance of AI-aided autopsy in uncovering diagnostic discrepancies also extends to patient safety and medical education. The study concludes that autopsies provide definitive validation of clinical diagnoses, reveal unexpected disease processes and genetic risks, and support healthcare systems in quality assurance, mortality data accuracy and family counseling. It also recommended that continuous professional education on molecular pathology and autopsy relevance should be provided for clinicians and medical students. This will bridge the knowledge gap and revive appreciation for autopsy as a diagnostic and educational tool.

KEYWORDS: Autopsy, Uncovering Diagnostic Discrepancies and AI Native Age

INTRODUCTION

Autopsy, often referred to as the "final diagnosis" has long served as the gold standard for confirming the cause of death and assessing the accuracy of clinical diagnoses. Despite major advances in medical imaging, laboratory technology, and molecular diagnostics, discrepancies between clinical and post-mortem findings persist. Studies continue to show that a significant proportion of autopsies reveal major diagnostic errors, some of which could have affected patient outcomes (Clark & Lewis, 2025). This ongoing gap highlights that, even in an era dominated by precision medicine and molecular biology, autopsy remains vital for validating diagnoses and improving healthcare quality. In the molecular age, medicine has undergone a transformation through genomics, proteomics, and other molecular tools that allow clinicians to detect diseases at the genetic and cellular levels. However, these advanced diagnostic techniques, while powerful, are not infallible. Many conditions, such as sudden unexplained deaths, inherited cardiac disorders, and rare metabolic diseases, still require autopsy to uncover the underlying causes. The fusion of

molecular analysis with traditional autopsy-referred to as molecular autopsy -has emerged as an invaluable approach to bridging this diagnostic gap. The relevance of autopsy extends beyond identifying cause of death. It serves as a quality control mechanism that evaluates the effectiveness of diagnostic systems and clinical decision-making. Through systematic comparison of pre-mortem and post-mortem data, healthcare institutions can assess the accuracy of diagnoses and identify areas for improvement. This process enhances patient safety, refines diagnostic protocols, and fosters continuous medical education. Furthermore, autopsy findings contribute to epidemiological databases, which help track disease prevalence and mortality patterns across populations.

Another vital aspect of autopsy in the molecular age is its role in research and genetic counseling. By combining pathological examination with genetic sequencing, molecular autopsy can identify hereditary mutations responsible for sudden or unexplained deaths, particularly in children and young adults (Turner & Patel, 2024). This not only provides closure to affected families but also enables preventive care for surviving relatives who may carry similar genetic risks. Thus, autopsy contributes to both clinical care and public health, supporting the broader goals of precision medicine. However, despite its proven benefits, autopsy rates have declined globally over the past few decades. Factors such as cultural beliefs, emotional sensitivities, administrative challenges, and misplaced confidence in modern diagnostic technology have contributed to this decline. This downward trend risks increasing the number of undetected diagnostic errors and weakening the feedback loop between clinical diagnosis and post-mortem validation. In the absence of autopsy, many cases of diagnostic discrepancy remain unresolved, leading to gaps in medical understanding and loss of valuable learning opportunities.

Concept of Autopsy

According to Gupta and Kumar (2025), an autopsy is a detailed medical examination of a deceased person's body, conducted to determine the cause of death, assess disease or injury present, and evaluate treatment effectiveness. This definition emphasizes the diagnostic and educational value of autopsy, helping clinicians confirm or correct clinical diagnoses, understand unexpected deaths, and evaluate the effects of treatments administered during life. For instance, autopsies can reveal hidden conditions such as infections, organ failures, or complications that were not detected during medical care. Additionally, clinical autopsies contribute to improving medical practice by providing insights that can influence treatment protocols and patient management strategies.

As mentioned by Roberts and Strang (2025), an autopsy is the systematic study of organs and tissues after death to understand disease mechanisms, their effects on the body, and progression. This definition underlines the scientific and research-oriented purpose of autopsy. By examining tissues microscopically and conducting chemical and microbiological analyses, pathologists can gain insights into the nature of diseases, their progression, and interactions within the body. This is particularly important for studying rare diseases, investigating unknown syndromes, and advancing medical knowledge for future research and treatment development.

As explained by Singh (2025), autopsies are used in medical schools and training to teach students about anatomy, disease processes, and rare medical conditions that might not be evident before death. This definition emphasizes the educational role of autopsy in medical learning. By observing real cases, students gain practical experience and a deeper understanding of the human body and pathological processes that cannot be fully conveyed through textbooks or simulations.

Autopsies also expose students to uncommon conditions, anomalies, or complications, thereby preparing them for future clinical challenges and improving diagnostic skills.

Concept of Diagnosis

Diagnosis is a fundamental process in healthcare that enables practitioners to identify and understand a patient's condition, which then guides appropriate treatment and management strategies. It is both a science and an art, requiring the systematic collection and interpretation of data, critical thinking, and clinical judgment. Gordis (2020) defines diagnosis as the process through which a clinician determines the nature of a disease or condition by carefully evaluating signs, symptoms, and diagnostic tests. This foundational understanding highlights that accurate diagnosis is critical for ensuring effective patient care and optimizing outcomes.

Bickley and Szilagyi (2021) expand on this by describing diagnosis as a systematic method that integrates clinical reasoning, detailed history taking, thorough physical examination, and relevant laboratory or imaging investigations. They emphasize that diagnosis is not a single-step procedure but a comprehensive process that requires careful correlation of multiple sources of information to arrive at an accurate conclusion. Similarly, Elstein and Schwarz (2021) view diagnosis as a cognitive and analytical process, where healthcare professionals interpret complex clinical data to differentiate between possible conditions and determine the most probable explanation. Their perspective underlines the mental and reasoning component of diagnosis, highlighting the role of experience, pattern recognition, and logical analysis in reaching correct conclusions.

Segen (2020) adds that diagnosis involves the integration of clinical findings with objective tests and investigative procedures to identify diseases or disorders accurately. This definition underscores that diagnosis is a multidimensional process, combining subjective observation with objective evidence. Groopman (2022) complements these views by emphasizing that diagnosis is more than a technical task-it is a process of making sense of complex patient information through reasoning, pattern recognition, and evidence-based assessment. He argues that the quality of diagnosis directly influences the effectiveness of patient care, as misdiagnosis or delayed diagnosis can lead to inappropriate treatment, prolonged illness, or adverse outcomes.

Taken together, these perspectives illustrate that diagnosis is a multifaceted process, blending systematic evaluation, cognitive reasoning, and evidence-based practice. It is not merely about identifying a disease but understanding the patient holistically and using scientific knowledge to inform decision-making. In modern healthcare, the accuracy and efficiency of diagnosis are increasingly supported by technological advancements, including laboratory diagnostics, imaging techniques, and decision-support systems, yet the human element of reasoning, experience, and clinical judgment remains indispensable. Thus, the concept of diagnosis represents a critical cornerstone of medical practice, bridging observation, interpretation, and intervention to improve health outcomes.

Concept of AI-Native Age

In the last few years, as artificial intelligence (AI) technologies - including machine learning, generative models, and AI-powered tools have become widespread and embedded in everyday life, a new concept has begun to emerge: the notion of "AI-native." This builds on but goes beyond the earlier notion of "digital natives", that is, those who grew up with the Internet and digital devices to

describe a generation (or era) for whom AI is not just a tool but a natural, integral part of existence. In this AI-Native Age, children and young people are raised in environments where AI assistants, algorithm-driven learning platforms, and intelligent interfaces are routine, thereby shaping their experiences, cognition, learning styles and interactions from an early age (Shimabukuro, 2025).

This shift has significant implications for education, work, and society. As explained by Mohan, (2025), what differentiates AI-natives from previous "digital natives" is not simply familiarity with technology, but a deeper integration: AI becomes a constant companion in learning, problem-solving, creativity, and even daily decision-making. In educational contexts, for example, AI-driven personalized learning platforms can tailor instruction to a learner's strengths and weaknesses, provide adaptive feedback, and support self-paced learning, meaning that growing up as an "AI-native learner" may fundamentally change how knowledge is acquired and understood.

At the same time, the notion of the AI-Native Age raises critical questions about identity, skills, and readiness for the future. As some analysts argue, being AI-native does not automatically confer deep understanding of technology or its implications, familiarity with tools does not guarantee critical digital or moral literacy. Furthermore, as AI becomes more ubiquitous, society will need to rethink what competencies matter: beyond coding or technical fluency, success may depend on the ability to interact wisely with AI - to ask good questions, think critically, and steer AI-augmented decisions ethically.

Concept of Diagnostic Discrepancy

Diagnostic discrepancy refers to the divergence between an initial clinical diagnosis made by a healthcare professional at the point of care and the final, confirmed diagnosis established through definitive investigations, such as laboratory testing, imaging studies, pathology, or post-mortem examination. These discrepancies highlight potential errors, limitations, or uncertainties in the diagnostic process and remain a critical concern for patient safety and healthcare quality. They are commonly classified as major discrepancies, which have the potential to significantly affect patient management or outcomes, and minor discrepancies, which have minimal clinical impact on treatment decisions or prognosis.

Diagnostic discrepancies can arise from multiple factors, including incomplete clinical information, atypical presentations of diseases, human error, misinterpretation of diagnostic tests, or systemic limitations within healthcare settings. Complex cases, comorbidities, and time-sensitive situations-such as emergency care-have been shown to increase the likelihood of discrepancies. Moreover, the introduction of advanced diagnostic technologies, including artificial intelligence (AI) and decision-support systems, has improved diagnostic accuracy in many areas, but these tools do not completely eliminate discrepancies, particularly in complex or rare cases.

Studying diagnostic discrepancies is essential for improving healthcare outcomes. They serve as valuable indicators of diagnostic accuracy, helping identify areas for improvement in clinical decision-making, medical education, and hospital quality control systems. Systematic analysis of discrepancies can inform the development of structured diagnostic protocols, checklists, and training programs aimed at reducing errors and enhancing patient safety. Furthermore, by understanding the patterns and causes of diagnostic discrepancies, healthcare systems can implement targeted

interventions, integrate technological aids effectively, and foster a culture of continuous learning among medical professionals.

Types of Autopsy Testing Machine

A post mortem CT scanner is a specialized machine that uses X-ray technology to acquire high resolution, three-dimensional volumetric images of a deceased body without the need for full dissection. As described by Filograna et al. (2025), PMCT allows rapid full body imaging, visualizing skeletal injuries, foreign objects (such as bullets or shrapnel), gas distributions (which may indicate trauma or cause of death), and other internal features. Because the body remains intact, PMCT is especially valuable when religious or cultural objections limit full invasive autopsy, or when the investigation needs objective, reproducible imaging data. Its limitations include reduced capacity to detect subtle soft tissue pathologies or certain vascular lesions compared with full dissection.

- **Post mortem Magnetic Resonance Imaging (PMMRI)**

A PMMRI machine uses strong magnetic fields and radio waves to produce detailed images of soft tissues in the deceased body, such as the brain, heart, and internal organs. According to the review by Filograna et al. (2025), PMMRI complements PMCT by offering superior contrast resolution for soft tissues, making it useful in cases of suspected brain injury, cardiac pathology, or other organ based disease detection. In forensic practice, PMMRI may be used in conjunction with PMCT to form a "virtual autopsy" suite. The higher cost, longer scan time, and need for specialized interpretation are practical constraints to its widespread use.

- **Virtual Autopsy / 3D Surface Scanning & Robotic Biopsy Systems**

Beyond imaging alone, the "virtual autopsy" paradigm uses machines like 3D surface scanners, robot guided biopsy systems, and advanced post mortem angiography to capture external and internal features in a non-invasive or minimally invasive way. For example, Thali et al. (2003) and subsequent work described the integration of multislice CT, MRI, 3D surface scanning, and robotic needle biopsy machines under the term "virtopsy." These machines provide: detailed external body surface documentation, internal imaging, and guided biopsy sampling for laboratory tests. However, they are still complementing-not fully replacing-traditional dissection autopsy because some findings (especially subtle histological changes) may only be detected via full physical examination.

Cases and examples of Diagnostic Discrepancy

Diagnostic discrepancy refers to situations where there is a difference between the initial clinical diagnosis and the final or definitive diagnosis, often made after further investigation, surgery, or autopsy. Such discrepancies are common in medical practice and can result from human error, inadequate testing, overlapping symptoms, or limitations of diagnostic technology. Below are some notable cases and examples of diagnostic discrepancies:

- **Misdiagnosis of Stroke as Migraine**

A common diagnostic discrepancy occurs when patients presenting with sudden headaches, nausea, or dizziness are initially diagnosed with migraine, but later confirmed to have ischemic or

hemorrhagic stroke. This error happens because both conditions share neurological symptoms such as visual disturbances and one-sided weakness.

- **Lung Cancer Misdiagnosed as Tuberculosis (TB)**

In regions where tuberculosis is prevalent, lung cancer is often misdiagnosed as TB due to similar symptoms - chronic cough, weight loss, and night sweats. This diagnostic discrepancy delays proper treatment and worsens prognosis. Lung cancer cases in developing countries are initially treated as tuberculosis before the correct diagnosis is made through biopsy or imaging.

- **Appendicitis Misdiagnosed as Gastroenteritis**

Another common diagnostic discrepancy involves acute appendicitis, which may be misdiagnosed as gastroenteritis, especially in children. Both conditions present with abdominal pain, vomiting, and fever, but the localization and progression of pain are key differentiators. A study by Weinberger et al. (2020) reported that a few number of patients with appendicitis are initially misdiagnosed, leading to delayed surgical intervention.

- **Myocardial Infarction Misdiagnosed as Acid Reflux**

Heart attacks (myocardial infarction) are sometimes misdiagnosed as acid reflux (GERD) or musculoskeletal pain, particularly in women and elderly patients. This discrepancy arises because of atypical presentations like mild chest discomfort, nausea, or fatigue rather than the classic crushing chest pain. According to Wildi (2025), about 5% of heart attacks are initially missed due to such diagnostic confusion.

- **COVID-19 Misdiagnosed as Common Cold or Malaria**

During the early phase of the COVID-19 pandemic, many patients were misdiagnosed with common cold, influenza, or malaria due to overlapping symptoms such as fever, fatigue, and body aches. This diagnostic discrepancy was particularly notable in tropical regions where malaria is endemic. Rana et al. (2021) reported that early misdiagnosis delayed isolation and increased community transmission.

Roles of Autopsy in Uncovering Diagnostic Discrepancy

Autopsy, sometimes referred to as post-mortem examination, has long been a mainstay of the medical sciences. It is a crucial tool for assessing diagnostic accuracy in clinical medicine as well as a means of identifying the cause of death. Autopsies continue to be the "gold standard" for verifying or disputing clinical diagnoses despite technological breakthroughs in diagnostic imaging, laboratory testing, and other clinical tools. When pre-mortem clinical diagnosis diverge from post-mortem discoveries, they are essential for spotting diagnostic inconsistencies (Shojania & Burton, 2008). The methodical examination of these disparities greatly enhances clinical practice, medical education, and healthcare quality control.

The capacity of autopsy to detect missed or inaccurate diagnoses that were not identified before death is one of its main functions in identifying diagnostic disparities. Even in contemporary

healthcare systems with sophisticated diagnostic equipment, studies have revealed that a significant portion of deaths demonstrate significant diagnostic differences between clinical and autopsy findings. Goldman et al. (1983) categorized diagnostic errors into major and minor classes, revealing that major errors-those that might have altered clinical management or survival-occurred in 10-20% of cases. More recent research by Shojania et al. (2003) confirmed that, despite medical advancements, major diagnostic errors still occur in approximately 8-10% of hospital deaths. Thus, autopsy continues to be a vital tool for identifying illnesses that may go undetected by clinical evaluation alone.

Another vital role of autopsy is its function as a feedback mechanism for clinicians and healthcare systems. By comparing ante-mortem diagnoses with post-mortem results, medical practitioners can identify weaknesses in clinical reasoning, diagnostic procedures, and treatment pathways (Roulson, Benbow, &Hasleton, 2005). This procedure improves future diagnosis accuracy and cultivates a culture of learning in hospitals. Additionally, autopsy data can direct the creation of clinical protocols and enhance medical residents' and students' diagnostic education. Institutions can strengthen clinical governance and execute focused improvements in patient care quality by analyzing disparities found during autopsy.

Additionally, autopsies are essential for epidemiological surveillance and medical research because they provide information that validates or corrects statistical and clinical assumptions. For example, they have played a significant role in improving the diagnostic standards for cardiovascular conditions, cancer, and infectious diseases (Maixner et al., 2017). Reforms that lower mortality and morbidity are made possible by the identification of inconsistencies, which frequently reveal systemic flaws, including limitations in diagnostic tools, biases in clinical interpretation, or deficiencies in communication between healthcare practitioners. Autopsy data's continued significance is highlighted by its contribution to public health surveillance, especially during disease outbreaks like COVID-19. The medical community now has a better grasp of disease mechanisms thanks to post-mortem studies that have revealed pathological abnormalities that were previously missed in clinical settings (Hanley et al., 2020).

Autopsy results are also important from a medicolegal and ethical standpoint when it comes to identifying diagnostic disparities. Autopsies are objective methods to determine the actual cause of death and determine if clinical therapy was appropriate in circumstances of unexpected death, medical malpractice claims, or unexplained clinical deterioration. In addition to shielding medical professionals from false allegations, this openness gives grieving families who are looking for precise details regarding the cause of death closure (Burton & Underwood, 2007). In this way, autopsies ensure responsibility and trust in the healthcare system by bridging the gap between medicine and law. The rate of autopsy has decreased worldwide despite its established advantages, primarily as a result of cultural resistance, budgetary limitations, and the false belief that autopsies are no longer necessary due to advancements in diagnosis (Turnbull, Osborn, & Nicholas, 2015). However, the persistence of diagnostic errors in contemporary medicine indicates that autopsies are still required. Reviving the profession through education, family involvement, and the use of less invasive techniques like virtual autopsy (using imaging modalities like MRI and CT scans) may preserve its role in diagnostic verification and clinical improvement. To sum up, autopsies are still vital in identifying diagnostic disparities that have significant effects on patient treatment, medical education, and the accountability of the healthcare system. Autopsy is still the most trustworthy way to assess diagnostic accuracy since it can definitively confirm or refute clinical diagnosis. The data it produces

supports the larger objectives of medical research and public health in addition to the ongoing enhancement of clinical practice. Thus, the continued pursuit of patient safety and medical quality depends on the maintenance and modernization of autopsy practice.

Hospitals that do Autopsy in USA, UK, Nigeria, Canada, Europe,

Hospitals That Perform Autopsies in the United States

In the United States, autopsies are performed in both hospital and forensic settings. Massachusetts General Hospital (MGH) in Boston, Massachusetts, operates one of the most active hospital autopsy services, performing hundreds of post-mortem examinations annually to confirm diagnoses, advance medical education, and support research. The MGH Office of Decedent Affairs oversees autopsy consent and communication with families (Massachusetts General Hospital, 2023). Similarly, Johns Hopkins Hospital in Baltimore maintains a well-established Autopsy Pathology Division and a Research Autopsy Program that allows examination of tissues for clinical and scientific purposes (Johns Hopkins Medicine, 2023). Other institutions such as UCLA Health and the University of Michigan Medical Center perform clinical and research autopsies, while forensic autopsies are handled by regional or state medical examiner offices (UCLA Health, 2024). These hospitals are affiliated with academic departments of pathology and contribute significantly to post-mortem medical research in the United States.

Hospitals That Perform Autopsies in the United Kingdom

In the United Kingdom, hospital and coroner autopsies are carried out within the framework of the National Health Service (NHS) and under the supervision of the Coroner's Service. For instance, King's College Hospital and Guy's and St Thomas' NHS Foundation Trust in London conduct both hospital and medico-legal post-mortems. Hospital autopsies are performed with the consent of the deceased's next of kin, while coroner autopsies are ordered when the cause of death is uncertain or suspicious (NHS England, 2022). Oxford University Hospitals and Cambridge University Hospitals (Addenbrooke's Hospital) also maintain pathology departments equipped for post-mortem examinations. The Royal College of Pathologists (RCPath) regulates autopsy standards across the UK, ensuring consistent practice and training (RCPath, 2023).

Hospitals That Perform Autopsies in Nigeria

In Nigeria, autopsy services are mainly provided by teaching hospitals and forensic units associated with state health ministries. The University College Hospital (UCH) in Ibadan has one of the country's oldest and most active pathology departments, performing both clinical and coroner autopsies for research, medical training, and medicolegal investigations. Similarly, the Lagos University Teaching Hospital (LUTH) provides hospital and forensic post-mortems through its Department of Anatomic and Molecular Pathology, often in collaboration with the Lagos State Coroner's Office (Ekanem & Akang, 2021). Other centers such as the Ahmadu Bello University Teaching Hospital in Zaria and the University of Nigeria Teaching Hospital in Enugu also conduct autopsies, particularly in suspected homicide or accident cases. Despite low autopsy rates in Nigeria, these institutions continue to play critical roles in public health surveillance and forensic investigation.

Hospitals That Perform Autopsies in Canada

In Canada, autopsy services are divided between hospital pathology departments and provincial forensic units. The Ontario Forensic Pathology Service (OFPS) in Toronto leads the country in forensic post-mortem investigations, working closely with the Office of the Chief Coroner for Ontario (Ontario Forensic Pathology Service, 2023). Hospital-based autopsies are routinely performed at teaching institutions such as Sunnybrook Health Sciences Centre, Toronto General Hospital (University Health Network), McGill University Health Centre in Montreal, and Vancouver General Hospital. These autopsies are essential for medical research, quality assurance, and public safety. Canada's autopsy system is governed by provincial legislation, and its forensic pathology training programs are internationally recognized for their excellence (Royal College of Physicians and Surgeons of Canada, 2024).

Hospitals That Perform Autopsies in Europe

Across Europe, many leading hospitals and universities maintain autopsy services for both medical and forensic purposes. In Germany, the Charité Institute of Forensic Medicine in Berlin is one of Europe's largest autopsy centers, performing medicolegal and research autopsies to support law enforcement and academic research (Charité - Universitätsmedizin Berlin, 2023). In Sweden, Karolinska University Hospital in Stockholm conducts both forensic and hospital autopsies in collaboration with the Swedish National Board of Forensic Medicine (Rättsmedicinalverket, 2022). The Erasmus University Medical Center in Rotterdam, Netherlands, performs hospital autopsies and contributes extensively to research on post-mortem diagnostic accuracy (Erasmus MC, 2023). In France, hospitals under the Assistance Publique - Hôpitaux de Paris (AP-HP) network, such as Hôpital Cochin, carry out both hospital and judicial autopsies as regulated by French health law (AP-HP, 2022). These European institutions remain vital for medical training, legal investigations, and epidemiological research.

AI-Aided Autopsy in Uncovering Diagnostic Discrepancies

AI-aided autopsy is a contemporary post-mortem investigative approach that combines artificial intelligence technologies with conventional autopsy practices to identify differences between clinical diagnoses made before death and the actual pathological causes of death. It focuses on the role of artificial intelligence in improving the detection, analysis, and interpretation of diagnostic discrepancies that may result from limitations in clinical evaluation, diagnostic imaging, or laboratory investigations during a patient's lifetime. Despite significant advances in medical diagnostics, evidence indicates that serious conditions such as cardiovascular diseases, infections, and malignancies are often misdiagnosed or remain undetected before death, thereby underscoring the importance of autopsy as a quality assurance tool in healthcare systems (Shojania, Burton, McDonald, and Goldman, 2018).

According to Thali, Jackowski, Oesterhelweg, Ross, and Dirnhofer (2019), AI-aided autopsy integrates machine learning algorithms, deep learning models, and natural language processing techniques to analyze post-mortem imaging, histopathological specimens, toxicology findings, and electronic health records. Through automated pattern recognition and data correlation, artificial intelligence systems are capable of identifying subtle pathological changes that may be overlooked during conventional human examination. This capability enhances the effectiveness of autopsies in

uncovering diagnostic discrepancies by systematically comparing ante-mortem clinical information with post-mortem findings.

A key component of this variable is the application of artificial intelligence in post-mortem imaging, commonly referred to as virtual or minimally invasive autopsy. Artificial intelligence applied to post-mortem computed tomography and magnetic resonance imaging has demonstrated high accuracy in detecting intracranial hemorrhages, pulmonary embolism, vascular occlusions, and internal organ injuries that were not diagnosed during life. Such findings often reveal diagnostic discrepancies in cases where death was clinically attributed to nonspecific causes such as respiratory failure or cardiac arrest, while AI-supported autopsy imaging identifies a definitive underlying pathology (Ruder, Thali, and Hatch, 2018). By enhancing image interpretation, artificial intelligence improves the reliability of autopsy outcomes in identifying missed diagnoses.

Artificial intelligence also plays a significant role in digital histopathology during autopsy examinations. The combination of whole-slide imaging and deep learning algorithms enables detailed analysis of tissue samples at the cellular level. AI systems have demonstrated the ability to accurately identify malignant cells, inflammatory patterns, and infectious agents, thereby uncovering diseases that were not detected during clinical management. This is particularly important in cases involving sepsis, myocarditis, and early-stage cancers, where clinical manifestations may be nonspecific and diagnostic confirmation is often difficult. As a variable, AI-aided autopsy reflects how these technologies contribute to identifying diagnostic gaps through enhanced tissue analysis.

The importance of AI-aided autopsy in uncovering diagnostic discrepancies also extends to patient safety and medical education. Findings from AI-supported post-mortem investigations contribute to the improvement of diagnostic protocols, enhancement of clinical training, and reduction of preventable diagnostic errors. According to Eric, (2023), the integration of artificial intelligence into medical evaluation processes improves diagnostic precision and enables clinicians to learn from previous diagnostic failures. Consequently, this variable represents an important link between post-mortem findings and improvements in future clinical practice.

However, the use of artificial intelligence in autopsy practice presents ethical and practical challenges that may affect its effectiveness. Concerns related to data quality, algorithmic bias, transparency, and consent for the use of post-mortem data remain significant. Char, Shah, and Magnus (2018) emphasize that the ethical application of artificial intelligence in healthcare requires accountability and sustained human oversight. Therefore, AI-aided autopsy should be regarded as a supportive tool that complements the expertise of pathologists rather than replacing professional judgment.

One important aspect of this variable is the use of AI in post-mortem imaging, often referred to as virtual or minimally invasive autopsy. Artificial intelligence applied to post-mortem computed tomography and magnetic resonance imaging has demonstrated high accuracy in detecting intracranial hemorrhages, pulmonary embolism, vascular occlusions, and organ injuries that were not diagnosed during life. These findings frequently reveal discrepancies where clinical diagnoses attributed death to less specific causes such as respiratory failure or cardiac arrest, while AI-supported autopsy imaging identifies a precise underlying pathology Ruder, Thali, and Hatch, (2018). By improving image interpretation, AI strengthens the reliability of autopsy outcomes in identifying missed diagnoses.

CONCLUSION

In conclusion, even in the era of molecular diagnostics and advanced imaging, autopsy retains a crucial role in uncovering diagnostic discrepancies and strengthening clinical practice. Autopsies provide definitive validation of clinical diagnoses, reveal unexpected disease processes and genetic risks, and support healthcare systems in quality assurance, mortality data accuracy and family counseling. Declining autopsy rates threaten these gains. To fully benefit from the molecular age, healthcare systems must integrate anatomical and molecular autopsy into routine diagnostic-verification frameworks, thereby closing the gap between technological promise and clinical reality.

RECOMMENDATIONS

1. Hospitals and forensic centers should incorporate molecular autopsy-using genetic and genomic testing-alongside traditional autopsy procedures to identify undetected hereditary and metabolic disorders.
2. Governments and research institutions should allocate more funding to autopsy programs that combine pathology, genomics, and bioinformatics. Sustained investment can help discover new disease mechanisms and improve diagnostic technologies.
3. Continuous professional education on molecular pathology and autopsy relevance should be provided for clinicians and medical students. This will bridge the knowledge gap and revive appreciation for autopsy as a diagnostic and educational tool (Turner et al., 2024)

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