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Procedural Analgesia in a Pediatric Emergency Department: Nurses' Perceptions, Decision-Making Processes, and Organizational Barriers

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Abstract

Introduction. Procedural pain is a common reason for pediatric emergency department visits and remains frequently undertreated despite the availability of evidence-based recommendations. Nurses play a key role in pain assessment and management; however, limited evidence is available regarding the factors influencing their clinical decision-making in everyday practice. This study aimed to describe nurses' perceptions, self-reported practices, decision-making criteria, and perceived barriers related to procedural analgesia in a tertiary pediatric emergency department.
Methods. A cross-sectional observational study was conducted in February 2026 in the emergency department of a tertiary pediatric hospital in Italy. An anonymous online questionnaire was administered to nurses working in the department. The survey explored procedural pain perception, analgesia and sedation decision-making, pain assessment practices, organizational barriers, and self-perceived competence. Descriptive statistics were performed, while exploratory analyses included Fisher's exact test, Mann–Whitney U test, and Spearman's correlation coefficient.
Results. Twenty-five nurses completed the survey (response rate 75.8%). Most participants had received specific training on procedural pain management within the previous 24 months

(68%) and reported the availability of local protocols (88%). Procedural pain management was considered a high priority by 68% of respondents, although 48% believed procedural pain was frequently underestimated in their workplace. Clinical judgment combined with team consultation represented the most common decision-making approach (80%). Procedural invasiveness was the main criterion guiding analgesic escalation (44%). Workload and crowding were identified as the principal barriers to effective analgesia (72%). Emergency department experience was positively associated with perceived competence (rho=0.428; p=0.037) and negatively associated with the perceived impact of crowding on clinical decisions (rho=-0.417; p=0.043).

Discussion. Organizational constraints and reliance on subjective clinical judgment continue to influence procedural analgesia practices. Decision-support tools, targeted training, and strategies to strengthen nursing autonomy may improve the consistency of pediatric procedural pain management.

Keywords: Pediatric Emergency Service, Procedural Pain, Pain Management, Nurses, Decision Making

Introduction

Pain is a complex and subjective phenomenon, influenced by psychosocial, physical, emotional and cognitive factors (Eull et al., 2023).

Pain management in the paediatric population represents a clinical and ethical challenge of primary importance, particularly within the emergency medicine setting where pain constitutes one of the main reasons for admission (Sabetsarvestani et al., 2024).

Despite the availability of validated assessment scales and international evidence-based recommendations, the literature documents a persistent inconsistency in the management of procedural pain (Mahon et al., 2023). Indeed, a significant gap remains between professionals' theoretical awareness and the systematic application of analgesic protocols in daily practice (Mahon et al., 2023).

This gap is driven by multifactorial barriers: structural and organisational constraints, such as high workloads, inadequate spaces for sedation, and time shortages (Mahon et al., 2023, Czarnecki et al., 2014, Langeli et al., 2025); specific educational deficits, especially regarding the use of non-pharmacological techniques (Hasanah et al., 2024, Skog et al., 2021); and intrinsic complexities in communicating with the paediatric patient and their family (Czarnecki et al., 2014, Yuan, 2024). The consequences of a sub-optimal approach to procedural pain are severe and well-documented both in the short term, in the form of anxiety, stress, and resistance to procedures (de Souza et al., 2025), and in the long term, promoting the development of specific phobias (needle phobia), hyperalgesia, and early avoidance of future healthcare (Mahon et al., 2023, de Souza et al., 2024, Guillari et al., 2024). Furthermore, in neonates, repeated exposure to painful stimuli can negatively interfere with brain development (Yan et al., 2024).

Promptly identifying and managing procedures perceived as most painful (such as airway suctioning, urinary catheterisation, nasogastric tube insertion, intravenous access, and suturing) therefore represents an absolute care priority (de Souza et al., 2025, Lorente et al. 2023). Although optimal management requires a multimodal and family-centred model capable of integrating pharmacological strategies (Moll-Berto et al., 2024, Stavleu et al., 2025) and non-pharmacological interventions (distraction, virtual reality, music therapy, sucrose administration) within nursing autonomy (Hasanah et al., 2024, Guillari et al., 2024, Moll-Berto et al., 2024), the effective translation of these principles into clinical routine remains imperfect. The nurse plays a central role in this

process (de Souza et al., 2024, Seipajaervi et al., 2025); however, there remains a compelling need to fully understand how professionals perceive procedural pain and what factors guide their choices.

This study therefore aims to explore the perceptions, clinical practices, and decision-making determinants of nursing staff in the management of procedural analgesia within a paediatric Emergency Department.

However, data remain limited regarding how paediatric Emergency Department nurses integrate protocols, clinical judgement, available resources, and organisational conditions when choosing procedural analgesic strategies.

The objective of this study was to describe the perceptions, self-reported practices, decision-making criteria, and organisational barriers reported by nurses in the management of paediatric procedural analgesia within a tertiary-level Emergency Department.

Methods

In February 2026, a cross-sectional observational study was conducted based on the administration of an anonymous online questionnaire via the Google Forms® platform.

The survey took place in the Emergency Department (ED) of a tertiary-level paediatric hospital in Italy. A convenience sampling method was adopted, which included nurses on duty within the Emergency and Admission Department (DEA). Out of a total of 33 eligible professionals, 25 completed the questionnaire, yielding a response rate of 75.8%.

The data collection tool was developed by the authors based on the available literature on paediatric procedural pain management, analgesia and sedation in the Emergency Department, and the main barriers perceived by nurses in clinical practice.

A first version of the questionnaire was subsequently reviewed by a group of professionals with experience in paediatric emergencies, procedural pain management, and nursing research. The review aimed to assess the clarity of the questions, the relevance of the contents to the study objectives, and the completeness of the areas investigated. Following this discussion, some items were modified in their phrasing and response options to improve understanding and uniformity of interpretation.

Prior to final dissemination, the questionnaire was piloted on a small group of professionals with characteristics similar to those of the study population but not included in the final analysis. This preliminary phase allowed for verification of the comprehensibility of the questions, the functionality of the online completion process, and the time required to complete the questionnaire. The feedback collected led to some minor modifications in the structure and formulation of the items, without altering the content of the planned thematic areas.

The final version comprised 25 questions, including 23 closed-ended and 2 open-ended questions, organised into five sections: professional and organisational characteristics, perception of procedural pain, decision-making criteria for analgesia and sedation, pain assessment and reassessment, and organisational and educational barriers.

The closed-ended questions included dichotomous questions, single-choice questions, multiple-choice questions, and ordinal Likert-type scales. The latter were used to explore aspects such as the priority attributed to procedural pain management, the perceived frequency of certain phenomena, the level of perceived competence, and the degree of support towards potential decision-making tools.

For multiple-choice questions, each option was analysed as an independent variable and coded as the presence or absence of the response. Consequently, the percentages reported for these items were not mutually exclusive and could overall exceed 100%.

For exploratory analyses using Fisher's exact test, some variables were recoded into a dichotomous format. Specifically, specific training received within the last 24 months was classified as present or absent; the perception of pain underestimation was divided into frequent versus non-frequent perception; perceived competence in selecting patients eligible for advanced analgesia or sedation was classified as high versus non-high. Similarly, support towards the introduction of a nursing decision-support algorithm was converted into in favour versus not in favour. This procedure was adopted to limit the fragmentation of categories and to make the statistical analysis more stable, given the small sample size. Quantitative variables analysed overall and specific professional experience

in the Emergency Department; categorical variables investigated training in the last 24 months, the presence of dedicated protocols, the perception of symptom underestimation, perceived competence, and the impact of crowding on clinical choices.

Statistical analysis was performed using R software (version 4.3.2). Given the sample size (n=25), the analysis was predominantly descriptive and exploratory. Continuous variables were summarised using mean, standard deviation, median, and interquartile range (IQR). Categorical variables were described as absolute frequencies and percentages. Associations between categorical variables were assessed using Fisher's exact test, applying the Haldane–Anscombe correction for cells with a frequency equal to zero. Group comparisons for non-parametric quantitative variables were performed using the Mann–Whitney U test, while correlations between ordinal variables and years of experience were calculated using Spearman's correlation coefficient (rho). Tests were two-tailed, assuming a p-value < 0.05 as the threshold for statistical significance.

Given the small sample size, inferential analyses were considered exclusively exploratory and aimed at identifying potential associative patterns to be further investigated in future studies. The results were not interpreted in terms of causality.

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki and EU Regulation 2016/679 (GDPR). Participation was voluntary and anonymous, following implicit informed consent expressed upon submitting the questionnaire. The study was authorised according to the internal procedures of the operational unit and health management. No identifying data of the participants nor information traceable to patients were collected.

Results

Sample characteristics

A total of 25 nurses working in the Emergency Department participated in the study. The most represented primary work area was triage (36%; n=9), followed by the short-stay observation unit (OBI) (16%; n=4), the resuscitation/red room (12%; n=3), and rotation/multi-area assignment (8%; n=2), while the remaining areas showed lower frequencies.

The mean overall professional experience was 13.87 ± 8.47 years, whereas the specific experience within the Emergency Department was 7.23 ± 7.62 years (Table 1 and Table 2).

Table 1. Sample characteristics.

Variable	n	Mean (DS)	Median (IQR)	Min–Max
Years of overall nursing experience	23	13.87 (8.47)	13 (10-18)	2-36
Years of ED experience	24	7.23 (7.62)	4 (2-8)	0-25

Table 2. Sample characteristics.

Area	n	%
Triage	9	36.0
Other	6	24.0
Short-stay observation room	4	16.0
Resuscitation room	3	12.0
Rotating	2	8.0
Low-acuity area	1	4.0

The majority of the sample (68%; n=17) reported having received specific training on pain management or procedural analgesia within the last 24 months, while 88% (n=22) stated that a procedural analgesia or sedation protocol was available in their Emergency Department.

Regarding available resources, 72% (n=18) reported the immediate availability of analgesic or sedative medications, 68% (n=17) the presence of written and updated protocols, and 56% (n=14) local or topical anaesthetics. Dedicated spaces and nitrous oxide were reported less frequently (28% each), as were distraction or comfort tools (16%).

Procedural pain perception and self-perceived competence

Procedural pain management was considered a care priority by nearly all participants: 68% (n=17) defined it as a high priority and 28% (n=7) as a priority. Despite this, nearly half of the sample (48%; n=12) reported that procedural pain is often underestimated within their work environment (Figure 1).

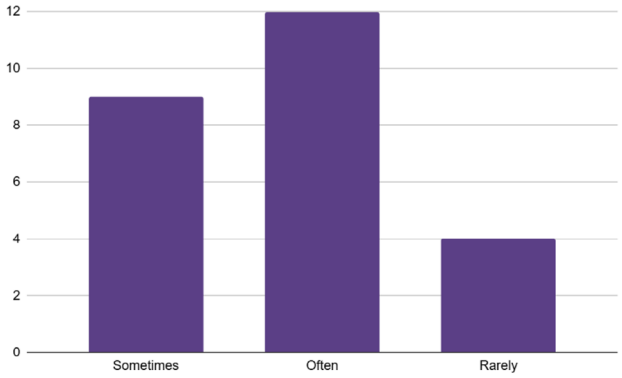


Figure 1. How frequently do you believe procedural pain is underestimated in your workplace?

In the exploratory analysis, no statistically significant association was found between years of Emergency Department experience and the frequent perception of pain underestimation (median 3.0 vs 5.0 years; Mann–Whitney U=64.0; p=0.663). However, a non-significant trend towards a lower perception of underestimation was observed among professionals who had received specific training within the last 24 months (OR=0.22; 95%CI 0.04-1.25; p=0.097) (Table 2).

The primary objective associated with procedural pain management was the reduction of pain intensity reported by the patient (48%; n=12), followed by the reduction of anxiety and distress (28%; n=7). The indicators deemed most useful for evaluating the effectiveness of the intervention were patient or caregiver satisfaction (76%; n=19) and improvement in pain scale scores (60%; n=15).

Forty-eight per cent (48%; n=12) of the participants reported feeling moderately competent in selecting cases eligible for advanced analgesia or sedation, while 24% (n=6) defined themselves as highly competent. Emergency Department experience showed a significant positive correlation with perceived competence (p=0.428; p=0.037), whereas no significant association emerged between recent training and perceived competence (OR=1.59; 95%CI 0.25-10.32; p=1.000) (Table 3).

Decisional criteria and organizational impact

The primary factor guiding the intensification of pain management was the type of procedure and its degree of invasiveness (44%; n=11), followed by patient characteristics (28%; n=7).

The criteria most frequently used to select cases eligible for procedural sedation were the high invasiveness of the procedure (68%; n=17) and expected severe pain (48%; n=12). Furthermore, 80% (n=20) of the participants stated that they base their decision-making approach predominantly on individual clinical assessment and consultation with the team (Figure 2).

Table 3. Inferential analyses.

Association	Test	Result
Training (yes/no) vs frequent underestimation (often yes/no)	Fisher exact + OR (95% CI)	OR=0.22 (IC95% 0.04-1.25); p=0.097
Training (yes/no) vs high competence	Fisher exact + OR (95% CI)	OR=1.59 (IC95% 0.25-10.32); p=1.000
Years of ED experience vs frequent underestimation	Mann–Whitney U	Median years in ED: frequent=3.0 vs non- frequent=5.0; U=64.0; p=0.663
Years of ED experience vs competence (ordinal)	Spearman's rho	rho=0.428; p=0.037
Years of ED experience vs crowding impact (ordinal)	Spearman's rho	rho=-0.417; p=0.043

Note. The inferential results must be interpreted strictly from an exploratory perspective, given the small sample size and the non-probability sampling method.

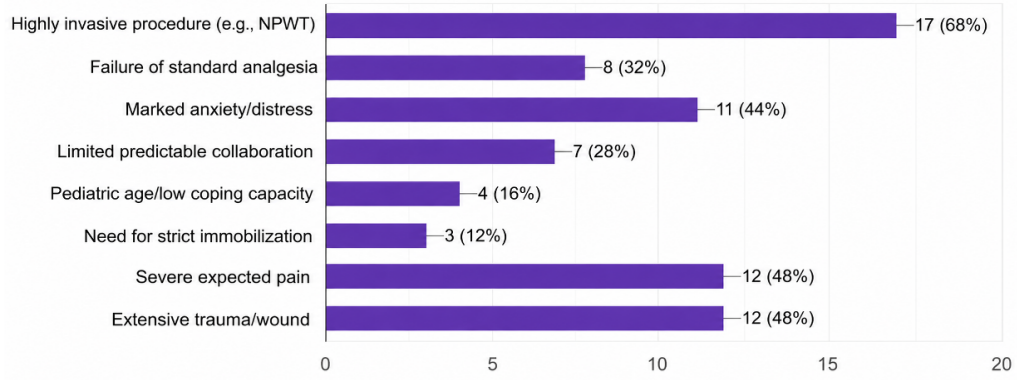


Figure 2. Which criteria do you use most frequently to select cases eligible for procedural sedation or advanced analgesia? (multiple choices allowed)

Regarding the impact of Emergency Department crowding, 28% (n=7) reported that it significantly affects analgesic choices, while 8% (n=2) stated that it directly determines the choice. Furthermore, a significant negative correlation was observed between years of Emergency Department experience and the perceived impact of crowding (p=-0.417; p=0.043) (Table 2).

When the procedure was perceived as painful but brief, the most frequently reported approach was a combined pharmacological and non-pharmacological one (36%; n=9). Lower percentages were observed for exclusively non-pharmacological techniques, baseline analgesia, and rapid analgesia (16% each).

The fear of adverse events was found to influence clinical choices with variable frequency, showing a substantially homogeneous distribution across the categories "often", "sometimes", and "rarely" (32% each).

Pain assessment, revaluation and organizational barriers

Fifty-two per cent (52%; n=13) of the participants reported always assessing pain before the procedure, while 72% (n=18) stated that they always or almost always reassess it within 30 minutes. The tools most frequently used were the NRS scale (60%; n=15) and the VAS (44%; n=11) (Table 4).

Table 4. Main descriptive outcomes (n = 25).

Variable	n (%)
Specific training within the last 24 months (yes)	17 (68%)
Analgesia/sedation protocol present (yes)	22 (88%)
Procedural pain management priority: "high priority"	17 (68%)
Perceived procedural pain underestimated "often"	12 (48%)
Pain assessment "Always before the procedure"	13 (52%)
Reassessment within 30 min: "Always/ Almost always"	18 (72%)
In favour of an algorithm (Very/ Completely)	19 (76%)

The main causes of failure to reassess pain were reported to be workload or crowding (92%; n=23) and competing clinical priorities (52%; n=13).

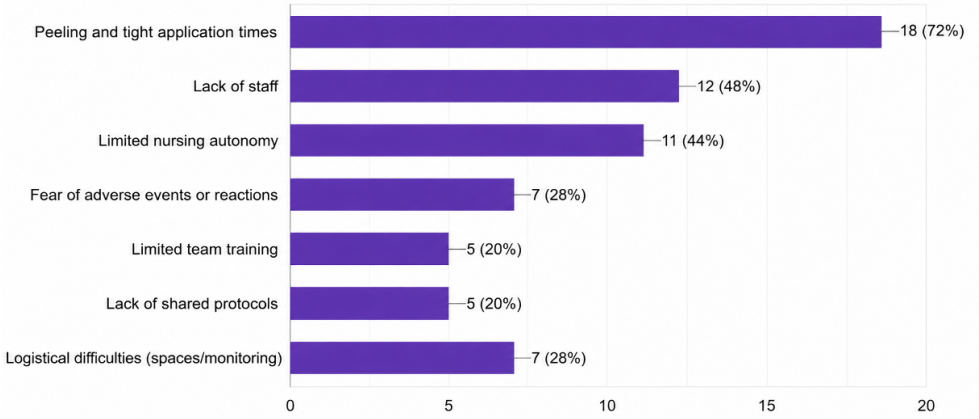


Figure 3. – What are the main barriers to an effective procedural analgesia in your ED? (multiple choices allowed)

Among the organisational barriers to effective procedural analgesia, nurses primarily indicated crowding and tight time constraints (72%; n=18), staffing shortages (48%; n=12), and limited nursing autonomy (44%; n=11) (Figure 3).

Seventy-six per cent (76%; n=19) of the sample reported being highly or completely in favour of introducing a nursing decision-support algorithm for procedural analgesia (Figure 4; Table 4).

Emergency Department experience showed a positive correlation with perceived competence and a negative correlation with the perceived

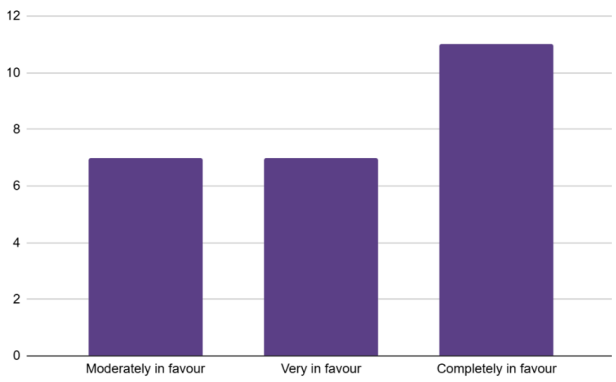


Figure 4. How much would you be in favour of a nursing decision-support algorithm for procedural analgesia?(multiple choices allowed)

impact of crowding. These findings must be interpreted with caution due to the small sample size.

Discussion

The findings describe a scenario characterised by high nursing sensitivity towards procedural analgesia, which is nonetheless counterbalanced by organisational resistance and decision-making dynamics that limit its effectiveness in the field (Mahon et al., 2023, Skog et al., 2021).

The primary evidence emerging from the statistical analysis maps a clear line of demarcation based on professional experience: the positive correlation between years of experience in the Emergency Department and perceived competence ($p < 0.05$) is associated with a lower subjective impact of crowding on clinical choices. In line with international literature using validated tools such as the PNKAS20, these results suggest that greater professional experience may be associated with increased decision-making confidence and a lower perceived influence of crowding on clinical choices. Professionals with more experience reported higher levels of perceived competence and a lower perceived influence of crowding (Mahon et al., 2023, de Souza et al., 2024). Conversely, staff with less seniority are more affected by the pressure of overcrowding, translating it into a potential clinical barrier. Furthermore, the lack of suitable spaces and structured monitoring remains a critical logistical barrier for complex procedures such as procedural sedation (Sahyoun et al., 2021).

Alongside experience, a further critical issue emerges regarding operational tools. The study highlights a substantial paradox: despite a high formal availability of institutional protocols (88%), 80% of nurses report relying predominantly on their "clinical eye" (subjective assessment) for pain management. This lack of operational integration of protocols into clinical routine reflects a scepticism towards assessment scales and the urgency imposed by tight work schedules (Skog et al., 2021, (Yuan, 2024). This tendency towards subjectivity increases care variability and directly fuels the phenomenon of paediatric pain underestimation, which is deemed frequent by 48% of respondents (Sabetsarvestani et al., 2024, Neshat & Ghorbani, 2023). The bureaucratic presence of guidelines is therefore insufficient if not supported by actual assimilation into triage pathways and by prescriptive autonomy (nurse-initiated analgesia), which nearly half of the sample still identifies as a stringent regulatory constraint (Czarnecki et al., 2014, de Souza et al., 2024).

The educational data also require a structural review. Although 68% of professionals reported recent training, the absence of statistically significant associations does not allow for conclusions to be drawn regarding the effectiveness of training, but highlights the need to further investigate the role and characteristics of educational interventions. Training cannot be limited to theoretical aspects but must evolve towards continuous strategies focused on non-pharmacological techniques—interventions that, despite being within full nursing autonomy, remain heavily underutilized (Guillari et al., 2024, Celik & Duzkaya, 2024, Shamsi, 2025).

The present results must be interpreted considering intrinsic methodological limitations. The cross-sectional design precludes the definition of causal links, and the monocentric nature of the study, conducted using convenience sampling in a single tertiary-level Emergency Department, limits the generalisability of the data. The small sample size (n=25) assigns an exclusively exploratory value to the inferential analyses. The observed associations must therefore be interpreted with caution and considered as hypothesis-generating for future studies rather than definitive evidence. Furthermore, the use of a self-reported tool that has not been psychometrically validated exposes the results to recall bias regarding training and social desirability bias in the responses. Nonetheless, this research provides a clear snapshot of care criticalities and the vulnerability of nursing decision-making processes under the effect of crowding. Finally, the study relies on self-reported practices and perceptions, which may not fully reflect the clinical behaviours actually adopted during procedures.

Conclusions

The study suggests that optimising paediatric procedural analgesia requires not only educational interventions but also organisational and decision-making tools capable of reducing clinical practice variability. Therefore, implementing rapid decision-support

algorithms, enhancing nursing autonomy at triage, and structuring practical training programmes emerge as key priorities.

Only by eliminating the variability linked to subjective judgment and managing the impact of crowding will it be possible to transform scientific recommendations into a systematic care reality for the paediatric patient. Future multicentre studies will be essential to validate the effectiveness of such interventions on larger samples and within an evidence-based framework.

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