

Original Article

Management of pain and anxiety in children in the emergency department

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ABSTRACT

INTRODUCTION. Injury-related pain and anxiety are common among children in the emergency department (ED) and often inadequately treated despite existing guidelines. This study aimed to assess the proportion of children who received adequate pain and anxiety relief in a Danish ED.

METHODS. We conducted a prospective study of 184 children (0-17 years) presenting with injuries at a level 1 trauma centre in Denmark (September–October 2025). Pain and anxiety were assessed during observation in the clinic using the Face, Legs, Activity, Cry, Consolability (FLACC) Scale (≤ 5 years) and the Wong-Baker visual analogue scale (VAS) (> 5 years). Adequate relief was defined as a FLACC Scale score ≤ 3 or a Wong-Baker VAS in the 1-3 range. We collected data on treatments, non-pharmacological interventions, senior anaesthesiologist involvement, satisfaction and adverse effects during the visit and through follow-up calls.

RESULTS. In the study, 50% (92 children, 95% CI: 43-57%) received adequate pain and anxiety relief. Non-pharmacological interventions were rarely used (not used in 57% of children ≤ 5 years and in 97% of children > 5 years). Although a senior paediatric anaesthesiologist was always available for phone consultation, this was used in only 1.7% of cases ($n = 3$). Adverse effects of medication were observed in 16.2% of children during the ED visit (6/37 treated with medications).

CONCLUSIONS. Half of paediatric patients did not receive adequate pain and/or anxiety relief in the ED. Protocolled non-pharmacological strategies and consultations with the available senior anaesthesiologist were rarely used.

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Injury-related pain and anxiety are common in patients attended to in the paediatric emergency department (ED), and often go unrecognised or are inadequately managed [1, 2]. Effective pain management is crucial to prevent long-term effects on pain perception [3]. Inadequate pain treatment can lead to increased psychological trauma, anxiety and mistrust towards healthcare professionals, impacting future medical and dental responses [4].

Pain is subjective, but requires objective, standardised assessment to ensure effective management [5]. Self-reported pain using age-appropriate scales is the gold standard [6]. In addition, tools with which to assess the child's behaviour are essential prerequisites to an accurate evaluation of injury-related pain and anxiety [7]. Due

to varying cognitive and emotional development, pain assessment and management must be individualised by age and developmental stage [6].

Historically, physical restraint was used in Denmark for children unwilling or unable to cooperate during painful procedures. However, an increasing focus on pain and anxiety management led to a national guideline in 2021 [8], recommending four mandatory non-pharmacological initiatives: surface analgesia, glucose water, proper positioning and distraction. These methods have proven effective in reducing pain and stress during procedures [8]. Subsequently, Aalborg University Hospital implemented a local guideline in 2023 to reduce injury-related pain and anxiety among children and other vulnerable groups [9].

This project aimed to: 1) measure the proportion of children experiencing adequate pain and anxiety relief, 2) assess caregiver satisfaction with pain and anxiety relief, and 3) record any adverse effects from analgesic or anxiolytic treatments during the ED visit.

Methods

This prospective cross-sectional study was conducted in the ED at Aalborg University Hospital, Denmark. Danish healthcare is organised into five regions that ensure quality and accessibility [10]. Approximately 83% of healthcare expenditures are tax-funded, providing free access to hospitals, outpatient clinics and general practitioners, with partial reimbursement for prescriptions [11]. In 2024, the ED had 24,558 visits, 5,790 of which involved children aged 0-17 years.

The study ran from 8 September to 8 October 2025, Monday to Friday, from 10 a.m. to 6 p.m. During this period, 533 ED contacts involved children aged 0-17 years. It was not possible to distinguish between patients attended by a healthcare professional in the ED and patients referred by their general practitioner to an AI-guided pathway. In the AI-guided pathway, AI software examines the children's X-rays, and if it detects no fractures or other obvious pathology, the child is discharged from the ED without being attended by ED personnel. The following day, an orthopaedic surgeon and a radiologist review the X-rays meticulously.

Data collection

Two medical students (RKK and LT) collected data in the ED; they had no clinical duties and did not interfere with patient-caregiver communication or treatment. Data management was done via REDCap, a secure web-based platform hosted by the North Denmark Region [12, 13]. Parents could consent to a follow-up phone call 2-4 days after the ED visit if their child received pharmacological treatment.

Participants

The inclusion criteria were children aged 0-17 years presenting to the ED with injuries. The exclusion criteria included lack of valid consent, refusal by the child or caregiver, absence of a caregiver and major trauma requiring multidisciplinary team activation. The recorded variables were age, sex, triage level, comorbidities, examination/procedure type, pharmacological treatment (generic drug and dosage) and involvement of a senior paediatric anaesthesiologist. Caregivers of children receiving pharmacological treatment were interviewed 2-4 days after the visit about delayed adverse effects.

Variables

Pain and anxiety were assessed before and during procedures using age-appropriate tools. The Face, Legs, Activity, Cry, Consolability (FLACC) Scale is used for children aged 28 days to five years, and for non-verbal or developmentally delayed children [14]. It rates five behavioural categories on a scale from 0 to 2, for a total score ranging from 0 to 10, with higher scores indicating more pain. Scores in the 0-3 range were considered indicative

of adequate pain and anxiety relief.

The Wong-Baker visual analogue scale (VAS) is a validated self-report tool for children > 5 years, consisting of a 1-10 numeric scale and a six-face FACES Pain Rating Scale (A-F) [15]. Caregivers used the numeric scale, whereas children used the FACES Pain Rating Scale to report pain and anxiety. Both scales range from 'no pain' to 'worst imaginable pain,' with scores of 1-5 or a FACES Pain Rating Scale A-C indicating adequate relief.

Patients were grouped based on pain and anxiety assessments. The adequate group (Group 1) included cases with both sufficient pain and anxiety relief. The inadequate group (Group 2) included cases with insufficient relief in either or both areas. Additional questions assessed patient and caregiver satisfaction with pain and anxiety management, as well as the overall ED experience.

Consent

Caregivers received written information on the study's purpose, data collection and usage. All participants and caregivers provided informed oral consent before inclusion. The hospital administration (ID 2017-011259) and the data safety office (ID K2023-080) registered and approved the study. Ethics committee approval was not required for non-interventional studies under Danish law, and oral consent sufficed.

Statistics

Statistical analysis was performed using SAS Enterprise Guide 71 (SAS Institute Inc., Cary, NC, USA). Continuous variables were presented as means $\pm$ SD or medians with IQR for normally and non-normally distributed data, respectively. We compared categorical variables using χ^2 tests. p values < 0.05 were considered statistically significant.

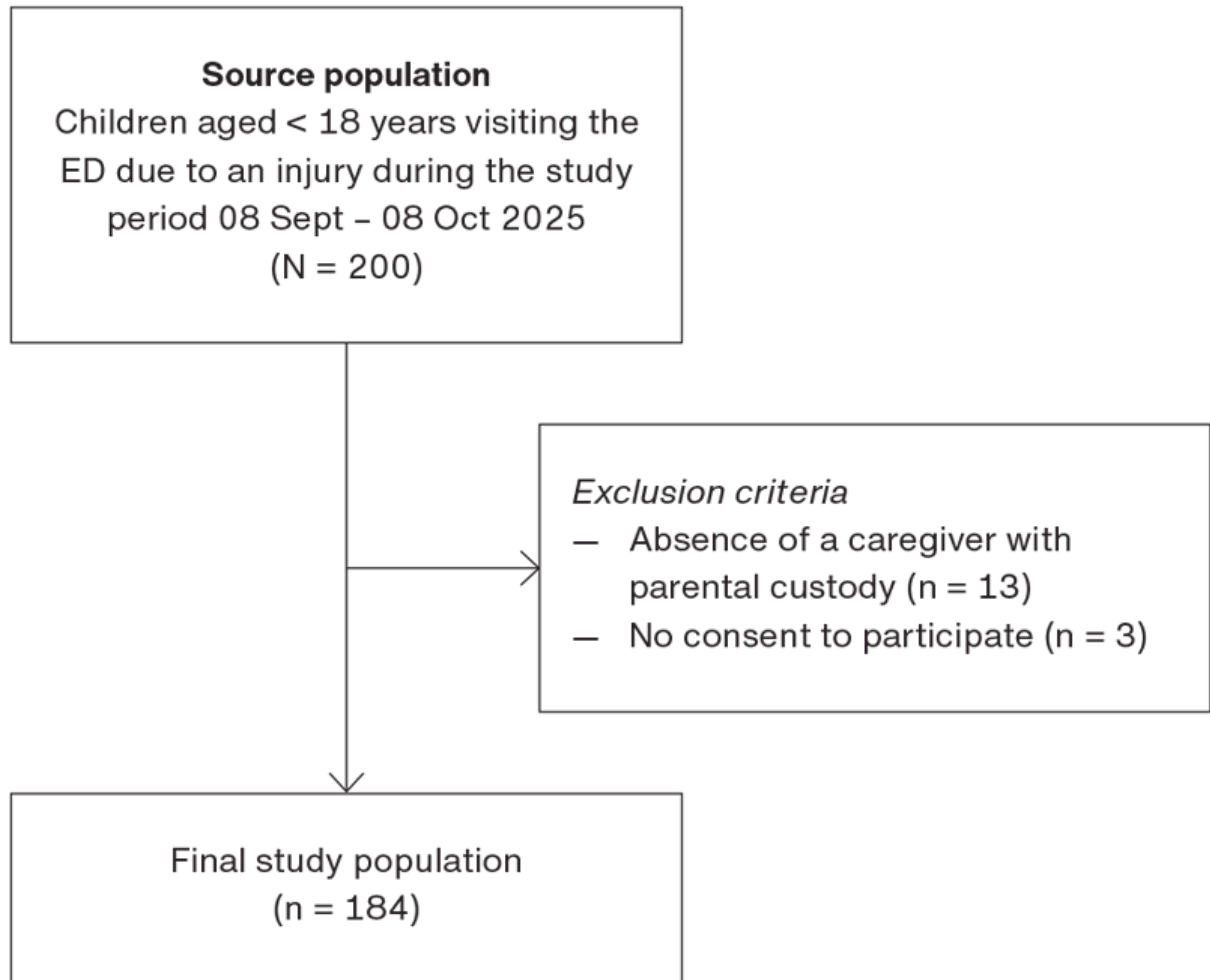
Trial registration: not relevant.

Results

Study population characteristics

A total of 200 children were screened, with 184 (92%) included in the study (**Figure 1**). They were categorised into two groups: adequate and inadequate pain/anxiety relief, based on criteria outlined in the Methods section. The groups were similar in age, sex distribution, comorbidity and triage levels (**Table 1**).

FIGURE 1 Flow chart illustrating the selection process for the study population (N = 200).



ED = emergency department.

TABLE 1 Demographics of the 184 included children with injury-related pain or anxiety in the emergency department.

	Pain/anxiety relief		All patients (N _{tot} = 184)
	adequate ^a (N _{ad} = 92 (50%))	inadequate ^b (N _{in} = 92 (50%))	
Age, mean (SD), yrs	11 (6.5-13)	11 (7.0-13)	11 (7.0-13)
<i>Age groups, n (%)</i>			
0-2 yrs	7 (7.6)	9 (12.0)	16 (8.8)
3-5 yrs	13* (14.1)	5* (5.4)	18 (9.9)
6-8 yrs	12 (13.0)	18 (20.7)	30 (16.5)
9-11 yrs	18 (20.7)	20 (21.7)	38 (20.9)
12-14 yrs	27 (29.4)	27 (29.4)	54 (29.7)
15-17 yrs	13 (14.1)	13 (14.1)	26 (14.3)
Subtotal	90 ^c	92	182
<i>Sex, n (%)</i>			
Female	40 (43.5)	37 (40.2)	77 (41.9)
Male	52 (56.5)	55 (59.8)	107 (58.2)
<i>Comorbidity, n (%)</i>			
None	85 (92.4)	84 (91.3)	169 (94.4)
Comorbidity	5 (5.4)	5 (5.4)	10 (5.6)
Severe chronic comorbidity	0	0	0
<i>Triage level, n (%)</i>			
Blue = non-urgent	64 (69.6)	67 (72.8)	131 (72.4)
Green = less urgent	22 (23.9)	23 (25.0)	45 (24.9)
Yellow = urgent	< 5 (< 5.4)	< 5 (< 5.4)	< 5 (< 2.7)
Orange = emergency	< 5 (< 5.4)	0	< 5 (< 2.7)
Red = life-threatening	0	0	0

FLACC = Face, Legs, Activity, Cry and Consolability Scale; VAS = visual analogue scale.

*) p = 0.04.

a) During the procedure: a FLACC < 3, a Wong Baker FACES Pain Rating Scale A-B or a VAS 1-5.

b) During the procedure: a FLACC ≥ 3, a Wong Baker FACES Pain Rating Scale C-F or a VAS 6-10.

c) Missing data: 2 children of unknown age.

Adequacy of pain and anxiety relief

Among the 184 children included, 50% (n = 92; 95% CI: 0.43-0.57) received adequate relief of both pain and anxiety (Table 1). In total, 93 children achieved adequate pain relief and 126 adequate anxiety relief. Because the FLACC scale does not distinguish between pain and anxiety, separate assessments were not possible for younger children; among those aged ≤ 5 years, 20 achieved adequate combined relief. Age distributions were similar between groups, except in the 3-5-year group, where a significantly higher proportion received adequate relief (Table 1). Procedures such as wound care were performed significantly more often in children with inadequate pain/anxiety relief, suggesting that more invasive interventions are associated with insufficient comfort management (Table 2). Use of non-pharmacological interventions was very low across all age groups (Table 3).

Only a few children received surface analgesia; none were offered glucose; and supportive positioning or distraction techniques were used in only a small proportion. In the inadequate pain/anxiety relief groups, 57.1% of children aged ≤ 5 years and 92.3% of those aged > 5 years received none of the nationally recommended non-pharmacological measures (Table 3). A significant difference was found between adequate and inadequate relief groups regarding pharmacological treatment, with more children in the inadequate group receiving more drugs than children in the adequate group ($p = 0.02$) (Table 3), indicating that lack of pharmacological intervention may contribute to insufficient pain relief in the ED. Notably, a senior paediatric anaesthesiologist was consulted in only 1.7% of cases ($n = 3$).

TABLE 2 Procedures and waiting times for the 184 children with injury-related pain or anxiety in the emergency department.

	Pain/anxiety relief		All patients ($N_{\text{tot}} = 184$)
	adequate ^a ($N_{\text{ad}} = 92$ (50%))	inadequate ^b ($N_{\text{in}} = 92$ (50%))	
<i>Procedure, n (%)</i>			
Examination	90 (97.8)	91 (98.9)	181 (98.4)
Wound care	< 5* (< 5.0)	10* (10.9)	13 (7.1)
Suture	5 (5.4)	6 (6.5)	11 (6.0)
Skin adhesive	< 5 (< 5.4)	< 5 (< 5.4)	< 5 (< 2.7)
Burn care	0	0	0
Blood tests or PVC	< 5 (< 5.4)	< 5 (< 5.4)	< 5 (< 2.7)
Bandage or collar and cuff arm sling	24 (26.1)	22 (23.9)	46 (25)
Cast	24 (26.1)	28 (30.4)	52 (28.3)
Joint reduction	< 5 (< 5.4)	< 5 (< 5.4)	< 5 (< 2.7)
Abscess treatment	0	< 5 (< 5.4)	< 5 (< 2.7)
Orthoses	9 (9.8)	8 (8.7)	17 (9.3)
Walking boot	6 (6.5)	< 5 (< 5.4)	7 (3.8)
<i>Waiting time from arrival at ED to discharge</i>			
Median (IQR), h	2.0 (1.3-3.0)	1.8 (1.3-2.5)	2.0 (1.3-2.8)
n	86	85	171

ED = emergency department; FLACC = Face, Legs, Activity, Cry and Consolability Scale; PVC = peripheral venous catheter; VAS = visual analogue scale.

*) $p = 0.04$.

a) During the procedure: a FLACC < 3, a Wong Baker FACES Pain Rating Scale A-B or a VAS 1-5.

b) During the procedure: a FLACC ≥ 3 , a Wong Baker FACES Pain Rating Scale C-F or a VAS 6-10.

TABLE 3 Non-pharmacological and pharmacological interventions for pain and anxiety relief in 184^a children. The values are n (%).

	Small children ≤ 5 yrs (N _s = 34)		School children > 5 yrs & teenagers (N _s = 148)	
	pain/anxiety relief		pain/anxiety relief	
	adequate ^b (N _{ad} = 20)	inadequate ^c (N _{in} = 14)	adequate ^b (N _{ad} = 70)	inadequate ^c (N _{inad} = 78)
<i>Non-pharmacologic initiatives (ATC code)</i>				
Surface analgesia: EMLA or LAT-gel (N01BB20)	< 5 (< 25.0)	< 5 (< 35.7)	< 5 (< 7.1)	< 5 (< 6.4)
Oral sucrose	0	0	0	0
Positioning the child	0	< 5 (< 35.7)	0	0
Distracting the child: bubbles, VR goggles	0	< 5 (< 35.7)	< 5 (< 7.1)	< 5 (< 6.4)
None of the above	18 (90.0)	8 (57.1)	68 (97.1)	72 (92.3)
<i>Pharmacological treatments (ATC code)</i>				
Dinitrogen monoxide (N01AX13)	0	< 5 (< 35.7)	0	< 5 (< 6.4)
Fentanyl (N01AH01)	0	0	0	0
Paracetamol (N02BE01)	< 5 (< 25.0)	< 5 (< 35.7)	< 5 (< 7.1)	12 (15.4)
Ketamine/sufentanil (IN) (N01AH51)	< 5 (< 25.0)	< 5 (< 35.7)	< 5 (< 7.1)	< 5 (< 6.4)
Ibuprofen (M01AE01)	0	< 5 (< 35.7)	0	< 5 (< 6.4)
Morphin (N02AA01)	0	0	< 5 (< 7.1)	5 (6.4)
Midazolam (N05CD08)	0	< 5 (< 35.7)	0	0
Locally injected lidocaine (N01BB02)	< 5 (< 25.0)	0	< 5 (< 7.1)	< 5 (< 6.4)
No drugs administered	17* (85.0)	7* (50.0)	62 (88.6)	61 (78.2)

ATC = Anatomical Therapeutic Chemical; EMLA = eutectic mixture of local anaesthetics; FLACC = Face, Legs, Activity, Cry and Consolability Scale; IN = intranasal; LAT = lidocaine-adrenaline-tetracaine; VAS = visual analogue scale; VR = virtual reality.

*) p = 0.02.

a) Missing data: 2 children with unknown age.

b) During the procedure: a FLACC < 3, a Wong Baker FACES Pain Rating Scale A-B or a VAS 1-5.

c) During the procedure: a FLACC ≥ 3, a Wong Baker FACES Pain Rating Scale C-F or a VAS 6-10.

Children's and parents' satisfaction

Most parents were satisfied with their child's pain and anxiety management (91.9%), and most children reported a positive overall ED experience (83.2%). Furthermore, 92.5% of parents were satisfied with the overall ED experience. Among dissatisfied parents, common concerns included long waiting times, lack of proactive follow-up regarding analgesia, insufficient information about procedures and the presence of disruptive or violent patients in the waiting area, which was distressing for children.

Adverse effects

A total of 20.1% (n = 37) of the children were treated with analgesics or anxiolytics, and six of these children experienced adverse effects (decrease in Glasgow Coma Scale (GCS), agitation, desaturation and mild sinus tachycardia). Of the 31 caregivers who consented to a follow-up phone call, 20 were reached and could report adverse effects. Among the 31 children with consenting caregivers, 14 had experienced possible adverse effects from the pharmacological treatment occurring after discharge from the ED. The possible adverse effects from the 20 children were nausea or vomiting (6.5%), dizziness (3.2%), an unpleasant taste in the mouth (16.1%), pruritus (3.2%), nasal itching (6.5%), nervousness (6.5%), restlessness (6.5%) or aggression (3.2%).

Discussion

In this prospective cross-sectional study, data from 184 children undergoing potentially painful procedures in the ED were evaluated to assess the adequacy of pain and anxiety relief. Half of the 184 children were assessed as having received both adequate pain and anxiety relief; specifically, 50.5% had adequate pain relief; 68.5%, adequate anxiety relief.

Pain and anxiety relief

Despite high caregiver (91.9%) and child (83.2%) satisfaction with pain and anxiety management, FLACC and VAS scores showed that only 50% of patients received adequate relief. This discrepancy highlights a gap between perceived and actual care quality in the ED. Satisfaction may be driven by expectations, cultural norms and the overall care experience rather than analgesic effectiveness. Only half of the patients achieved adequate relief despite updated guidelines, highlighting a persistent gap between evidence and practice. Caregivers' high satisfaction despite insufficient pain or anxiety relief supports previous findings of undertreatment in paediatric emergency settings [1, 2]. Their satisfaction may instead reflect overall care experience. When dissatisfaction occurred, it was primarily linked to waiting times and staff interactions, factors known to strongly influence parental satisfaction in paediatric EDs [16].

Non-pharmacological treatment

The limited use of non-pharmacological interventions in this study aligns with evidence showing a gap between guidelines and clinical practice. Despite their effectiveness in reducing pain and anxiety in children during medical procedures [17], implementation remains inconsistent. A recent Danish study similarly reported low use of non-pharmacological strategies despite their benefits [18]. An Italian study found that only 26% of EDs routinely assessed paediatric pain, with pharmacological treatment often being preferred over non-pharmacological approaches [19].

Anaesthesiologist

A senior paediatric anaesthesiologist was consulted in only three cases, despite ED personnel being encouraged to request support at any time, indicating a missed opportunity to draw on specialised expertise. Although the consultation number was clearly displayed, a clearer protocol for involving specialists may be needed. The limited use of paediatric anaesthesiology and multimodal pain management in this study aligns with patterns described in the literature [2, 7].

Strengths and limitations

A strength of this study is that the Danish regions are comparable and representative of the national population, enhancing the generalisability of regional epidemiological studies [20]. While the study offers valuable insights into paediatric pain and anxiety management in the ED, its representativeness may be limited by daytime-only data collection and by potential differences in treatment protocols at Aalborg University Hospital compared with other Danish or international settings.

The study mainly included healthy children without comorbidities (87%) and no red triage cases, limiting generalisability to those with chronic or complex conditions, who often require individualised management and may experience higher levels of pain and anxiety. This underrepresentation according to children with comorbidity may lead to an underestimation of pain and anxiety levels compared with other studies. Another limitation is that excluding children presenting during evenings, nights or weekends when more severe cases occur likely led to an underestimation of overall pain and anxiety levels.

Data were collected only during weekday daytime hours, potentially excluding severe or off-hour cases. Nighttime staffing and interobserver variability influenced pain assessments. Furthermore, pain was assessed using both observational and self-report instruments, which may be influenced by the child's developmental capacity to communicate pain accurately. Another limitation is that the study did not account for whether children were held or restrained by staff or parents during procedures, which may have affected the observed outcome.

Reporting bias and factors, such as socioeconomic or cultural influences and prior pain experiences, may have affected the results. A larger sample might reveal variations in treatment. Future qualitative studies with ED staff

may help identify barriers to optimal paediatric pain and anxiety management. Given the gap between guidelines and practice, a nationwide educational programme focused on optimal pain and anxiety management in EDs may help standardise practices with potential for national educational sessions across the country to promote awareness and implementation.

Conclusions

In this prospective cross-sectional clinical study of 184 paediatric patients attending an ED with injury-related pain or anxiety, only half received adequate pain and anxiety relief. Across all age groups, staff rarely used non-pharmacological strategies and consulted with a senior paediatric anaesthesiologist. Consistent and comprehensive application of national guidelines remains limited in clinical practice. Strengthened implementation of both pharmacological and non-pharmacological evidence-based strategies, recurrent staff education and more consistent reassessments are needed to ensure that all children receive adequate pain and anxiety relief.

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