



Medico-Legal Evaluation of Bodily Injury: Towards Harmonization of Practices

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Abstract

Background: Medico-legal evaluation of bodily injury is essential for judicial decisions in both criminal and civil cases. Despite the availability of assessment tools and protocols, practices remain heterogeneous and subject to significant inter-expert variability.

Objective: To synthesize current literature on medico-legal assessment of bodily injury, highlighting variability between experts, methodological limitations, and strategies for harmonization.

Methods: A literature search was conducted in PubMed, Scopus, and Google Scholar for articles published between 2019 and 2025, in English and French. Keywords included: forensic evaluation, medico-legal assessment, bodily injury, inter-expert variability, harmonization. Sixteen studies were included, covering descriptive, analytical, observational, and validation designs.

Results: Included studies revealed significant inter-expert variability, especially in complex cases such as torture, sexual and physical violence, or cognitive trauma. Standardized tools and structured evaluation frameworks improved reproducibility. Variability in report quality and methodological inconsistencies remain major challenges. Harmonization through guidelines, consensus, and training is increasingly recommended.

Conclusion: Medico-legal assessment of bodily injury is influenced by methodological, experiential, and contextual factors. Adoption of standardized tools, validated protocols, and harmonized practices is essential to enhance reliability, consistency, and equity in medico-legal expertise. Future multicenter studies are needed to evaluate the impact of these strategies.

Keywords: Medico-legal evaluation; Bodily injury; Inter-expert variability; Harmonization; Forensic medicine

Introduction

Medico-legal assessment of bodily injury is a central component of judicial and compensation decisions in both criminal and civil proceedings. It enables the evaluation of the physical, functional, and psychological consequences of bodily harm and guides the compensation of damage. This mission places the medical expert in a key position at the interface between medicine and law [1]. Despite the existence of standardized scales and assessment tools, practices remain heterogeneous. Inter-expert variability may lead to divergent conclusions in similar clinical situations [2,3]. Traditional scales sometimes lack reproducibility and are insufficiently adapted to complex cases [4,5]. Consequently, the harmonization of assessment methods has become a major challenge to improve the equity and reliability of medico-legal

expertise [6,7]. The objective of this review is to synthesize current practices, identify sources of variability, and discuss perspectives for harmonizing medico-legal assessment methods of bodily injury.

Methodology

A literature search was conducted in the PubMed, Scopus, and Google Scholar databases, covering publications published between 2019 and 2025, in French and English. The keywords used included: forensic evaluation, medico-legal assessment, bodily injury, inter-expert variability, and harmonization. Inclusion criteria comprised original studies or reviews addressing medico-legal assessment of bodily injury, as well as articles focusing on inter-expert variability and recommendations

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for harmonizing practices. Exclusion criteria included animal or experimental studies and publications lacking original data or not relevant to medico-legal practice. Extracted data included study type, study population, methods used, main findings, and recommendations regarding the harmonization of medico-legal assessment of bodily injury.

Results

A total of sixteen studies published between 2019 and 2025 were included in this review and summarized in (Table 1) [1-16].

Table 1: Characteristics and main findings of studies included in the review on medico-legal assessment of bodily injury.

Study	Author, year [reference]	Main topic	Study type	Population / Material	Main findings
1	Ingravallo F et al., 2020 [1]	Methodological consensus	Consensus conference	Multidisciplinary experts	Harmonized recommendations
2	Franceschetti L et al., 2023 [2]	Inter-expert variability	Inter-observer analysis	Victims of torture	Low inter-expert agreement despite use of the Istanbul Protocol
3	Walz C et al., <i>Int J Legal Med</i> , 2023 [3]	Physical violence	Comparative study	Examined victims	Forensic experts outperform non-trained clinicians
4	Stevenson C et al., 2022 [4]	Reliability of assessment tools	Validation study	Medico-legal reports	Standardized tool improves reproducibility
5	Albano GD et al., 2025 [5]	Forensic imaging	Review	Musculoskeletal injuries	Limitations in injury dating
6	Kerbacher S et al., 2019 [6]	European organization	Descriptive review	EU forensic medicine services	Major heterogeneity in practices
7	Giovannini E et al., 2024 [7]	Road traffic injuries	Systematic review	Traffic accidents	Need for flexible assessment tools
8	Makni C et al., 2021 [8]	Quality of initial medical certificates	Descriptive study	450 IMCs – Tunisia	High heterogeneity of certificates with judicial impact
9	Colin P et al., 2024 [9]	Quality of expert reports	Analytical study	30 judicial expert reports	Frequent methodological shortcomings
10	El Shehaby DM et al., 2020 [10]	Maxillofacial assessment	Retrospective study	Facial trauma	Correlation between facial injuries and CT findings
11	Aydoğdu H et al., 2022 [11]	Cognitive trauma	Observational study	Traumatic brain injury	Frequent underestimation of cognitive disorders
12	Giovannini E et al., 2024 [12]	Injured children	Systematic review	Pediatrics	Specific medico-legal considerations
13	Tullio V et al., 2023 [13]	Sexual violence	Qualitative study	Migrant women	Ethical and medico-legal challenges
14	Giuvara RC et al., 2024 [14]	Maxillofacial trauma	Observational study	General practice	Inadequate management and assessment
15	Jühling M et al., 2023 [15]	Torture – Germany	National study	Asylum seekers	Incomplete application of the Istanbul Protocol

16	Jali MMA et al., 2025 [16]	Forensic medicine and justice	Review	Criminal cases	Multiple interfaces and systemic limitations
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Inter-expert variability and reproducibility of assessments

Several studies highlight significant inter-expert variability in the medico-legal assessment of bodily injury. An inter-observer analysis conducted among victims of torture demonstrated a low level of agreement between experts, despite the use of the Istanbul Protocol, underscoring the limitations of existing guidelines when applied without strictly standardized procedures [2]. Similarly, the assessment of physical violence revealed notable discrepancies between trained forensic experts and non-specialist clinicians, with potential consequences for the evaluation of injury severity and outcomes [3]. Post-traumatic cognitive disorders also represent a major source of variability. An observational study reported frequent underestimation of these impairments in routine medico-legal practice [11]. These findings highlight persistent difficulties in objectively assessing certain functional and psychological dimensions of bodily injury.

Quality of medico-legal documents

The quality of initial medical certificates (IMCs) and expert reports appears to be a key determinant of assessment reliability. A Tunisian study focusing on IMCs revealed substantial heterogeneity in drafting practices, which may influence judicial and compensation decisions [8]. Similarly, analyses of judicial expert reports identified recurrent methodological shortcomings, particularly in terms of structure, justification of conclusions, and traceability of expert reasoning [9]. These findings emphasize the need for improved practitioner training and increased use of standardized reporting templates.

Contribution of standardized tools and guidelines

Several studies assessed the value of structured tools in improving the reliability of medico-legal expertise. A validation study of a tool designed to assess the quality of medico-legal reports demonstrated a significant improvement in reproducibility and inter-expert consistency, suggesting real potential for reducing subjectivity [4]. These results are consistent with recommendations from consensus conferences, which emphasize the importance of methodological harmonization while preserving individualized expert judgment [1]. At the European level, a review of forensic medicine services highlighted marked heterogeneity in organization and practices, reinforcing the argument for shared standards and common reference frameworks [6].

Specific contexts of bodily injury

Studies focusing on specific contexts illustrate the growing complexity of contemporary medico-legal assessment. Road traffic injuries have been addressed in systematic reviews highlighting the need for flexible tools capable of accounting for the diversity of injury mechanisms and functional consequences [7]. In pediatrics, significant medico-legal specificities have been reported, requiring adaptation of assessment methods to the developmental characteristics of children [12]. Maxillofacial injuries were examined in several studies, revealing deficiencies in both management and assessment in specialized settings as well as in general practice [10,14]. Furthermore, situations involving sexual violence and migration raise major ethical and medico-legal challenges, requiring a multidisciplinary and culturally sensitive approach [13,15]. Finally, a broader reflection on the interfaces between forensic medicine and the justice system highlights current limitations of the expert system and the need for evolving practices in response to increasing societal expectations [16].

Discussion

This review highlights the persistent variability in medico-legal assessment practices of bodily injury, despite the availability of recognized protocols, recommendations, and methodological tools [1,5,6]. The analyzed studies demonstrate that this variability affects the interpretation of injuries, the drafting of medico-legal documents, and the assessment of functional and psychological consequences, with direct implications for judicial and compensation decisions [2,3,4,8,9]. Inter-expert variability emerges as a recurrent finding, particularly in complex situations such as intentional violence, torture, or cognitive trauma [2,3,11,15]. Even in contexts where international reference frameworks exist, such as the Istanbul Protocol, a low level of inter-observer agreement has been reported, underscoring the limitations of non-standardized application and the dependence on individual expert experience [2]. These findings confirm that the mere availability of methodological guidelines is insufficient to ensure homogeneous assessments in the absence of specific training and structured tools [4,5,6]. The quality of initial medical certificates and judicial expert reports represents another major issue. The included studies reveal substantial heterogeneity in the structure, content, and medico-legal reasoning of produced documents, with methodological shortcomings that may weaken their evidentiary value [8,9]. This drafting variability is particularly concerning in judicial contexts, where medical

documents often constitute key elements in judges' appraisal of bodily injury [9].

Several studies emphasize the value of standardized tools and structured reporting templates in improving the reproducibility and reliability of expert assessments [4,10]. The use of validated assessment grids or standardized report formats appears to reduce subjectivity and promote better inter-expert consistency [4,5]. However, these studies also stress the importance of preserving individualized expert judgment, which is essential to account for the specific clinical, functional, and contextual characteristics of each victim [1,5,6]. The challenge therefore lies in achieving a balance between methodological standardization and personalized assessment of bodily injury. The specific contexts addressed in the included studies—road traffic injuries, maxillofacial trauma, pediatrics, sexual violence, and migration—illustrate the increasing complexity of contemporary medico-legal situations [7,10,12,13,14,15]. These contexts require specialized skills and adaptation of assessment methods, further reinforcing the need for continuous training of physicians involved in forensic medicine and close multidisciplinary collaboration with judicial and social stakeholders [12,13,14]. Finally, the heterogeneity observed across countries and medico-legal systems highlights the absence of a harmonized international framework for bodily injury assessment [6,16]. Organizational, legal, and cultural disparities influence practices and represent a barrier to the comparability of expert evaluations. Nevertheless, consensus initiatives and recent efforts toward shared reference frameworks offer promising perspectives for improving the coherence and equity of medico-legal expertise [1,5].

This review has certain limitations. It is based on a limited number of studies with substantial methodological heterogeneity, precluding quantitative meta-analysis. In addition, most of the included studies are observational or descriptive, exposing the findings to potential bias [2,3,8]. Nevertheless, this diversity reflects the reality of medico-legal practices and supports the relevance of a qualitative and synthetic approach [4,5]. The findings of this review support the development and validation of standardized assessment tools, the improvement of initial and continuing education in forensic medicine, and the progressive harmonization of practices at both national and international levels [1,4,5,6]. Future multicenter and comparative studies are needed to assess the actual impact of these approaches on the reliability and equity of medico-legal assessment of bodily injury [16]. These methodological challenges are also observed in specific contexts such as the assessment of alleged injuries among asylum seekers. A four-year retrospective study highlights the importance of rigorous documentation of physical evidence to support accounts of torture and abuse [17]. The absence of clear definitions, such as wound depth in many medico-legal reports, represents a major methodological shortcoming, emphasizing the

need for more precise documentation of bodily injuries [18]. Furthermore, the psychological and physical sequelae of torture survivors require medico-legal expertise that integrates both clinical and psychological elements, reinforcing the idea that assessments should not be limited to traditional scales focused solely on isolated physical criteria [19]. Finally, a multidisciplinary approach incorporating specialized examinations and instrumental tools has been proposed to improve the quality of physical abuse assessments, in line with recommendations advocating methodological harmonization across medico-legal practices [20].

Conclusion

Medico-legal assessment of bodily injury remains characterized by significant inter-expert variability, methodological shortcomings, and heterogeneity in the quality of medical certificates and expert reports. The use of standardized tools, validated assessment grids, and harmonized reference frameworks, combined with specialized training, appears essential to improve the reliability, consistency, and equity of expert evaluations. Future perspectives include the implementation of national and international protocols and the conduct of multicenter studies aimed at reducing disparities and strengthening the credibility of medico-legal expertise.

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