Legal Medicine 78 (2025) 102717

Contents lists available at ScienceDirect

Legal Medicine

journal homepage: www.elsevier.com/locate/legalmed

Towards a standard of scientific evidence in on-site inspection: compilation of the ECLM on-site inspection form in a broad case history☆

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☆ This article is part of a special issue entitled: 'Proceedings Congress Forensic Science' published in Legal Medicine.

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https://doi.org/10.1016/j.legalmed.2025.102717
Received 7 July 2025; Accepted 20 September 2025
Available online 22 September 2025
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ARTICLE INFO

Keywords:
Scene of suspicious death
On-site inspection
Forensic pathology
Forensic sciences
Protocol

ABSTRACT

The *European Council of Legal Medicine (ECLM) on-site inspection* form allows the collection of data relevant to the identification, collection, sampling and preservation of all elements that, during the on-site inspection, may be useful as forensic evidence. The aim of this study is to assess the completeness of the information collected in a large number of on-site inspections, the records of which were drawn up without the use of the *ECLM on-site inspection form*, in order to verify the usefulness and the application of this form.

The authors present a multicentre study involving 20 Italian forensic medicine institutes. For each institute, the reports of on-site inspections carried out without the use of the *ECLM on-site inspection form* were collected and a forensic pathologist was asked to analyse the individual cases and to identify, for each case, the presence or absence of information regarding all the points examined by the *ECLM on-site inspection form*. A practical database was prepared and sent to each institute for this analysis.

Data were collected and analysed from a total of 1721 on-site inspection reports. Our results document that certain items on the *ECLM on-site inspection form* are not always investigated in reports written without the use of this tool.

The use of the *ECLM on-site inspection form* proves to be a valid tool to assist the forensic pathologist during the on-site inspection. We therefore hope that the forms developed by the ECLM will be systematically adopted in the forensic practice of the forensic pathologist.

1. Introduction

The evolving complexity of forensic sciences, particularly in the context of medico-legal death scene inspections, has driven the need for structured and standardized methodologies across Europe. Recognizing the importance of harmonized documentation and data collection, the European Council of Legal Medicine (ECLM) spearheaded an initiative to establish an interdisciplinary form – the *ECLM on-site inspection form*, also known as *Parma Form* – designed to guide forensic practitioners in the on-site inspection of corpses and surrounding environments. The *ECLM on-site inspection form* is a checklist that can be used by the forensic pathologist in the course of on-site investigations. Proposed by the ECLM in 2022, it allows the collection of data relevant to the identification, collection, sampling and preservation, of all elements that, during the on-site inspection, may be useful as forensic evidence in the setting of unknown cause of death or suspicious circumstances [1].

The formulation of the *ECLM on-site inspection form* was grounded in principles outlined by the ECLM between 2016 and 2017. During this period, the Council emphasized the necessity for a robust forensic protocol that ensured standardized and scientifically valid practices during on-site inspections of corpses. These guidelines established the core criteria for documentation and emphasized interdisciplinary cooperation [2].

The *ECLM on-site inspection form* is organized as a modular checklist, divided into six main sections corresponding to the major disciplines of forensic science. Each section allows for thorough data collection relevant to the specific investigative domain. The checklist format ensures a systematic approach, reducing the risk of oversight and promoting meticulous documentation. *Section 1 – Forensic Pathology* includes general information, corpse identification, environmental context, injury description, body position, and evidence collection. *Section 2 – Forensic Anthropology* applies to decomposed or skeletonized remains, focusing on osteological analysis and trauma assessment. *Section 3 – Forensic Odontology* aids identification through dental charting and prosthesis documentation. *Section 4 – Forensic Entomology* records insect activity to estimate time since death. *Section 5 – Forensic Genetics* covers biological sample collection for DNA analysis, while *Section 6 – Forensic Toxicology* ensures proper documentation and handling of samples for toxicological testing. A dedicated instructional section accompanies the form, guiding practitioners on proper completion protocols.

The *ECLM on-site inspection form* represents a landmark achievement in the standardization of forensic medico-legal scene inspections. Developed through collaborative efforts spanning academic institutions, professional societies, and international bodies, it stands as a practical, interdisciplinary, and internationally validated tool.

The aim of this study is to assess the completeness of the information collected in a large number of on-site inspections, the records of which were drawn up without the use of the *ECLM on-site inspection form*, in order to assess the usefulness of the application of this form.

2. Materials and methods

The authors present a multicenter study involving 20 Italian forensic medicine institutes, led by the Institute of Forensic Medicine of Modena. Each participating institute was instructed to retrospectively collect and review on-site inspection reports drafted without the use of the *ECLM on-site inspection form*, with no restrictions on the time period of case selection. For every report included, the Institute performed a detailed analysis to determine the presence or absence of information corresponding to each item outlined in the *ECLM on-site inspection form*.

The extracted data were entered into a database provided by the lead Institute. In this database, each row represented a single on-site inspection report, while each column corresponded to a section or subsection of the *ECLM on-site inspection form*. For items under Forensic Pathology, the reporting options were binary: *Yes* (information present) or *No* (information absent). For the disciplines of Forensic

Anthropology, Odontology, Entomology, Genetics, and Toxicology, each item was categorized as: *Relevant and complete*, *Relevant and incomplete*, or *Irrelevant*, based on the applicability and thoroughness of documentation in each case.

Upon completion, the compiled database was returned to the coordinating institute in Modena for central collection and analysis.

3. Results

A total of 1721 on-site inspection reports were collected and analysed.

Data regarding *Section 1. Forensic Pathology* are reported in Table 1. In at least 80 % of the cases analyzed, the following 17 items were consistently documented: identification of the forensic pathologist and other professionals involved, date and time of corpse discovery, presence of other intervening professionals (e.g., first aid, police), time of the forensic pathologist's arrival, environmental temperature, corpse's identity status, name and surname, gender, clothing, state of conservation, and signs of algor, rigor, and livor mortis, as well as descriptions of injury, corpse position, and photo report.

A second group of five items was reported in 50–80 % of cases: last time the deceased was seen alive, presumed age, type of indoor setting, whether the space was inhabited or uninhabited, and level of environmental exposure.

In contrast, a third group of eight items appeared in less than 50 % of the reports, indicating frequent omissions: weather conditions, general environmental characteristics, presence of heating or cooling sources, and the status (open or closed) of entrance doors, interior doors, and windows, as well as information about the outdoor environment and any sampling performed. These findings reveal that while core medico-legal data are generally well recorded, contextual environmental information is often missing, which may impact the overall interpretation of forensic cases.

Table 2 summarizes the data pertaining to Sections 2 through 6 of the reports analyzed. *Section 2 – Forensic Anthropology* was deemed pertinent in 50 cases, with 20 of these containing complete information and 30 were incomplete. *Section 3 – Forensic Odontology* was pertinent in 136 cases; among these, 53 reports included complete data, while 83 were incomplete. *Section 4 – Forensic Entomology* was considered pertinent in 139 cases, of which 25 were complete and 114 incomplete. *Section 5 – Forensic Genetics* was found pertinent in 294 cases; 37 of these sections were complete, whereas 257 were incomplete. Finally, *Section 6 – Forensic Toxicology* appeared to be the most frequently pertinent, with 636 cases, including 360 complete and 276 incomplete reports.

Table 1
Data regarding Section 1. Forensic Pathology. Left Blank = no choice was selected.

	Yes N (%)	No N (%)	Left Blank N (%)
Forensic Pathologist ID	1707 (99.2)	14 (0.8)	0 (0)
Other professionals ID	1393 (80.9)	328 (19.1)	0 (0)
Date/Time of corpse finding	1442 (83.8)	279 (16.2)	0 (0)
Last time seen alive	1161 (67.5)	559 (32.5)	1 (0.1)
Intervention of other professionals (first aid, police…)	1487 (86.4)	234 (13.6)	0 (0)
Time of Forensic Pathologist arrival	1717 (99.8)	4 (0.2)	0 (0)
Corpse: Identity known/presumed/ unknown	1698 (98.7)	23 (1.3)	0 (0)
Corpse: Name and Surname	1610 (93.6)	111 (6.4)	0 (0)
Corpse: Gender	1600 (93.0)	120 (7.0)	1 (0.1)
Corpse: Presumed age	1274 (74.0)	446 (25.9)	1 (0.1)
Weather conditions	326 (18.9)	1323 (76.9)	72 (4.2)
Environment	727 (42.2)	983 (57.1)	11 (0.6)
Heating/Cooling source	266 (15.5)	1408 (81.8)	47 (2.7)
Environmental temperature	1451 (84.3)	270 (14.7)	0 (0)
Indoor type	1195 (69.4)	347 (20.2)	179 (10.4)
Entrance door open/close	522 (30.3)	1018 (59.2)	181 (10.5)
Interior doors open/close	205 (11.9)	1330 (77.3)	186 (10.8)
Windows open/close	533 (31.0)	1006 (58.5)	182 (10.6)
(Un)Inhabited	992 (57.6)	550 (32.0)	179 (10.4)
Outdoor environment type	807 (46.9)	572 (33.2)	342 (19.9)
Corpse: environment exposure	1158 (67.3)	562 (32.7)	1 (0.1)
Corpse: clothing	1615 (93.8)	105 (6.1)	1 (0.1)
Corpse: conservation	1571 (91.3)	150 (8.7)	0 (0)
Corpse: algor	1501 (87.2)	219 (12.7)	1 (0.1)
Corpse: rigor	1625 (94.4)	95 (5.5)	1 (0.1)
Corpse: livor	1643 (95.5)	77 (4.5)	1 (0.1)
Presence/Absence of Injury description	1635 (95.0)	85 (4.9)	1 (0.1)
Corpse position	1697 (98.6)	23 (1.3)	1(0.1)
Photo report	1597 (92.8)	124 (7.2)	0 (0)
Sampling	791 (46)	930 (54)	0 (0)

4. Discussion

On-site inspection plays a crucial role in ensuring that the cause and manner of death are accurately determined, and that the dynamics of the death are properly reconstructed. The initial examination of the scene provides essential context that may not be fully appreciated later during external examination and autopsy. For this reason, it is mandatory that the forensic pathologist can carry out his/her professional duties in optimal conditions, with reference to all relevant forensic disciplines – including forensic anthropology, genetics, toxicology, odontology, and entomology. Indeed, these specialized areas often contribute key elements necessary for a comprehensive and accurate forensic evaluation. As such, scientific evidence related to on-site inspection is of great value to the forensic pathologist, as it supports more precise, multidisciplinary assessments. In recent years, several authors have emphasized the importance of this aspect of forensic practice, contributing to a growing body of literature that underscores its relevance and calls for standardized, collaborative approaches [1–7].

The *ECLM on-site inspection form* is designed to facilitate the systematic collection, sampling, and preservation of all elements that may serve as valuable forensic evidence during scene investigations [2]. In the light of these considerations, the present study aims to evaluate the completeness of information documented in a large sample of on-site inspections conducted without the use of the *ECLM on-site inspection form*, in order to assess the potential benefits and added value of adopting this standardized tool.

Regarding *Section 1: Forensic Pathology*, the aspects least frequently documented pertain to environmental characteristics and sampling details. Specifically, information on weather conditions, general environmental features, presence of heating or cooling sources, and the status

Table 2
Data regarding Section 2 – Forensic Anthropology, Section 3 – Forensic Odontology, Section 4 – Forensic Entomology, Section 5 – Forensic Genetics, Section 6 – Forensic Toxicology.

	Pertinent and complete N (%)	Pertinent and incomplete N (%)	Not pertinent N (%)
Forensic anthropology	20 (1.2)	30 (1.7)	1671 (97.1)
Forensic odontology	53 (3.1)	83 (4.8)	1585 (92.1)
Forensic entomology	25 (1.5)	114 (6.6)	1582 (91.9)
Forensic genetics	37 (2.1)	257 (14.9)	1427 (82.9)
Forensic toxicology	360 (20.9)	276 (16.0)	1085 (63.0)

(open or closed) of entrance doors, interior doors, and windows – along with details about the outdoor environment – were reported in fewer than 50 % of the cases. Our findings indicate that such information is often overlooked, despite the fact that the environmental context can significantly influence forensic observations, including the progression of thanatological signs [8]. Furthermore, documenting the status of entrance and interior doors and windows is critical for assessing the potential involvement of third parties. Additionally, thorough recording of sampling procedures in the report is essential to account for all investigative actions performed during the examination.

Conversely, information such as the last time the deceased was seen alive, the estimated age, the type of indoor setting, whether the space was inhabited or uninhabited, and the degree of environmental exposure was reported in 50–80 % of cases. Nevertheless, environmental factors continue to be underreported despite their significant importance for accurate forensic interpretation [8]. Finally, in at least 80 % of cases, the following seventeen items were reported: identification of the forensic pathologist and other professionals involved, date and time of corpse discovery, presence of additional intervening personnel (e.g., emergency responders, police), time of the forensic pathologist's arrival, and the corpse's identity status (known, presumed, or unknown). Additionally, information on the deceased's name and gender, environmental temperature, clothing, state of preservation, presence of algor, rigor, and livor mortis, injury descriptions, body position, and photographic documentation were routinely recorded.

The results from Sections 2 to 6, which cover various forensic sciences (Section 2 – Forensic Anthropology, Section 3 – Forensic Odontology, Section 4 – Forensic Entomology, Section 5 – Forensic Genetics, Section 6 – Forensic Toxicology), are concerning. Except for forensic toxicology, at least 50 % of cases in which each section was deemed pertinent were found to be incomplete. This indicates that information related to these forensic disciplines is frequently inadequately examined and reported. The role of specialized forensic branches – such as forensic anthropology, odontology, entomology, genetics, and toxicology – is well established within the framework of medico-legal investigations. These disciplines provide critical contributions to the identification of the deceased, determination of the postmortem interval, reconstruction of death dynamics, and clarification of the cause and manner of death. Their integration into forensic practice enhances the accuracy, reliability, and completeness of investigative outcomes [9–37]. It is well recognized that, in most cases, the forensic pathologist conducts the on-site inspection without the immediate presence of other specialists, who are often involved at later stages. Therefore, the forensic pathologist must be familiar with the key elements to prioritize for each forensic discipline; however, our findings clearly show that this is often not the case. The implementation of the *ECLM on-site inspection form* could substantially address this deficiency and improve the quality of forensic documentation and the procedure for involvement of other forensic specialists.

Overall, the results obtained document that the items on the *ECLM on-site inspection form* are not always investigated in the on-site inspection reports written without the use of this tool. The results document proving the usefulness of the form as a checklist to examine the main elements of forensic interest.

The use of the *ECLM on-site inspection form* would enable systematic tracking of information gathered during on-site forensic investigations with particular focus not only on the corpse but also on environmental conditions (the least frequently formalized data). The forms offer a straightforward, comprehensive and structured data collection method (via checklist), with the possibility of using specialized forms for specific cases. The use of the *ECLM on-site inspection form* proves to be a valid tool to assist the forensic pathologist during the on-site inspection contributing to the standardization of data collected at the scene, which may ultimately constitute relevant scientific evidence in judicial proceedings (methodological standard). The use of the forms will also prompt the forensic pathologist to guide the investigating officer of the police or other authorities to engage the services of the relevant specialised forensic disciplines. We therefore hope that the forms developed by the ECLM will be systematically adopted in the forensic practice of the forensic pathologist, so that they become a methodological standard for the collection of information during the inspection, which is crucial to produce scientific evidence in court.

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