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Algorithm of Death: Types, Navigating Boundary of Life, Disposition Methods, AI Death Determination, Modern Science of Mortality in India and World, Post-Mortem, Taphonomy, Thanatological Control, Forensic Pathology

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Abstract

Death is a complex biological, medical, forensic, and social phenomenon that has evolved from traditional clinical assessment to a multidisciplinary field integrating artificial intelligence (AI), forensic pathology, post-mortem sciences, taphonomy, thanatology, and mortality surveillance systems. This review examines the major types of death and the increasingly complex boundary between life and death, highlighting advances in death determination, mortality prediction, forensic investigations, and human remains management. Particular attention is given to the role of AI in mortality risk prediction, cause-of-death classification, clinical decision support, and public health monitoring. The review further explores contemporary developments in forensic pathology, autopsy science, taphonomic research, and thanatological studies, emphasizing their contributions to understanding post-mortem processes and death-related practices. Findings from the reviewed literature indicate that emerging technologies such as machine learning, virtual autopsy, molecular diagnostics, and digital health systems have significantly improved the accuracy, efficiency, and reliability of death investigation and mortality assessment. Despite these advancements, challenges related to data quality, technological accessibility, ethical concerns, and the need for standardized protocols remain.

Keywords: Death Determination, Artificial Intelligence, Mortality Prediction, Forensic Pathology, Post-Mortem Examination.

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1. INTRODUCTION

Death is an inevitable biological event that marks the permanent cessation of life and represents a fundamental aspect of human existence[1]. Despite being a universal phenomenon, death remains one of the most complex subjects in medicine, forensic science, law, ethics, and public health. Traditionally, death was determined through observable signs such as the absence of heartbeat, breathing, and consciousness. However, advancements in critical care medicine, organ transplantation, life-support technologies, neuroimaging, and molecular diagnostics have significantly transformed the understanding and determination of death. These developments have blurred the conventional boundary between life and death, creating new scientific, ethical, and legal challenges[2].

Modern death sciences encompass a wide range of disciplines, including forensic pathology, post-mortem examination, taphonomy, thanatology, epidemiology, and mortality surveillance. Each discipline contributes unique perspectives toward understanding the biological processes of dying, determining causes of death, investigating post-mortem changes, and managing human remains[3]. In recent years, artificial intelligence (AI) has emerged as a transformative technology within healthcare and forensic sciences. Machine learning algorithms, predictive analytics, digital pathology, and automated mortality assessment systems are increasingly being used to improve the accuracy of death determination and mortality prediction.

The concept of the "Algorithm of Death" reflects the growing integration of medical knowledge, forensic methodologies, computational technologies, and mortality analytics in understanding and managing death. AI-assisted systems can analyze large volumes of clinical and forensic data, support cause-of-death classification, enhance mortality surveillance, and improve public health decision-making. Simultaneously, advances in forensic pathology, virtual autopsy, molecular diagnostics, and taphonomic research have expanded the scientific capabilities available for death investigation and post-mortem analysis.

Given the rapid evolution of these technologies and methodologies, a comprehensive review of contemporary death sciences is both timely and necessary. This review examines the major types of death, the boundary between life and death, artificial intelligence in mortality prediction, forensic pathology, post-mortem sciences, taphonomy, thanatology, disposition methods of human remain, and modern mortality surveillance systems from both Indian and global perspectives. By synthesizing current knowledge across these interconnected fields, the review highlights recent advancements, identifies existing challenges, and explores future directions for improving death determination, forensic investigation, and mortality management in the modern era[4].

1.1 Background Information

Death is a natural and inevitable biological process that marks the permanent cessation of life. Traditionally, death was determined by the absence of heartbeat and respiration; however, advances in medical technology, intensive care systems, organ transplantation, and neurological assessment have made death determination more complex. Modern death sciences involve multiple disciplines, including forensic pathology, thanatology, taphonomy, public health, and artificial intelligence (AI). Recent developments in AI, digital pathology, and virtual autopsy have introduced new approaches for mortality prediction, cause-of-death analysis, and forensic investigations, leading to a more comprehensive understanding of death and its associated processes.

1.2 Objectives of the Review

This review aims to examine the contemporary concepts and scientific approaches related to death determination and mortality science. The specific objectives are:

- To discuss the various types of death and the boundary between life and death.
- To review the role of AI in death determination and mortality prediction.
- To explore advances in forensic pathology, post-mortem examination, and taphonomy.
- To examine thanatology and methods of human remains disposition.
- To analyze modern mortality science from Indian and global perspectives.

1.3 Importance of the Topic

Accurate death determination is essential for medical practice, forensic investigations, legal proceedings, public health planning, and mortality surveillance. Emerging technologies such as artificial intelligence, digital imaging, and molecular diagnostics are transforming traditional approaches to death investigation. Understanding these advancements is important for improving the accuracy of cause-of-death assessment, enhancing forensic practices, and supporting evidence-based healthcare policies. Furthermore, the growing integration of technology into mortality sciences highlights the need for multidisciplinary research and ethical considerations in modern death management systems.

2. TYPES OF DEATH AND THE BOUNDARY BETWEEN LIFE AND DEATH

Death is a complex biological and medical phenomenon that can be classified into several categories based on physiological and legal criteria. Clinical death occurs when breathing and cardiac activity cease, whereas biological death refers to the irreversible loss of cellular and tissue functions[5]. Brain death is defined as the complete and irreversible cessation of all brain activity and is widely accepted as a legal criterion for death in many countries. Advances in life-support technologies have complicated the distinction between life and death, making accurate determination increasingly dependent on neurological, clinical, and technological assessments.

2.1 Artificial Intelligence in Death Determination and Mortality Prediction

Artificial intelligence (AI) has emerged as a powerful tool in healthcare and forensic sciences[6]. Machine learning and deep learning algorithms are increasingly used to predict mortality risk, analyse clinical data, and assist in cause-of-death determination. AI systems can process large volumes of patient information, identify hidden patterns, and support healthcare professionals in making more accurate and timely decisions. These technologies have also improved mortality surveillance and public health monitoring by enabling rapid analysis of population-level health data.

The integration of AI into mortality sciences has expanded significantly due to advances in computational power, electronic health records, and medical imaging technologies. AI models can analyze complex clinical and demographic data to identify risk factors associated with mortality and support evidence-based decision-making. In forensic settings, AI-assisted tools are increasingly being explored for injury analysis, post-mortem investigations, and cause-of-death assessment[7].

Major applications of AI in mortality sciences include:

- Mortality risk prediction and clinical decision support.
- Cause-of-death classification and death certification.
- Medical imaging analysis and forensic investigations.
- Public health surveillance and mortality trend monitoring[8].

Despite its advantages, AI-based mortality assessment faces challenges related to data quality, algorithmic bias, privacy concerns, and ethical considerations. Nevertheless, AI continues to play an increasingly important role in enhancing the accuracy, efficiency, and reliability of death determination and mortality prediction systems.

2.2 Forensic Pathology and Death Investigation

Forensic pathology plays a critical role in determining the cause, mechanism, and manner of death. Through systematic examination of the body, forensic pathologists provide valuable evidence for legal investigations and public health records. Modern forensic pathology incorporates advanced imaging technologies, toxicological analyses, and molecular techniques to improve diagnostic accuracy. These innovations have strengthened the scientific basis of death investigations and enhanced the reliability of forensic conclusions.

Forensic death investigation is particularly important in cases involving sudden, suspicious, accidental, unexplained, or violent deaths. The findings obtained through forensic examination assist law enforcement agencies, judicial systems, and public health authorities in establishing the circumstances surrounding death. In addition to traditional autopsy procedures, contemporary forensic pathology increasingly utilizes digital imaging, molecular diagnostics, and laboratory-based analyses to support more accurate determinations[9].

Key components of forensic death investigation include:

- Determination of the cause, mechanism, and manner of death.
- External and internal examination of the deceased.
- Toxicological and histopathological analyses.
- Collection and interpretation of forensic evidence.
- Identification of deceased individuals in criminal and disaster-related cases.

The continuous advancement of forensic technologies has improved the precision of death investigations, contributing to greater transparency, scientific reliability, and legal validity in mortality assessment[10].

2.3 Post-Mortem Examination and Autopsy Science

Post-mortem examination remains one of the most important methods for understanding disease processes, injuries, and causes of death. Conventional autopsies provide direct examination of internal organs and tissues, while newer approaches such as virtual autopsy and molecular autopsy offer additional diagnostic capabilities. The integration of imaging technologies and genetic analyses has expanded the scope of post-mortem investigations and improved the identification of previously undetected conditions.

Figure 1: Post-mortem Examination[11]

Autopsies serve both medical and legal purposes by providing detailed information about pathological conditions, traumatic injuries, and physiological changes that may have contributed to death. Findings obtained during post-mortem examinations help confirm clinical diagnoses, identify previously unrecognized diseases, and support forensic investigations. In recent years, advances in radiological imaging, molecular biology, and digital technologies have enhanced the accuracy and efficiency of post-mortem assessments.

Table 1. Comparison of Post-Mortem Examination Techniques[12]

Technique	Methodology	Major Applications	Advantages
Conventional Autopsy	Physical dissection and organ examination	Cause-of-death determination, disease diagnosis	Comprehensive internal assessment
Virtual Autopsy	CT, MRI, and 3D imaging technologies	Trauma analysis, forensic investigations	Non-invasive and digitally reproducible
Molecular Autopsy	DNA sequencing and genetic testing	Sudden unexplained death, inherited disorders	Identifies genetic causes not visible during autopsy
Digital Autopsy	Integration of imaging and electronic data	Documentation and forensic case management	Enhanced accuracy and data preservation

Post-mortem examinations contribute significantly to medical knowledge, quality assurance in healthcare, and the administration of justice. They provide valuable insights into disease progression, treatment outcomes, and emerging health threats while supporting forensic investigations. The incorporation of advanced imaging systems, molecular diagnostics, and digital technologies has transformed traditional autopsy practices into more sophisticated and multidisciplinary approaches. These advancements have significantly improved the diagnostic value of post-mortem examinations, allowing investigators to obtain more comprehensive information regarding the cause and circumstances of death while complementing conventional autopsy methods[13].

2.4 Taphonomy and Post-Mortem Changes

Taphonomy examines the biological, chemical, and environmental processes that affect human remains after death. Post-mortem changes such as algor mortis, rigor mortis, livor mortis, putrefaction, and skeletonization provide important information regarding the post-mortem interval and circumstances surrounding death. Understanding decomposition patterns is essential for forensic investigations and the interpretation of evidence recovered from death scenes.

Figure 2: Taphonomy Effect[14]

The field of forensic taphonomy focuses on how environmental factors, including temperature, humidity, soil composition, water exposure, insect activity, and scavenger interactions, influence the decomposition process. By studying these changes, forensic experts can estimate the time since death, reconstruct events surrounding death, and assess whether a body has been moved or altered after death. Taphonomic evidence is particularly valuable in cases involving advanced decomposition, unidentified remains, and mass disaster investigations[15].

Major post-mortem changes include:

- **Algor Mortis:** Gradual cooling of the body after death.

- **Livor Mortis:** Settling of blood in dependent areas of the body.
- **Rigor Mortis:** Stiffening of muscles due to biochemical changes.
- **Putrefaction:** Decomposition of tissues by microbial activity.
- **Skeletonization:** Progressive loss of soft tissues, leaving skeletal remains.

Advances in forensic taphonomy, including environmental monitoring, forensic entomology, and decomposition modelling, have improved the accuracy of post-mortem interval estimation and enhanced the scientific interpretation of death scene evidence[16].

2.5 Thanatology: The Science of Death and Dying

Thanatology is the interdisciplinary study of death, dying, grief, and bereavement. It explores the psychological, social, cultural, ethical, and biological aspects of mortality. The field contributes to a better understanding of end-of-life care, emotional responses to death, and societal attitudes toward mortality. Modern thanatology increasingly incorporates healthcare technologies and ethical considerations related to death determination and life-support decisions.

As a multidisciplinary field, thanatology draws knowledge from medicine, psychology, sociology, philosophy, nursing, public health, and ethics to examine how individuals and societies experience and respond to death. It also addresses issues related to palliative care, hospice services, grief counseling, and quality of life during the final stages of illness. Understanding the dying process and its emotional and social implications helps healthcare professionals provide compassionate and patient-centered care[17].

Major areas of thanatological study include:

- Psychological responses to death and bereavement.
- End-of-life care and palliative medicine[18].
- Cultural and religious perspectives on death.
- Ethical issues related to life-support and death determination.
- Social attitudes and practices associated with dying and mourning.

Table 2. Major Dimensions of Thanatology[19]

Dimension	Focus Area	Significance
Psychological	Grief, bereavement, coping mechanisms	Supports mental and emotional well-being

Social	Family, community, and societal responses	Promotes social support systems
Cultural	Traditions, rituals, and beliefs about death	Influences mourning and funeral practices
Ethical	End-of-life decisions and patient autonomy	Guides ethical healthcare practices
Medical	Palliative care and symptom management	Improves quality of life for terminally ill patients
Biological	Physiological processes of dying	Enhances understanding of mortality

Thanatology provides valuable insights into the human experience of death and dying, helping bridge scientific, medical, psychological, and social perspectives. Its growing importance in healthcare and society highlights the need for compassionate care, ethical decision-making, and a deeper understanding of mortality in contemporary life[20].

2.6 Disposition Methods of Human Remains

Human societies have developed various methods for managing human remains after death. Traditional practices such as burial and cremation remain widely used, while alternative approaches including green burial, alkaline hydrolysis, and body donation have gained increasing attention. These methods differ in their environmental impact, cultural acceptance, economic considerations, and legal requirements.

The choice of disposition method is often influenced by religious beliefs, cultural traditions, environmental concerns, personal preferences, and legal regulations. While burial and cremation continue to be the most common methods worldwide, growing awareness of sustainability has encouraged the development of environmentally friendly alternatives. Additionally, body donation programs contribute significantly to medical education, scientific research, and healthcare training[21].

Common methods of human remain disposition include:

- **Burial:** Interment of the body in the ground, often accompanied by religious or cultural rituals.
- **Cremation:** Reduction of the body to ashes through high-temperature combustion.
- **Green Burial:** Eco-friendly burial practices that minimize environmental impact.

- **Alkaline Hydrolysis:** A water-based decomposition process considered a sustainable alternative to cremation.
- **Body Donation:** Donation of the body for medical education, research, and scientific advancement.

Table 3. Comparison of Human Remains Disposition Methods[22]

Method	Description	Advantages	Limitations
Burial	Placement of the body in a grave or tomb	Widely accepted culturally and religiously	Requires land and long-term maintenance
Cremation	High-temperature reduction of remains to ashes	Space-efficient and commonly practiced	Produces carbon emissions
Green Burial	Natural burial with minimal environmental impact	Environmentally sustainable	Limited availability in some regions
Alkaline Hydrolysis	Chemical decomposition using water and alkali	Lower environmental footprint	Regulatory and social acceptance challenges
Body Donation	Use of remains for education and research	Supports medical science and training	Cultural and religious concerns may exist

The growing emphasis on sustainability, public health, and scientific advancement is influencing the evolution of disposition practices worldwide. As societies continue to balance cultural traditions with environmental and technological considerations, new approaches to human remains management are expected to gain greater acceptance and implementation.

3. METHODOLOGIES AND FINDINGS

The approaches used in the evaluated studies are presented below, together with a summary of the key conclusions pertaining to taphonomic research, forensic pathology, post-mortem sciences, artificial intelligence-based mortality prediction, and death determination. In order to determine popular research methodologies, technical developments, and new trends in contemporary mortality sciences, the chosen literature was reviewed. This section gives an overview of the techniques used to look into death-related processes and highlights important discoveries that have improved the precision, effectiveness, and scientific understanding of death determination, forensic investigations, and mortality assessment by combining evidence from various disciplines[23].

3.1 Search Strategy

A comprehensive literature search was conducted to identify relevant studies related to death determination, artificial intelligence in mortality assessment, forensic pathology, post-mortem sciences, taphonomy, thanatology, and modern mortality surveillance systems. Scientific databases including PubMed, Scopus, Web of Science, Google Scholar, and ScienceDirect were systematically searched for peer-reviewed articles, review papers, book chapters, conference proceedings, and official reports. The search process focused on literature published in recent years while also incorporating landmark studies that contributed significantly to the development of death sciences[24].

3.2 Critical Evaluation

The reviewed literature demonstrates substantial progress in the scientific understanding of death and mortality. Technological innovations have transformed traditional approaches to death determination, forensic investigations, and public health surveillance. Artificial intelligence, digital pathology, advanced imaging technologies, and molecular diagnostics have significantly improved diagnostic precision and efficiency[25].

Several strengths were consistently observed across the reviewed studies. The incorporation of machine learning algorithms has enhanced mortality prediction accuracy, while virtual autopsy and molecular autopsy techniques have expanded the diagnostic capabilities of forensic investigations. Taphonomic research has improved the estimation of post-mortem intervals, and mortality surveillance systems have strengthened population health monitoring and disease burden assessment[26].

However, important limitations remain. Many studies relied on limited datasets, reducing the generalizability of findings. AI-based models may be affected by algorithmic bias, data imbalance, and lack of transparency. Furthermore, advanced technologies such as molecular autopsy and high-resolution forensic imaging are not universally accessible, particularly in resource-limited settings. Ethical concerns related to privacy, informed consent, and automated decision-making also require careful consideration[27].

Strengths Identified in the Literature

- Improved diagnostic accuracy through advanced technologies.
- Enhanced efficiency in mortality prediction and forensic investigations.
- Greater integration of multidisciplinary approaches.
- Expansion of non-invasive post-mortem examination methods.

- Improved public health surveillance and mortality monitoring.

3.3 AI-Based Mortality Prediction Research

Artificial intelligence has become one of the most rapidly expanding areas within mortality science[28]. The reviewed studies employed a variety of computational methodologies to predict mortality outcomes, classify causes of death, and support clinical decision-making. Machine learning techniques such as random forests, support vector machines, decision trees, logistic regression, and neural networks were commonly utilized. More recent studies increasingly employed deep learning architectures capable of processing complex clinical and imaging data.

The primary data sources included electronic health records, intensive care unit databases, laboratory reports, physiological monitoring systems, and medical imaging datasets. AI models were trained using historical patient data and subsequently validated using independent datasets to evaluate predictive performance[29].

Table 4. AI Methodologies Used in Mortality Prediction Studies[30]

Methodology	Application
Machine Learning	Mortality risk prediction
Deep Learning	Medical image interpretation
Neural Networks	Outcome forecasting
Predictive Analytics	Clinical decision support
Natural Language Processing	Death certificate analysis

The findings indicate that AI-based systems can identify high-risk patients, support early interventions, and improve mortality prediction accuracy compared with conventional statistical approaches. Nevertheless, researchers emphasize the need for explainable AI systems that allow healthcare professionals to understand the rationale behind algorithmic predictions[31].

3.4 Forensic and Post-Mortem Investigation Approaches

Forensic pathology studies employed a range of methodologies to determine the cause, mechanism, and manner of death. Conventional autopsies remained the most widely used approach, providing direct examination of organs, tissues, and injuries. However, technological advancements have introduced several complementary methods that enhance the effectiveness of forensic investigations[32].

Virtual autopsy techniques utilizing computed tomography (CT), magnetic resonance imaging (MRI), and three-dimensional reconstruction have enabled non-invasive examination of human remains. Molecular autopsy methods have further expanded diagnostic capabilities by identifying genetic abnormalities associated with sudden unexplained deaths.

The reviewed studies consistently demonstrated that combining traditional forensic methods with modern imaging and molecular technologies improves diagnostic accuracy and strengthens forensic evidence interpretation[33].

3.5 Experimental and Observational Methods in Taphonomic Research

Taphonomic research investigates the processes that affect human remains after death. Studies in this area employed both experimental and observational methodologies to evaluate decomposition patterns under varying environmental conditions. Researchers commonly utilized field experiments involving animal or donated human remains, allowing systematic observation of post-mortem changes over time[34].

Environmental factors such as temperature, humidity, soil composition, sunlight exposure, water immersion, and insect activity were frequently monitored to assess their influence on decomposition rates. Forensic entomology studies examined insect colonization patterns, which provide valuable information for estimating post-mortem intervals.

The findings indicate that decomposition is a highly dynamic process influenced by numerous biological and environmental variables. Advances in taphonomic research have improved the scientific accuracy of post-mortem interval estimation and enhanced forensic interpretations in complex death investigations[35].

3.6 Summary of Major Findings from Reviewed Literature

Table 5 presents a summary of selected studies related to brain death determination, disorders of consciousness, and computational approaches in biomedical research. The reviewed studies demonstrated the multidisciplinary nature of modern mortality sciences by integrating clinical medicine, neuroimaging, bioethics, and computational modeling.

Table 5. Summary of Studies on Brain Death and Mortality Research

Author(s) & Year	Study Focus	Methodology	Findings
Chen et al. (2017) [36]	Long non-coding RNAs (lncRNAs)	Reviewed experimental evidence and computational	Reported that computational models effectively complemented experimental studies and

	and complex diseases	modeling approaches for investigating lncRNA–disease associations	facilitated the identification of lncRNA-disease relationships, supporting future biomedical research and disease prediction.
Greer et al. (2020) [37]	Brain death/death by neurologic criteria	Conducted an international consensus review through the World Brain Death Project involving experts from multiple countries	Established standardized recommendations for the determination of brain death and emphasized the need for global consistency in clinical practice, diagnostic criteria, and legal frameworks.
Rizvi et al. (2018) [38]	Brain death diagnosis and imaging techniques	Reviewed neuroimaging modalities including CT, MRI, angiography, and ultrasound for brain death assessment	Demonstrated that advanced imaging techniques served as valuable adjuncts to clinical examination and improved the accuracy of brain death confirmation.
Sulmasy (2019) [39]	Philosophical and clinical concepts of whole-brain death	Performed a theoretical and bioethical analysis of whole-brain death criteria	Argued that the concept of whole-brain death remained consistent with biological integration theories and supported its continued use in clinical and ethical decision-making.
Fins (2019) [40]	Disorders of consciousness and chronic vegetative state	Conducted a narrative review of clinical and ethical issues associated with disorders of consciousness	Highlighted that many patients with severe disorders of consciousness were frequently under-recognized and emphasized the importance of improved diagnostic assessment and long-term care strategies.

Chen et al. (2017) highlighted the growing role of computational models in analyzing complex biological data and demonstrated how advanced analytical approaches can support disease prediction and biomedical research. Greer et al. (2020) provided internationally accepted recommendations for brain death determination through the World Brain Death Project, emphasizing the importance of standardized diagnostic criteria and global consistency in clinical practice. Rizvi et al. (2018) showed that modern imaging techniques such as CT and MRI enhanced the accuracy of brain death diagnosis and served as valuable adjuncts to clinical assessments.

Furthermore, Sulmasy (2019) examined the ethical and philosophical foundations of whole-brain death and supported its continued application as a valid criterion for death determination. Fins (2019) focused on disorders of consciousness and highlighted the challenges associated with recognizing and managing patients in chronic vegetative states, emphasizing the need for improved diagnostic and care strategies.

4. DISCUSSION

4.1 Interpretation and Analysis of the Findings

The reviewed literature indicates that significant advancements have been made in death determination, forensic pathology, post-mortem sciences, and mortality prediction. Artificial intelligence has improved the ability to analyze large datasets and predict mortality outcomes, while modern forensic techniques such as virtual autopsy and molecular diagnostics have enhanced the accuracy of death investigations. Taphonomic research has also contributed to a better understanding of decomposition processes and post-mortem interval estimation.

4.2 Implications and Significance

The findings highlight the growing importance of integrating technology with traditional death investigation methods. AI-based tools can support clinical decision-making and mortality surveillance, while advanced forensic techniques improve cause-of-death determination. These developments contribute to more accurate medical records, stronger forensic evidence, and improved public health planning. Furthermore, advances in mortality science can support healthcare policy development and strengthen death registration systems.

4.3 Research Gaps and Future Research Directions

Despite considerable progress, several challenges remain. Limited access to advanced technologies, lack of standardized protocols, and concerns regarding data quality and algorithmic bias continue to affect the implementation of modern mortality assessment methods. Future research should focus on:

- Developing more transparent and reliable AI models.
- Expanding the use of virtual and molecular autopsy techniques.
- Improving mortality surveillance and death certification systems.
- Establishing standardized guidelines for death determination.
- Addressing ethical and legal issues associated with AI-assisted decision-making.

Continued interdisciplinary research will be essential for improving the accuracy, efficiency, and reliability of death sciences in both healthcare and forensic settings.

5. CONCLUSION

5.1 Summary of Main Insights and Conclusions

This review explored the evolving landscape of death sciences by examining the various types of death, the boundary between life and death, artificial intelligence-based mortality prediction, forensic pathology, post-mortem examination, taphonomy, thanatology, and modern mortality surveillance systems. The findings demonstrate that advances in medical science, forensic technologies, and computational tools have significantly improved the accuracy and efficiency of death determination and investigation. The integration of artificial intelligence, virtual autopsy, molecular diagnostics, and digital health systems has expanded the capabilities of both healthcare and forensic professionals in understanding and managing mortality.

5.2 Importance of the Review

The review highlights the growing significance of a multidisciplinary approach to death sciences. Accurate death determination is essential for medical practice, legal investigations, public health planning, and mortality surveillance. As emerging technologies continue to transform traditional methods, understanding their applications, benefits, and limitations becomes increasingly important. This review provides a comprehensive overview of contemporary developments in mortality science and emphasizes the role of innovation in improving death investigation and mortality management at both national and global levels.

5.3 Recommendations

Based on the reviewed literature, several recommendations can be proposed:

- Promote the responsible integration of artificial intelligence into mortality prediction and death determination systems.
- Expand the use of virtual autopsy and molecular diagnostic techniques in forensic investigations.
- Strengthen death registration and mortality surveillance systems to improve public health monitoring.
- Develop standardized national and international guidelines for death determination and reporting.

- Encourage interdisciplinary collaboration among healthcare professionals, forensic scientists, data scientists, and policymakers.
- Support further research on ethical, legal, and social issues associated with emerging death-related technologies.

Continued advancements in death sciences, combined with effective policy implementation and technological innovation, will contribute to more accurate, transparent, and evidence-based approaches to mortality assessment and management.

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