Sources of Discomfort and Treatment Strategies for Trauma Patients in the Pre-Hospital Setting: A Scoping Review

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Contribution to Emergency Nursing Practice

- Trauma patients in prehospital care often experience acute pain, along with anxiety, fear, cold exposure, and immobilization-related discomfort. Guidelines recommend a multimodal approach to managing these symptoms.
- To the best of our knowledge, this is the first scoping review to map the full range of discomforts in prehospital trauma care and the interventions, pharmacologic and nonpharmacologic, used to address them.
- Findings support the use of nurse-led, patient-centered strategies to assess and manage discomfort beyond pain, enhancing both comfort and care outcomes in prehospital trauma settings.

Abstract

Introduction: Trauma remains a leading cause of mortality and long-term disability worldwide, often causing significant discomfort during prehospital care. Addressing these discomforts effectively is crucial for improving patient outcomes. This scoping review aimed to identify and categorize the types of discomforts experienced by adult trauma victims in prehospital settings and map the pharmacologic and nonpharmacologic interventions used to mitigate them.

Methods: This scoping review followed the Joanna Briggs Institute framework and Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews guidelines. A comprehensive search was performed in databases including MEDLINE, CINAHL, Scopus, Embase, PsycINFO, Joanna Briggs Institute Evidence Synthesis, Cochrane Database, and relevant gray literature sources. Studies involving adult trauma patients (≥18 years) in prehospital care that reported on discomfort and interventions were included without restrictions on publication date.

Results: Seventeen studies met the inclusion criteria, covering various international contexts. Acute pain was the most frequently reported discomfort, followed by anxiety, fear, cold-induced discomfort, and discomfort caused by immobilization. Pharmacologic interventions predominantly included opioids, nonsteroidal anti-inflammatory drugs, paracetamol, ketamine, and methoxyflurane, whereas nonpharmacologic interventions comprised acupressure, transcutaneous electrical nerve stimulation, cryotherapy, warming measures, communication strategies, and emotional support. Nonpharmacologic interventions, especially acupressure and communication techniques, showed promising results in reducing pain and anxiety.

Discussion: The findings underline the multidimensional nature of discomfort in prehospital trauma care and highlight effective interventions, including pharmacologic and complementary nonpharmacologic strategies. However, significant gaps remain regarding standardized assessment tools for non–pain-related discomforts and combined interventions. This review underscores the necessity for comprehensive management protocols and further research to optimize patient comfort and care outcomes in trauma settings.

Key words: Trauma; Emergency medical services; Pain management; Analgesia; Complementary therapies; Prehospital care

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Introduction

Trauma remains 1 of the most significant causes of mortality and long-term disability across all age groups worldwide.[1] It can result from a variety of events, such as road traffic accidents, falls, physical violence, sports-related injuries, and natural disasters.[2] The severity of trauma-related injuries can vary considerably, ranging from minor fractures to severe polytrauma affecting multiple organ systems.[3] Prehospital emergency care plays a crucial role in the survival and recovery of trauma patients. The time between the injury and hospital admission is a critical window for stabilization and transport. During this period, prehospital health care providers perform essential interventions aimed at minimizing further injury and improving the patient's prognosis. In addition, trauma patients frequently experience various sources of discomfort that can complicate both their condition and the medical care they receive.[4]

Multiple forms of discomfort have been identified in trauma patients within the prehospital setting, including pain, exposure to cold, fear, anxiety, and other symptoms that require further investigation. Pain is the most reported issue, which can arise not only from traumatic injuries such as fractures, lacerations, and contusions but also from medical procedures such as intravenous catheterization and immobilization.[5] Furthermore, trauma patients are often subjected to harsh environmental conditions, particularly in outdoor accidents, which may lead to thermal discomfort, particularly cold exposure. Cold stress can develop rapidly and worsen shock, increase the risk of complications, and intensify pain perception, thereby aggravating overall discomfort.[6] The psychological impact of experiencing a traumatic event is also significant, often resulting in heightened anxiety levels. Uncertainty regarding the severity of the injuries, concern about potential long-term disabilities, and fear for the safety of others involved in the accident are factors that contribute to psychological distress. This heightened state of anxiety can impair patient cooperation with emergency responders and exacerbate the perception of pain.[7] Although the use of cervical collars, spinal boards, and limb immobilization is critical to preventing further injury, these interventions may also cause significant discomfort, particularly when maintained for prolonged periods. Immobilization not only contributes to physical discomfort but may also evoke feelings of restriction and helplessness, which can increase emotional stress.[5] Fear is another frequently encountered emotional response in trauma patients. It can stem from the fear of death, pain, or potential long-term health consequences. This emotional state may worsen the perception of pain and other discomforts and can negatively affect patient compliance during rescue and treatment efforts. A lack of information regarding their condition and prognosis may further heighten fear and distress.[8]

These various sources of discomfort are interconnected and often influence one another. Pain can exacerbate both anxiety and fear, which, in turn, can further amplify pain perception. Likewise, cold exposure may intensify both pain and anxiety.[9] Although immobilization is necessary for injury stabilization, it may also increase fear and anxiety owing to the perception of being restrained. These interacting factors not only affect the patient's immediate well-being but can also influence long-term recovery outcomes.[5]

A comprehensive understanding of the different sources of discomfort experienced by trauma patients in prehospital care, as well as the interventions applied to alleviate them, is essential for the development of more effective management strategies. By systematically identifying and mapping these discomforts, it is possible to improve prehospital care practices, enhance the speed and effectiveness of interventions, and, consequently, optimize both clinical outcomes and patient experience.

The lack of broad knowledge regarding discomfort management in trauma patients represents a significant gap in prehospital emergency care. No previous scoping reviews specifically addressing this topic were identified in the literature. To address this gap, we conducted a scoping review to map the sources of discomfort experienced by adult trauma patients in prehospital settings and the pharmacologic and nonpharmacologic interventions applied to mitigate them. Our findings aim to support clinical decision making and identify priority areas for future research in the field of trauma care.

This review aimed to determine the following: (1) What are the sources of discomfort experienced by trauma patients in prehospital care? (2) What pharmacologic and nonpharmacologic interventions are implemented to mitigate the distinct sources of discomfort in trauma patients during prehospital care?

INCLUSION CRITERIA

Participants

The review included studies involving adults aged 18 years or older who are trauma patients in prehospital care, regardless of gender or any other personal characteristics. Trauma patients will include individuals with injuries caused by falls, traffic accidents, physical assaults, penetrating injuries, and burns.[10]

CONCEPT

This review focuses on 2 key concepts: (1) the various forms of discomfort experienced by trauma patients and (2) the interventions implemented in prehospital settings to alleviate these discomforts. The scope of this review includes all interventions, whether pharmacologic or nonpharmacologic, that have been applied and assessed by prehospital health care professionals, including nurses, physicians, paramedics, emergency medical technicians, and law enforcement personnel, among others. The primary objective of these interventions is to reduce the discomfort experienced by individuals who have suffered trauma.

For the purposes of this study, "discomfort" is defined as an unpleasant bodily sensation, which can manifest as pain or other distressing physical and psychological experiences, such as fatigue, dyspnea (shortness of breath), or insomnia.[11] This review examined trauma-related discomfort broadly, without restricting it to a specific injury mechanism. The interventions analyzed in this review encompassed all forms of treatments administered in prehospital care, with an emphasis on their mechanism of action, duration, dosage, frequency, potential adverse effects, and contraindications. In addition, the review also takes into consideration the underlying trauma mechanism associated with each intervention.

CONTEXT

This study focuses on prehospital emergency care, which is the initial phase of trauma management and takes place before the patient reaches a hospital. This type of care is delivered in resource-limited environments, often under physically demanding conditions, making it a crucial component of the trauma care system.[12] Emergency medical teams provide on-scene assistance and care during transportation, adhering to established protocols, triage systems, clinical guidelines, and procedures for continuity of care. The duration of prehospital care can vary widely, depending on the severity of the injuries, necessary interventions, and the distance to the nearest medical facility. In some cases, the response and transport time may take only a few minutes, whereas in others, particularly in rural or remote locations, it can extend for several hours before the patient reaches definitive care.[13]

TYPES OF SOURCES

This review incorporated both quantitative and qualitative studies, including primary research and systematic reviews. Within the quantitative domain, various study designs were analyzed, such as randomized and nonrandomized clinical trials, quasi-experimental research, and retrospective observational studies. In the case of qualitative studies, those using qualitative methodologies, including phenomenological research, grounded theory, and ethnographic approaches, were selected.

In addition, systematic reviews were examined, regardless of whether they contained meta-analyses, meta-syntheses, or mixed methods approaches. Furthermore, the review encompassed opinion-based literature, narrative reviews, nonempirical research, and relevant gray literature that contributed to the broader understanding of the topic.

Methods

This scoping review was conducted according to the methodological framework recommended by the Joanna Briggs Institute (JBI).[14] The reporting of findings adhered to the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews.[15] In addition, the protocol guiding this review[16] was structured in line with the recommendations provided by the PRISMA Protocols guidelines.[17]

The review protocol was registered prospectively on the Open Science Framework (https://osf.io/pwz98/).

SEARCH STRATEGY

This review used a systematic 3-step search strategy to locate both published and unpublished studies. Initially, an exploratory search was performed in MEDLINE (PubMed), and a CINAHL (EBSCO) search was undertaken in January 2025 to find relevant literature on the topic and capture significant key words and index terms. Titles, abstracts, and indexing terms from these preliminary findings were thoroughly analyzed to construct a comprehensive search strategy for MEDLINE (PubMed), incorporating key terms and subject headings identified through this initial exploration. This preliminary analysis was essential to guarantee that the subsequent searches were exhaustive and captured all pertinent terminology.

In the second step, the developed search strategy was extended across additional databases, using the identified key words and indexing terms to broaden literature coverage effectively. During this process, new relevant key words and indexing terms discovered were also integrated to further refine and enhance the search strategy.

In the final stage, reference lists from all selected articles and reports were carefully reviewed to identify additional pertinent studies, thus minimizing the possibility of overlooking relevant literature.

The databases systematically searched included MEDLINE (PubMed), CINAHL (EBSCO), Scopus, Embase, APA PsycINFO (EBSCO), JBI Evidence Synthesis, and the Cochrane Database. The search strategy, including all identified key words and index terms, was adapted for each database and/or information source included. This comprehensive database selection aimed to ensure a diverse representation of sources and perspectives. For unpublished materials, searches were conducted in the Scientific Repository of Open Access of Portugal, OpenGrey, and the CAPES Theses Bank, selected owing to their recognized relevance and scholarly value. The full search strategies are presented in Supplementary Appendix I.

Eligible studies were published or unpublished works available in English, French, Spanish, or Portuguese, without restrictions on publication dates. Studies in other languages were excluded, considering practical limitations related to translation resources. This linguistic criterion allowed for a thorough inclusion of relevant literature while recognizing logistical constraints. The described methodology ensured a comprehensive and rigorous review, contributing meaningfully to the body of existing knowledge. No restrictions were applied regarding publication date or geographic location.

STUDY SELECTION

Collected references were systematically organized and managed through the Rayyan Intelligent Systematic Review software, and duplicate references were removed. The initial screening involved reviewing the titles and abstracts independently by 2 reviewers (F.M. and M.M.) with expertise in trauma care, guided by the predetermined inclusion criteria. Subsequently, the full texts of the studies shortlisted from this initial screening underwent detailed evaluation, also independently by 2 reviewers (F.M. and M.M.), applying the same inclusion standards.

Studies failing to meet these criteria were excluded, with explicit documentation of exclusion reasons detailed in an appendix of the scoping review. Reviewer discrepancies were addressed and resolved through discussion until consensus was achieved. Given the scope and objectives of this review, no formal methodological quality assessment of the included studies was performed.

The entire selection process was described narratively and visually summarized using a PRISMA flow diagram, specifically adapted from the PRISMA extension for Scoping Reviews.[18] This diagram clearly illustrates each stage of the research process, including identification, screening based on inclusion criteria, and removal of duplicates.

DATA EXTRACTION

Data extraction was conducted for each article, capturing details regarding study participants, concepts, context, and methods, using a modified version of the JBI data extraction instrument. To ensure the collection of all relevant data and maintain consistency across reviewers, this tool was initially tested independently on 3 selected studies. The results were then compared and discussed among the reviewers, allowing for refinement of the tool if needed.

The extraction process was performed independently by 2 reviewers (F.M. and M.M.). In cases where disagreements arose, a third reviewer (M.B.) was consulted to facilitate resolution. If additional clarification or further information was required, the authors of the included studies were contacted accordingly.

DATA ANALYSIS AND PRESENTATION

Alongside the tabulated data, a detailed narrative summary explains how the findings align with the review's objectives and research questions. In addition, a thorough examination was conducted to ensure that any original research studies appearing in multiple systematic or literature reviews were not counted more than once.

Results

STUDY INCLUSION

A summary of the search results and article selection process is presented in Figure 1. Initially, 1060 papers were identified. After removing duplicates, 951 papers were screened by title and abstract. Of these, 920 were deemed irrelevant, leaving 31 papers; however, 14 of these did not meet the inclusion criteria. Details on the excluded papers and the reasons for their exclusion are presented in Supplementary Appendix II. Ultimately, 17 papers were included in the review, and screening the reference lists of these papers did not reveal any additional eligible articles.

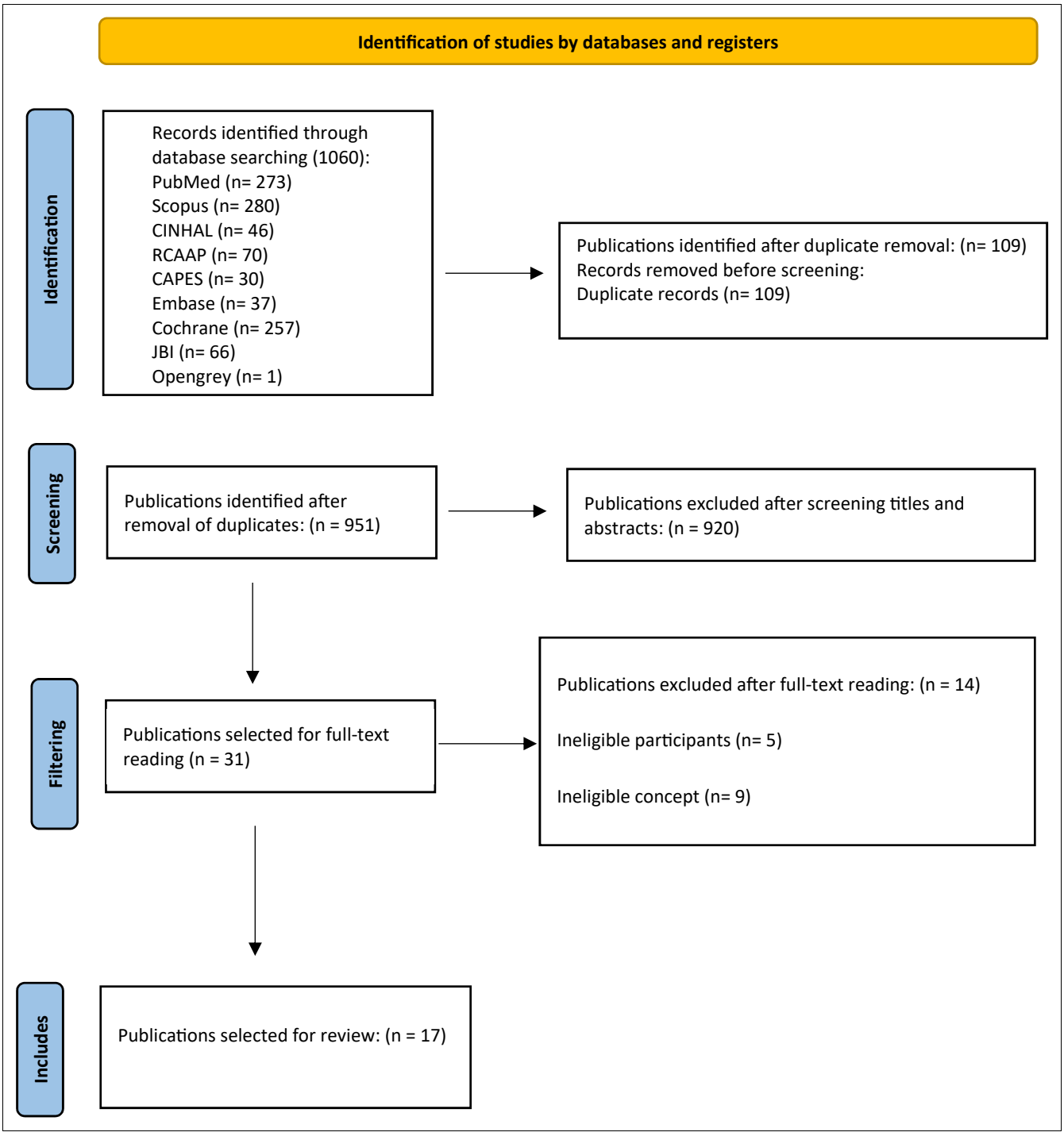

FIGURE 1

Flowchart of the process of study selection. JBI, Joanna Briggs Institute; RCAAP, Repository of Open Access of Portugal.

CHARACTERISTICS OF INCLUDED STUDIES

Publication Type

All 17 of the included citations encompass a diverse range of study designs. Three studies were randomized controlled trials (RCTs).[19-21] Seven studies used observational designs, both retrospective and prospective.[8,22-27] Two studies used qualitative methods.[28,29] In addition, 5 citations were review-type publications, comprising systematic reviews, scoping reviews, and technical reviews.[9,30-33] Publications began in 1997.

Country of Publication

The investigations were performed across 9 different nations. In particular, 3 studies took place in Austria,[19-21] Portugal,[8,9,27] and the United Kingdom[26,29,32]; 2 in France[25,31] and Australia[22,33]; and 1 each in The Netherlands,[23] the United States,[24] and Denmark,[28] and 1 additional study served as a European recommendation.[30]

All the studies from Austria are RCTs.[19-21] In Australia, 1 study was a retrospective cohort study,[22] and another was a systematic review.[33] The European recommendation study[30] is a guideline based on a literature review and expert consensus. In the United States, a prospective study compared the assessments of emergency medical services (EMS) and emergency physicians.[24] The French studies include a technical review with a feasibility study[31] and a prospective observational study.[25] In the United Kingdom, 1 study is a systematic review,[32] another is a qualitative study,[29] and a third is a prospective descriptive study.[26] The Dutch study is a retrospective observational study,[23] and the Danish study is a qualitative investigation.[28] Finally, the Portuguese studies consist of a scoping review[9] and 2 observational cohort studies.[8,27]

Participant's Details

All participants were aged 18 years or older. One study included only elderly patients, aged between 80 and 95 years,[19] whereas another focused on groups with higher mean ages—ranging from 63 to 78 years.[21] One study focused on patients with femur fractures and pelvic bone injuries who attended a prehospital emergency setting.[31] Five studies aimed to include a mix of men and women,[21-23,25,28] whereas another presented heterogeneous samples, such as the one that included patients, paramedics, and emergency clinicians.[29] In 2 studies, the sex of the participants was not specified.[20,32] Three reviews and guidelines[9,30,33] aggregated data from multiple sources, enriching the overall picture.

Sample Size and Setting

The sample sizes of the RCTs[19-21] were consistent, ranging from 32 to 60 participants. In contrast, the observational studies[8,22-27] featured larger samples, with sizes ranging from 92 to 717 participants. The remaining studies, including qualitative investigations, guidelines, technical reviews, and systematic reviews,[9,28-33] aggregated data from multiple sources or focused on context-specific analyses and therefore did not present a uniform sample size.

The studies included in the review were performed in prehospital environments, using various rescue methods such as helicopter EMS and ground EMS. These varied contexts were analyzed to determine the discomfort experienced by trauma patients and the strategies applied to alleviate these issues. A summary of the included studies is presented in the Table.

Review Findings

Acute pain is universally reported across studies; additional discomforts such as anxiety, fear, and discomfort related to cold and immobilization are also featured prominently in the prehospital trauma care context.[8] Each discomfort type is identified by a distinct set of studies, underscoring the complex interplay of physical and emotional factors in patient outcomes.

DISCOMFORT IN TRAUMA PATIENTS DURING PREHOSPITAL CARE

The studies included in this review consistently highlight that discomfort experienced by trauma patients in prehospital contexts is multidimensional, encompassing both physical and emotional domains. Acute pain emerged as the most frequently reported form of discomfort across nearly all studies. It was assessed using validated scales such as the visual analog scale,[20,21] and the numerical rating scale.[8,19,27,33] Verbal and descriptive scales were used,[28,29] although some studies did not specify a standardized assessment tool.[23]

Anxiety was another prevalent form of discomfort.[8,9,25,27] Although anxiety-specific scales were not always explicitly detailed, proxy measures such as heart rate, behavioral signs, or correlation with pain intensity were commonly used.[19,21] Fear, although mentioned less frequently,[8,9,27,30,31] was typically associated with pain

TABLE
Summary of the studies

Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
Braybrook et al[22]/ 2023/Australia	Retrospective cohort study (2015-2021)/ prehospital care for mountain bikers and hikers on trails	717 patients treated in the prehospital setting	Fractures, dislocations, contusions, abrasions/acute pain	Pharmacologic: administration of methoxyflurane, IV and intranasal fentaNYL, paracetamol, and ketamine, according to clinical protocols Nonpharmacologic: the study did not directly analyze the application of nonpharmacologic interventions. However, it mentioned that clinical guidelines recommend the use of immobilization, proper positioning, ice application, and distraction, although no specific data on their implementation in the analyzed cases were provided.	The study analyzed the administration of analgesics by paramedics, highlighting that methoxyflurane was the most frequently used option (65%), followed by IV fentaNYL (41%), paracetamol (23%), and ketamine (4%). The effectiveness of methoxyflurane was reported as satisfactory in most cases, providing rapid pain relief. Patients who received IV fentaNYL showed the greatest reduction in pain (81%), whereas those treated with methoxyflurane alone reported a success rate of 52%. Notably, 37% of patients who did not receive pharmacologic analgesia still experienced a reduction in pain, suggesting the influence of nonpharmacologic factors.
Hachimi-Idrissi et al[30]/2020/ Europe	Guideline based on literature review and expert consensus/ guidelines for the management of acute pain in emergency settings (prehospital and hospital)	Not applicable	Trauma in the prehospital setting/ acute pain, anxiety, fear, cold-induced discomfort, discomfort caused by immobilization	Pharmacologic: administration of morphine, fentaNYL, SUFentanil, NSAIDs, paracetamol, ketamine, nitrous oxide, methoxyflurane Nonpharmacologic: communication, distraction techniques, respiratory control, relaxation, acupressure, application of cold/heat, immobilization, use of splints	The study highlights a lack of standardization in acute pain management across Europe, emphasizing the need for continuous pain assessment and reassessment. It advocates for the use of multimodal analgesia combining opioids and nonopioids and encourages the implementation of nonpharmacologic interventions, including distraction, relaxation techniques, acupressure, and respiratory control.

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Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
Brown et al[24]/ 1998/USA	Prospective study comparing EMS and emergency physician assessments/ evaluation of EMS professionals' accuracy in deciding to immobilize patients with suspected cervical spine injury	573 adult patients attended by emergency services	Trauma with suspected cervical spine injury/acute pain, discomfort caused by immobilization	Nonpharmacologic: immobilization	The study included 573 eligible patients. EMS professionals and emergency physicians agreed in 78.7% of cases on the decision to immobilize trauma victims. In 60.4% of patients, both recommended immobilization, and in 18.3%, neither considered it necessary. Discrepancies occurred in 21.3% of cases, 7.7% of cases only the emergency physician indicating immobilization and 13.6% only by the EMS professional. The kappa coefficient for the immobilization decision was 0.48, indicating a moderate to substantial level of agreement between assessments.
Lefort et al[31]/2013/ France	Technical review and feasibility study of fascia iliaca block/ prehospital regional anesthesia for pain control in femur fractures and hip injuries	Patients with femur fractures and pelvic bone injuries treated in prehospital emergency care	Femoral neck fractures/acute pain, fear, anxiety, cold-induced discomfort	Pharmacologic: local anesthetic lidocaine or ropivacaine administered in the fascia iliaca compartment Nonpharmacologic: positioning, immobilization, communication	The study demonstrates that the fascia iliaca block is effective for analgesia in femur and femoral neck fractures, showing a significant reduction in pain within 10 minutes of administration, with a 94% success rate in pain relief. It provides a dual effect—direct analgesia and muscle relaxation—with reduced need for systemic opioids, thereby minimizing adverse effects.

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Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
Pak et al[32]/2015/ England	Systematic review/ literature review on nonpharmacologic interventions for pain management in prehospital and emergency settings	Review of multiple studies	Various types of trauma/acute pain, anxiety, nausea	Pharmacologic: opioids, NSAIDs, paracetamol, NMDA receptor antagonists, methoxyflurane, and local anesthetics for nerve blocks Nonpharmacologic: TENS, manual acupressure (applied to specific points to relieve pain and anxiety), active warming (using thermal blankets)	The study demonstrates that nonpharmacologic interventions can be effective in controlling pain and discomfort in trauma victims. Several studies reported significant improvements in nausea scores and patient satisfaction with the use of acupressure. Moreover, the combination of pharmacologic and nonpharmacologic approaches may enhance the overall patient experience and reduce the reliance on pharmacologic treatments.
Barker et al[19]/ 2006/Austria	Double-blind randomized clinical trial comparing true auricular acupressure with control/prehospital transport of elderly patients with femoral neck fractures, in settings where paramedics are not authorized to administer medications	38 patients with femoral neck fractures treated in the prehospital setting	Femoral neck fracture in elderly patients/ acute pain, anxiety	Nonpharmacologic: auricular acupressure at specific points	The results indicate that auricular acupressure was effective in reducing pain and anxiety in patients from the "true" intervention group compared with the "sham" control group. Patients in the true intervention group reported significantly lower levels of pain and anxiety upon hospital arrival, as well as a significantly lower average heart rate. Auricular acupressure is a noninvasive and easy-to-apply technique that provides significant relief from pain and anxiety without the use of medications.

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Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
Scholten et al[23]/ 2015/The Netherlands	Retrospective observational study based on medical record review/ evaluation of adherence to pain management guidelines in prehospital and hospital emergency care	1066 patients treated in emergency services (414 in the prehospital setting)	Trauma resulting from domestic, traffic, sports, occupational accidents, and violence, leading to fractures, dislocations, injuries, contusions, and open wounds/ acute pain	Pharmacologic: paracetamol, NSAIDs, fentaNYL, morphine, 50% nitrous oxide/50% oxygen, other unspecified medications Nonpharmacologic: immobilization, limb elevation, compression with bandages, others (unspecified)	The study results show that only 19%-30% of patients received adequate pharmacologic treatment for pain. Pain assessment using scales was documented in just 0%-52% of cases, and the time of medication administration was recorded in less than 27% of cases. Deviations from national pain management guidelines were identified in 73%-99% of cases. Pain reassessment was performed in only half of the patients treated by the HEMS and was nearly absent in other services. Identified challenges included a lack of training, inconsistent protocols, and the low prioritization of pain management.
Ottosen et al[28]/ 2019/Denmark	Qualitative study using semistructured interviews/ evaluation of the experience of immobilized patients after trauma in a level 1 trauma center	50 patients treated in the prehospital setting	Blunt trauma, including vehicle collisions, falls, and bicycle accidents/ acute pain; discomfort caused by immobilization, anxiety, and dyspnea	Nonpharmacologic: early assessment for the removal of unnecessary immobilization to relieve discomfort	The results show that 38% of patients reported discomfort related to immobilization; 24% reported pain associated with immobilization, without a predominant specific location; 80% reported a sense of protection owing to immobilization, mainly because they believed that it prevented further injuries; and 6% reported anxiety and dyspnea caused by immobilization. Pressure on specific body areas was common, with more frequent complaints in the pelvis (21%) and the back of the head (16%). Half of the

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Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
					patients did not remember being immobilized.
Iqbal et al[29]/2013/ United Kingdom	Qualitative study based on interviews and focus groups/ evaluation of patients' and health care professionals' perceptions of pain management in the prehospital setting	55 participants (17 patients, 25 paramedics, 13 emergency clinicians)	Orthopedic trauma (fractures), musculoskeletal pain/acute pain	Pharmacologic: morphine, Entonox (nitrous oxide) Nonpharmacologic: immobilization, positioning, distraction, communication, therapeutic touch	Results for trauma patients include the administration of morphine and Entonox for pain relief, along with nonpharmacologic interventions such as distraction techniques and proper positioning. Some patients reported confusion regarding the pain assessment, which was evaluated using verbal rating scales.
Bounes et al[25]/ 2010/France	Prospective observational study/ comparison between ambulances with physicians (Smur) and other transportation methods in prehospital pain management	304 trauma patients treated in different prehospital transportation modalities	Blunt and penetrating trauma, fractures, collisions, upper and lower limb injuries/ acute pain, anxiety	Pharmacologic: morphine, other unspecified medications Nonpharmacologic: immobilization, restraint techniques	The study investigated prehospital factors associated with low pain levels in trauma patients upon arrival at an emergency department. It included 304 patients and revealed an average pain score of 5.8 of 10, with 64% of patients reporting moderate to severe pain. Key findings indicate that care provided by ambulances with medical teams (Smur) was associated with lower pain levels, with a significant predictive factor for effective analgesia. In addition, higher levels of anxiety were correlated with higher pain scores, suggesting that anxiety may negatively affect pain perception. The study highlights the importance of prehospital analgesia and suggests that anxiety management could improve pain outcomes.

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Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
Lang et al[20]/2007/ Austria	Double-blind randomized clinical trial/use of acupressure for prehospital analgesia in patients with distal radius fractures	32 patients treated in the prehospital setting	Distal radius fracture/ acute pain, anxiety	Nonpharmacologic: acupressure at Baihui (GV20) and Hegu (LI4) points	The study showed that patients with distal radius fractures who received true acupressure at the Baihui (GV20) and Hegu (LI4) points reported a significant reduction in pain (36.6% vs 56% on the visual pain scale) and anxiety (34.9% vs 53.4%) upon arrival at the hospital compared with the control group, which received acupressure at nontherapeutic points. These results suggest that acupressure can be an effective and noninvasive alternative for pain and anxiety relief in emergency situations for trauma victims. It is a noninvasive, quick, and safe technique with good patient acceptance. Pressure applied for 3 minutes at each point significantly reduces pain and anxiety without the need for pharmacologic analgesia.
Kober et al[21]/2002/ Austria	Double-blind randomized clinical trial/use of acupressure for pain relief in minor trauma victims during prehospital transport	60 trauma victims treated in the prehospital setting (19 in the true acupressure group, 20 in the sham group, 21 in the control group)	Mild trauma (simple fractures, minor wounds, contusions)/acute pain, anxiety	Nonpharmacologic: acupressure at points Di4 (Hegu), KS9 (Zhongchong), KS6 (Neiguan), BL60 (Kunlun), and LG20 (Baihui)	Group 1 (true acupressure): 45% of patients reported a reduction in pain, 68% showed a decrease in anxiety, and 89% experienced a significant reduction in heart rate. The satisfaction level was higher at 17.6 (0 = maximum satisfaction; 100 = zero satisfaction). Group 2 (sham acupressure): 50% of patients showed a decrease in anxiety. Pain did not show significant changes, and heart rate

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Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
					remained unaffected. Satisfaction level was 28.1. Group 3 (no acupressure): 52% of patients reported a decrease in anxiety. Pain did not show significant changes, and heart rate remained unaffected. Satisfaction level was 35.1. These data show that group 1 had significantly better results in terms of pain relief, anxiety reduction, and patient satisfaction than groups 2 and 3.
Mota et al[9]/2020/ Portugal	Scoping review/review of prehospital interventions to prevent hypothermia in trauma victims	Review of 7 studies, including 2 quantitative studies, 1 qualitative study, and 4 literature reviews	Blunt and penetrating trauma; exposure to cold environments; falls; explosions; heat, cold, or chemical exposure/ cold-induced discomfort; anxiety; fear	Nonpharmacologic: Passive warming: blankets, positioning the ambulance as a wind barrier, removing wet clothing, drying the victim, increasing the ambulance temperature Active warming: heating plates, heated IV fluids, heated oxygen, peritoneal irrigation	The results showed that both passive warming measures (blankets and removal of wet clothing) and active warming measures (heating plates and heated IV fluids) are effective in increasing core temperature and reducing cold-induced discomfort. The combination of both approaches was considered more effective. The study emphasizes the need for a structured intervention protocol for hypothermia prevention in prehospital care and the importance of nurses' knowledge of these interventions to improve patient comfort. In addition, there is a lack of consensus on best practices, highlighting the need for further research and standardized protocols.

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Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
Davis et al[33]/2021/ Australia	Systematic review based on PRISMA/ review of pain management in femur fractures by paramedics in prehospital care	Systematic review of 19 studies (total number of patients not specified)	Femur fractures/acute pain, anxiety, nausea	Pharmacologic: morphine, fentaNYL, methoxyflurane, Entonox, ondansetron Nonpharmacologic: traction of the limb, FICB, auricular acupressure, TENS, immobilization, removal of traction for pain relief	The results indicate that the interventions are effective in reducing pain and anxiety, with TENS and auricular acupressure showing a 100% application rate and no adverse effects. However, there is an underutilization of traditional methods, such as traction and pharmacologic analgesia, with application rates ranging from 30% to 67% among paramedics. The study emphasizes the need for regular training and updates to improve the use of analgesia techniques and suggests that emerging alternatives may enhance pain control in femur fractures
Mota et al[8]/2023/ Portugal	Prospective cohort observational study/ evaluation of the relationship between acute pain and other types of suffering in prehospital trauma victims	605 trauma victims treated in the prehospital setting	Blunt trauma, blunt and penetrating trauma, penetrating trauma/acute pain, fear, anxiety, sadness, apathy, cold-induced discomfort, immobilization-induced discomfort	Nonpharmacologic: immobilization	The study demonstrates that 90.5% of victims reported some level of pain, 47.1% high levels of pain during the initial assessment by nurses, 39% discomfort caused by cold, 49.8% anxiety, 15.7% fear, 8.4% sadness, and 4.5% apathy. Victims with higher thermal discomfort tended to report more intense pain. Fear and anxiety were statistically associated with higher pain levels. Immobilization was linked to an increase in pain intensity.

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Continued

Author/y/Country	Study type/Study objective	Participants	Type of trauma/Type of discomfort	Applied interventions	Results
Ellerton et al[26]/ 2013/United Kingdom	Descriptive prospective study/ use of analgesia for mountain rescue victims with moderate to severe pain	92 trauma victims treated in the prehospital setting	Mountain trauma/ acute pain	Pharmacologic: buccal prochlorperazine, ondansetron IV, cyclizine IM or IV, metoclopramide IV, midazolam, inhaled methoxyflurane, ketamine, Entonox, fentaNYL	The study reveals that 38% of patients experienced a 50% reduction in pain within 15 minutes, and 60.2% reported pain reduction by the time they arrived at the hospital. The initial average pain score was 8/10, reducing to 5 after 15 minutes and 3 upon arrival at the hospital. The majority, 87% of patients, received opioids, with 7% receiving more than 1 type of opioid. Different analgesic strategies were used, with IV opioids being the most effective. Entonox and oral analgesics showed limited efficacy in severe cases.
Mota et al[5]/2022/ Portugal	Observational study, prospective cohort/ evaluation of nurses' interventions in the management of acute traumatic pain in prehospital care	596 trauma victims treated in the prehospital setting	Cranioencephalic, cervical, thoracic, abdominal, pelvic, upper and lower limb, and vertebromedullary trauma/acute pain, anxiety, fear, cold-induced discomfort, immobilization-induced discomfort	Pharmacologic: IV morphine, paracetamol, tramadol Nonpharmacologic: heat application, distraction, cryotherapy, immobilization, limb elevation, emotional support (therapeutic touch, active listening, holding the patient's hand, therapeutic presence without touch), positioning, presence of family and friends	The study demonstrates that, at the initial assessment, 46.7% of patients reported severe pain (level 7 or higher), but this number decreased to only 7.08% at the final assessment, indicating a significant reduction in pain throughout the treatment ($P <$ .005). Pharmacologic measures (morphine) were highly effective. Nonpharmacologic measures such as cryotherapy and emotional support had a significant impact on pain reduction. General comfort measures did not show a relevant impact on pain relief.

EMS, emergency medical services; USA, United States of America; HEMS, helicopter emergency medical services; FICB, fascia iliaca compartment block; IM, intramuscular; IV, intravenous; NMDA, N-methyl-D-aspartate; NSAID, nonsteroidal anti-inflammatory drug; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; Smur, service mobile d'urgence et de reanimation; TENS, transcutaneous electrical nerve stimulation.

and emotional stress. Some of these studies relied on patient narratives or observational indicators rather than structured instruments.

Cold-related discomfort was a prominent issue, especially in regions with variable climates. It was observed that combining passive warming methods, such as blankets and protection from wind, with active methods, such as warmed intravenous fluids and heated oxygen, was more effective in improving thermal comfort.[9] Other research has similarly highlighted the significance of cold-related discomfort, demonstrating its prevalence and impact on patient outcomes.[30,31]

Discomfort resulting from immobilization was another significant theme. Although immobilization is often necessary for patient safety, it was frequently associated with pain, anxiety, or general discomfort. This variability in discomfort suggests a need for more individualized application of immobilization.[8,28] In addition, some studies have shown variability in clinicians' agreement on the need for immobilization, further indicating the complexity of its use.[24]

Less commonly reported discomforts included nausea and dyspnea. Nausea, likely secondary to pain or pharmacologic side effects, was observed in some patients.[32,33] Dyspnea, although less frequently noted, was associated with both physical restriction and emotional stress.[28] Finally, emotional states such as sadness and apathy were documented, highlighting a neglected dimension of trauma-related suffering that deserves further exploration.[8]

INTERVENTIONS FOR ALLEVIATING PREHOSPITAL DISCOMFORT

Interventions for alleviating prehospital discomfort include a broad range of pharmacologic and nonpharmacologic strategies. Pharmacologic approaches were predominantly aimed at relieving acute pain, with opioids such as morphine, fentaNYL, and SUFentanil being the most used. These were often administered alongside nitrous oxide (Entonox) or in multimodal combinations with paracetamol, tramadol, or nonsteroidal anti-inflammatory drugs.[25,27,33] Inhaled anesthetics such as methoxyflurane, commonly used in Australia and administered via a handheld inhaler containing a 3 mL dose with a charcoal filter, were also included in specific protocols. Its ease of administration by all ambulance staff, regardless of location, contrasts with agents such as fentaNYL and ketamine, which can only be administered by advanced paramedics. N-methyl-D-aspartate receptor antagonists such as ketamine were also applied in specific protocols. In cases requiring regional analgesia, local anesthetics (lidocaine, ropivacaine) were used for nerve blocks, particularly the fascia iliaca block.[31] Additional medications included antiemetics (ondansetron, metoclopramide) and sedatives such as midazolam.

Nonpharmacologic strategies also played a significant role, particularly when pharmacologic management was delayed or insufficient. Cryotherapy and proper positioning were commonly applied. Cryotherapy, although less explored in isolation, was effectively integrated into combined strategies, contributing to a significant decrease in severe pain.[27] Positioning, often used alongside immobilization, was an important factor in pain control success rates.[29,31] However, immobilization itself showed mixed results regarding patient comfort, with nearly 40% of patients reporting discomfort directly associated with immobilization.[28]

Distraction techniques, recommended by clinical guidelines,[22] were consistently described as beneficial when included in broader multimodal strategies, even though their isolated effectiveness was not always evaluated quantitatively.[27,30] Communication-based interventions, including active listening and reassurance, were repeatedly shown to support pain and anxiety control. Therapeutic touch, combined with clear communication, was reported to enhance patient trust and comfort.[29] Communication in ongoing pain reassessment was emphasized as a key factor in managing trauma-related discomfort.[30]

Respiratory control and relaxation techniques were mentioned as helpful in anxiety-related contexts, although specific outcome measures were not always provided. These techniques were believed to reduce sympathetic activation and improve overall well-being.[30] Acupressure, which is a complementary therapeutic technique that involves applying pressure to specific points on the body, both manual and auricular, was rigorously evaluated in several studies, with results showing significant reductions in pain and anxiety, as well as physiological improvements such as decreased heart rate.[20,21] The use of auricular acupressure was further validated by other studies, which showed enhanced comfort and reduced anxiety among elderly trauma patients.[19,33]

Transcutaneous electrical nerve stimulation (TENS) was shown to significantly reduce pain, anxiety, and heart rate, with no adverse effects reported.[33] TENS was included as part of a broader nonpharmacologic strategy and noted for its role in enhancing comfort and reducing reliance on pharmacologic analgesia.[32] Finally, measures such as limb elevation and compression were reported as part of pain management protocols, although specific outcome data for these interventions were limited.[23,27]

Emotional support techniques, including the therapeutic presence of family members and empathetic communication by prehospital professionals, were cited as effective in alleviating both pain and anxiety. The integration of these strategies significantly reduced the prevalence of severe pain, suggesting that emotional reassurance can modulate physical symptoms in acutely injured patients.[27]

Taken together, the integration of pharmacologic and nonpharmacologic strategies, grounded in effective communication, appropriate evaluation tools, and patient-centered care, appears essential for optimizing comfort and safety in trauma patients during the critical prehospital phase. The visual summary of the conclusions of the scoping review is presented in Figure 2.

Discussion

This scoping review synthesizes evidence on discomfort management in trauma patients receiving prehospital care, integrating both physical and emotional dimensions of suffering. Acute pain remains the most prevalent complaint, consistently reported across nearly all included studies. It was frequently assessed using validated tools such as the visual analog scale and numerical rating scale.[8,20,21,27,33] However, discomfort in trauma care extends beyond pain. Anxiety, fear, cold exposure, and immobilization-induced discomfort were also prominent, highlighting the complexity of the trauma experience.[5,9]

Anxiety was often assessed indirectly through heart rate and behavioral indicators rather than standardized anxiety scales, suggesting the need for improved evaluation methods. Emotional distress such as fear and sadness—although less frequently quantified—was found to coexist with physical suffering and seemed to modulate patients' pain perception.[8] Similarly, cold-related discomfort and immobilization were recurrent and significant themes. The effectiveness of combining passive and active warming strategies to improve thermal comfort in prehospital trauma care has been documented.[9]

Immobilization-induced discomfort was a central concern. Although spinal immobilization remains a critical intervention in prehospital trauma protocols, evidence shows that it can contribute significantly to patient suffering, with a large proportion of trauma patients reporting pain and discomfort directly associated with immobilization, despite also acknowledging a sense of protection.[8,28] The recently published Discomfort Assessment Scale for Immobilized Trauma Victims (DASITV)[34] directly addresses this gap by proposing a dual-component assessment: discomfort, through a numerical discomfort scale ranging from 0 to 10, and skin pressure through an objective skin pressure measurement using pressure-mapping systems. This innovative instrument allows for a nuanced interpretation of discomfort based on both perceived suffering and measurable physiological pressure points, enabling clinicians to better understand and respond to immobilization-related discomfort. DASITV is a new scale for measuring discomfort caused by immobilization. It should be noted that the validity and reliability of this scale have not yet been reported/published.

Pharmacologic interventions remain the cornerstone of acute pain management. Across the reviewed studies, opioids, especially morphine and fentaNYL, were the most commonly used agents. Their effectiveness in reducing pain was consistently demonstrated, particularly when administered early in the prehospital phase. Intravenous fentaNYL was associated with an 81% reduction in pain, whereas methoxyflurane alone resulted in a 52% success rate in pain relief.[22] Notably, a subset of patients reported improvement in pain even in the absence of pharmacologic treatment, suggesting the influence of nonpharmacologic or contextual factors.

Nonpharmacologic interventions were frequently used in parallel or as standalone measures. Cryotherapy, effective positioning, and traction adjustments were applied to support pharmacologic measures and reduce pain exacerbated by environmental or procedural factors.[27] The therapeutic value of communication, particularly its role in reducing anxiety and subsequently modulating pain perception, has been well documented.[29,30] Distraction, breathing control, and relaxation techniques were also used with promising results, although standardized outcome measures for these interventions remain limited.

Acupressure, both manual and auricular, was among the most rigorously tested nonpharmacologic techniques. The stimulation of specific acupoints has been associated with significant reductions in pain and anxiety,[20,21] whereas auricular acupressure demonstrated both feasibility and clinical benefit in elderly patients with hip fractures.[19,33] The application of TENS has been shown to significantly reduce pain, anxiety, and physiological stress during prehospital care, with no adverse effects reported.[33]

Importantly, emotional support strategies such as therapeutic touch, active listening, and presence without physical contact were found to have a measurable impact on patient comfort. A significant reduction in the prevalence of severe pain, from 46.7% to 7.08%, was observed when emotional support was incorporated into the intervention protocol.[27] These findings reinforce the biopsychosocial nature of pain and the need for trauma care models that address both physiological and emotional dimensions of suffering.

The development and validation of DASITV[34] represent a critical step forward in the management of trauma-

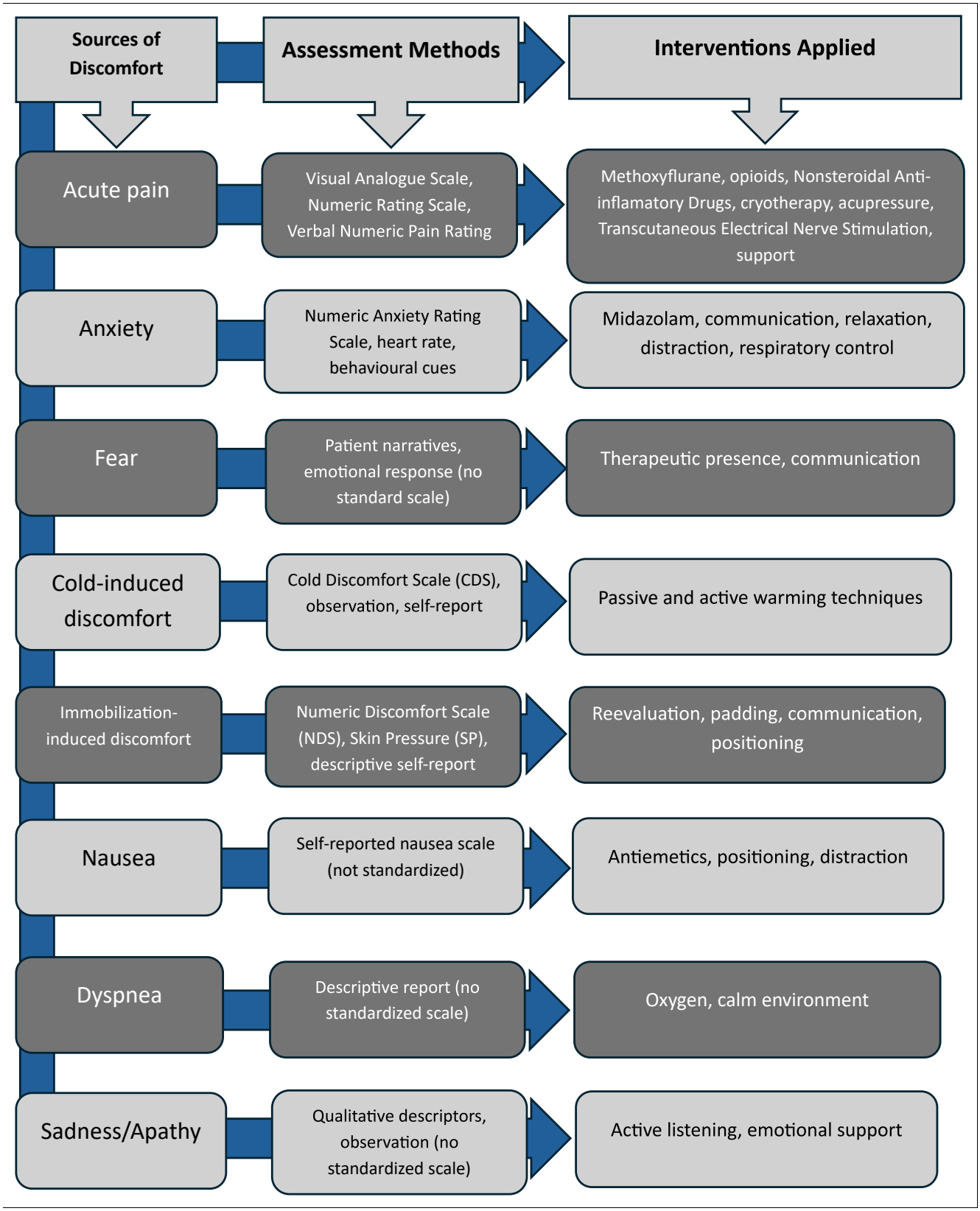

FIGURE 2
Visual summary of scoping review findings.

related discomfort. Unlike general pain scales, DASITV specifically targets immobilization discomfort, combining subjective reports with objective data to guide clinical decisions. This dual-assessment approach, endorsed by expert consensus via a modified Delphi process, has the potential to transform both clinical practice and research in prehospital trauma care. By enabling consistent documentation and evaluation of discomfort, DASITV may also support the refinement of immobilization techniques and the tailoring of interventions to reduce unnecessary suffering.

This scoping review presents several strengths that reinforce the robustness of its findings. The comprehensiveness of the search strategy, spanning multiple international databases and gray literature sources, ensured broad coverage of both published and unpublished studies. The application of strict inclusion criteria enabled the selection of diverse and relevant studies focused on adult trauma patients in prehospital care, encompassing a wide variety of injury mechanisms and care contexts. Importantly, this review systematically mapped, for the first time, the range of physical and emotional discomforts experienced by trauma patients and the corresponding pharmacologic and nonpharmacologic interventions implemented to alleviate them.

Limitations

The review identified notable gaps in the literature, such as the underrepresentation of validated tools for assessing non–pain-related discomforts and the limited quantification of the effects of certain nonpharmacologic measures. These gaps highlight important directions for future research and underscore the relevance of developing more holistic and standardized approaches to discomfort management in trauma care. Nonetheless, certain limitations must be acknowledged. Although the included studies represent a range of international contexts—particularly from Europe, North America, and Oceania—there was limited representation of research from other regions such as South America, Asia, and Africa. This may be partly attributed to the language restrictions adopted (English, Portuguese, French, and Spanish) and the lower volume of research publications on this topic from some of these regions. Furthermore, despite the inclusion of studies addressing both pharmacologic and nonpharmacologic interventions, relatively few provided in-depth analyses of their combined effects. Given the potential benefits of an integrated, multimodal approach, this remains an important area for future investigation.

Implications for Emergency Nurses

Emergency nurses play a crucial role in the early identification and management of multiple discomforts experienced by trauma patients during prehospital care. This review presents a structured synthesis of commonly reported discomforts—including acute pain, anxiety, fear, cold-induced distress, and discomfort related to immobilization—and outlines the interventions implemented to mitigate them. The findings support the role of emergency nurses in applying targeted strategies such as effective positioning, thermal control, therapeutic communication, distraction techniques, and complementary approaches such as acupressure and respiratory regulation.

Although the structure of emergency services varies internationally and nurses are less frequently present on ambulances in the United States, unless part of interfacility critical care transport or air medical teams, emergency nurses are key to receiving and continuing care for patients exposed to these interventions. Familiarity with prehospital measures allows emergency nurses to better anticipate patient needs, reassess discomforts, and ensure continuity of care. The evidence presented may inform both protocol development and continuing education priorities for emergency nursing practice across diverse care settings.

Conclusions

This scoping review identified and categorized the sources of discomfort experienced by adult trauma patients in prehospital care and mapped the pharmacologic and nonpharmacologic interventions used to alleviate them. Acute pain emerged as the most common discomfort, but anxiety, fear, cold exposure, and immobilization-related discomfort were also prominent. Interventions ranged from pharmacologic strategies with opioids and nonsteroidal anti-inflammatory drugs to nonpharmacologic strategies such as acupressure, TENS, warming measures, communication techniques, and emotional support.

The evidence reveals a multidimensional approach to discomfort management in trauma patients yet highlights the need for more consistent use of validated assessment tools, particularly for emotional and environmental discomforts. The findings reinforce the importance of integrating pharmacologic treatment with tailored nonpharmacologic strategies to address the biopsychosocial complexity of discomfort in trauma care.

By systematically mapping existing evidence, this review contributes to the understanding of how discomfort is addressed in prehospital settings and identifies critical

gaps, especially regarding the assessment and management of non–pain-related discomforts. These insights can inform the development of clinical protocols, training programs, and future research aimed at optimizing trauma care and improving patient experience in the earliest phases of medical intervention.

Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2025.08.014.

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Appendix

APPENDIX I

SEARCH STRATEGY

Medline (Pubmed): Searched on January 15, 2024

Search	Query	Records retrieved
#1	((((((((((((((Pain[MeSH Terms]) OR (psychological distress[MeSH Terms])) OR (multiple trauma[MeSH Terms])) OR (burns[MeSH Terms])) OR (Pain[Title/Abstract])) OR (discomfort[Title/Abstract])) OR (hurt[Title/Abstract])) OR (anxiety[MeSH Terms])) OR (fear[MeSH Terms])) OR (penetrating injuries[Title/Abstract])) OR (pharmacological measures[Title/Abstract])) OR (iatrogenic injury[Title/Abstract])) OR (uncomfortable[Title/Abstract])) OR (bone fracture[Title/Abstract])) OR (polytrauma[Title/Abstract])	1,304,797
#2	((((((((((((((((((((((((biofeedback psychology[MeSH Terms]) OR (imagery psychotherapy[MeSH Terms])) OR (cognitive behavior therapy[MeSH Terms])) OR (cryotherapy[MeSH Terms])) OR (musculoskeletal manipulations[MeSH Terms])) OR (relaxation[MeSH Terms])) OR (music therapy[MeSH Terms])) OR (therapeutic touch[MeSH Terms])) OR (massage [MeSH Terms])) OR (acupuncture points[MeSH Terms])) OR (acupressure[MeSH Terms])) OR (non-pharmacological[Title/Abstract])) OR (immobilisation[Title/Abstract])) OR (distraction[Title/Abstract])) OR (family presence[Title/Abstract])) OR (psychosocial intervention[Title/Abstract])) OR (massage[Title/Abstract])) OR (music[Title/Abstract])) OR (progressive relaxation[Title/Abstract])) OR (biofeedback[Title/Abstract])) OR (cognitive behavior therapy[Title/Abstract])) OR (acupunctur[Title/Abstract])) OR (cryotherapy[Title/Abstract])	221,486
#3	(((((((((ambulances[MeSH Terms]) OR (emergency medical technicians[MeSH Terms])) OR (air ambulances[MeSH Terms])) OR (emergency medical services[MeSH Terms])) OR (emergency responders[MeSH Terms])) OR (emt[Title/Abstract])) OR (field triage[Title/Abstract])) OR (out-of-hospital[Title/Abstract])) OR (HEMS[Title/Abstract])) OR (prehospital emergency care[MeSH Terms])	240,686
#4	#1 AND #2 AND #3	291
Language limits (English, French, Spanish and Portuguese)		273

Scopus: Searched on January 15, 2025

Search	Query	Records retrieved
#1	(TITLE-ABS-KEY ("pain" OR "psychological distress" OR "multiple trauma" OR "burns" OR "discomfort" OR "hurt" OR "anxiety" OR "fear" OR "penetrating injuries" OR "pharmacological measures" OR "iatrogenic injury" OR "uncomfortable" OR "bone fracture" OR "polytrauma"))	2,594,762
#2	(TITLE-ABS-KEY (""biofeedback psychology" OR "imagery psychotherapy" OR "cognitive behavior therapy" OR "cryotherapy" OR "musculoskeletal manipulations" OR "relaxation" OR "music therapy" OR "therapeutic touch" OR "massage" OR "acupuncture points" OR "acupressure" OR "non-pharmacological" OR "immobilisation" OR "distraction" OR "family presence" OR "psychosocial intervention" OR "massage" OR "music" OR "progressive relaxation" OR "biofeedback" OR "cognitive behavior therapy" OR "acupunctur" OR "cryotherapy"))	1,107,658
#3	(TITLE-ABS-KEY ("ambulances" OR "emergency medical technicians" OR "air ambulances" OR "emergency medical services" OR "emergency responders" OR "emt" OR "field triage" OR "out-of-hospital" OR "HEMS" OR "prehospital emergency care"))	154,288

continued

APPENDIX I
Continued

Scopus: Searched on January 15, 2025

Search	Query	Records retrieved
#4	(TITLE-ABS-KEY("pain" OR "psychological distress" OR "multiple trauma" OR "burns" OR "discomfort" OR "hurt" OR "anxiety" OR "fear" OR "penetrating injuries" OR "pharmacological measures" OR "iatrogenic injury" OR "uncomfortable" OR "bone fracture" OR "polytrauma")) AND (TITLE-ABS-KEY(""biofeedback psychology" OR "imagery psychotherapy" OR "cognitive behavior therapy" OR "cryotherapy" OR "musculoskeletal manipulations" OR "relaxation" OR "music therapy" OR "therapeutic touch" OR "massage" OR "acupuncture points" OR "acupressure" OR "non-pharmacological" OR "immobilisation" OR "distraction" OR "family presence" OR "psychosocial intervention" OR "massage" OR "music" OR "progressive relaxation" OR "biofeedback" OR "cognitive behavior therapy" OR "acupunctur" OR "cryotherapy")) AND (TITLE-ABS-KEY ("ambulances" OR "emergency medical technicians" OR "air ambulances" OR "emergency medical services" OR "emergency responders" OR "emt" OR "field triage" OR "out-of-hospital" OR "HEMS" OR "prehospital emergency care"))	325
Language limits (English, French, Spanish and Portuguese)		280

CINAHL (EBSCO): Searched on January 15, 2025

Search	Query	Records retrieved
S1	(MH Pain OR MH psychological distress OR MH multiple trauma OR MH burns OR AB Pain OR AB discomfort OR AB hurt OR MH anxiety OR MH fear OR AB penetrating injuries OR AB pharmacological measures OR AB iatrogenic injury OR AB uncomfortable OR AB bone fracture OR AB polytrauma)	1444987
S2	MH biofeedback psychology OR MH imagery psychotherapy OR MH cognitive behavior therapy OR MH cryotherapy OR MH musculoskeletal manipulations OR MH relaxion OR MH music therapy OR MH therapeutic touch OR MH massage OR MH acupuncture points OR MH acupressure OR AB non-pharmacological OR AB immobilisation OR AB distraction OR AB family presence OR AB psychological intervention OR AB massage OR AB music OR AB progressive relaxation OR AB biofeedback or AB cognitive behavior therapy OR AB acupunctur OR AB cryotherapy	242,479
S3	MH ambulances OR MH emergency medical technicians OR MH air ambulance OR MH emergency responders OR AB emt OR AB field triage OR AB out-of-hospital OR AB HEMS OR MH prehospital emergency care	70179
S4	(S1 AND S2 AND S3)	46
Language limits (English, French, Spanish and Portuguese)		46

RCAAP – Repositório Científico de Acesso Aberto de Portugal: Searched on January 16, 2025.

Search	Query	Records retrieved
Full text: pain OR discomfort AND trauma		70
Language limits (English, French, Spanish and Portuguese)		70

Catálogo de Teses & Dissertações - CAPES: Searched on January 16, 2025.

Search	Records retrieved
dor OR desconforto AND trauma	30
Language limits (English, French, Spanish and Portuguese)	30

continued

Embase (Elsevier): Searched on January 17, 2025

Search	Query	Records retrieved
#1	'Pain':ab,ti OR 'psychological distress':ab,ti OR 'multiple trauma':ab,ti OR 'burns':ab,ti OR 'discomfort':ab,ti OR 'hurt':ab,ti OR 'anxiety':ab,ti OR 'fear':ab,ti OR 'penetrating injuries':ab,ti OR 'pharmacological measures':ab,ti OR 'iatrogenic injury':ab,ti OR 'uncomfortable':ab,ti OR 'bone fracture':ab,ti OR 'polytrauma':ab,ti	1,911,990
#2	'biofeedback psychology':ab,ti OR 'imagery psychotherapy':ab,ti OR 'cognitive behavior therapy':ab,ti OR 'cryotherapy':ab,ti OR 'musculoskeletal manipulations':ab,ti OR 'relaxation':ab,ti OR 'music therapy':ab,ti OR 'therapeutic touch':ab,ti OR 'massage':ab,ti OR 'acupuncture points':ab,ti OR 'acupressure':ab,ti OR 'non-pharmacological':ab,ti OR 'immobilisation':ab,ti OR 'distraction':ab,ti OR 'family presence':ab,ti OR 'psychosocial intervention':ab,ti OR 'massage':ab,ti OR 'music':ab,ti OR 'progressive relaxation':ab,ti OR 'biofeedback':ab,ti OR 'cognitive behavior therapy':ab,ti OR 'acupunctur':ab,ti OR 'cryotherapy':ab,ti	298,680
#3	'ambulances':ab,ti OR 'emergency medical technicians':ab,ti OR 'air ambulances':ab,ti OR 'emergency medical services':ab,ti OR 'emergency responders':ab,ti OR 'emt':ab,ti OR 'field triage':ab,ti OR 'out-of-hospital':ab,ti OR 'HEMS':ab,ti OR 'prehospital emergency care':ab,ti	90,714
#4	#1 AND #2 AND #3	41
#5	#1 AND #2 AND #3 AND ([english]/lim OR [french]/lim OR [portuguese]/lim OR [spanish]/lim)	37

Cochrane Library: Searched on January 17, 2025.

Search	Query	Records retrieved
#1	Pain	274378
#2	discomfort	23647
#3	Pain Measurement	49202
#4	Psychological Distress	11035
#5	Cold discomfort	722
#6	immobilization	3503
#7	uncomfortable	1899
#8	anguish	47
#9	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8	296542
#10	Trauma	26733
#11	Multiple Trauma	3710
#12	Spinal Cord Injuries	3160
#13	Spinal Injuries	4026
#14	#10 OR #11 OR #12 OR #13	30283
#15	out-of-hospital	2695
#16	prehospital	2594
#17	emt	538
#18	Emergency Medical Services	4363
#19	Emergency Responders	502
# 20	Air Ambulances	79
#21	#15 OR #16 OR #17 OR #18 OR #19 OR #20	8957
#22	#9 AND #14 AND #21	424 (257)

continued

JBI Evidence Synthesis: Searched on January 17, 2025.

Search	Records retrieved
Trauma AND Discomfort Language limits (English, French, Spanish and Portuguese)	66

Opengrey Database: Searched on January 01, 2025

Search	Records retrieved
Pain OR discomfort AND trauma Language limits (English, French, Spanish and Portuguese)	1

Appendix II: Publications excluded after full-text reading

Baptista J. Gestão da Dor: Perceção do Enfermeiro em Ambulância de Suporte Imediato de Vida [dissertação de mestrado]. Viana do Castelo: Instituto Politécnico de Viana do Castelo; 2021.

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Boland LL, Satterlee PA, Jansen PR. Cervical spine fractures in elderly patients with hip fracture after low-level fall: an opportunity to refine prehospital spinal immobilization guidelines? *Prehosp Disaster Med*. 2014 Feb;29(1):96-9. https://doi.org/10.1017/S1049023X14000041.

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Bucher J, dos Santos F, Frazier D, Merlin MA. Rapid Extrication versus the Kendrick Extrication Device (KED): Comparison of Techniques Used After Motor Vehicle Collisions. *West J Emerg Med*. 2015 May;16(3):453-8. https://doi.org/10.5811/westjem.2015.1.21851.

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Fahey D. Liston's splint – a forgotten first aid technique. *J Emerg Prim Health Care*. 2009;7(1). https://hdl.handle.net/10147/269856

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Gochenour KS, Ellis RS, Meredith SL, Vesely KC, Kang P, Haefner S. Music and Medicine Come Together Over Pain in the Air Medical Transport Environment. *Air Med J*. 2020 Nov-Dec;39(6):484-488. https://doi.org/10.1016/j.amj.2020.08.003.

Reason for exclusion: Ineligible participants (Evaluates pediatric patients)

Jayaraman S, Sethi D, Wong R. Advanced training in trauma life support for ambulance crews. *Cochrane Database Syst Rev*. 2014 Aug 21;2014(8):CD003109. https://doi.org/10.1002/14651858.CD003109.pub3.

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Kober A, Scheck T, Schubert B, Strasser H, Gustorff B, Bertalanffy P, et al. Auricular acupressure as a treatment for anxiety in prehospital transport settings. *Anesthesiology*. 2003 Jun;98(6):1328-32. https://doi.org/10.1097/00000542-200306000-00005.

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Lord S, Brodell J, Lenhardt H, Dailey M, Cushman J. Implementation of a Prehospital Patella Dislocation Reduction Protocol. *Prehosp Emerg Care*. 2020 Nov-Dec;24(6):800-803. https://doi.org/10.1080/10903127.2019.1704322.

Reason for exclusion: Ineligible participants (Evaluates pediatric patients)

Pule MS, Hodkinson P, Hardcastle T. A descriptive study of trauma patients transported by helicopter emergency medical services to a level one trauma centre. *Afr J Emerg Med*. 2022 Sep;12(3):183-190. https://doi.org/10.1016/j.afjem.2022.03.004.

Reason for exclusion: Ineligible participants (Evaluates pediatric patients)

Stuhlmiller DF, Lamba S, Rooney M, Chait S, Dolan B. Music reduces patient anxiety during interfacility ground critical care transport. *Air Med J*. 2009 Mar-Apr;28(2):88-91. https://doi.org/10.1016/j.amj.2008.10.008.

Reason for exclusion: Ineligible context (The study is not conducted in a prehospital setting)

Strong D, Powell E, Tilney PV. A 20-Year-Old-Male with Hemorrhagic Shock. *Air Med J*. 2016 Jan-Feb;35(1):8-11. https://doi.org/10.1016/j.amj.2015.10.003.

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Syme K. Are you Pulling My Leg? Does the Use of Traction Splints in the Pre-Hospital Management of Patients with Femur Fractures Reduce the Complications Compared to Traditional Splinting? *Australas J Paramedicine*. 2020;17:1-7. https://doi.org/10.33151/ajp.17.769

Reason for exclusion: Ineligible participants (Evaluates pediatric patients)

van der Velde J, Linehan L, Cusack S. Helicopter winchmen's experiences with pain management in challenging environments. *Irish Med J*. 2013. http://hdl.handle.net/10147/269856

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)

Weber SR, Rauscher P, Winsett RP. Comparison of a Padded Patient Litter and Long Spine Board for Spinal Immobilization in Air Medical Transport. *Air Med J*. 2015 Jul-Aug;34(4):213-7. https://doi.org/10.1016/j.amj.2015.03.004.

Reason for exclusion: Ineligible concept (Does not assess the discomforts experienced by trauma patients)