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A Systematic Review of Pain Assessment Tools in Prehospital Emergency Care: Evidence from Observational Studies

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Abstract

Background: In the prehospital setting, pain assessment and documentation are often insufficient due to time constraints and high workload. Although validated tools such as the Numerical Rating Scale (NRS), Visual Analogue Scale (VAS), and Verbal Rating Scale (VRS) exist for rapid pain assessment, their use in emergency medical services (EMS) remains unclear.

Methods: This systematic review was conducted according to the PRISMA 2020 guidelines. A comprehensive search of PubMed, Web of Science, Scopus, and Google Scholar databases was performed for observational studies conducted in prehospital emergency settings, including both trauma and mixed patient populations reporting pain assessment practices.

Results: Of the 1,834 identified articles, 8 studies in which pain intensity was measured using standard instruments such as NRS, VAS, or VRS were eligible for inclusion. The results showed that the documentation and assessment of pain in the prehospital setting were performed in only 22.5% to 46.7% of patients, indicating a generally low frequency of pain evaluation before hospital admission. Across the included observational studies, EMS-related pain management interventions were reported to be associated with reductions in pain intensity; however, due to methodological heterogeneity and the absence of quantitative synthesis, the magnitude of these changes could not be reliably estimated.

Conclusion: Pain recording and assessment in the prehospital setting are below recommended standards, and only a limited proportion of patients are systematically monitored. This deficiency can lead to inadequate decision-making in pain management. Strengthening the training of EMS personnel for recording pain is essential to improve the quality of care.

Keywords: Pain Assessment Tools, Emergency Care, emergency medical services, Visual Analogue Scale, pain

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Introduction

Acute pain is one of the most common clinical problems in trauma patients, and inadequate control of it is associated with increased morbidity and worse clinical outcomes (1-3). Valid and continuous assessment of pain severity can lead to better treatment decisions, including the appropriate administration of analgesics, thereby reducing pain intensity and improving the patient's experience (4, 5). Uncontrolled pain can be associated with neurohormonal stress responses and hemodynamic changes, which may delay recovery and increase the risk of complications (6, 7).

Pain assessment in the prehospital emergency setting faces specific challenges, including time constraints, high workload, the complexity of the scene, and limited resources for recording and monitoring pain (8, 9). These factors lead to many EMS missions in which pain intensity is not fully recorded or pain assessment is not performed at all (10, 11). Therefore, the use of rapid, simple, and valid tools to measure pain in such settings is essential. International studies have identified several tools for measuring pain intensity in adult patients, with the most widely used being the Numerical Rating Scale (NRS), the Visual Analog Scale (VAS), and the Multilevel Verbal Scale (VRS) (12, 13). These tools have the advantages of

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Key Messages:

↑What is "already known" in this topic:

Pain assessment tools like Numerical Rating Scale (NRS), Visual Analog Scale (VAS), and Multilevel Verbal Scale (VRS) are easy to interpret and allow rapid documentation in emergency situations.

→What this article adds:

Pain assessment in the prehospital setting remains below recommended standards, and strengthening the training of EMS personnel for recording pain is essential.

requiring only a short time to administer, being easy for personnel to interpret, and allowing rapid documentation in emergency situations (14, 15).

However, evidence suggests that in the EMS setting, the use of these tools and continuous pain recording is inadequate. In a registry review of the Swedish EMS system, only 22.5% of missions assessed pain using a valid scale (10). This gap in systematic pain documentation hinders the assessment of the quality of care and the effective comparison of pain management interventions (10). In view of this situation, although suitable tools exist to measure pain severity, the role, extent of use, and variety of these tools in trauma patients undergoing prehospital care are not well understood (16, 17). Therefore, it is necessary to systematically collect and analyze the available evidence to clarify which tools are most commonly used, how frequently they are applied, and in which settings, as well as to identify their strengths and weaknesses.

The aim of this study is to identify and evaluate pain intensity measurement tools used in patients receiving prehospital emergency care, with particular emphasis on trauma-related pain, and to describe the extent and patterns of their application in real-world EMS settings through a systematic review of observational studies.

Methods

This systematic review aimed to investigate instruments for measuring pain intensity in trauma patients receiving prehospital emergency care and was conducted in accordance with the PRISMA 2020 reporting guideline. The main intervention in these studies was the recording and assessment of pain using standard instruments. To ensure the accuracy of the results, only studies in which the pain measurement instrument was clearly defined and the method of measurement was fully reported were included in the review.

Inclusion and exclusion criteria

Observational studies, including cross-sectional, cohort, and case series designs, conducted in prehospital EMS/paramedic services, were included. Studies were eligible if they reported pain assessment using standardized and validated instruments such as the NRS, VAS, and VRS. Studies including trauma patients as well as mixed populations (traumatic and non-traumatic cases) were considered eligible, provided that they reported relevant data on pain assessment practices in the prehospital setting.

Review articles, case reports without clearly defined pain assessment tools, non-English publications, animal or laboratory studies, and studies lacking standardized pain measurement instruments were excluded. Studies focusing exclusively on pediatric populations (<18 years) were also excluded. Studies were excluded if they did not report pain assessment practices or if the measurement tools were not clearly specified. Studies in which pain intensity was reported qualitatively or descriptively, or in which the pain measurement instrument was not specified, were also excluded from the analysis.

Search Strategy

A comprehensive database search was conducted to identify all cross-sectional studies relevant to the differences in pain assessment between adult patients and prehospital emergency personnel. Primary sources included PubMed, Web of Science, Scopus, and Google Scholar search engine, and the reference lists of included studies were also reviewed to identify potential additional articles. The search covered all studies published from January 1990 to November 2025 and was last updated on 21 March 2025. Database-specific search strategies and retrieved records are presented in Table 1. Studies were limited to English-language publications. Articles with incomplete pain intensity data or without a clearly defined pain assessment instrument were excluded.

Study Selection Process

No restrictions were applied regarding injury type, patient group, or cause of pain (traumatic or non-traumatic), in order to reflect real-world EMS populations, and only articles published in English were included in the review. The study selection process was carried out in accordance with the PRISMA 2020 guidelines. In the first step, all search results from the PubMed and Google Scholar databases were entered into EndNote 2025 software, and duplicates were removed.

Data extraction process

The data extraction process was carried out systematically using a pre-designed form in Microsoft Excel 2021 software. Two independent researchers (M.S and M.M) separately extracted all variables, and any discrepancies were resolved through discussion or by the opinion of a third researcher (R.H). For each study, a set of key information was extracted, including publication characteristics, population characteristics, type of trauma, pain assessment tool, pain-related outcomes, and the quality of study methodology. The extracted variables included the following:

- General study characteristics: name of the first author, year of publication, journal name, country of study, and type of study design.

- Population characteristics: total sample size, demographic characteristics of patients, clinical conditions at

Table 1. Database-specific search strategies

Source	MeSH Keywords
Scientific databases	(("EMS"[tiab] OR paramedic[tiab] OR prehospital[tiab] OR "pre-hospital"[tiab]) AND ("pain assessment"[ti] OR "pain measurement"[ti] OR "pain scale"[ti] OR "pain intensity"[ti]) AND ("cross-sectional"[pt] OR "cohort"[pt] OR survey[tiab] OR "observational"[tiab]) AND adult[tiab] AND Humans [MeSH] AND English[lang])
Google Scholar	((EMS OR paramedic OR prehospital OR "pre-hospital") AND ("pain assessment" OR "pain measurement" OR "pain scale" OR "pain intensity") AND ("cross-sectional" OR "cohort" OR survey OR observational) AND adult AND Humans)

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admission, and, if applicable, the number of subjects in the study groups.

- Trauma type: classification of injury type (blunt, penetrating, fractures, injuries from accidents, falls, or mixed injuries) and prehospital transfer conditions.
- Pain assessment tools: includes all tools used to measure pain intensity in trauma patients in the EMS setting, such as the NRS, VAS, VRS, and behavioral scales, as well as information related to their use (time of measurement, personnel training, environmental conditions).
- Pain-related outcomes: patient-reported pain intensity and other indicators related to the use of the tools (such as usability, simplicity, validity, and patient acceptance).
- Key findings of each study: main results related to the use and performance of pain assessment tools, strengths and limitations of the tools, and clinical outcomes related to pain assessment in the prehospital setting.
- Study quality and risk of bias: assessment of the methodological quality of each study using appropriate tools for the study design, including risk of bias in sample selection, risk of bias in pain measurement, and accuracy of data reporting.

Variables and precise definition of outcomes

The primary outcome variable was the instruments used to assess pain severity in trauma patients in the EMS setting. In the included studies, pain severity was typically measured using standard instruments such as the NRS, VAS, or behavioral scales. These instruments are widely recognized and validated for acute pain assessment in emergency and prehospital settings; however, reporting of formal validation procedures and cross-cultural validation across different EMS systems was inconsistent among the included studies. Variables extracted for analysis included the type of pain assessment instrument (NRS, VAS, or behavioral scales), the time and conditions of measurement, patient-reported pain severity, type and severity of trauma, history of prehospital treatment (if available), and characteristics of the study population. The results of the included studies in this review were presented as descriptive analyses, and due to heterogeneity among the studies in terms of pain assessment instruments, study populations, and outcome reporting, statistical pooling or meta-analysis was not performed. Due to heterogeneity in population composition across studies, the analysis focused on overall pain assessment practices rather than trauma-specific pooled estimates. Assessor blinding was not reported in the majority of included studies, which may introduce potential measurement bias in pain assessment and should be considered when interpreting the findings.

Risk of bias assessment

The methodological quality and risk of bias of the included studies were assessed using the Joanna Briggs Institute (JBI) critical appraisal tools for observational studies(18). The JBI framework is a widely used and validated instrument designed to evaluate the methodological rigor and internal validity of non-randomized studies. The JBI checklist assesses risk of bias across multiple methodological domains, including .clarity of inclusion and exclusion criteria

appropriateness of study population description; sampling strategy and recruitment methods; validity and reliability of exposure and outcome measurements (in this review: pain assessment tools such as NRS, VAS, and VRS); identification and management of confounding factors; completeness and handling of missing data; appropriateness of statistical analysis; transparency of results reporting. Each item in the JBI checklist is typically rated as “Yes”, “No”, “Unclear”, or “Not applicable”, reflecting whether the study adequately addressed each methodological criterion. In the present review, responses across items were used to generate a domain-level appraisal of bias risk rather than relying solely on a simple summary score. For synthesis purposes, the overall risk of bias for each study was categorized as low, moderate, or high risk, based on the proportion and severity of unmet criteria across domains. Studies with multiple limitations, particularly regarding retrospective design, incomplete outcome reporting, or unclear sampling procedures, were classified as having moderate to high risk of bias. Across the included studies, the most frequent sources of bias were retrospective study designs, incomplete documentation of pain assessments, and variability in inclusion criteria, which may have influenced the precision and comparability of findings. The results of the risk of bias assessment were summarized in Table 2 and used to inform the interpretation of the overall evidence synthesis.

Strength of Evidence Assessment / GRADE

The quality and strength of the extracted evidence were assessed using the GRADE framework (19). Within this framework, factors such as study design, risk of bias, heterogeneity among studies, precision of results, likelihood of publication bias, and the direct relevance of the evidence to the use and performance of pain intensity measurement tools in trauma patients were examined.

Given that this systematic review included observational studies and qualitative analysis without quantitative meta-analysis, the final assessment of the quality of evidence was performed descriptively. The final classification of evidence quality was based on four levels: "very high", "high", "moderate", and "low", and the results of this assessment are reported in the summary of findings table.

Sensitivity and subgroup analyses

Subgroup analyses were planned based on injury type (traumatic vs. non-traumatic) and type of pain assessment tool. However, due to the lack of disaggregated data in most included studies, trauma-specific subgroup analysis was not feasible. In addition, to examine the robustness and consistency of the findings, a descriptive sensitivity analysis was conducted, in which studies of lower quality or higher risk of bias were analyzed separately to determine whether their exclusion would change the overall trend of the results. This approach allowed careful consideration of the impact of study methodological quality on the final findings of the review.

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Table 2. Risk of Bias Assessment of Included Studies

Study No.	Author & Year	Study Design	Inclusion Criteria	Exclusion Criteria	Risk of Bias Assessment (JBI)
1	Ricard-Hibon, 1997	Prospective Survey	Adult patients ≥10 years admitted by EMS during a 3-month period	Children <10 years, non-communicable patients	Unclear / Cannot be assessed
2	Lohmann, 2025	Retrospective Multicenter Observational	Patients ≥18 years with trauma-related pain receiving IV analgesia by paramedics	Patients <18 years, non-trauma pain, pregnancy, incomplete documentation, analgesic contraindication	Moderate
3	Deslandes, 2024	Observational Retrospective	Patients ≥18 years with NRS ≥4 receiving analgesic treatment by paramedics	Patients <18 years, no need for analgesic treatment, prehospital care by physician, other drugs, incomplete data	Moderate
4	Larsson, 2025	Retrospective Observational Cohort	Adults ≥18 years, alert, RETTS ESS pain code	Children <18 years, altered consciousness, non-pain ESS code, missing data	Moderate
5	Ferri, 2022	Retrospective Observational, Monocentric	Adults ≥18 years under EMS care via ambulance or nurse-led vehicle	Patients <18 years, non-advanced EMS, incomplete/illegible forms, inability to assess pain	Moderate
6	Lidauer, 2025	Descriptive Retrospective Cohort	All patients receiving EMS care	Not specified	Moderate
7	Wennberg 2020	Prospective Observational Study	Adult patients (≥18 years) with suspected traumatic hip fractures receiving prehospital emergency medical services	Patients <18 years; patients unable to self-report pain; missing or undocumented pain assessments	Moderate
8	Schempf 2017	Retrospective Observational Comparative	Adult trauma patients with isolated limb injury receiving prehospital analgesia by emergency physicians or paramedics	Patients <18 years; patients without isolated limb trauma; incomplete analgesia documentation	Moderate

Results

In the Identification phase, a total of 1,834 articles were obtained (PubMed = 325, Web of Science = 1,509). After removing 420 duplicate articles, 1,414 unique records remained. In the Screening phase, two researchers independently reviewed the titles and abstracts of all articles. In cases of disagreement, the final decision was made through joint discussion or by the opinion of a third referee. Of these, 1,360 articles were excluded due to their relevance to the study purpose (studies that did not assess pain severity in prehospital emergency care populations using standardized instruments), nonhuman studies, narrative reviews or letters to the editor, and incomplete studies. In the full-text assessment phase (eligibility), the remaining 54 articles were reviewed in full. Of these, 48 studies were excluded due to the lack of concurrent patient pain data and staff assessment, limited sample sizes, or incomplete data. Finally, 8 studies were eligible for inclusion in the analysis. The complete process of study selection is presented in the PRISMA flow chart (Figure 1).

General characteristics of included studies

In this systematic review, 8 studies were included, involving a total of 16,000 adult patients and EMS dispatchers (18 years and older), where the intervention studied involved prehospital pain assessment and management with various analgesics (nalbuphine, morphine, paracetamol, and other drugs). Ricard-Hibon (20) and Wennberg (21) were prospective, single-center studies, while the other studies were multicenter or single-center retrospective (Lohmann (22), Deslandes (23), Larsson (4), Ferri (14), Lidauer (24), Schempf (23)) (Table 3).

The studies were conducted in France, Germany, Sweden, Italy, and Finland, and the mean age of patients was reported to be between 55 and 65 years, with a range of 0 to 103 years. All studies included adult patients under EMS care, while pediatric patients (<18 years), patients with impaired consciousness, or those with incomplete data were excluded from the analyses. The included studies comprised both trauma and mixed (trauma and non-trauma) patient populations, reflecting real-world EMS case-mix. Pain types included traumatic and non-traumatic, with a major focus on traumatic pain in the German and Italian studies (Table 3).

Pain scales used included NRS, VRS, and VAS. The timing of pain assessment was often at the initial EMS contact, and some studies included a reassessment before the patient was transferred to the hospital. The rate of pain assessment and analgesic prescription varied considerably, with pain assessment performed in only 22.5–46.7% of patients (Table 3).

Main outcomes

A review of six studies found that pain assessment and management in the prehospital setting by EMS was significantly inadequate across both trauma and mixed patient populations. Pain recording and measurement rates were low, with only 22.5% to 46.7% of patients assessed at the time of EMS contact. Analgesic administration was also limited, with fewer than a third of patients receiving

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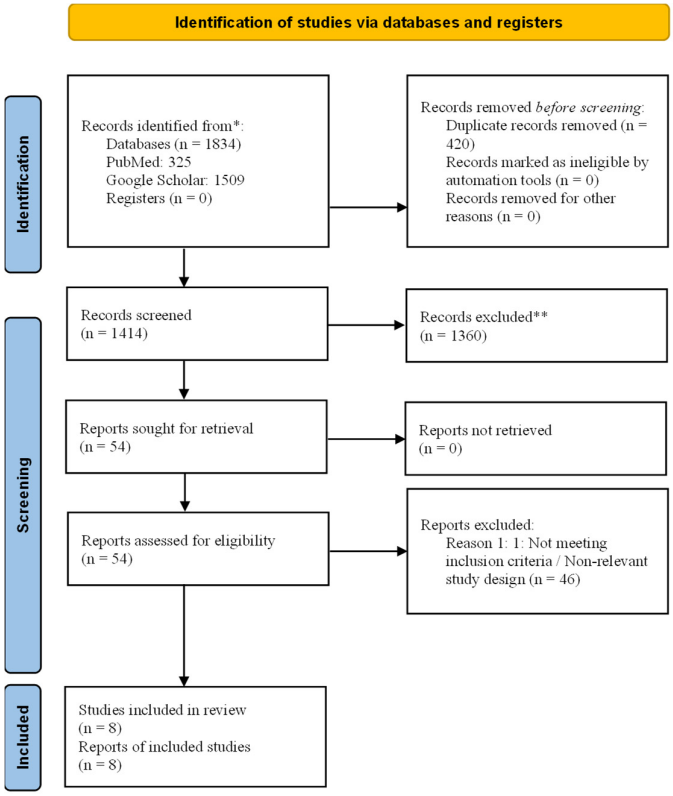

Figure 1. PRISMA Flow Diagram of Study Selection

pharmacological treatment in most studies. However, when pain management was provided, observational findings across studies consistently reported reductions in pain intensity following EMS interventions, although the magnitude of these changes varied across studies and could not be quantitatively synthesized due to methodological heterogeneity. In comparative observational studies, the combination of nalbuphine and paracetamol was reported to achieve lower pain scores (e.g., NRS ≤ 4) earlier than morphine, although these findings should be interpreted cautiously given differences in study design and patient populations.

Secondary outcomes

Studies showed that the type of pain (traumatic) and patient characteristics influenced assessment and treatment; patients with traumatic injuries were more likely to have their pain assessed and receive analgesia. Pain reassessment during transfer was also very inconsistent and limited, which hinders the monitoring of intervention effectiveness. These patterns were generally observed across both trauma and mixed patient populations.

Risk of bias and sensitivity analysis

Most included studies were retrospective observational in design and showed varying methodological limitations across JBI domains, particularly regarding selection bias, incomplete outcome data, and confounding. These limitations were more evident in registry-based studies with inconsistent documentation of pain assessments .One older study was not fully appraised due to insufficient methodological reporting .A qualitative sensitivity analysis, based on exclusion of studies with a higher risk of bias or missing data, indicated that the overall pattern of findings remained stable across studies. However, due to heterogeneity in study populations, EMS systems, and pain assessment methods, the magnitude of changes in pain outcomes could not be reliably estimated or pooled .Overall, findings should be interpreted cautiously, as differences in study design and data quality may have influenced the observed results.

GRADE Quality of Evidence Assessment / Descriptive

The certainty of evidence was assessed using the GRADE approach, considering study design, risk of bias, inconsistency, indirectness, imprecision, and publication bias. All included studies were observational in design; therefore, the initial level of evidence was considered low. The evidence was further downgraded due to a serious risk of bias, as most studies were retrospective with incomplete outcome reporting and limited control for confounding. Inconsistency was also present, as considerable variability was observed in pain assessment tools, EMS protocols, and study populations. In addition, imprecision and indirectness were noted, given heterogeneity in meas-

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Table 3. Characteristics of included studies in the systematic review

Author / Study year	Ricard-Hibon 1997	Lohmann 2025	Deslandes 2024	Larsson 2025
Country	France	Germany	Germany	Sweden
Study Design	Prospective Questionnaire	Retrospective Multicenter	Retrospective Observational	Retrospective Observational Cohort
Sample Size / EMS Missions	255 patients	1,241 missions	1,808 patients	394,700 missions
Mean Age ± SD / Range	58 ± 1.5	60.3 ± 22.7	55.5 ± 21.3 (overall)	65 ± 22 / 18–?
Inclusion Criteria	Patients ≥10 years, EMS admission over 3 months	Patients ≥18 years with trauma-related pain receiving IV analgesia by paramedics	Patients ≥18 years with NRS ≥4 receiving analgesic treatment by paramedic	Adults ≥18 years, alert, RETTS ESS pain code
Exclusion Criteria	Children <10 years	Patients <18 years, non-trauma pain, pregnancy, incomplete data, drug contraindication	<18 years, absence of pain requiring treatment, physician-administered treatment, other drugs, incomplete data	Children <18 years, impaired consciousness, non-pain ESS code, incomplete data
Type of Pain / Trauma	General acute pain – prehospital pain from various causes	Trauma-related pain (various locations)	Mixed population (trauma and non-trauma pain cases)	Mixed population (medical 60.4%, trauma 39.6%)
Pain Assessment Tool	5-point VRS and VAS	NRS 0–10	NRS	NRS, BRS
Pain Assessment Timing	EMS arrival (T0) and post-management (T_end)	EMS arrival and hospital admission	Before analgesia and hospital handover	During the EMS mission
Patient Pain Outcomes	Only 49% reported good improvement	NRS ≤4 in 38.4% of patients at hospital admission	NRS 3.7 ± 2.0 (Nal+Par) vs 5.1 ± 2.0 (Morphine)	Pain reduction in 26.2% of evaluated patients
Pain Assessment Rate	42% with VRS, 60% with VAS usable	38.4%	100% of treated patients	22.5%
Key Findings / Conclusions	VRS and VAS are suitable for prehospital assessment; pain management is often inadequate; need for a better protocol	Nalbuphine+Paracetamol is more effective, safer, rare side effects	Nalbuphine+Paracetamol is more effective than Morphine, has fewer side effects, is safe and effective	Low pain assessment, only 27.5% received analgesia, higher pain in women and younger patients
Limitations	Limitations not clearly stated; only patients able to report pain included	Retrospective; possible selection/documentation bias; only initial NRS ≥7 analyzed	Retrospective, non-random, limited SOP coverage, baseline differences between groups	Retrospective, incomplete data, 8 regions excluded, selection bias
Quality of evidene (GRADE)	Moderate	Moderate	Moderate	Moderate

urement timing and differences in EMS system structures. Publication bias could not be formally assessed.

Overall, the certainty of evidence was rated as low. The findings suggest that pain assessment in prehospital EMS settings is generally inconsistent across both trauma and mixed populations. While several studies reported reductions in pain following EMS interventions, the certainty of this effect remains limited due to methodological and clinical heterogeneity across studies.

Discussion

In this systematic review, six observational studies of adult patients receiving prehospital EMS care were reviewed to determine the status of pain assessment and documentation in the prehospital setting. The results showed that the process of pain assessment and documentation in EMS is significantly below recommended standards across both trauma and mixed patient populations. The rate of pain recording during the initial assessment by EMS personnel was reported to range from 22.5% to 46.7%, indicating a substantial gap between clinical guidelines and actual practice in the prehospital setting. These findings suggest that pain as a fifth vital sign is not yet systematically assessed in EMS and that factors related to training, workload, and operational protocols likely influence the quality of initial patient assessment.

Structural Weaknesses and Inadequacy of Pain Assessment in EMS Missions

The study by Larsson et al (4) showed that out of 394,700 EMS missions in Sweden, pain intensity was recorded using a valid NRS scale in only 22.5% of cases. The study by Lidauer et al (24) also reported that out of 7,245 patients under EMS care, only 36% were assessed for pain once, and pain reassessment was performed in 27%. These data are consistent with the results of the study by Ricard-Hibon et al.; in this study, conducted on 255 patients, VRS or VAS were used to assess pain, but only 42% of patients reported pain, and the VAS was usable in 60%. Wennberg et al (21) demonstrated that adult patients with hip fractures experienced severe pain, yet pain reassessment during prehospital care was limited, highlighting a structural gap in systematic pain evaluation. Thus, the evidence clearly shows that pain assessment is rarely performed systematically in EMS, across different healthcare systems and study populations, including registry-based, trauma-focused, and mixed-case cohorts, whether in Sweden, Finland, or in more traditional EMS systems. This structural

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Table 3. Cont

Author / Study year	Ferri 2022	Lidauer 2025	Wennberg 2020	Schempf 2017
Country	Italy	Finland	Sweden	Germany
Study Design	Retrospective Observational, Single-Center	Retrospective Descriptive	Prospective observational study	Retrospective observational comparative study
Sample Size / EMS Missions	629 missions	7,245 missions	328 patients (suspected hip fracture, EMS missions)	207 completed records (patients with isolated limb injury treated prehospital)
Mean Age ± SD / Range	64.2 ± 22 / 18–108	60.1 ± 24.9 / 0–103	Mean age ≈ 83 years (elderly population)	Not reported in abstract (likely adult trauma patients)
Inclusion Criteria	Adults ≥18 years, prehospital care by ambulance or nurse-led vehicle, historical forms Jan–May 2019	All patients receiving EMS care	Adult patients (≥18 years) with suspected hip fracture receiving prehospital emergency care	Adult trauma patients with isolated limb injury receiving prehospital analgesia by either emergency physicians or paramedics
Exclusion Criteria	<18 years, non-advanced EMS, incomplete or illegible forms, inability to assess pain	Not specified	Patients <18 years; patients unable to self-report pain; missing pain assessment data	Patients without isolated limb trauma, incomplete prehospital analgesia, or documentation [not explicitly detailed]
Type of Pain / Trauma	Trauma 22%, Medical 78%	Mixed EMS population (medical and trauma cases)	Traumatic pain – suspected hip fracture	Traumatic pain due to isolated limb injury
Pain Assessment Tool	NRS	NRS (primary), VAS, VRS	Numeric Rating Scale (NRS), Behavioral Rating Scale (BRS)	Numeric Rating Scale (NRS)
Pain Assessment Timing	During EMS mission	Initial contact and reassessment (if NRS ≥4)	At first, EMS contact and during prehospital care	Pain measured at the start and end of prehospital treatment
Patient Pain Outcomes	Pain reduction after pharmacological treatment	853/7,245 patients reported pain	High pain intensity at first contact; limited pain reduction before hospital arrival	Pain reduced from NRS ~8 to ~2 in both paramedic and physician groups.
Pain Assessment Rate	46.7%	36% initial, 27% reassessment	Pain was assessed in the majority of patients, but reassessment was inconsistent.	Pain assessment documented pre- and post-analgesia for included cases.
Key Findings / Conclusions	Pain is common and severe in trauma patients; pain management is inadequate; treatment effectively reduces pain.	Unstable pain assessment; analgesics are effective; need for systematic assessment	Pain in suspected hip fracture patients was often severe; pain management in the prehospital setting was frequently inadequate; elderly patients were at risk of under-treatment	Paramedics under medical supervision can safely and effectively perform prehospital analgesia comparable to emergency physicians; both groups achieved significant pain reduction.
Limitations	Small sample, short study period, single-center, 25% missing pain data	Retrospective, small month, small analgesic group, unclear timing	Single-region study; elderly-dominant population; possible documentation bias; no randomization	Retrospective design; limited report detail; potential selection/documentation bias
Quality of evidene (GRADE)	Moderate	Moderate	Moderate	Moderate

Values are reported as provided in original studies (patients or EMS missions, depending on study design.

gap can lead to incomplete recognition of pain and, consequently, inadequate care.

Heterogeneity between EMS systems and methods: Differences in pain recording and follow-up

The above studies differ significantly in design, population, and method of pain recording: a large national registry in Sweden, a regional study in Finland (24), and a single-center prehospital study in Italy (14) involving 629 patients. In the Italian study, EMS paper forms were used to record the NRS, and it was found that in 24.5% of the forms, pain data were missing or not recorded. In the study by Deslandes et al (23) it was shown that accurate recording of pain intensity with the NRS before prescribing medication was directly related to the choice of medication type and dose, and patients with higher pain levels were treated more quickly. In the German study (9), data were collected from electronic EMS records in two regions. This diversity in design and methodology suggests that the lack of a global or international standard protocol for pain assessment in EMS is a serious obstacle to result comparison, consistent analysis, and policy formulation, and limits the external validity of comparative findings across EMS systems.

The Impact of Continuous Pain Assessment on Patient Care Quality

The study by Larsson et al (4) showed that in missions where pain was recorded with the NRS and followed up, patients were more likely to receive medication and received more appropriate treatment. The study by Lidauer et al (24) also showed that patients with an NRS ≥ 4 were

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more likely to receive treatment, and that pain recording was effective in guiding decisions about pain management. The study by Lohmann et al (22) found that systematic pain assessment was associated with fewer errors in treatment decisions and improved quality of pain management and improved the quality of pain control, while patients whose pain was not recorded correctly were more likely to receive inadequate or delayed medication. Schempf et al (25) demonstrated that both emergency physicians and paramedics can safely and effectively perform prehospital analgesia, and that systematic pain assessment leads to a significant reduction in pain and improved quality of care. Consequently, the available evidence suggests that accurate and continuous pain assessment is not only an ethical imperative, but also an effective clinical tool for improving prehospital care.

Limitations, Bias, and Validity of Evidence

All of the studies reviewed were retrospective or registry-based; therefore, causal inference is limited. In Ferri et al (14), 24.5% of forms lacked pain data; in the Finnish study, only 36% of patients were assessed, leaving a large group without any documented evidence of pain. Furthermore, differences in EMS systems, staff training levels, and regional policies (medication, regulations, patient age) necessitate cautious interpretation of the results. However, the consistency of the findings, that is, where pain assessment was performed, the quality of care was better, provides considerable strength to our argument.

The Need to Revise EMS Protocols

Ignoring pain in the prehospital setting is not only a technical weakness but also a lack of professional ethics, as severe pain causes suffering, anxiety, aggravation of the patient's condition, and the possibility of clinical deterioration, factors that can be mitigated by appropriate pain recording and management. The data from this review suggest that implementing standardized pain assessment protocols (such as NRS) and requiring recording and follow-up can improve the quality of care, equity in access to pain relief, and accuracy of treatment across prehospital emergency systems.

Conclusion

The findings of this systematic review indicate that pain assessment and documentation in the prehospital EMS setting remain below recommended standards, with only a limited proportion of patients receiving care having their pain systematically recorded. This may limit clinical decision-making for appropriate pain management and increase the risk of inadequate pain relief in patients experiencing acute or severe pain in prehospital settings. Therefore, it is essential to improve the training of EMS personnel, develop standard operating protocols, and emphasize pain recording as a fifth vital sign. Overall, the results of this review highlight the importance of systematic pain assessment in the prehospital setting, the need for practical measures to improve the quality of primary patient care, and suggest the need for further high-quality observational and interventional research to strengthen evidence in this field.

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Conflict of Interests

The authors declare that they have no competing interests.

Authors' Contributions

Concept – S.M.H.K., M.M.; Design –S.M.H.K., M.M., M.S., R.H.; Supervision – S.M.H.K.; Funding – S.M.H.K., M.M., M.S., R.H.; Materials – S.M.H.K., M.M., M.S., R.H.; Data collection and/or processing – S.M.H.K., M.M., M.S., R.H.; Data analysis and/or interpretation – S.M.H.K., M.M., M.S., R.H.; Literature search – S.M.H.K., M.M., M.S., R.H.; Writing – S.M.H.K., R.H.

Ethical Considerations

No ethical approval was required for this study.

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Data Availability

Data will be available upon reasonable request from the corresponding author.

AI Use Statement

We have not used any AI in the present study.

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