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Recognition, Collection, and Preservation of Forensic Evidence by Perioperative Nurses in Trauma Patients: A Scoping Review

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Abstract

Background

Trauma patients treated in the operating room may also be involved in a forensic investigation, particularly after firearm, sharp-force, penetrating, or blunt injuries. During their care, perioperative nurses may encounter clothing, projectiles, biological material, or other physical evidence that must be recognized and protected. Most forensic nursing reviews have examined emergency care or Sexual Assault Nurse Examiner practice. What is known about evidence management during surgery has not been brought together in the same way.

Methods

This scoping review was conducted in accordance with Joanna Briggs Institute methodology and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). PubMed, CINAHL Ultimate, Scopus, Web of Science Core Collection, ProQuest Dissertations & Theses, and Google Scholar were searched from database inception to July 2026. TR Dizin and backward and forward citation searches were also used. Two reviewers independently screened records against Population-Concept-Context eligibility criteria.

Results

The search yielded 375 records (PubMed n = 37, CINAHL Ultimate n = 38, Scopus n = 54, Web of Science n = 36, ProQuest Dissertations & Theses n = 10, and Google Scholar n = 200). After 88 duplicate records were removed, 287 unique records underwent title and abstract screening. Twenty reports were assessed in full. Fifteen studies identified through database searching and one additional study identified through CitationChaser-assisted forward and backward citation searching met the eligibility criteria, resulting in 16 included sources.

Conclusions

Research on forensic evidence recognition, collection, and preservation has concentrated mainly on emergency departments, Sexual Assault Nurse Examiner programmes, and forensic mental health settings. Perioperative forensic nursing remains under-researched despite the risk that evidence may be altered or permanently lost during surgical care. Perioperative-specific research, standardized evidence-preservation and chain-of-custody protocols, and integration of forensic competencies into perioperative nursing education and practice are needed.

Trial and protocol registration

The review protocol was registered with the Open Science Framework (OSF) on 21 July 2026 and is available at https://osf.io/7gkq9.

Background

Patients undergoing trauma surgery due to firearm injuries, injuries caused by sharp or cutting instruments, blunt trauma, or other injuries of suspicious or criminal origin may arrive in the operating room with physical evidence of

forensic significance. Clothing, bullet projectiles and fragments, gunshot residue, trace evidence collected from the hands and under the fingernails, foreign objects removed from the body, and the morphological characteristics of the wounds themselves may serve as evidence in the subsequent forensic judicial process [1–3]. Clinical forensic nursing has evolved based on the recognition that, in forensic processes across all healthcare facilities, it is often the first—and sometimes the only—point where such materials can be secured before they are lost or compromised [4].

The operating room is a particularly vulnerable point in the life of forensic evidence. Clothing may be cut away, wounds cleaned or debrided, and body cavities irrigated as part of necessary treatment. Instruments used to retrieve a projectile may also mark its surface and interfere with later ballistic comparison. Evidence can therefore be altered or lost through otherwise routine surgical care when collection and preservation procedures are not followed [5, 6]. Perioperative nurses often handle these materials before such changes become irreversible. How they recognize, handle, document, and transfer an item may ultimately influence whether it can be relied upon in court [2, 7].

Only a small body of literature has examined these responsibilities within perioperative practice, and much of it is historical. Muro and Easter discussed how clinical forensic principles apply to the care of victims and suspected perpetrators, including the recording of patients' statements and behaviour and the preparation of legally defensible documentation [1]. Carrigan et al. linked evidence loss in the operating room to limited experience and the absence of established procedures, and outlined elements for institutional policy [8]. Wick described how the care of a patient affected by violence differs from routine surgical care, with particular attention to identifying, preserving, and documenting physical evidence [2]. Evans and Stagner concentrated on the chain of custody, from recognition and collection through packaging, secure storage, documented handover, and protocol development [7]. Porteous considered the tension between confidentiality, patient privacy, police requests, and legal documentation [9]. These concerns were later reflected in AORN recommendations for specimen care and handling [3]. Nevertheless, the literature still consists largely of professional guidance, expert commentary, and practice recommendations rather than primary research. In one of the few descriptive studies, Ozsaker et al. [10] reported uncertainty among staff about patients' forensic status, perceived deficiencies in evidence-preservation practice, and a clear demand for in-service education.

In contrast, the field of forensic nursing as a whole has expanded significantly over the past 30 years; established roles such as the sexual assault examination nurse have emerged, and studies have brought greater attention to the forensic responsibilities of emergency department nurses [11, 12]. However, a study assessing the scientific state of the field has revealed persistent gaps between the research base and areas of practice and has emphasized the need to expand the evidence base [13]. Rabiais et al. [14] mapped the responsibilities of nurses regarding the preservation of forensic evidence in in-hospital and out-of-hospital emergency settings and highlighted six key areas, including evidence recognition, documentation, chain of evidence, and interprofessional collaboration. However, the review did not specifically address perioperative nursing practice. Similarly, previous reviews have focused on emergency departments or disaster settings, largely overlooking the perioperative setting [14–16]. No review has been found in the literature that systematically maps forensic evidence management in the perioperative setting—a distinct environment characterized by its unique workflow, team structure, and points of risk for evidence loss. Since the existing literature on forensic evidence includes practice guidelines, expert opinions, and experimental and descriptive studies, a scoping review was selected as the appropriate design to identify gaps by mapping the scope, diversity, and characteristics of the literature [17, 18]. The overall objective of this scoping

review is to map the literature regarding the identification, collection, preservation, and documentation of forensic evidence by perioperative nurses in trauma patients.

Methods

Study design

A scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) methodology and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [17, 18]. The review process comprised formulation of the review question, identification and selection of eligible evidence sources, data charting, and descriptive and narrative synthesis. The Population-Concept-Context (PCC) framework was used to formulate the review question and eligibility criteria (Table 1). The protocol was registered with the Open Science Framework (OSF) on 21 July 2026 (https://osf.io/7gkq9), before data charting. PROSPERO does not accept registrations for scoping reviews, as it is restricted to systematic reviews with a health-related outcome; OSF was therefore used, consistent with JBI guidance and with current practice in the field.

Table 1
Population–Concept–Context (PCC) eligibility framework.

PCC Element	Description
Population	Perioperative nurses, including nurses working in operating rooms and post-anesthesia care units (PACUs). Studies involving multidisciplinary surgical teams (e.g., nurses and physicians) were also eligible when nurse-specific data or perioperative nursing findings could be identified separately.
Concept	Forensic evidence recognition, collection, preservation, documentation, and transfer (chain of custody); perioperative nurses' knowledge, attitudes, and practices regarding forensic evidence management; as well as relevant protocols, clinical guidelines, and educational interventions.
Context	Perioperative care settings, including operating rooms and the perioperative period, involving patients with forensic or medicolegal significance (e.g., penetrating trauma, blunt trauma, assault, suspected injury, or suspicious death). Studies conducted in all countries and healthcare systems were considered eligible.

Search methods

A systematic search strategy was developed to identify studies relevant to the review question. A three-block search strategy combining terms related to (i) the perioperative setting/operating room, (ii) nursing, and (iii) forensic evidence/chain of custody were initially developed and piloted in PubMed before being adapted to the controlled vocabulary and search syntax of each database.

The literature search was conducted between 21 and 26 July 2026 in PubMed, CINAHL Ultimate (EBSCOhost), Scopus, Web of Science Core Collection, ProQuest Dissertations & Theses, and Google Scholar, without restrictions on publication year. In accordance with the registered protocol, the first 200 records retrieved from Google Scholar were screened. Records were imported into Zotero, where duplicate records were removed during import (200 to 185 records).

To maximize retrieval of national literature, the Turkish national database TR Dizin was searched on 24 July 2026. Because the search interface does not support Boolean operators, six individual keyword searches were performed in the abstract field (operating room, perioperative, forensic evidence, forensic case, forensic nursing, and chain of evidence), and all retrieved records were screened manually. The complete search strategies for all databases are presented in Additional file 1.

To complement the database search, backward and forward citation searching was performed for all included studies. Citation chasing was conducted using the open-access CitationChaser tool via the Lens.org citation index for studies with available DOIs [19]. For studies without DOIs, reference lists were screened manually. Records identified through citation searching were deduplicated against the database results and assessed using the same eligibility criteria. Citation searching continued iteratively until no additional eligible studies were identified, and this point was considered evidence saturation.

Inclusion and exclusion criteria

The eligibility criteria were defined to capture evidence concerning the role of perioperative nurses in the recognition, collection, preservation, documentation, transfer, and management of forensic evidence in trauma patients. Eligible evidence sources included qualitative, quantitative, and mixed-methods primary studies; case series and program descriptions; clinical or expert reviews containing substantive perioperative guidance; and reports describing the development or implementation of clinical protocols or practice guidelines. Sources were required to be available in full text and published in English or Turkish. No publication-date restriction was applied.

Sources were excluded if they: (a) focused exclusively on emergency department nurses or Sexual Assault Nurse Examiners without perioperative findings; (b) were book reviews, letters, editorials, or commentaries without substantive empirical data or perioperative clinical guidance; (c) addressed autopsy, post-mortem, or mortuary procedures rather than the care of living perioperative patients; (d) focused on forensic psychiatric or mental health nursing rather than evidence preservation and management; or (e) addressed medicolegal liability or malpractice without examining forensic evidence recognition, collection, preservation, documentation, transfer, or management.

Data charting and collation of results

Data were extracted from the included studies using a predefined data-charting form developed in accordance with the Joanna Briggs Institute (JBI) guidance for scoping reviews. Before formal data extraction, the charting form was independently piloted by two reviewers using five purposively selected studies representing the diversity of evidence included in the review, comprising a clinical guidance article, a retrospective record review, a protocol development study, and two cross-sectional studies. After comparing data from pilot studies, three limitations of the preliminary scheduling form were identified during a consensus meeting where evaluators discussed the results. The scheduling form was improved by adding fields for pre- and post-operative stages and for the type of forensic evidence as deemed necessary, using a predefined coding framework, and establishing standardized registration rules for studies without participant samples.

The final data-charting form captured information on the author(s), year of publication, country, study aim, study design and publication type, setting and sample, concept addressed [knowledge, attitudes, practices, protocols/guidelines, or educational interventions], perioperative phase, type of forensic evidence, measurement tools, key findings, and research gaps identified by the study authors. Data extraction was undertaken by one

reviewer and independently verified by a second reviewer to ensure the accuracy and consistency of the extracted information. An overview of the studies included is presented in Table 2.

Study selection was conducted independently by two reviewers using Rayyan [20]. Titles and abstracts were screened against the predefined eligibility criteria, followed by independent full-text assessment of potentially relevant reports. Disagreements at both stages were resolved through discussion; consultation with a third reviewer was planned if consensus could not be reached. The selection process is reported in a PRISMA-ScR flow diagram.

In keeping with JBI guidance, we did not conduct a formal methodological appraisal or risk-of-bias assessment, because the purpose was to describe the range and nature of the available evidence rather than judge intervention effectiveness. A meta-analysis was likewise inappropriate. We summarized the extracted data using counts, tables, and narrative synthesis, and grouped recurrent findings under six areas: study characteristics and geographical distribution; types of evidence and recognition strategies; preservation and chain of custody; nurses' roles and ethical responsibilities; knowledge, practice, and education; and protocol or quality-improvement initiatives. The two reviewers revisited these groupings during synthesis and agreed on the final thematic structure used in Tables 2 and 3.

Table 2
Characteristics of the included studies (n = 16)

Study	Country	Aim	Methods/study design	Setting and sample	Key findings
Schramm (1991) *Forensic medicine: what the perioperative nurse needs to know.*	USA	Introduces forensic principles for perioperative practice.	Expert review / educational article	Educational article; no participant sample	Foundational guidance on evidence of integrity and injury patterns.
Muro & Easter (1994) *Clinical forensics for perioperative nurses.*	USA	Describe perioperative forensic evidence management.	Clinical review	Literature review; no participant sample	Comprehensive guidance on recognition, collection, preservation and chain of custody.
Davis (1994) *Your role in death investigations.*	USA	Outline perioperative responsibilities in death investigations.	Practice article, case-based	Case-based; no participant sample	Reporting duties and evidence preservation.
Carrigan et al. (2000) *Forensic perioperative nursing: advocates for justice.*	Canada	Describe forensic nursing in trauma surgery.	Review, conceptual	Conceptual; no participant sample	OR-specific handling of bullets, knives and chain of custody.
Wick (2000) *Don't destroy the evidence!*	USA	Develop evidence management procedures.	Mixed educational/practice	Level I trauma center; 76 cases	Protocols for GSR/bullets and documentation.
Evans & Stagner (2003) *Maintaining the chain of custody: evidence handling in forensic cases.*	USA	Implement a forensic nursing program.	Program description	Hospital operating room; no participant sample	Drop-box system and standardized documentation.
Porteous (2005) *Don't tip the scales! Care for patients involved in a police investigation.*	Canada	Provide perioperative evidence-preservation guidance.	Practice guideline	Operating room; no participant sample	Guidance across all perioperative phases.

Study	Country	Aim	Methods/study design	Setting and sample	Key findings
AORN RP (2006) *Recommended practices for the care and handling of specimens in the perioperative environment.*	USA	Standardize forensic specimen management.	Guideline, consensus	Consensus guideline; no participant sample	Dedicated forensic specimen recommendations.
Snow (2009) *The role of the registered nurse in collecting and documenting physical forensic evidence related to fatal gunshot wounds.*	USA	Evaluate ballistic evidence management.	Retrospective record review	Medical examiner setting; 451 records	Most ballistic evidence managed in the OR.
Eldredge (2010) *Forensics in the trauma setting.*	USA	Implement forensic resources.	Case study	Level II trauma center; 1 case	SAFE program and forensic cart.
Masteller et al. (2014) *Proper handling of bullet evidence in trauma patients.*	USA	Recommend bullet retrieval techniques.	Expert review	Technical guidance; no participant sample	Plastic instruments reduce toolmark damage.
Ozsaker et al. (2020) *Forensic cases in the operating room: knowledge and practices of physicians and nurses.*	Turkey	Assess forensic knowledge.	Cross-sectional	Hospital; 198 physicians and nurses	Knowledge deficits and training needs.
Luque-Oliveros et al. (2023) *MLuq protocol: immobilization of the white weapon, preservation of*	Spain	Develop the MLuq protocol.	Expert consensus	Multidisciplinary panel; no participant sample	Protocol for penetrating injuries.

Study	Country	Aim	Methods/study design	Setting and sample	Key findings
DNA traces, and chain of custody.					
Marlor et al. (2024) *Misplaced evidence, missed opportunities: protocols for handling ballistic evidence in pediatric patients.*	USA	Evaluate protocol implementation.	Quality improvement	Pediatric trauma centre; 36 cases	Protocol improved timely evidence transfer.
Jeon & Park (2025) *The effect of job characteristics and professional self-concept on competency of forensic nursing among perioperative nurses.*	South Korea	Identify competency predictors.	Cross-sectional	4 university hospitals; 164 OR nurses	Professional self-concept predicted competency.
Özkan et al. (2025) *Healthcare professionals' knowledge level regarding forensic cases in the intensive care and operating room.*	Turkey	Compare knowledge and practice.	Comparative cross-sectional	Operating room and ICU; 116 professionals	High knowledge but moderate practice.

Table 3
Key themes patterning chart of the included studies (n = 16)

Study	Types of forensic evidence and recognition strategies	Evidence preservation and chain of custody	Roles, responsibilities and documentation	Knowledge, clinical practice and education	Protocol development and quality improvement
Schramm (1991) *Forensic medicine: what the perioperative nurse needs to know.*	✓	✓		✓	
Muro & Easter (1994) *Clinical forensics for perioperative nurses.*	✓	✓		✓	
Davis (1994) *Your role in death investigations.*	✓	✓	✓		
Carrigan et al. (2000) *Forensic perioperative nursing: advocates for justice.*	✓	✓			✓
Wick (2000) *Don't destroy the evidence!*	✓	✓	✓		✓
Evans & Stagner (2003) *Maintaining the chain of custody: evidence handling in forensic cases.*	✓	✓	✓	✓	✓
Porteous (2005) *Don't tip the scales! Care for patients involved in a police investigation.*	✓	✓	✓		✓
AORN RP (2006) *Recommended practices for the care and handling of specimens in the perioperative environment.*	✓	✓	✓	✓	✓
Snow (2009) *The role of the registered nurse in collecting and documenting physical*	✓	✓	✓		

Study	Types of forensic evidence and recognition strategies	Evidence preservation and chain of custody	Roles, responsibilities and documentation	Knowledge, clinical practice and education	Protocol development and quality improvement
forensic evidence related to fatal gunshot wounds.					
Eldredge (2010) *Forensics in the trauma setting.*	✓	✓	✓	✓	✓
Masteller et al. (2014) *Proper handling of bullet evidence in trauma patients.*	✓	✓			
Ozsaker et al. (2020) *Forensic cases in the operating room: knowledge and practices of physicians and nurses.*	✓	✓		✓	
Luque-Oliveros et al. (2023) *MLuq protocol: immobilization of the white weapon, preservation of DNA traces, and chain of custody.*	✓	✓	✓		✓
Marlor et al. (2024) *Misplaced evidence, missed opportunities: protocols for handling ballistic evidence in pediatric patients.*	✓	✓	✓		✓
Jeon & Park (2025) *The effect of job characteristics and professional self-concept on competency of forensic nursing among perioperative nurses.*				✓	
Özkan et al. (2025) *Healthcare professionals' knowledge level regarding forensic cases in the intensive care and operating room.*	✓	✓		✓	

Use of AI-assisted tools

ChatGPT and Grammarly assisted with English-language editing and manuscript presentation. They were not used to decide eligibility, extract data, analyze findings, or draw conclusions. Both authors reviewed every suggested revision and accept responsibility for the submitted text.

Results

Study selection

Database searches returned 375 records: 37 from PubMed, 38 from CINAHL Ultimate, 54 from Scopus, 36 from Web of Science Core Collection, 10 from ProQuest Dissertations & Theses, and the first 200 Google Scholar results. Zotero removed 15 duplicates within the Google Scholar set, leaving 185 records from that source. The combined set contained 360 records; removal of a further 73 cross-database duplicates left 287 unique records for title and abstract screening.

Two reviewers independently screened the titles and abstracts of 287 records and excluded 268. The remaining 19 database records were retrieved for full-text assessment. CitationChaser-assisted backward and forward searching identified one further report for full-text review, so 20 reports were assessed in full. Four were excluded at this stage: two provided neither original research findings nor substantial guidance for perioperative practice, one thesis fell outside the scope of the review, and one study did not report perioperative findings separately from other clinical data. The review therefore included 16 sources, comprising 15 found through database searches and one added through citation searching. Hanshaw [21], a potentially eligible experimental report on bullet retrieval, was sought through interlibrary loan but could not be obtained. It was recorded separately as a report not retrieved and was not counted among the 20 full texts assessed. Figure 1 presents the complete selection process.

The Turkish national database (TR Dizin) was searched separately. Because the platform does not support reliable Boolean searching, bulk export, or electronic deduplication, records were screened manually and reported independently of the PRISMA flow. A total of 450 records were identified through multiple search strategies; however, none met the eligibility criteria for inclusion in the review.

Citation searching

Backward and forward citation searching was undertaken for all 16 included studies, together with forward-only searching for Hanshaw, whose backward reference list could not be screened because its full text was unavailable. Backward searching used CitationChaser through the Lens.org database for the ten included studies with a DOI (89 records) and manual reference-list screening for the remaining five without a DOI (136 records). Forward searching used CitationChaser for the same ten studies with a DOI (83 records); Carrigan et al. and Hanshaw were searched forward individually through CitationChaser (3 records); and the remaining four included studies without a DOI were searched forward manually via Google Scholar (5 records). None of the manual or individually screened records met the eligibility criteria. A second round of citation searching was subsequently undertaken on the newly identified eligible study's own backward and forward citations, yielding a further seven records; no additional eligible studies were identified. Overall, 323 citation records were examined, of which nine unique records underwent full assessment: eight were excluded, and one additional study was included in the review. No further eligible studies were identified in subsequent rounds, indicating that citation searching had reached saturation.

Study characteristics

The 16 included sources were published from 1991 to 2025, showing that perioperative evidence management has appeared intermittently in the nursing literature for more than three decades. Ten originated in the United States, two in Canada, two in Turkey, one in Spain, and one in South Korea. North American publications account for most of the evidence, consistent with the earlier development of forensic nursing practice in that region. The Turkish studies were both recent (2020 and 2025), which may indicate growing national interest. Tables 2 and 3 summarize the included sources [1–3, 5–10, 22–28].

Research studies were outnumbered by guidance and practice-based publications. We identified three descriptive cross-sectional studies, two retrospective record reviews, and three protocol-development or quality-improvement reports. The remaining eight sources were guidance documents, expert consensus papers, reviews, or practice articles. Table 2 provides their main characteristics.

Types of forensic evidence and recognition strategies

The literature covered several forms of perioperative forensic evidence, but ballistic material received the greatest attention. Bullets, cartridge cases, fragments, and gunshot residue were discussed in sources spanning both early guidance and more recent protocol work [1, 2, 5–9, 27, 28]. Clothing was another recurring concern, especially when textiles carried blood, other biological material, or gunshot residue and therefore required careful handling [1, 2, 7, 9, 10, 25]. Fewer sources addressed blood, DNA, hair, and fingernail material in detail. The MLuq protocol and the AORN recommendations were notable exceptions, setting out standardized handling intended to limit contamination and retain evidential value [3, 26].

Recognition preceded every other evidence-management task described in the included sources. Schramm [22], for example, linked the recognition of entry and exit wounds and related gunshot patterns with accurate recording and preservation. Wick [2] similarly warned that clinical material may be lost, contaminated, or destroyed when staff do not appreciate its possible forensic relevance. Taken together, the sources position early recognition as the practical starting point for collection, preservation, documentation, and continuity of custody [1–3, 5–10, 22, 26–28].

Forensic evidence preservation techniques and chain of custody

Chain of custody is the uninterrupted documentation of the process of handling evidence to preserve its legal validity [3, 7]. A consistent pattern of recommendations is seen in bullet packing: bullets should not be handled with metal tools [forceps, hemostat]; instead, they should be removed with plastic or rubber-tipped tools or gloved hands [2, 3, 6, 7]. Section Recommended Practices IX of the AORN guidance requires bullets to be placed in a non-metallic container and then in a sealed evidence envelope [3]. Common emphasis in garment management is that the garment should be cut at the hole or seam line, stored in separate paper bags [never plastic], and air-dried if wet [2, 3, 7, 10, 25]; the use of plastic bags can trap moisture, leading to mold growth and DNA degradation [7]. AORN standards also require that each specimen be identified with two authenticators and that chain of custody forms be signed at each handover (from nurse to law enforcement, from law enforcement to laboratory) [3].

Roles, responsibilities and ethical considerations

The role of a nurse is not limited to technical evidence gathering. Carrigan et al. [8] stated that nurses are "advocates for justice." The basic principle is that the legal process should never delay life-saving intervention, but the integrity of evidence should also be considered during the intervention [22]. Porteous [9] drew attention to the delicate balance between patient privacy and the obligation to provide information to law enforcement in patients

who are the subject of police investigation; he emphasized that hospital records can be accepted as evidence in court. Davis [23] addressed the legal reporting obligations of nurses in cases resulting in death.

Knowledge, practice and educational needs

Descriptive studies show significant gaps in the level of forensic knowledge of perioperative personnel. Ozsaker et al. [10] reported that only 38.9% of participants knew that hands should not be wiped before evidence collection, 52.5% had received no training, and 80.3% requested training. Özkan et al. [25] reported that knowledge scores were high, while application scores were moderate, with a moderate positive correlation between the two ($r = 0.541$; $p < 0.001$); significant knowledge gaps were found in technical matters such as drying wet material. Jeon and Park [24] showed that professional self-concept and job characteristics were related to forensic nursing competence.

Protocol development and quality improvement

The strongest practical evidence in the set comes from studies demonstrating the effectiveness of structured protocols. Luque-Oliveros et al. [26] developed the MLuq protocol for instrument immobilization and DNA preservation in patients with embedded sharp instruments. Marlor et al. [6] reported that following a new ballistic delivery protocol in a pediatric trauma center, 100% of the evidence retrieved after the protocol was delivered to law enforcement within 14 days, in contrast to 24 "unclaimed" ballistic pieces of evidence before the protocol (median time lost 1,397 days). Eldredge [28] describes the institutional forensic practice experience developed by the SAFE team at York Hospital Level II trauma center; the AORN-approved "Forensics and the OR: The Basics" training program; and the creation of a forensic cart specific to the operating room.

Discussion

We found no earlier review devoted specifically to forensic evidence management by perioperative nurses. Across the 16 included sources, three findings recurred. First, recommendations to avoid metal instruments, package items separately and dry, and document each handover were remarkably consistent, but were usually supported by expert guidance rather than comparative research. Second, descriptive studies from different countries repeatedly reported limited forensic education and a gap between what staff knew and what they did in practice. Third, the small number of protocol reports suggested that structured procedures can reduce evidence loss. Earlier reviews concentrated on emergency departments, SANE practice, or disaster settings [11–16]. By focusing on surgery, this review identifies risks that those syntheses did not examine separately: work within the sterile field, treatment-related alteration of evidence, and the need to preserve material without delaying urgent care. The reference patterns also underline the gap. Even Eldredge's operating-room programme and forensic cart [28] drew much of their support from emergency and sexual-assault practice.

Methodological inconsistency. Guidance was not uniform for every procedure. Evans and Stagner [7] advised wrapping a retrieved bullet in cotton before placing it in a peel pack, whereas Porteous [9] specified dry gauze. Masteller et al. [5] and Marlor et al. [6] agreed that metal instruments should be avoided but left washing decisions to local policy. Such variation is more consistent with institution-based practice than with a well-tested comparative evidence base.

Training gap

Descriptive studies from three different countries exhibit a consistent pattern: Ozsaker et al. [10] (Turkey) reported that 52.5% of participants had received no forensic training, Özkan et al. [25] (Turkey) reported that the level of

knowledge was high but the level of application was moderate [r = 0.541], and Jeon and Park [24] (South Korea) reported that only 12.8% of participants had received training. The similarity of these three independent findings, despite their geographical diversity, indicates that the training gap is a structural, not a local, problem.

The impact of structured protocols

The strongest empirical evidence in the set comes from the only study that directly measures the outcome of protocol implementation: Marlor et al. [6] reported that 100% of ballistic evidence extracted following a new chain-of-custody protocol was delivered to law enforcement within 14 days (following a period before the protocol where 24 pieces of evidence were lost in a median of 1,397 days). This single study is the most concrete evidence in the set that standardization can provide feasible and measurable benefits; however, its single-center nature limits its generalizability.

Excluded related literature

Studies on the medicolegal/malpractice liability of perioperative nurses (e.g., counting errors/forgotten body cases, death under anesthesia cases) have been deliberately excluded; these are oriented towards “clinical error liability” rather than “forensic evidence preservation”. As a recent example from Turkey, Liman et al. [29] examined cases of wrong-side surgery from a forensic medicine perspective through Supreme Court decisions and press reports; this study is important because it shows that the forensic dimension in the perioperative field is addressed in the Turkish literature on the axis of malpractice/patient safety rather than evidence preservation, and exemplifies how separately the two axes (evidence preservation vs. malpractice liability) have developed in the literature. National literature gap. A search of the TR Dizin (450 records, manual search) revealed no suitable records regarding perioperative forensic evidence management. This finding shows that the identified gap is not limited to the international literature but is equally – or even more significantly – valid in the Turkish national literature. However, the two included studies of Turkish origin [10, 25] suggest an increasing interest in forensic case management in the country.

Emerging digital evidence

The included sources mostly treated forensic evidence as a physical object. Current perioperative practice, however, also produces clinical photographs and video recordings that may later become relevant to legal proceedings. Mosquera called for consistent preoperative, intraoperative, and postoperative photography so that clinical images are reproducible and useful for documentation [30]. Torkmandi et al. described educational, safety, quality-improvement, and legal uses of operating-room CCTV and noted its possible value as documentary evidence [31]. These uses introduce unresolved questions about consent, privacy for patients and staff, confidentiality, security, access, and differences between legal systems. A usable image is not automatically forensically reliable. Policies should therefore cover the source and authenticity of a file, retention of originals and metadata, tamper-evident storage, access records, custody documentation, retention and deletion, and lawful disclosure. They should also state who within the surgical team is responsible for creating, recording, protecting, and transferring digital material.

Implications for practice, education, and policy

Perioperative education should address the practical basics identified throughout this review: recognizing potential evidence, avoiding contact with metal instruments, using dry and separate packaging, and documenting custody. Institutions can support this practice with a single custody form and an explicit handover route; the experience reported by Marlor et al. [6] suggests that these changes may reduce loss. Local and national procedures for forensic specimens should also be aligned with AORN guidance [3]. Evidence for educational and protocol

interventions remains sparse, because only Marlor et al. [6] compared outcomes before and after implementation. Multicentre controlled pre-post research is therefore needed, together with validated measures of perioperative forensic nursing competence and studies from a wider range of legal and health-system settings.

Strengths and limitations

This review has several strengths. The protocol was registered prospectively on OSF, and the search and reporting were guided by JBI and PRISMA-ScR. We searched six international sources and TR Dizin, then supplemented those searches with CitationChaser, Lens.org, and manual examination of reference lists. Citation searching was repeated until it produced no further eligible studies. Two reviewers completed study selection independently in Rayyan and resolved differences by discussion. We also piloted the charting form before full extraction and revised it when the pilot exposed fields that needed clarification. Together, these steps make the search, selection, and charting decisions traceable.

Several limitations should be considered. Relevant work may still have been missed despite the broad search. Eligibility was limited to English- and Turkish-language publications, and Embase was unavailable through our institution. Some of this loss may have been offset by overlap with Scopus, although it cannot be quantified here. TR Dizin required manual handling because its interface joins multiword terms with AND and offers neither bulk export nor electronic deduplication. Google Scholar posed a different constraint: incomplete abstracts and limited export meant that initial screening relied largely on titles and source information. We were also unable to retrieve Hanshaw [21], an apparently relevant experimental report published in a discontinued journal with no online archive, despite interlibrary loan requests. It appears in Fig. 1 as one report not retrieved and was not synthesized. Finally, we did not appraise methodological quality or risk of bias, in line with the mapping purpose of the review and JBI guidance. The findings were therefore not weighted by study quality, and publication bias remains possible.

Conclusions

Perioperative nurses occupy an important but insufficiently studied position in the management of forensic evidence from trauma patients. The available literature agrees on several basic preservation practices, yet much of that agreement rests on expert guidance, while studies from different countries continue to show shortcomings in forensic education and implementation. One protocol study provides promising evidence that standardization can reduce loss, but it is not enough to establish effectiveness across settings. Progress will depend on clearer institutional custody procedures, forensic content in perioperative education, and multicentre intervention studies that test these approaches in practice.

Abbreviations

JBI
Joanna Briggs Institute
OSF
Open Science Framework
PCC
Population–Concept–Context
PACUs
Post-Anesthesia Care Units
AORN

Association of periOperative Registered Nurses
PRISMA-ScR
Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews
SANE
Sexual Assault Nurse Examiner
GSR
Gunshot Residue
OR
Operating Room
SAFE
Sexual Assault Forensic Examiner
ICU
Intensive Care Unit

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The article and Additional file 1 contain all data generated or analyzed for this review.

Competing interests

The authors declare no competing interests.

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Authors' contributions

BÖ: Methodology, investigation, and writing—original draft, review, and editing.

EE: Conceptualization, methodology, investigation, and writing—original draft, review, and editing.

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Figures

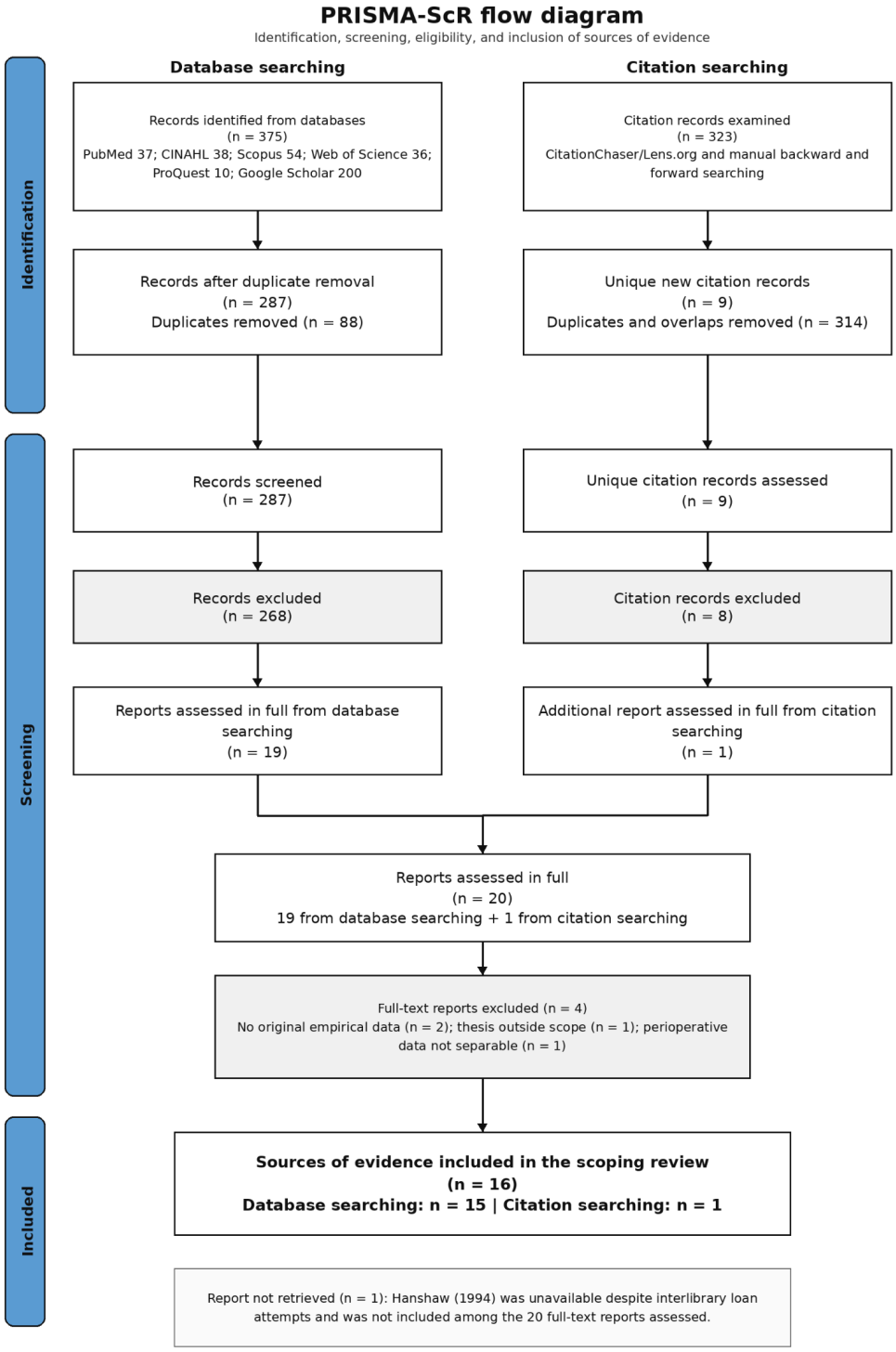


Figure 1

PRISMA-ScR flow diagram of study identification, screening, and inclusion through database searching and citation chasing.

Supplementary Files

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