The "Magnificent Seven Errors" in Forensic Autopsy Practice: The Italian Context

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ABSTRACT

According to the Italian legal system, forensic autopsies are performed by a medical doctor specialized in legal medicine, otherwise known as a medicolegal expert (MLE), who has a range of very complex responsibilities. Indeed, the quality of forensic autopsy activity is always questioned in courts of law; incorrect assessments are dangerous because they can jeopardize the validity of a criminal investigation and thus affect the outcome so that a real culprit may be acquitted or an innocent person convicted. Nonconformities also discredit the professionalism of the specialist who performs the autopsy. The work of a MLE implies a series of assignments and duties that should be given constant consideration, but when certain aspects of this activity are underestimated or overlooked, this can lead the expert to make mistakes with irreparable consequences for the judicial investigation. In this article, for the first time, we present a summary of seven known errors related to autopsy activity following death by unnatural causes, with the purpose of alerting MLEs who work under the Italian judicial system to the potential dangers of such errors. These relate to: oversights in autopsy technique, incorrect collection of photographic and video material, unauthorized attendance at the autopsy, missing/mistaken reporting at any stage of the forensic activity, failure to notify the party forensic consultant, using histological or toxicological nonaccredited laboratories for forensic activities, and lack of observance of the chain of custody.

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INTRODUCTION

The performance of a forensic autopsy is a fundamental component of any medicolegal death investigation, although the legislation and regulations governing the conduct of postmortem examinations differ from one nation to another and may even vary between regions within the same country (1). For example, in the United States there are two death investigation systems, the coroner system based on English law, and the medical examiner system, which evolved from the coroner system. Also, in some states the medical examiner is a licensed forensic pathologist while in other states he is a physician with other duties. The Italian legal system does not impose mandatory requirements for choosing which professional will perform an autopsy exam. Art. 45 of the Mortuary Police Regulations (Presidential Decree 285/1990) makes the general statement that autopsies must be "performed by physicians legally authorized to operate." The instructions contained in the previous Circular of the Ministry of Justice and Cults of 30/06/1910, n. 1665, specify that a forensic autopsy must be performed by "two experts chosen among doctors who, by virtue of the position they occupy or the specialization of their studies, have sufficient knowledge of the procedure for performing a forensic examination." In reality, the autopsy is usually performed by one or more medical doctors specialized in legal medicine, also known as medicolegal experts (MLEs), or more rarely by an anatomopathologist.

It is well known that the aims of a forensic autopsy depend on the specific case. The first priority is always to determine the cause, manner, and time of death for the legal system, along with the identity of the deceased, but a medical examiner may also set the following objectives: to establish the pathological consequences of drug or toxin use or abuse, to determine whether any natural disease might have increased susceptibility to the effects of a drug or toxin, to collect trace evidence or any other evidence in order to reconstruct and interpret a chain of events, to assess whether death is due to acute workplace injury, to ascertain if there has been a lack of surveillance by a public health or federal institution, to verify if death is a result of complications associated with surgery, and to evaluate possible health malpractice (2).

A MLE must strictly comply with procedural guidelines to guarantee the correct development of an investigation. This implies a complex range of duties and responsibilities which often go unnoticed or poorly considered but which can have major repercussions in the context of a legal investigation. Given the potential for a forensic specialist to commit any one of a list of nonconformities (minor or major), in this article we intend to propose seven potential key errors that may occur in forensic autopsy practice, with irreversibile judicial consequences.

1. Oversights or Errors in Autopsy Technique

The quality of observation and accuracy of interpretation of autopsy findings are always stressed, along with the importance for the autopsy examiner to keep an open mind, remain flexible, and maintain awareness of different possibilities. Failure to adhere to a high standard of care in postmortem examinations due to a low level of competency in forensic pathology can lead to mistakes in conclusive reports (3).

Though the actual performance of an autopsy is fairly uniform whatever the nature of death, there are a number of associated matters that vary according to the circumstances. For example, the procedural precautions required following a murder are not necessary in the case of a sudden natural death, and the dissection in a criminal abortion or fatal rape is different from that performed on a drowned body (4). This is not the place to report the standard autopsy procedures to be adopted and represented by the most accredited international protocols. However, we wish to underline that every effort should be made to document the presence of pathologies and/or injuries in detail. While this may not seem necessary to establish the cause of death, key information about circumstances and concomitant factors may be lost if insufficient detail is recorded during the examination. It may not be known in the early stages of an investigation how much attention should be given to some signs of harm. Moreover, some pathologies, which could be studied more carefully

during the autopsy, emerge only after the body has been released (either through the examination of the attending physician or through the recovery of previous health documentation). However, a systematic approach will allow the necessary information to be recorded for later analysis; consider, for example, a severely traumatized and/or burned body, which may present a daunting prospect to those not accustomed to dealing with such cases (5).

Postmortem imaging may provide an efficient guide to supplement a conventional autopsy (6), especially in view of the different techniques currently available, such as postmortem X-rays, postmortem computed tomography, multiphase postmortem computed tomography angiography, and postmortem magnetic resonance imaging.

In cases of addiction, a complete autopsy is necessary to ascertain the definitive or most likely cause of death. Incomplete autopsies, including needle autopsies, or endoscopic autopsies that are comparatively less invasive, or noninvasive, are not routinely part of forensic practice (7).

Nevertheless, the relevant legal authority can sanction postmortem examinations that are not complete (8).

Finally, clinical data may be important, for instance, where a deceased person has undergone medical treatment for some time prior to death. Medicolegal experts may also be able to shed light on the circumstances of death. All of this information is useful to the pathologist in planning the best approach to undertaking the examination with minimal risk of error. A perfect sector-specific technique that adheres to the established guidelines contributes decisively to the provision of a detailed written postmortem examination report of the autopsy findings, and all inferences drawn must be based on scientific reasoning.

2. Incorrect Collection of Photographic and Video Material

In addition to a complete and meticulous dissection of the dead body, photographs and video films for future evidential use in a court of law should be taken. Photographs and videos often allow forensic experts to see signs of micro lesions or other particular necroscopic aspects that may escape during the autopsy procedure. Even when a specialist photographer takes the photographs, it is ultimately the responsibility of the pathologist to ensure that enough photographs of sufficient quality have been taken. In our experience, MLEs often take their own photographs; in this case, technical errors are more likely to be committed, and there is a risk of failing to depict the evidence on the body (lack of focus, blurred photograph, etc.).

Forensic video-filming and photography (9), although similar to medical photography, have different objectives. The images are taken primarily for legal reasons, which means that they may be used in court, and the results must therefore be accurate and detailed. The photographer must have an understanding of the related requirements on three levels: technical, medical, and legal. While causing as little delay as possible to the postmortem examination procedure, autopsy photography must be extremely reliable, as the images are not repeatable. The photographs can be submitted later with the postmortem report or preserved as part of the medicolegal report, to be produced whenever required by a court of law. The following set of photographs should be taken: full body shots from above with clothes intact; full body shots, front and back, after clothes have been removed; close-up photographs of each single external and internal lesion including an indication of scale, such as a ruler, in the image; photographs of organs, tissues, and liquids that are taken as samples for subsequent investigations. Care must be taken to ensure that photographs and videos are not editable and the exact date and time must be set on the camera, otherwise such material could be contested as evidence; this is sometimes negligible for the MLE.

3. Unauthorized Attendance at the Autopsy

In research on the benefits of autopsy-based teaching in undergraduate medical education, repeated attendance at postmortem examinations was seen to have positive impacts on diagnostic and communication skills, potentially enhancing future patient care.

Observing postmortems is probably likely to foster broader differential diagnosis and a better understanding of the associated problem-solving methodologies for investigation. In addition to generating greater knowledge, postmortem attendance has also been documented to enhance students' abilities to describe what they observe with more accuracy (10).

However, in the case of forensic autopsy, attendance is limited to support staff (e.g., autopsy assistants), medical professionals, appropriate trainees, magistrates, inquirers into sudden death, and people from relevant investigative agencies including the police, fire investigators, and traffic investigators. No casual observer should be present; a register consisting of the names of those persons legally entitled to be present during a forensic autopsy should be maintained.

If the MLE, as is often the case, is assisted by technical auxiliary staff of the autopsy room, or if external people, such as students or practitioners, are to attend the examination, a formal permit must be issued by the relevant Legal Authority (11). The MLE, therefore, needs to request permission to receive assistance from auxiliaries and/or clinical specialists during the autopsy, and the presence of other collaborators must also be authorized. If this protocol is not respected, the unrepeatable assessment could become voidable in the context of a hearing. Furthermore, any accidents involving persons not formally authorized to attend the autopsy could not only adulterate forensic evidence but also lead to the civil or criminal liability of the medical sector. For this reason, in a criminal or suspicious case, the MLE should try to limit the number of those present at the autopsy to a minimum, which will reduce the risk of loss of confidentiality. In addition, when too many people descend on the morgue, with hardly any room to move, the MLE may well lose concentration during the autopsy or neglect to verify who is actually authorized to be present.

4. Missing/Mistaken Reporting and Documentation at any Stage of Forensic Activity

The activities recorded in the final autopsy report constitute suitable evidence that those same activities were actually carried out. It is difficult to prove, before a judge, that an operation has been carried out when it is not included in the filed report.

Vice versa, the sector must not report any activities (even those of apparently minor significance) that have not been performed. It may happen that by overwriting previous reports or written advice, sentences related to actions not performed or typing errors may be left in the text.

Indeed, studies have been conducted in which autopsy reports were found to contain many transcription errors and implied negligence, carrying a high risk of compromising judicial investigations (12). Therefore, MLE must precisely describe what has been done in the final report, step by step, without including anything that is commonly done if this action was not in actual fact executed.

It is essential to detail which liquids have been withdrawn and where they will be stored, which (if any) organs have been removed and fixed in formaldehyde, and whether or not subsequent investigations are to be conducted on them. Any new documentation that is acquired must be recorded, and whenever samples are taken for research purposes, this must be noted. Since there is considerable variation in the legal aspects of tissue and organ retention between different countries, it stands to reason that all MLEs must be fully conversant with local regulations.

At the end of the autopsy, the expert is responsible for determining the cause of death and giving other relevant medicolegal opinions based on the autopsy findings, results of instrumental or laboratory testing, and circumstantial information relating to the death. Therefore, each singular phase of the forensic autopsy must be mentioned and described in detail. In the performance of the postmortem examination, both shortcomings and unnecessary activity may compromise the validity of the final report.

5. Failure to Notify the Party Forensic Consultant

The performance of an autopsy is an act that is intended to provide evidence in a court of law, and the

expert findings obtained will be regarded as such. The legislator must therefore prepare a form of guarantee, with the participation of the defenders, the parties, and, possibly, their forensic consultants (FCs). These professional figures have different roles, rights, and obligations in different legal systems. In the Italian legal system, pursuant to Art. 225 of the Code of Criminal Procedure, the suspect and the offended party can directly appoint a FC to carry out investigations outside the trial. The FC, whose technical findings may be presented as evidence, will then be heard in court.

Forensic consultants have so the right to attend all stages of the technical assessment, up to its conclusion. They can work in defense of the injured party or the suspect(s) under investigation; they also have the task of supporting the family or the client by providing a medical opinion along with information regarding the autopsy activity.

In criminal (as well as civil) cases (13), the party FC is expected to propose technical assessments, which result in an opinion rendered orally or in written records. In this perspective, the consultant qualifies as a subject who assists the party with their technical and scientific skills, but also as a possible source of evidence through the use of their statements at the hearing, thus approaching the figure of the "expert witness" in common law systems (14).

Obviously intervening in this context does not mean hindering the work of the MLE of the Prosecutor's Office: the FC can make observations or suggestions or express reservations, and these must be registered. The expert of the Public Prosecutor's Office will then have to take the FC's contributions into account in the final report, giving the reasons why they have been accepted or rejected. In the latter case, a sustainable technical explanation is required. The FC must therefore verify that important details are examined by the court's expert and shared, or at least recorded, in the report that will be submitted to the magistrate.

In this context, it is the task of the MLE to report every phase of his or her activity to the FC during the autopsy activity, and in subsequent examinations on organs, in laboratory analysis, in the reading of histological slides, and in carrying out and visualizing instrumental investigations made on the corpse. Failure to fulfill this kind of notification will jeopardize the entire investigation, even more so if the examinations are classified as "unrepeatable" by a court of law.

6. Conducting Histological or Toxicological Analyses in Nonaccredited Laboratories for Forensic Purposes

The role of forensic histopathology in routine practice is to establish the cause of death in particular cases, as well as diagnose or confirm pathologies that are not macroscopically visible or that are of doubtful interpretation. This is achieved on the basis of microscopic analysis of representative cell and tissue samples taken from the major internal organs and from abnormal findings made from the autopsy. A prerequisite of this is adherence to the quality standards set out for conventional histological/cytological staining and enzyme histochemical and immunohistochemical methods (15).

Some countries already have accreditation requirements for work carried out in histological laboratories, which also cover the use of immunohistochemical methods. In addition to the issue of quality in specimens for microscopic analysis, the question of reliability of histopathological diagnoses in forensic routine needs to be considered, in view of the strict standards of evidence, particularly in criminal proceedings. A forensic pathology laboratory, therefore, should have specific standard operating procedures (16).

Also, drug testing laboratories must guarantee highly precise chemical-toxicological analysis, so for forensic purposes they need accreditation standards and procedures (17), which enable laboratories to demonstrate that they operate competently and generate valid and irrefutable results which can be submitted to a court, in the context of forensic toxicology.

Almost always, the expert is asked where the histological and/or toxicological investigations were conducted, whether the laboratory is accredited, whether the staff are qualified, whether the instruments used are for forensic or clinical purposes, and whether the

laboratory keeps constantly updated on the quality of analytical procedures and follows the evolution of techniques capable of satisfying forensic investigations.

In many cases, ancillary studies are critical in determining the cause and mode of death (e.g., post mortem vitreous chemistry, DNA testing, microbiology, diatom testing, other biochemical tests). The MLE, therefore, will inform the Authority of the need to perform them at the end of the autopsy, requesting the authorization (if not granted at the time of the assignment) to perform ancillary tests in authorized laboratories.

Failure to comply could make histopathological and/or toxicological results potentially inadmissible for judicial purposes, with disastrous repercussions in terms of establishing guilt or exoneration of a criminal defendant.

7. Lack of Observance of the Chain of Custody

The chain of custody is particularly significant in environmental sampling, which not only helps to identify contamination but can also be used to determine accountability. Laboratories should also be aware of other legal implications such as expert testimony and appropriateness of scientific evidence (18).

Preserving the chain of custody is critical in forensic practice (19) for it guarantees the integrity and authenticity of a piece of evidence. The traceability of the record of the control, transfer, and analysis of samples indicates the transparency of the procedure. This sequential documentation is vital because every step in the examination and analysis of the evidentiary sample must be accounted for, authorized, and recorded.

The documentation should be comprehensive including the following information: the circumstances of evidence collection, the people who handled the evidence, the period of the guardianship of evidence, safekeeping conditions when the evidence was handled and/or stored, and how evidence was handed over to subsequent custodians every time a transfer occurred (along with the signatures of individuals involved at each respective stage). In this way, the police officers and other law officials or laboratory staff involved are prevented from tainting or misplacing a piece of evidence (20). The final responsibility lies with all those who come into contact with the finding, not exempting the MLE who carried out the sampling and then entrusted the sample to be analyzed or stored to a laboratory, health facility, or forensic institute.

The chain of custody is therefore a documented procedure designed to guarantee the authenticity, integrity, and traceability of a sample from the time of its collection to its disposal. Among other things, this critical procedure must make it possible to reconstruct the process of sample collection within the laboratory, to locate the sample at any time, to identify it unequivocally, to store it correctly (and to verify the suitability of the storage conditions), to preserve it in all phases from tampering and voluntary or involuntary adulterations, and finally to identify all the movements and manipulations of the sample, on what dates and involving which subjects. Maintaining the chain of custody should be considered a professional and ethical responsibility by those in charge of the evidence. For the MLE, the chain of custody is of particular interest in the following procedures:

- removal of organs taken for subsequent investigation or simply stored and kept at the disposal of the judicial authority for any diagnostic-forensic investigations;
- tissue sampling for histological, microbiological, or molecular biological examinations;
- the preparation of paraffin blocks and stained histological slides;
- sample collections of biological liquids or matrices, for toxicological examinations or genetic testing;
- clothing that is worn by an individual at the time of the crime;
- projectiles recovered from a dead body or shooting scene.

It is advisable to use specific modules, thus making each movement of the sample traceable, from the moment of its collection to its arrival in the laboratory that will perform the analysis and its subsequent storage.

The importance of the chain of custody as a post-autopsy procedure is often underestimated by the medical sector. However, the practitioner should remember that it is the most critical procedure that ultimately decides the admissibility of evidence in any trial (21).

CONCLUSION

The autoptic activity, performed by MLEs under Italian jurisdiction, is fundamental for the reconstruction of events leading to suspicious death, while their technical evaluations have important consequences in the judicial field. The procedures to be adopted must ensure a complete study of the case, in order to be able to respond in a technical and scientific manner to the questions formulated by the judicial authority. Therefore, performing this type of forensic work requires a high level of skill and expertise; the MLE must be rigorous and avoid potential errors which, in our experience, unfortunately, are still quite frequent. Seven distinct nonconformities have been reported in this article, which may lead to errors that interfere with the quality of the MLE's activity and the integrity of a criminal investigation. Attention to these circumstances appears to be a preliminary element in order to organize a correct scientific approach to the performance of a forensic autopsy.

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