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Effectiveness of Forensic Autopsy As Evidence in Murder Crimes

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Abstract. *This study aims to analyze the effectiveness of forensic autopsies as evidence in the criminal justice process for murder, using an empirical study at Bhayangkara Hospital in Semarang City. The study used an empirical juridical approach with descriptive-analytical specifications. Primary data were obtained through in-depth interviews with forensic doctors and police investigators as well as direct observation, while secondary data included relevant laws and regulations and literature. Data analysis was conducted qualitatively. Based on the study, it was concluded that the implementation of forensic autopsies was in accordance with Articles 133 and 134 of the Criminal Procedure Code, starting from the official request of the investigator, notification to the family, to the production of the Visum et Repertum. The effectiveness of forensic autopsies as evidence was considered very high, contributing significantly to revealing the cause of death (as many as 80-85% of cases), determining the mode of crime, and strengthening the judge's conviction. Its success was supported by the competence of forensic doctors, inter-agency coordination, and the quality of documentation. However, this effectiveness was hampered by cultural resistance factors from the victim's family, limited advanced laboratory facilities, and a less than ideal number of forensic human resources. This study recommends increased investment in infrastructure, a massive public education program, and continuous strengthening of forensic medical human resources capacity.*

Keywords: *Autopsy; Evidence; Forensic; Repertum; Visum.*

1. Introduction

The Indonesian criminal justice system has experienced significant developments in terms of proving criminal acts, particularly in murder cases that require high precision in uncovering legal facts (Hamzah, 2019). Forensic autopsy, as a scientific method in the field of forensic medicine, has become an important instrument in the law enforcement process, especially in uncovering the causes of unnatural

deaths (Budiyanto, 2017). In the context of Indonesian criminal law, as regulated in Article 338 of the Criminal Code (KUHP), murder is punishable by a maximum of fifteen years in prison. The complexity of murder cases often requires the assistance of science and technology to uncover the material truth, in which forensic autopsy plays a crucial role (Chazawi, 2019).

An autopsy on a corpse cannot be performed haphazardly, but must be based on applicable legal provisions. According to Article 133 of the Criminal Procedure Code (KUHAP), an autopsy may only be performed if the investigator suspects an unnatural death. Furthermore, Article 134 of the KUHAP stipulates that before conducting an autopsy, the investigator must notify the victim's family. This provision demonstrates that the implementation of a forensic autopsy in a legal context is limited and must meet formal requirements stipulated by law to safeguard human rights and legal certainty in the criminal justice process.

In the Indonesian criminal justice system, a visum et repertum, the result of a forensic autopsy, is included in the category of documentary evidence as stipulated in Article 187 letter c of the Criminal Procedure Code (Harahap, 2018). The visum remains valid for use in court even if the doctor who prepared it is not present in person, as long as there are no objections or requests from interested parties to have an expert present to provide oral testimony. In practice, a visum issued by a forensic doctor has stronger evidentiary power than a visum issued by a non-forensic doctor, which is generally only considered a clue (Kinandani & Layang, 2021).

Prof. Awaloedin Djamin Bhayangkara Hospital in Semarang City is a healthcare institution belonging to the Indonesian National Police (Polri) and has been classified as a Level II Bhayangkara Hospital (Purba et al., 2016). This status indicates that the hospital has a more comprehensive capacity and facilities than Level III and IV hospitals, and is a regional referral within the Polri healthcare network. As an institution with a Forensic Medicine Installation, this hospital has the authority and strategic role in handling criminal cases requiring forensic examination, including various forensic autopsies for murders occurring in and around Semarang (Munandar et al., 2023).

The effectiveness of a forensic autopsy as evidence is not only assessed from a technical medical perspective, but also from a legal perspective, namely the extent to which the autopsy results can help uncover material truth in the judicial process (Andrisman, 2019). In practice, various challenges are faced in conducting forensic autopsies, ranging from limited human resources and facilities to procedural issues that can affect the quality of the examination results (Kusuma, 2020). Other issues that often arise are related to the chain of custody in handling evidence, coordination between relevant agencies, and law enforcement officials' understanding of the limitations and capabilities of forensic autopsies (Setiawan, 2021). This can impact the effectiveness of the use of forensic autopsy results in

the criminal justice process (Wahyuni, 2020).

Empirical studies on the effectiveness of forensic autopsies in cases involving death are essential for providing an objective picture of the contribution of forensic medicine to the Indonesian criminal justice system (Suharto, 2021). This study will examine not only the technical aspects of autopsy implementation but also its impact on the overall law enforcement process (Barda Nawawi Arief, 2017). In the context of criminal justice system reform that prioritizes justice, legal certainty, and expediency, the role of forensic autopsies as a means of achieving material truth is becoming increasingly strategic (Rawls, 2020). Research on the effectiveness of forensic autopsies at Bhayangkara Hospital in Semarang City is relevant given that this hospital is one of the centers of forensic medicine services in Central Java, handling cases from various regions (Atmasasmita, 2018). This study aims to analyze the effectiveness of forensic autopsies as evidence in murder crimes and identify influencing factors.

2. Research Methods

This study uses an empirical juridical approach (socio-legal research), namely legal research that examines the effectiveness of law in society (Marzuki, 2021). The empirical juridical approach was chosen because this study not only examines the normative aspects of forensic autopsy regulations but also their implementation in law enforcement practice (Soekanto & Mamudji, 2019). The juridical approach in this study was carried out by analyzing laws and regulations related to forensic autopsies and evidence in criminal procedure law (Sunggono, 2021). Meanwhile, the empirical approach was carried out by examining the implementation of forensic autopsies in the field, specifically at the Bhayangkara Hospital in Semarang City. The specifics of this research are descriptive analytical, namely research that aims to provide a systematic, factual, and accurate description of the facts and relationships between the phenomena studied (Marzuki, 2021). Data sources consist of primary and secondary data. Primary data were obtained through in-depth interviews with Forensic Doctors at the Bhayangkara Hospital in Semarang City and Investigators from the Semarang City Police Resort; as well as direct observation of the forensic autopsy process. Secondary data include primary legal materials (Criminal Procedure Code, Criminal Code, Health Law, Medical Practice Law), secondary legal materials (books, scientific journals, articles, and previous research), and tertiary legal materials (legal dictionaries, encyclopedias). Data collection methods were conducted through literature studies for secondary data, structured interviews using purposive sampling techniques, observations using non-participant observation techniques, and documentation of forensic autopsy-related documents such as visum et repertum and case files. Data analysis in this study used a qualitative analysis method with a descriptive analytical approach through the stages of data reduction, data presentation, and drawing conclusions. Data analysis was also conducted using

data triangulation to check the validity of the data by utilizing various data sources, methods, and theories.

3. Results and Discussion

3.1. Implementation of a Forensic Autopsy in a Murder Case at Bhayangkara Hospital, Semarang

The results of the study indicate that the implementation of forensic autopsies at the Bhayangkara Hospital in Semarang City has followed standard procedures mandated by Indonesian positive law. The autopsy initiation process always begins with an official, written request from the investigator in accordance with the provisions of Article 133 of the Criminal Procedure Code, which clearly states that external and internal examinations of the body can only be carried out based on the investigator's order for the purpose of evidence. This provision not only serves as a barrier to prevent invasive medical procedures from being carried out without a legal basis, but also as a guarantee that the autopsy process is carried out within the strict corridor of criminal procedural law.

The autopsy request letter generally contains the victim's complete identity, a brief description of the events leading to the death, and a list of technical questions or specific forensic issues that are expected to be answered through the examination.

These questions typically relate to crucial elements of evidence, such as the estimated time of death (post-mortem interval), the exact cause of death, the mechanism of death, or indications of physical violence, the use of sharp or blunt weapons, poisoning, or signs of asphyxia. This information serves as an initial guide for forensic doctors in determining the focus of the examination, the methods to be used, and the possible need for further examinations such as toxicology or histopathology.

This initial stage provides a valid legal basis so that any invasive medical procedure on the body not only has formal legitimacy but is also protected within the framework of due process of law. This legitimacy is crucial, given that an autopsy is a procedure that touches on ethical, moral, and cultural sensitivities. With a strong legal basis, such medical procedures can be legally accounted for and do not have the potential to give rise to disputes with the victim's family or other interested parties.

Furthermore, a comprehensive and structured autopsy request helps prevent scope creep, a condition where an examination is conducted without boundaries or a clear direction. A detailed request document serves as a control tool to ensure the autopsy remains within the scope of the investigation, while also facilitating forensic physicians in preparing an examination report relevant to the investigator's needs. To a certain extent, the quality of the investigation

administration through the request letter reflects the quality of the law enforcement process as a whole.

Thus, performing an autopsy is not merely a medical procedure, but rather an integral part of the investigative process aimed at establishing material truth in the criminal justice system. Autopsies provide objective scientific evidence that cannot be manipulated or influenced by the subjectivity of the parties. Evidence obtained through autopsies is often crucial in proving elements of a crime, refuting or corroborating witness statements, and scientifically uncovering the mechanisms of a crime. Thanks to the implementation of procedures in accordance with Indonesian law, forensic autopsies at Bhayangkara Hospital in Semarang City can be said to have made a significant contribution to law enforcement, justice, and legal certainty in resolving criminal cases.

Once the legal aspects have been met, the process continues with intensive coordination between the forensic medical team and investigators as a first step to ensure that the autopsy is effective, focused, and aligned with the evidentiary needs of the case. This coordination is not merely administrative, but a strategic step that determines the final quality of the forensic information produced. Determining the autopsy schedule, for example, must take into account the urgency of the investigation, the degree of decomposition of the body, and the need for additional examinations that may require specific time. Furthermore, establishing the scope of the examination is also crucial, as investigators and forensic doctors must agree on whether the autopsy will be complete (full autopsy) or limited (partial autopsy), taking into account its relevance to the alleged crime being investigated.

The preparation of a multidisciplinary team is crucial, especially in cases of high complexity, such as suspected poisoning, sexual assault, or multiple trauma. The involvement of other specialists, such as a toxicologist for hazardous substance analysis, a radiologist for pre-incision imaging, or an anatomical pathologist for histopathological tissue examination, allows for more comprehensive interpretation and reduces the potential for analytical errors. According to sources, the briefing session before the autopsy is a critical moment because it is at this stage that investigators convey all relevant contextual information, including initial suspicions, case dynamics, crime scene processing results, witness statements, and even digital forensic data, if available. This information is crucial for the focus of the examination because it can direct the forensic doctor to specific areas of the body or types of injuries that require more in-depth examination.

In turn, forensic physicians in briefing sessions provide professional perspectives on possible injury patterns based on specific modes or mechanisms of violence, the potential need for additional sampling, and potential technical challenges during the examination, such as the decomposition of the body or environmental

contamination. This exchange of information fosters alignment between medical and legal investigations, enabling the autopsy to provide relevant answers to the legal questions posed by investigators.

The presence of an investigator during the autopsy process also provides significant added value. Investigators have the opportunity to directly observe forensic findings, understand the biological context of any injuries or anatomical changes, and ask additional questions in real time regarding any findings that appear unusual or require clarification. This direct interaction allows investigators to obtain a more complete factual picture and thus relate it to other evidence in the field. From the forensic physician's perspective, the presence of an investigator also helps provide immediate clarification regarding specific suspicions, allowing medical interpretations to be tailored to the investigative context.

This two-way interaction enriches case analysis by combining evidence-based investigation methods with the scientific approach of forensic medicine. This synergy ultimately yields a deeper understanding of the cause of death, the mechanism of injury, and the reconstruction of the incident. Thus, the autopsy process not only produces biological data but also contributes to constructing a more complete, accurate, and legally accountable criminalistic narrative for the purposes of evidence in the criminal justice system.

The examination methodology applied in the forensic autopsy at Bhayangkara Hospital in Semarang City follows international protocols that have been adapted to local regulations and operational standards of the Indonesian Police and Forensic Medicine. The implementation of these protocols not only demonstrates alignment with advances in global forensic practice but also ensures that each stage of the examination has a scientific basis that can be accounted for, both medically and legally. The external examination is conducted thoroughly using a head-to-toe survey approach, a systematic method that examines the entire surface of the body from head to toe. At this stage, the forensic doctor identifies signs of violence such as bruises, cuts, stab wounds, abrasions, or open fractures, and looks for identifying features including tattoos, surgical scars, anatomical abnormalities, or other special marks that can aid in the identification process of the body. The examination also includes observations of the general condition of the body, the degree of decomposition, the presence of distinctive odors, exuded bodily fluids, and skin abnormalities that can provide clues to the mechanism or cause of death.

In the next stage, an internal examination is performed through a systematic dissection of the body's three main cavities: the cranial, thoracic, and abdominal cavities. In the cranial cavity, the examination involves opening the skull to examine the brain, meninges, and cerebral blood vessels. In the thoracic cavity, the condition of the heart, lungs, and major blood vessels is examined, as well as

any indication of blunt or penetrating trauma to vital organs. Meanwhile, the abdominal examination includes observing organs such as the liver, spleen, kidneys, stomach, intestines, pancreas, and reproductive organs. This procedure allows forensic doctors to assess for bleeding, organ rupture, signs of infection, toxicity, or other pathologies that contributed to death.

In addition to anatomical examinations, supporting sample collection is also performed as part of the standard procedures. Tissue samples are taken for histopathological examination to identify microscopic changes such as inflammation, degeneration, necrosis, or signs of certain diseases that are not visible macroscopically. Meanwhile, the collection of bodily fluids such as blood, urine, bile, or gastric contents is essential for toxicological analysis, which can reveal the presence of alcohol, narcotics, poisons, heavy metals, or certain medications in the victim's body. These supporting examinations are especially important in cases that do not show clear signs of physical violence.

All examination results, including macroscopic and microscopic findings, as well as laboratory analysis, are then presented in the Visum et Repertum, a legal document compiled using a systematic and structured methodology following the standard Indonesian forensic medicine format. This document is divided into two main sections: the pars narralis and the pars conclusiva. The pars narralis contains an objective description of all examination findings without subjective interpretation, written in detail yet precise enough to be verified by third parties if necessary. The pars conclusiva contains the forensic doctor's medical analysis and interpretation, including conclusions regarding the cause of death, mechanism of death, and estimated time of death if sufficient supporting data is available.

The language used in drafting the Visum et Repertum is designed to be precise, objective, and neutral, so that it can be understood by law enforcement officers without a medical background. Choosing the right language is crucial to avoid multiple interpretations in the legal process. Once completed, the Visum et Repertum is submitted to investigators through an official procedure that follows strict protocols to maintain the document's integrity. This protocol includes recording the time of submission, the recipient's identity, and physical security of the document to ensure continuity of the chain of custody. This procedure ensures that the document remains authentic, unaltered, and admissible as evidence in court.

Thus, the examination methodology applied not only meets scientific and medical standards but also supports the strength of evidence in the criminal justice process. A systematic and well-documented forensic autopsy makes a significant contribution to uncovering material truth, answering legal questions posed by investigators, and strengthening the position of the Visum et Repertum as a strategic piece of evidence in the Indonesian criminal justice system.

In terms of facilities and infrastructure, Bhayangkara Hospital in Semarang City has generally adequate facilities for performing forensic autopsies. These facilities include an autopsy room designed according to forensic medicine operational standards, equipped with a stainless steel autopsy table, a set of basic forensic surgical instruments, an adequate lighting system, and a mechanical ventilation system that minimizes odor exposure and ensures the safety of staff. Furthermore, temperature-controlled body storage facilities are available to allow for professional corpse management, especially in cases with a long delay between the discovery of the body and the autopsy. The autopsy room is also equipped with supporting facilities such as a drainage system, sterilization equipment, and personal protective equipment in accordance with Occupational Health and Safety (K3) standards.

However, this study identified several limitations to the advanced diagnostic tools that have become a vital part of modern forensic practice. One major limitation is the limited access to post-mortem imaging facilities, such as forensic CT scans (PMCT) or post-mortem MRI, which in many countries have been used as a complement to, or even an alternative to, conventional autopsies in certain cases. The lack of these tools limits the forensic team's ability to detect non-invasive internal abnormalities before incision, such as complex fractures, internal bleeding, or foreign objects in the body that are difficult to detect through manual examination.

Furthermore, limitations were also found in the availability of high-capacity DNA analysis equipment. The laboratories collaborating with these hospitals were not always capable of handling large volumes or complex genetic testing needs, especially when cases involved degraded or contaminated samples. This lack of facilities often necessitated the sending of samples to out-of-town laboratories, which not only required travel time but also potentially compromised the continuity of the chain of custody if not handled with care.

Another limitation lies in the toxicology laboratory's lack of facilities to perform advanced toxicology tests, such as trace analysis of psychoactive substances, identification of complex organic compounds, or heavy metal testing using advanced chromatography methods (GC-MS or LC-MS/MS). This lack of facilities means that only a portion of toxicology tests can be performed internally, while the remainder must be sent to a larger reference laboratory.

These accumulated limitations directly impact the institution's ability to conduct comprehensive supporting examinations. The examination process, which involves external referrals, results in longer wait times, even reaching weeks or months in some cases. This situation has the potential to reduce investigative momentum, as investigators must await toxicology, histopathology, or DNA analysis results to complete case files. These delays not only impact the effectiveness of investigations but, in some situations, can also affect public

perception of the performance of law enforcement officials, particularly in sensitive cases or those that attract widespread public attention.

Thus, while existing facilities generally meet the basic requirements for performing forensic autopsies, improving diagnostic infrastructure is an urgent need to support the speed, accuracy, and completeness of modern forensic examinations. This capacity enhancement will strengthen the quality of forensic services and have positive implications for the effectiveness of law enforcement and the achievement of material justice in the criminal justice system.

To maintain the objectivity, accuracy, and credibility of forensic medical examination results, a multi-layered, continuous quality assurance system is implemented. This system is designed as an internal control mechanism that ensures that every stage of the examination, from victim admission and clinical data collection to wound documentation and medical conclusion, is carried out in accordance with established ethical, professional, and standard operating procedures. This approach is crucial given that forensic examination results have significant legal consequences and are often crucial pieces of evidence in court.

In practice, every junior doctor is required to work under the supervision of a senior doctor with higher competency and sufficient experience in handling forensic cases. This mentoring is not a formality, but rather includes clinical discussions, evaluation of findings, and harmonization of wound interpretation with the reported chronology of events. Thus, the learning process runs simultaneously with quality control, minimizing errors from the outset.

Furthermore, before the post-mortem examination results are finalized and submitted to investigators, internal consultations are conducted between doctors or between units to cross-check data consistency, technical accuracy, and the relevance of conclusions. This process also serves as a risk mitigation mechanism, particularly in complex cases such as sexual violence, alleged torture, gunshot wounds, or unnatural deaths. This peer discussion ensures that every medical conclusion outlined in the post-mortem report can be methodologically and scientifically justified.

In the context of criminal procedure, maintaining the chain of custody is a crucial element in ensuring the integrity and admissibility of evidence in court. This process requires intensive coordination between doctors, facility staff, and investigators to ensure that every transfer of evidence, whether in the form of biological samples, victim clothing, or visual documentation, is recorded in detail. These records include the identity of the receiving or handing over officer, the time and location of the transfer, and the condition of the evidence at each stage. This detailed documentation is intended to prevent alteration, contamination, or manipulation of evidence that could weaken its evidentiary value in court.

Furthermore, the commitment to accountability for examination results is

demonstrated through the doctor's readiness to appear as an expert witness in criminal trials. The presence of an expert witness is not limited to simply reiterating the contents of the post-mortem examination but also includes explaining the examination method, the rationale for interpreting the injuries, and the relationship between objective findings and the mechanism of the incident. In this capacity, the doctor must be able to provide scientific, neutral, and impartial explanations, thereby helping the judge and the parties understand the significance of the medical findings in the context of the evidentiary process.

Thus, the entire series of mechanisms, from quality assurance and competency development to documentation enhancement, to professional responsibility in court, form a system that ensures that forensic examination results are not only medically correct but also legally valid and compelling. This approach reflects the crucial role of the forensic medical profession in supporting the upholding of justice by providing reliable, objective, and standardized evidence.

3.2. The Effectiveness of Forensic Autopsies as Evidence in the Judicial Process

Research findings indicate that forensic autopsies have a very high level of effectiveness as evidence in criminal justice processes. This is reflected in the results of interviews with sources, both from investigators, prosecutors, and forensic medical personnel, who consistently assessed that Visum et Repertum, especially those derived from autopsies, has an evidentiary value ranging from 8 to 9 on a scale of 10. This assessment indicates that the visum is considered one of the most reliable pieces of evidence in revealing material truth, especially in cases involving the cause of death, patterns of violence, or scientific reconstruction of events.

This high level of effectiveness does not arise by chance, but rather is rooted in the fundamental characteristics of forensic autopsy: scientific, objective, and verifiable. The autopsy process follows standard procedures, from external examination to internal examination, biological sampling, and visual and narrative documentation of findings. Thus, any conclusions drawn are not based on personal perception, but on empirical data that can be methodologically justified.

Unlike other forms of evidence, such as witness testimony, which are highly susceptible to perceptual bias, memory impairment, psychological stress, or even specific motives, autopsy results provide stable information that is unaffected by the emotional state or social relationships of the parties involved. Similarly, the defendant's testimony as evidence often lacks high reliability due to the possibility of denial, fabrication, or discrepancy with objective facts. In this context, autopsies serve as evidence that offers a higher level of certainty through a systematic, scientific approach.

Furthermore, according to the sources, forensic autopsies also play a crucial role in helping law enforcement officers reconstruct the incident more accurately, for

example, in determining the mechanism of death, the estimated time of death, patterns of impact or penetration by blunt and sharp objects, and indications of third-party intervention. This information is often unobtainable through other forms of evidence, particularly when there are no direct witnesses or witnesses with limited vision and perception.

Thus, the high evidentiary value of the Visum et Repertum autopsy results reflects its crucial role in the criminal justice system. Autopsies not only serve as supporting evidence but also serve as a crucial element in the effort to find objective, scientific, and irrefutable material truth. This finding also underscores the importance of strengthening forensic medical capacity as an integral part of the just law enforcement process.

Research analysis shows that forensic autopsies have a very high success rate, ranging from 80 to 85 percent, in producing key information that can direct the investigation process in the right direction. This figure illustrates that the majority of tactical and strategic decisions in death investigations are heavily influenced by the medical findings obtained through autopsy procedures. This information not only provides certainty regarding the cause of death but also opens up the scope for scientific interpretation regarding the mechanism of death, the time of death, and the potential involvement of other parties.

The ultimate effectiveness of a forensic autopsy lies in its differential diagnosis, which allows forensic doctors to distinguish whether a death was caused by homicide, suicide, or accident. This differential diagnosis is fundamental because the classification of the cause of death directly influences the direction of the investigation, the questioning of witnesses, the identification of suspects, and the types of additional evidence investigators must seek. Mistakes in this initial stage can have serious consequences, ranging from misdirecting the investigation to errors in determining the legal qualifications of the incident.

Forensic autopsies provide the scientific basis for accurate differentiation. Through a thorough examination of wound patterns, trauma distribution, internal organ function, toxicological findings, and biological markers, forensic physicians can determine whether a wound was self-inflicted, accidental, or caused by violence perpetrated by another party. For example, incision patterns in suicides typically exhibit a specific direction, consistent location, and the presence of hesitation wounds, while in homicides, the wound patterns tend to be chaotic, irregular, and often located in vital areas.

These autopsy findings also have direct implications for the evidentiary strategy used in the trial. If the autopsy results support the hypothesis of homicide, investigators and prosecutors will focus on the motive, the tools used, and the relationship between the suspect and the victim. Conversely, if the autopsy results point to an accident or suicide, the investigation will focus on mechanical

reconstruction and the victim's personal factors, thus avoiding unfounded criminalization.

Thus, the forensic autopsy's ability to perform comparative diagnosis serves not only as a medical verification tool but also as a crucial instrument in preventing errors in persona, errors in objecto, and errors in legal qualification. The accuracy of autopsy results is a crucial pillar in ensuring that the investigative process is conducted in accordance with the principles of prudence, proportionality, and an objective search for material truth.

The contribution of a forensic autopsy to a homicide investigation is multidimensional, encompassing various scientific aspects that directly influence the direction of the investigation and the evidentiary process. The first dimension is the accurate identification of the cause of death, which is the primary foundation for constructing a criminal case. Without an accurate determination of the cause of death, such as whether it was caused by blunt force trauma, sharp weapon wounds, asphyxia, poisoning, or other mechanisms, the entire investigation can go astray. An autopsy ensures that investigators have a solid scientific basis for understanding how events occurred and whether there is any indication of a crime.

The second dimension is wound pattern analysis, which has strategic value in revealing injury mechanisms and the potential involvement of other parties. Wound patterns can indicate the characteristics of the weapon used, the direction of the attack, the number of attacks, the force exerted by the perpetrator, and even the possibility of resistance from the victim. These wounds, when analyzed comprehensively, can provide insight into the perpetrator's profile, the distance of contact, the dynamics of the attack, and the sequence of events. In certain cases, wound patterns can even differentiate between defensive wounds and fatal injuries, thus influencing the scientific reconstruction of events.

The third dimension is the estimated time of death (post-mortem interval/PMI), which is one of the most important verification instruments for the consistency of a suspect's alibi. Time of death estimation is conducted using various indicators, such as body temperature, rigor mortis, livor mortis, skin color changes, degree of decomposition, and forensic entomology data. This information can corroborate or refute statements by suspects, witnesses, or other parties regarding their whereabouts at the time of the incident. Thus, the estimated time of death has not only biological value but also probative value, which is crucial in the evidentiary process.

The fourth dimension is body position and bloodstain pattern analysis, which significantly contributes to the reconstruction of the scene and the dynamics of the incident. Through analysis of the shape, direction, distribution, and volume of bloodstain, forensic experts can determine the victim's position at the time of the

attack, the direction of the blow or stab, the height of the blood source, and even the possibility of the victim moving before or after receiving the injury. This data is directly relevant to the accuracy of crime scene reconstruction, confirming whether witness or suspect statements align with scientific evidence on the ground.

Taken together, these four dimensions of contribution demonstrate that forensic autopsy serves not only as a medical procedure but also as an integral scientific analytical tool for constructing an objective narrative of events. Autopsies bridge the gap between investigators' initial suspicions and the biological facts present in the victim's body. Thus, autopsies play a central role in ensuring that murder investigations proceed with a high degree of accuracy, avoiding misinterpretations, and facilitating a comprehensive search for the material truth.

From the perspective of evidentiary theory, Visum et Repertum occupies a very strategic position as a written evidence that has high evidentiary power within the framework of the negative evidentiary system adopted by Indonesian criminal procedure law. The negative evidentiary system (negative wettelijk bewijstheorie) requires a combination of statutory provisions and the judge's conviction in passing a verdict, so that each piece of evidence must be tested not only from a legal-formal aspect, but also from the aspect of rationality and consistency with the facts revealed in court. In this context, Visum et Repertum makes a significant contribution because it contains scientific findings that are objective, measurable, and methodologically accountable.

However, as emphasized by R. Soesilo, criminal penalties should not be based on a single piece of evidence, no matter how strong it is. This principle emphasizes that the Visum et Repertum, despite its high probative value, must still be placed within a holistic and comprehensive evidentiary framework. This means that the visum must be integrated with other pieces of evidence such as witness testimony, physical evidence, expert testimony, and clues obtained from the series of trial facts. This synergy between the pieces of evidence then forms a complete and coherent evidentiary construction that convinces the judge in assessing whether a criminal event actually occurred and whether the defendant can be held legally responsible.

In practice, this integration of evidence requires intensive coordination between forensic doctors and investigators. This coordination extends beyond the submission of post-mortem results, but also involves substantive dialogue regarding the case context, suspected mechanisms of events, investigative needs, and scientific interpretation of medical findings. This collaboration ensures that investigators understand the limits of medical interpretation and avoid overreaching conclusions. Conversely, forensic doctors also gain a clearer chronological picture, allowing for more accurate wound readings, determining the mechanism of injury, and drawing conclusions from the post-mortem

examination to meet evidentiary needs.

Furthermore, this integration reflects the professional awareness of law enforcement officers regarding the basic principle in criminal procedure law: that material truth can only be achieved through mutually reinforcing evidence, not through the dominance of one type of evidence. The Visum et Repertum is a scientific component that strengthens the construction of evidence, but it must still be juxtaposed with witness testimony to test the consistency of the incident, evidence to strengthen the mechanism of the event, and expert testimony to clarify technical interpretations that cannot be understood by the layperson.

Thus, the position of the Visum et Repertum is not only strong probatively, but also crucial in establishing the relationship between the evidence. This synergistic relationship ensures that the judge's conviction is shaped by complete, objective, and mutually confirming evidence, so that the resulting decision reflects the principles of justice, legal certainty, and material truth as idealized in the criminal justice system.

From the perspective of Soerjono Soekanto's theory of legal effectiveness, the effectiveness of forensic autopsies in the criminal justice system can be analyzed through five interrelated main factors. First, from the legal or legal substance aspect, the provisions governing autopsy procedures in the Criminal Procedure Code, particularly Articles 133 and 134, actually provide a fairly clear normative basis. These regulations emphasize that autopsies can be performed upon the order of investigators and require forensic doctors to prepare a Visum et Repertum (Visual Report). This clarity provides legal certainty and prevents a normative vacuum in investigative practice. However, several experts believe that the technical regulations for their implementation still require updating to align with developments in modern forensic medicine.

Second, from a law enforcement perspective, the effectiveness of forensic autopsies is largely determined by the professional competence of forensic physicians and the quality of their coordination with investigators at every stage of the case. Forensic physician competence encompasses not only the technical ability to perform anatomical and histopathological examinations, but also interpretive skills in reading wound patterns, understanding trauma mechanisms, and integrating biological findings with the context of the events being investigated. In many of the cases studied, forensic physicians demonstrated consistent ability to draw accurate, systematic, and scientifically sound conclusions. This demonstrates that the individual capacity and professionalism of forensic physicians have become factors that strengthen the effectiveness of autopsies as evidence.

Furthermore, coordination between investigators and forensic physicians plays a central role in determining the smoothness and quality of the autopsy process.

This coordination extends beyond the formal request for an autopsy to include pre-autopsy processes such as gathering initial information, analyzing the crime scene, understanding the chronology of events, and determining examination priorities. This collaborative approach allows forensic physicians to work with a more comprehensive understanding of the case context, allowing for interpretation of injuries and analysis of medical findings to be tailored to the needs of the evidence. Effective communication between the two parties also plays a crucial role in avoiding misconceptions or conclusions that are inconsistent with the facts on the ground.

However, this effectiveness still faces structural challenges, particularly related to the unequal distribution of forensic doctors in Indonesia. Large urban areas generally have an adequate number of forensic doctors, complete with supporting laboratory facilities, while many remote areas and districts lack permanent forensic doctors. This situation leads to delays in autopsies, limited scope of examinations, or even reliance on general medical personnel with minimal forensic training. As a result, the quality of post-mortems and the validity of medical findings in these areas can be suboptimal, thus reducing the effectiveness of autopsies in assisting the investigative process.

Furthermore, these limited human resources often force forensic doctors to handle extremely high workloads, including covering extensive areas. This can potentially impact response speed, time available for in-depth analysis, and the doctors' readiness to provide expert testimony in court. In the context of legal effectiveness, according to Soekanto, this situation demonstrates that the capacity of law enforcement—in this case, forensic personnel—is a determining factor that is far from ideal.

Thus, although individual forensic physician competence is considered good and coordination with investigators has been effective, structural challenges such as the unequal distribution of forensic personnel and uneven workloads remain significant obstacles to achieving optimal autopsy effectiveness across Indonesia. Policies are needed to strengthen institutions, increase the number of experts, and ensure equitable distribution of forensic facilities to ensure equitable quality of post-mortem examination services across all jurisdictions.

Third, in terms of facilities and infrastructure, the effectiveness of a forensic autopsy is greatly influenced by the quality and availability of supporting facilities. In large cities, most forensic installations are equipped with standard autopsy rooms, visual documentation equipment, anatomical dissection instruments, and adequate body storage facilities. The availability of these basic facilities allows forensic doctors to perform examinations with a reasonable degree of accuracy, especially in conventional cases that do not require the use of advanced technology.

However, significant limitations remain, particularly in modern forensic technology. Not all institutions have tools such as post-mortem CT scans, forensic virtual autopsies (virtopsy), international-standard DNA laboratories, or toxicology facilities capable of performing broad-spectrum analyses with high sensitivity. In complex cases, such as deaths with an unclear mechanism, suspected poisoning, or internal injuries not visible externally, the lack of these technologies can limit the depth of scientific analysis performed by forensic physicians. As a result, the process of determining the cause of death often requires referral to a facility with better capabilities, which means additional time, expense, and potential degradation of sample quality.

Furthermore, the disparity in infrastructure between urban areas and areas outside Java, or the 3T (frontier and remote) regions, is a structural obstacle that impacts the effectiveness of autopsy implementation nationally. Many remote areas still rely on minimally equipped public hospitals, without adequate forensic laboratory support. This situation not only delays the examination process but also potentially reduces the strength of evidence because not all findings can be analyzed comprehensively. Therefore, infrastructure and facilities are crucial factors in determining the extent to which the autopsy process can maximally contribute to law enforcement and the search for material truth.

Fourth, from a societal perspective, family resistance to autopsies remains a significant challenge in law enforcement practices in Indonesia. This resistance is often rooted in a lack of public understanding of the function and importance of autopsies as a scientific instrument for objectively determining the cause of death. Many families worry that autopsies will damage the dignity of the deceased, alter their physical condition, or conflict with their moral and religious values. These concerns are exacerbated by a lack of legal and medical literacy at the grassroots level, often resulting in autopsies being perceived as inhumane or merely a bureaucratic formality.

In some cases, public resistance also stems from suspicion of law enforcement officials, fueled by traumatic experiences, mistrust of the investigative process, or the perception that autopsies can be manipulated for personal gain. This creates psychological barriers for families to consent, even when an autopsy is urgently needed to clarify the circumstances of the death, particularly when there are indications of a crime.

In response, investigators and forensic physicians often must employ a persuasive and educational approach, including providing detailed explanations of the procedures, purposes, benefits, and legal protections associated with performing an autopsy. This communication process requires empathy, patience, and interpersonal skills to help families understand that an autopsy is not simply a technical procedure but a vital part of the quest for material truth and justice.

However, these social dynamics often lead to delays in the autopsy process, which can have practical implications, including the deterioration of biological samples or the loss of important forensic evidence. In this context, societal factors are a key determinant of the effectiveness of forensic autopsies, as public resistance can directly hinder the smooth progress of investigations and diminish the state's ability to scientifically uncover the truth.

Fifth, from a cultural perspective, religious values and customs prevalent in Indonesian society play a significant role in shaping public perceptions and attitudes toward autopsies. In many communities, there is a strong belief that the body must be honored and should not be dissected after death. Certain religious beliefs emphasize the importance of preserving the body's integrity as a final act of respect for the deceased, while some customary systems consider dissection a violation of the sacredness of death rites. These beliefs are not merely symbolic but also contain spiritual and moral dimensions that are highly valued by the community.

This situation creates a clash between cultural values and scientific needs, particularly when an autopsy is required as a crucial instrument in uncovering the cause of death and proving the presence or absence of criminal elements. In the context of law enforcement, autopsies play a highly strategic role in uncovering material truth, but the process often encounters resistance based on local values. In communities with high levels of cultural or religious adherence, refusal of autopsies can even occur spontaneously without considering legal urgency, as customary values and religious teachings are considered more important than investigative interests.

These cultural sensitivities often force law enforcement officials to take a very cautious and persuasive approach. Investigators and forensic doctors must be able to provide explanations that are not merely technical but also respectful of local religious values and customs. In some cases, religious or traditional leaders need to be involved to facilitate communication, so that the family understands that the autopsy is not performed to damage the dignity of the body, but rather to protect the rights of the deceased and their family through proper evidence.

However, the reality on the ground shows that these cultural factors can significantly impact the effectiveness of an autopsy. Refusal based on religious or customary beliefs can lead to delayed examinations, the loss of biological evidence, or even the complete failure of the autopsy. Thus, cultural factors pose not only a technical but also a structural obstacle in the pursuit of legal truth. This challenge makes cultural factors one of the most influential determinants of the success of forensic autopsies in Indonesia, particularly in regions that still strongly adhere to customary norms and religious teachings in managing death ceremonies.

When these five factors are analyzed comprehensively, it appears that the effectiveness of forensic autopsies is the result of a complex interaction between normative, institutional, and socio-cultural elements that shape the law enforcement ecosystem in Indonesia. Autopsy effectiveness cannot be understood from a single dimension, as its success is the result of the harmonization of various interconnected factors.

From a normative perspective, clear regulations in the Criminal Procedure Code (KUHAP) and related regulations provide a strong foundation for conducting autopsies. However, the strength of the rules does not automatically guarantee optimal implementation without institutional capacity and public acceptance. Therefore, regulatory improvements must be accompanied by increased implementation effectiveness through standardized procedures, up-to-date technical guidelines, and clear inter-agency coordination mechanisms.

At the institutional level, the competence of forensic doctors, the availability of examination facilities, and the quality of coordination with investigators play a crucial role in determining the quality of autopsy results. Without the support of professional human resources and adequate facilities, comprehensive scientific analysis cannot be performed, especially in cases requiring advanced forensic technology. Therefore, strengthening institutional capacity, modernizing facilities, and evenly distributing forensic personnel throughout Indonesia are integral to efforts to improve autopsy effectiveness.

Meanwhile, socio-cultural elements are a crucial external factor, particularly in the context of public acceptance of autopsy practices. Resistance based on religious and customary values can be a serious obstacle, potentially hindering the search for material truth. Therefore, increasing the effectiveness of autopsies cannot simply rely on improving regulations and institutions; it also requires a more empathetic, persuasive, and communicative socio-cultural approach. Public education, the involvement of religious and traditional leaders, and increased legal and public health literacy are important strategies for building an understanding that autopsies are not profane acts, but rather part of the process of achieving justice.

Thus, efforts to improve the effectiveness of forensic autopsies must be viewed as a multidimensional project that requires synergy between legal reform, strengthening forensic institutions, and a social approach sensitive to community values. Only through the integration of these three elements can forensic autopsies function optimally as scientific instruments that support the realization of material truth in the criminal justice process.

3.3. Factors Affecting the Effectiveness of Forensic Autopsies

Based on in-depth analysis, several key factors can be identified that influence the effectiveness of forensic autopsy as evidence.

Supporting Factors:

1) Professional Competence

The high technical expertise and extensive experience of forensic doctors, supported by professional certification and ongoing training, are the backbone of quality autopsy results. The mentoring and support system at Bhayangkara Hospital ensures consistency and knowledge transfer.

2) Effective Coordination

Clear communication protocols between forensic physicians and investigators create productive synergy. Regular briefings and a collaborative approach ensure that each party understands their role and the context of the case, allowing autopsy results to be optimally integrated with other evidence.

3) Systematic Documentation

Detailed and standardized documentation, including photographs and videos, forms the foundation of the evidentiary power of the Visum et Repertum. A comprehensive written report ensures that all relevant information is recorded and readily accessible during the judicial process.

4) Compliance with Legal Procedures

Compliance with Articles 133 and 134 of the Criminal Procedure Code provides strong legal legitimacy to the entire autopsy process and results, making them difficult to challenge in court.

Inhibiting Factors:

a. Infrastructure Limitations

The lack of facilities such as forensic CT scans and fully equipped toxicology laboratories limits the depth of analysis. Long wait times for toxicology analysis (up to months) can disrupt investigative momentum and delay the judicial process.

b. Human Resource Limitations

The number of certified forensic doctors that is not commensurate with the volume of cases creates an excessive workload, which has the potential to affect the quality of examinations and cause burnout.

c. Socio-Cultural Resistance

Refusal by victims' families due to religious, cultural, and psychological trauma considerations presents significant operational obstacles. Overcoming this resistance requires a sensitive communication approach, education, and often the

involvement of religious or community leaders.

d. Communication Barriers in Trials

The complexity of forensic medical findings is often difficult to communicate effectively to judges and parties to a trial who do not have a medical background, potentially leading to misinterpretation and reducing the impact of the evidence.

4. Conclusion

Based on the research results and discussion outlined above, it can be concluded that the forensic autopsy at Bhayangkara Hospital in Semarang City for the purpose of the crime of murder was carried out in accordance with the provisions of Indonesian criminal procedure law, specifically Articles 133 and 134 of the Criminal Procedure Code. The procedures implemented were standardized and systematic, supported by competent human resources and good coordination with law enforcement officials. Forensic autopsies have proven to be highly effective as evidence, with a significant contribution in revealing the cause of death, determining the modus operandi of the crime, reconstructing the event, and ultimately strengthening the judge's confidence in deciding the case. The evidentiary value of the Visum et Repertum is very high due to its objective scientific basis. However, this optimal effectiveness still faces a number of challenges. The main inhibiting factors come from limited high-tech infrastructure, the availability of less than ideal forensic human resources, and resistance from the community stemming from cultural and religious values. To overcome this, a sustained commitment from the government and law enforcement institutions is needed to invest in the procurement and maintenance of advanced forensic equipment, programs for developing and increasing forensic human resources, and massive and culturally sensitive public education about the strategic role of forensic autopsies in upholding justice.

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