BMJ Paediatrics Open

Pain management in children and young adults with minor injury in emergency departments in the UK and Ireland: a PERUKI service evaluation

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To cite: Hartshorn S, Durnin S, Lyttle MD, *et al*. Pain management in children and young adults with minor injury in emergency departments in the UK and Ireland: a PERUKI service evaluation. *BMJ Paediatrics Open* 2022;**6**:e001273. doi:10.1136/bmjpo-2021-001273

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjpo-2021-001273).

Received 27 August 2021
Accepted 3 March 2022

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ABSTRACT

Background Management of acute pain should commence at the earliest opportunity, as it has many short-term and long-term consequences. A research priority of Paediatric Emergency Research in the UK and Ireland (PERUKI) was to examine paediatric pain practices.

Objective To describe the outcomes for paediatric pain management of minor injuries presenting to emergency departments (EDs) across PERUKI.

Methods A retrospective service evaluation was performed over a 7-day period in late 2016/early 2017 across PERUKI sites, and analysis performed using an adapted Donabedian framework. Patients under 16 years presenting with minor trauma were eligible, and data were collected on prehospital management, pain assessment, analgesia administered and injury diagnosed.

Results Thirty-one sites submitted data on 3888 patients. There were 111 missed cases (missed rate 3.6%). The most common injuries were sprains, lacerations, contusions/abrasions and fractures. Documentation of receiving analgesia before arrival in ED occurred in 21% of patients (n=818). A pain assessment was documented in 57.5% of patients (n=2235) during their ED visit, and 3.5% of patients had their pain reassessed (n=138). Of the patients who presented in severe pain (pain score 7–10 or rated severe), 11% were reassessed. Site variability of initial pain assessment ranged from 1.4% to 100% (median 62%). The characteristics of the top quartile performing centres against the bottom quartile performing centres based on completion rate of initial pain scores were identified.

Conclusion Pain assessment was documented in under 60% of children with minor injury, re-assessment of pain was almost completely absent, data and outcomes were missing in a substantial volume of patients, indicating that pain management and the associated outcomes have not been adequately addressed and prioritised within existing network structures and processes.

What is known about the subject?

- Oligoanalgesia and failure to reassess pain scores have been repeatedly demonstrated in the acute paediatric pain management in emergency departments in national audits.

What this study adds?

- The existing processes resulted in pain assessment in <60% of children, almost completely non-existent pain re-assessments and missing pain outcomes in patients with minor injury.
- Outcomes related to paediatric pain are highly variable across sites. More research is required to determine the core structures and processes to overcome the suboptimal outcomes for paediatric pain management.

INTRODUCTION

'It is unacceptable to be ignorant of anyone's pain in the 21st century, particularly those who are vulnerable'.[1] Inadequate management of acute pain has many consequences and it should be managed at the earliest opportunity,[2 3] yet despite availability of consensus standards[4] and guidelines[5–7] on childhood pain, its management remains suboptimal. A UK study from emergency departments (EDs) revealed pain management was not well aligned with the core priorities of the ED and not perceived to be a key organisational priority for which staff were held accountable.[8]

Despite the Royal College of Emergency Medicine (RCEM) identifying pain management as the most popular indicator of ED quality of care in 2002,[9] an ongoing significant gap has been identified between standards and clinical practice. One recent RCEM audit revealed substandard performance across fundamental, developmental and aspirational standards for paediatric pain management related to limb fractures.[10]

Paediatric Emergency Research in the UK and Ireland (PERUKI) identified pain practice as a priority research domain.[11] Donabedian created a conceptual model that

provides a framework for examining health services and evaluating quality of healthcare which has been used in several domains of healthcare to drive improvement.[12] Health services research utilising the Donabedian conceptual framework (structure, process and outcome) is widely applied in evaluating quality of care.[12 13] Healthcare pain outcomes cannot be understood in isolation, as they are a product of health system-related structures and processes which include the prehospital care, resources (guidelines, staffing, tools, medicines etc) and processes at each department from reception to discharge.[14] The structures related to paediatric pain are the physical and organisational characteristics where healthcare occurs and the processes are the actual steps involved in optimal analgesic practices (recognition of pain, assessment, intervention, reassessment and maintenance of pain relief). A previous PERUKI study identified high variation of pain management structures in the network.[15] The foundation for improving quality of paediatric pain management should include the identification of gaps in our knowledge on pain related processes and outcomes.

The aim of this study is to describe the network's processes and resultant 'real-world' pain outcomes for children and young people with all minor injuries in our EDs, to inform baseline network characteristics and identify gaps with a view to identifying further areas for improvements.

METHODS

Study design and setting

This retrospective service evaluation occurred across PERUKI,[16] a research collaborative in both urban and rural settings. The sites in the network invited to participate in the study (n=34) were based in England 76%, Ireland 12%, Scotland 6%, Wales 3% and Northern Ireland 3%. The hospital characteristics of these sites were tertiary centres 23 (67.6%) or district general hospitals 11 (32.4%). The annual paediatric attendance ranged from 11 500 to 65 000. Eighteen sites (52.9%) were trauma centres, 11 (32.4%) were trauma units and 5 (14.7%) were neither. Participating sites identified a site lead for this study, who was responsible for completing all elements.

Data pertaining to the assessment and management of pain were identified and abstracted from the clinical charts of all children who presented over a 1-week period with minor injuries for any seven consecutive days from 28 November 2016 to 16 January 2017. Study case report forms were retrospectively completed from routinely collected clinical data. Data included demographic details, injury characteristics, disposition and related processes and outcomes during the attendance. The case report form and the accompanying guidance notes are available as online supplemental appendix 1. In parallel to the patient level data being collected a site survey was conducted.[15]

Eligibility criteria

All children aged from birth to 15 years (prior to their 16th birthday), presenting with minor trauma, were eligible. Exclusion criteria were (1) trauma team activation, (2) major trauma (injury severity score >15),[17] (3) left before completion of treatment or (4) missing injury details.

Data collection, analysis and statistical analysis

Injury classification criteria were provided. The optimal method for identifying eligible children at each site was delegated to the site lead. Charts of potentially eligible participants were reviewed, and eligibility confirmed. Data were collected in Excel, irrevocably anonymised, and transmitted securely to the central study team. The pain score/rating performed used a validated pain scale and the time of assessment was recorded for each pain assessment. Medications administered including time, dosage, route and if given based on patient group directive were recorded. We applied an adapted paediatric pain Donabedian framework[12] to the structures, processes and outcomes involved in paediatric pain management in the emergency setting (framework available as online supplemental appendix 2).

Data were analysed using Statistical Package for Social Sciences (SPSS, V.21.0 for Windows). Data are presented as categorical and continuous variables, and descriptive and comparative analyses were performed. Results are expressed as frequency (percent) or medians with IQR. The pain score per cent details the number of patients who had a pain score recorded over the total number of patients expressed as a percent. Analysis was performed using Pearson χ^2 and Mood's median test as appropriate. Alpha level was set at 0.05.

Patient and public involvement

One of the top factors affecting parental ED satisfaction is pain management[18] which was also a research priority of PERUKI[11] which guided the design. Routinely collected patient data was retrospectively collected and consent was not deemed necessary for the anonymised data. Collective results are presented which is detailed with site characteristics.

RESULTS

Site responses

Data were completed by 31 sites from the 34 who were invited to submit data. Twenty-one sites (67.7%) were tertiary centres and 10 (32.3%) were district general hospitals; 11 (35.5%) were mixed adult/paediatric hospitals with a separate paediatric ED, 10 (32.3%) were mixed adult/paediatric hospitals with a combined paediatric ED, and the remaining 10 (32.3%) were paediatric hospitals. Seventeen sites (54.8%) were trauma centres, 10 (32.3%) were trauma units and 4 (12.9%) were neither (table 1). The annual paediatric attendance ranged from 11 500 to 65 000 (median 30000, IQR 24 500–38500).

Table 1 Site characteristics and rates of documentation of prehospital analgesia, pain score and repeat pain score

Type	Attendances	Trauma	No of patients	Prehospital analgesia documented %	Pain score %	Repeat pain score % of all patients
District general hospital—mixed adult and paediatric	<15 K	TU	92	3	58	0
	<15 K	TC	92	63	62	10
	15–24.99 K	TU	90	32	87	9
	15–24.99 K	TU	74	96	70	8
	25–34.99 K	TU	81	81	35	16
	25–34.99 K	n	144	100	82	5
	25–34.99 K	TU	11	100	82	0
	25–34.99 K	TU	79	63	37	5
	35–49.99 K	TU	102	72	65	5
District general hospital—paediatric	25–34.99 K	TU	140	71	56	1
Tertiary centre—mixed adult and paediatric	<15 K	n	40	90	60	3
	15–24.99 K	TC	169	81	6	0
	15–24.99 K	TC	104	94	97	15
	25–34.99 K	TC	129	75	59	8
	25–34.99 K	n	159	92	42	3
	25–34.99 K	TC	119	15	84	0
	25–34.99 K	TC	180	17	100	0
	25–34.99 K	TC	56	98	54	0
	25–34.99 K	TC	145	55	1	1
	35–49.99 K	TC	100	84	15	0
	35–49.99 K	TU	178	67	76	1
	≥50 K	TC	247	60	9	1
Tertiary centre—paediatric	15–24.99 K	TU	94	100	97	12
	35–49.99 K	TC	58	97	97	5
	35–49.99 K	TC	160	88	63	1
	35–49.99 K	TC	124	94	36	2
	35–49.99 K	TC	61	15	2	0
	35–49.99 K	n	77	94	99	4
	≥50 K	TC	292	79	75	0
	≥50 K	TC	213	52	100	9
	≥50 K	TC	278	59	38	1
		<25%		25%–74.9%		≥75%

n, Neither TU or TC, K=1000; TC, trauma centre; TU, trauma unit.

Data were submitted for 3888 patients, with a range across sites from 11 to 292 (median 104, IQR 80–159.5). Data were collected for 7 days in 30/31 sites (97%). The remaining site collected for 4 days (omitted 43 patients), and one site which collected data for 7 days included only 60% of eligible patients (51 patients omitted). Clinical records were not located for 17 cases. The total number of missed eligible patients was 111, giving a missed rate of 3.6% (n=111/3999). The individual site rates of prehospital analgesia, and performance of initial and subsequent pain scoring are described in table 1.

Patient and injury characteristics

The primary injury characteristics of included patients are shown in table 2.

The proportions of injury type varied by age band—for example, sprains were more common in older age groups (6 years and older), lacerations were most common in 2–5 years old, and injuries such as head injuries and burns/scalds showed a more even distribution across age groups. Full details are available as online supplemental appendix 3.

Mode of transport

Most patients (3578, 92%) self-presented or were brought by carers, with 170 (4.4%) conveyed by ambulance, 47 (1.2%) were transferred from other ED's and 9 (0.2%) came from GP/walk-in centre. This was unknown/not documented in 84 patients (2.2%). Prehospital analgesia was given to 818 (21%) of patients, this was highest in

Table 2 Primary injury type (n=3888)

Injury type	Patients	
	No	%
Sprain	777	20.0
Laceration	731	18.8
Contusion or abrasion	714	18.4
Fracture	665	17.1
Non-specific soft tissue injury	335	8.6
Minor head injury	231	5.9
Burn or scald	127	3.3
Pulled elbow	76	2.0
Other*	57	1.5
Dislocation	40	1.0
Fingertip/nailbed injury	25	0.6
No injury identified	87	2.2
Unknown/not documented	23	0.6
Total	3888	100

*Other=foreign body (n=18), bite or sting (n=14), dental trauma (n=14), muscle strain or tendon injury (n=10), electric shock (n=1)

patients transferred from other EDs 53.2% (n=25), and children brought by ambulance 51.4% (n=89). The proportion was lower in children who self-presented at 18.9% (n=674).

Time from injury to ED presentation varied, with 48% (n=1866) registering within 4 hours of injury, 10.3% (n=400) between 4–12 hours, 9.4% (n=366) between 12 and 24 hours, and 14.2% (n=554) after more than 24 hours.

Prehospital analgesia

Documentation of prearrival analgesia showed analgesia was administered to 818 patients (21%), 1831 patients (47.1%) had no analgesia, and 1239 (31.9%) did not have this information documented. There was a statistical relationship between mode of transport and if prehospital analgesia was given (p<0.0001). The rate of prehospital analgesia administration was greater for patients who arrived by ambulance or who were transferred from another ED 51.8% (95% CI 45.2% to 58.4%), than patients who presented by all other methods 19.2% (95% CI 17.9% to 20.5%) (p<0.001).

Pain assessment(s)

For 2235 patients (57.5%), a pain assessment was documented at some point during their ED attendance. This varied with a range of 1.4% to 100% (median 62%, IQR 37.4%–83%) across sites (table 2). Of those with a documented pain assessment, 138 (6.2%) had a repeat pain assessment. The most frequently documented pain score was 0 (no pain), occurring in 41% of cases (table 3). A repeat assessment of pain was more likely to occur in patients with higher initial pain scores, or those who received analgesia in the ED (available in online supplemental appendix 4)

In the five sites which have local policy/guidelines on all aspects of pain assessment and management as described previously,[16] the mean per cent of patients with pain scores recorded was 42.9% (95% CI 39.1% to 46.7%). This compared with the six sites where there were no local guideline documents where the mean rate of patients with pain scores recorded was 47.3% (95% CI 43.9% to 50.6%).

Table 3 Initial pain score/assessment when performed (n=2235), and analgesia administration according to pain score

Initial ED pain score/assessment	Total patients (% of those with a documented pain assessment, n=2235)	Prehospital analgesia only (%)	ED analgesia only (%)	Prehospital and ED analgesia (%)	No analgesia or unknown (%)	Any analgesia in ED (%)
0 or 'no pain'	916 (41.0)	121 (13.2)	132 (14.4)	27 (2.9)	636 (69.4)	159 (17.4)
1–3 or 'mild pain'	688 (30.8)	97 (14.1)	297 (43.2)	66 (9.6)	228 (33.1)	363 (52.8)
4–6 or 'moderate pain'	456 (20.4)	49 (10.7)	255 (55.9)	76 (16.7)	76 (16.7)	331 (72.6)
7–10 or 'severe pain'	160 (7.2)	13 (8.1)	103 (64.4)	35 (21.9)	9 (5.6)	138 (86.3)
Pain reported but not scored	4 (0.2)	0 (0)	0 (0)	1 (25.0)	3 (75.0)	1 (25.0)
Performed but not recorded	11 (0.5)	2 (18.2)	4 (36.4)	1 (18.2)	4 (36.4)	5 (45.5)
All patients with a baseline pain score/assessment	2235 (100.0)	282 (12.6)	791 (35.4)	206 (9.2)	956 (42.8)	997 (44.6)

ED, emergency department.

Table 4 Analgesic agents administered to patients during their ED attendance (n=1991)

Medication	No of patients	% of all patients (n=3888)	% of those receiving analgesia (n=1533)
Paracetamol PO	1116	28.7	72.8
Ibuprofen PO	734	18.9	47.9
Morphine PO	16	0.4	1.0
Codeine/codydramol/ dihydrocodeine PO	9	0.2	0.6
Diclofenac PO	4	0.1	0.3
Tramadol PO	1	0.0	0.1
Diamorphine IN	45	1.2	2.9
Fentanyl IN	13	0.3	0.8
Entonox/Nitrous oxide INH	15	0.4	1.0
Morphine IV	4	0.1	0.3
Paracetamol IV	2	0.1	0.1
Fentanyl IV	2	0.1	0.1
Ketamine IV	1	0.0	0.1
LAT gel TOP	23	0.6	1.5
Local anaesthetic eye drops TOP	2	0.1	0.1
Not documented	4	0.1	0.3
Total	1991		

ED, emergency department; IN, intranasal; INH, inhaled; IV, intravenous; PO, per oral; TOP, topical.

The time frame for performing repeat pain assessments was not uniformly carried out in all centres. The median time interval between pain assessments in 122 episodes of pain reassessment was 68.5 min (IQR 37.25–110.75 min) with a range from 4 minutes to 254 minutes. In 29 instances where the pain was reassessed the interval was unknown as the time of one of the pain assessments was not documented. The length of stay in the ED was recorded in 94.8% of presentations (n=3648). The median length for the minor injury management was 113 min (IQR 72–167 min).

Analgesia administration

An offer of analgesia was documented in 1812 patients (46.6%), of whom 1533 (84.6%) were administered analgesia. In just under half, it was not known whether analgesia had been administered (19.7%) or why it had not been given (27.4%). Table 4 shows the breakdown of administered analgesic agents.

Of the 1991 analgesic agents administered, 1067 were given based on patient group directions (53.6%). Eighty-six patients (2.2%) (for 90 prescriptions) received an opiate, and one patient received intravenous ketamine. Twenty patients (0.5%) required procedural sedation during their attendance.

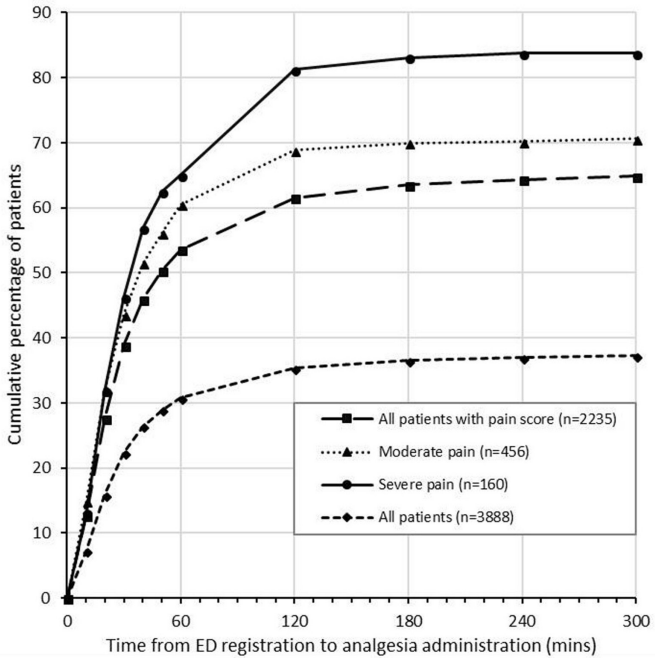

Figure 1 Relationship between analgesia administration and time in all patients and patients with moderate and severe pain. ED, emergency department.

Analgesia administration stratified by baseline pain score

For patients with a pain score, the cumulative percentage of analgesia administration varied by pain score and time (figure 1). The higher the pain score, the greater the proportion that received analgesia (52.8% with mild pain, compared with 86.3% with severe pain).

Time to first analgesia, including subgroup analyses of those with moderate (n=456) and severe (n=160) pain is shown in figure 1. Only 197 (32%) of the 456 patients with moderate or severe pain received analgesia within 20 min of arrival. Seventeen patients (10.6%) received an opiate as per RCEM guidelines.[10]

DISCUSSION

We have reported the outcomes of paediatric pain management across the PERUKI network. A pain assessment was documented in under 60% of children with minor injury, re-assessment of pain was almost completely absent, and outcomes were missing in a substantial volume of patients, indicating that pain management and the associated outcomes have not been adequately addressed and prioritised within existing network structures and processes.

For a patient, nothing is as important as finding relief for severe pain,[1] and tools exist for measuring (and guiding management of) this pain regardless of age.[5] Rates of initial pain assessment ranged widely, half of those presenting in severe pain received intravenous/intranasal opioid, nitrous or ketamine, and only 11% had their pain formally reassessed. Repeat pain scoring occurred more frequently in patients with more severe initial pain and in those who received analgesia, but

overall rates were low. This suggests a lack of uniform assertive ED pain management across the network, with the source issue likely to be related to knowledge translation and culture.[2 6] A previous PERUKI study identified that training was included in induction/orientation in 24 sites (63%), professional development in 16 sites (42%), and pain/analgesia competencies were mandatory in 15 sites (39%),[15] implying that pain education is a low priority for over 50% of responding institutions.

One-third of the patients did not have documentation regarding prehospital analgesia, a rate mirrored in a recent RCEM audit.[10] Rates of analgesia administration prior to ED arrival are likely to be genuinely suboptimal, with only one-fifth of patients being treated before arrival in this study. This is particularly the case when children self-present or are brought by parents/carers. A whole system approach for public health strategies to educate and empower parents about their role in appropriate analgesia administration may therefore be beneficial.[19] However, further research is required to understand the reasons why rates of analgesia administration is so low in this situation is essential, in order to inform the development of any such resources. In cases where the patient had been previously seen by a healthcare provider (general practitioner, ambulance, walk-in centre or transferred from another ED) the rate of analgesia was 51.5% (n=111/229), in keeping with previous studies in prehospital paediatric analgesia in the UK[20] and higher than 26% previously noted in Ireland.[21] There is a necessity to further investigate the system wide lack of documentation of prehospital analgesia in 31.9% of cases with severe/moderate pain. The health system network wide strategy must consider pain outcomes when pain management inside and outside the hospital (including at home, by prehospital emergency services and referring institutions) has been sufficiently demonstrated.

Local structures and processes must also be centred on achieving optimal pain outcomes. A recent systematic review which aimed to identify existing quality indicators for assessment and treatment of pain in EDs identified three structure related indicators.[22] Our adapted framework included 10 structures, 8 processes and 4 outcomes related to paediatric pain management (online supplemental appendix 2). There is a need for a clear health system network wide strategy, with a person-centred focus, which details out both the structures and processes needed to achieve optimal outcomes.[1] Therefore, we recommend further stakeholder consensus on the core structures and processes across the network to best achieve optimal outcomes and this would provide the basis of future improvement.

RCEM has introduced a national quality improvement project for 2021/2022 on 'Pain in Children' with data entry commencing October 2021 with the project anticipated to last for a year.[23] The results of this project including the benefits and the sustainability of improvements are awaited. We advocate is the introduction of national measures for pain assessment and management similar to the previous national improvements implemented in sepsis management. This would allow comparison between sites and could supports improvements in the quality of services motivated by fiscal incentives. Another avenue which we feel warrants further exploration involves giving ownership of pain reporting and control to families.

We have identified fundamental gaps in structures and processes that have resulted in the suboptimal outcomes. A strength of this study is that we have paired this study to the related structures .[15] This study included patients aged from birth to 15 years (prior to their 16th birthday), with a range of nociceptive injuries, allowing for generalisable conclusions about pain practices for almost 4000 paediatric ED patient episodes related to minor injury.

Limitations

The most significant limitation is that this was a retrospective analysis of clinical notes, rather than prospective data capture. This data collection method represents the 'real world' collection of data points (or lack thereof) representing the patient journey and would be less prone to the Hawthorne effect. The retrospective nature of the study meant that not all elements of the adapted framework could be analysed and the adapted framework (online supplemental appendix 2) requires further validation. For certain data parameters, there was a relatively large proportion of 'unknown' responses, due to lack of documentation by existing structures and processes. It is recognised from clinical audit that documentation, or lack thereof, may not capture actual practice, therefore some results may underestimate or overestimate performance at our EDs. The absence of data is itself a critical finding and a key recommendation for improvement. For example, patients with moderate or severe pain analysis might not include patients who may have received prehospital analgesia shortly before arrival as this was not documented in 31.9% of cases. The retrospective methodology employed also meant that we were limited to assessing analgesia that was documented in chart prescriptions and would not capture analgesia which was offered but was declined. Non-pharmacological methods, such as ice packs, splints and slings, are important modes of pain relief, but lack of routine documentation of these practices meant that we were unable to assess their use across sites. A future prospective study is needed to gain more granular detail into structures, processes and outcomes relating to pain management across the PERUKI network.

The service evaluation was conducted for a single week in the winter, and we have not assessed any seasonal variation in pain processes at times when there are changes in total attendances and changes in relative proportions of injuries compared with illness.

Our approach allowed us to gain an understanding of key variations of the pain assessment and management in sites across the PERUKI network. This study did not obtain information on the clinical record systems used

and the qualifications of staff. We did not evaluate patient, parental or healthcare worker satisfaction, which are all key outcome measures. This limits the ability to fully evaluate the outcomes of paediatric pain management across the PERUKI network. However, this outcome was not feasible owing to its retrospective design.

CONCLUSIONS

To advance improvements in paediatric pain management more research is required to determine the core structures and processes that contribute to optimal outcomes. We recommend that the effectiveness and feasibility of each recommendation is considered. Structures and processes across the network do not support optimal outcomes.

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Acknowledgements The following acted as site leads for this study and were responsible for data collection: M Anderson, Great North Children's Hospital, Newcastle; A Appelboam, Royal Devon and Exeter Hospital, Exeter; M J Barrett, Children's Health Ireland at Crumlin, Dublin; T Bolger, Children's Health Ireland at Tallaght, Dublin; A Boyle, Addenbrooke's Hospital, Cambridge; F Cleugh, St Mary's Hospital, London; A Cowton, County Durham & Darlington NHS Foundation Trust; C Deasy, Cork University Hospital, Cork; J Evans, Sheffield Children's NHS Foundation Trust, Sheffield; S Gardner, Ormskirk & District General Hospital, Ormskirk; C Gough, Nottingham Children's Hospital, Nottingham; D Hall, Evelina Hospital, London; S Hall, Queen Elizabeth Hospital, Woolwich; S Hartshorn, Birmingham Children's Hospital, Birmingham; H Jarman, St George's Hospital, London; G Johnson, Royal Derby Hospital, Derby; J Maney, Royal Belfast Hospital for Sick Children, Belfast; S Messahel, Alder Hey Hospital, Liverpool; S Prudhoe, City Hospitals Sunderland Foundation Trust, Sunderland; M Nyirenda, Lewisham and Greenwich NHS Trust, London; G Patton, Royal Aberdeen Children's Hospital, Aberdeen; K Potier, Royal Manchester Children's Hospital, Manchester; Z Roberts, Children's Hospital for Wales, Cardiff; D Roland, University Hospitals Leicester NHS Trust, Leicester; F Sa'adedin, King's College Hospital, London; A Scott, James Cook University Hospital, Middlesbrough; A Smith, Bristol Royal Hospital for Children, Bristol; J Smith, Derriford Hospital, Plymouth; E Walton, Royal Alexandra Children's Hospital, Brighton; A Wedgewood, Royal United Hospital, Bath; S Wong, Royal Free London NHS Foundation Trust, London; We would also like to thank Aidan Beegan, Biostatistician at the National Children's Research Centre for his statistical support.

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Contributors SH, MB, SD and ML contributed to the study design. SH and SD were involved in the data analysis. All authors contributed to the study implementation/data acquisition, manuscript preparation and revisions. SH is the guarantor for the study content.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Full ethical approval was deemed not to be required for this service evaluation, following assessment against the Health Research Authority framework by the Research and Innovation department in the lead site (Birmingham Children's Hospital).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information. Not applicable.

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Appendix 1

Guide to Data Collection

Confidentiality

All data will be entered into a site-specific Excel spreadsheet, which will be password protected. Data will be entered by a single extractor who is not blinded to the study hypothesis. There will be no interrater agreement testing.

For cross-referencing and future data queries, the hospital number for each patient included in the audit should be saved in the appropriate cell. On completion of data collection, the investigator should save a copy of the spreadsheet and delete the column containing the hospital numbers, prior to transferring the spreadsheet to the study team.

Inclusion/Exclusion Criteria

1. Chronological age from birth to 17 years (up to their 18th birthday).

2. Presenting to ED during the 7 day audit period (dates will be confirmed to sites)

3. Presenting with minor trauma, to include:
   a) fractures or dislocations of the extremities
   b) sprains/strains
   c) burns and scalds
   d) lacerations, contusions/abrasions
   e) other soft tissue injuries

The following injury types should <u>not</u> be included:

1. Major trauma patients (injury severity score >15)

Unknown and Not-applicable Data Points

Many cells contain dropdown lists to select from. Where it may be relevant, an “unknown” option is included

Other cells require free-text entry. For any data point that is unknown (or not documented) please type “NK”.

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Some fields can be left empty. For example, if you answer that patient did not receive any pre-hospital analgesia, the subsequent questions regarding name/dose/route, etc of pre-hospital analgesia should be left empty.

Similarly, the spreadsheet offers the ability to enter multiple pain scores, multiple analgesic agents and multiple injuries for any one patient. Most patients will only require data entry for a small number of these fields, and the excess fields can be left blank.

Missed Patients

The spreadsheet contains a second workbook (tab) to list any eligible patients that were missed from the audit, e.g. due to missing notes. Please log all missed patients in this table. This worksheet should not be transferred to the study team, but a summary of the number of missed patients will be requested after the data collection period has finished.

Date & Time Formats

Please enter all dates as **DD/MM/YYYY**, e.g. 16/12/2016.

Please enter all times in 24-hr format at **HH:MM**, e.g. 18:04.

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Section 1 – Demographics

1) **Date of ED registration**

DD/MM/YYYY

2) **Time of ED registration**

HH:MM (24 hour clock)

3) **Age (at last birthday)**

☐ Years

If younger than 1 year, enter "0" and, in next column enter age in months.

4) **Gender**

- ○ Male
- ○ Female

5) **Ethnicity**

- ○ White British
- ○ White Irish
- ○ Other White
- ○ White/Black Caribbean
- ○ White/Black African
- ○ White/Asian
- ○ Other Mixed
- ○ Indian
- ○ Pakistani
- ○ Bangladeshi
- ○ Black Caribbean
- ○ Black African
- ○ Other Black
- ○ Chinese
- ○ Asian
- ○ Other: _____ (please specify)
- ○ Unknown/not documented

6) **Accompanying adult(s)**

- ☐ Parent(s)
- ☐ Legal guardian(s)
- ☐ Other relative(s)
- ☐ Teacher
- ☐ Carer
- ☐ Unaccompanied
- ☐ Other: _____ (please specify)
- ☐ Unknown/not documented

Enter "X" in the appropriate cell(s)

7) **Weight**

☐ kg *2 decimal places*

If unknown/not documented, please type "UK"

8) **Documented co-morbidities**

- ☐ Cardiac disease
- ☐ Liver disease
- ☐ Renal disease
- ☐ Developmental delay (other than mild impairments)
- ☐ None of the above

Enter "X" in the appropriate cell(s)

9) **Drug allergies**

- ○ Yes: Please specify: _____
- ○ No
- ○ Unknown/not documented

Section 2 – Pre-Hospital Data

1) **Date of injury**

DD/MM/YYYY

2) **Approximate time of injury, prior to ED attendance**

- ○ < 1 hour
- ○ 1 – 2 hours
- ○ 2 – 4 hours
- ○ 4 – 6 hours
- ○ 6 – 12 hours
- ○ 12 – 24 hours
- ○ 24 – 48 hours
- ○ > 48 hours
- ○ Unknown/not documented

3) **Location of accident/injury**

- ○ Home
- ○ Other house
- ○ School/nursery
- ○ Road/street
- ○ Park/playground/soft play area
- ○ Sport/leisure activity
- ○ Other: _____ (please specify)
- ○ Unknown/not documented

4) **Mechanism of injury**

Brief free text summary *(e.g. fall from standing, fall from 3ft height, rugby tackle, pedestrian versus car, etc.)*

5) **Mode of arrival to ED**

- ○ Ambulance
- ○ Self-presentation
- ○ Transfer from other ED
- ○ Unknown/not documented

If self-presentation/unknown, then section 3 can be left blank

Section 3 – Pre-Hospital Pain Scores

1) **Were pain scores recorded by the ambulance/pre-hospital crew or a previous ED?**

- ○ Yes
- ○ No
- ○ Unknown/no documentation

2) **List all pain scores performed by ambulance/pre-hospital crew or at a previous ED**

	Pain Score	Time
Initial Pre-hospital Pain Score	____	*HH : MM*
Repeat Pain Score 1	____	*HH : MM*
Repeat Pain Score 2	____	*HH : MM*

Only enter data for the pain scores that were measured, leave additional fields blank

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Section 4 – Pre-Hospital Analgesia

1) **Has any analgesia been given since the injury, prior to arrival at the ED?**

- ○ Yes
- ○ No
- ○ Unknown/not documented

2) **If yes, enter data for all analgesia given (space for up to 4 medications)**

The "route" must be selected first, before the list of relevant medications will appear in the "name" cell.

	Route	Name	Dose	Date	Time	Administered by
Medication 1	*Dropdown list*	*Dropdown list*	*Free-text*	*DD/MM/YYYY*	*HH : MM*	*Dropdown list*

Dropdown lists for analgesic agents administered		
Route	**Name**	**Dose (Preferred units)**
Oral	Paracetamol	mg
Oral	Ibuprofen	mg
Oral	Diclofenac	mg
Oral	Morphine sulphate	mg
Oral	Codeine	mg
Oral	Tramadol	mg
Oral	Other: _____ *(please specify)*	*blank - free text*
Inhalational	Entonox	N/A
Inhalational	Nitrous oxide	___% mix ____duration (mins)
Inhalational	Other: _____ *(please specify)*	*blank - free text*
Intranasal	Diamorphine	mg
Intranasal	Fentanyl	micrograms
Intranasal	Other: _____ *(please specify)*	*blank - free text*
Intravenous	Fentanyl	micrograms
Intravenous	Morphine sulphate	mg
Intravenous	Paracetamol	mg
Intravenous	Ketamine	mg
Intravenous	Other: _____ *(please specify)*	*blank - free text*
Topical	LAT gel	ml
Topical	Other: _____ *(please specify)*	*blank - free text*

Unknown/not documented	N/A	*N/A*

Dropdown list- Administered by
Self
Parent/guardian
Other family member
Ambulance crew
GP/walk-in-centre
Previous ED
Other: _____ *(please specify)*
Unknown/not documented

Section 5 – ED Pain Assessment

1) **Time of initial nurse assessment/triage**

HH:MM

2) **Location of initial assessment**

- ○ Triage room/bay
- ○ Waiting area
- ○ Resus bay
- ○ Non-resus clinical cubicle/area
- ○ Ambulance trolley
- ○ Other: _____ (please specify)
- ○ Unknown

3) **Were pain scores recorded in ED?**

- ○ Yes
- ○ No
- ○ Unknown/no documentation *If no, then go to section 6*

4) **List all pain scores performed in ED**

	Pain Score	Time
Initial ED Pain Score	____	*HH : MM*
Repeat ED Pain Score 1	____	*HH : MM*
Repeat ED Pain Score 2	____	*HH : MM*
Repeat ED Pain Score 3	____	*HH : MM*
Repeat ED Pain Score 4	____	*HH : MM*
Repeat ED Pain Score 5	____	*HH : MM*
Repeat ED Pain Score 6	____	*HH : MM*

Only enter data for the pain scores that were measured, leave additional fields blank

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Section 6 – ED Analgesia

1) **Was analgesia offered in the ED?**

- ○ Yes
- ○ No – adequate pre-hospital analgesia
- ○ No – forgot
- ○ No – allergy to available options
- ○ No – reason not documented
- ○ Unknown

2) **Was analgesia accepted by the patient?**

- ○ Yes
- ○ No – spat out
- ○ No – verbally refused
- ○ No – reason not documented

3) **Any recorded analgesia-associated adverse events?**

- ○ Yes _____ (please specify)
- ○ No

4) **If analgesia given in ED, enter data for all drugs administered (space for up to 6 medications)**

The "route" must be selected first, before the list of relevant medications will appear in the "name" cell.

	Route	Name	Dose	Date	Time	Given as PGD?
Drug 1	*Dropdown list*	*Dropdown list*	*Free-text*	*DD/MM/YYYY*	*HH : MM*	*Enter "X" if so*

See table in Section 4 for available route/name options

Section 7 – Injury Data

1) **Classification of Injury**

Enter data for up to 4 injuries (listing the primary injury first).

The "injury type" must be selected first, before the relevant list of "location/severity" options will appear.

	Injury Type	**Location/Severity**
Injury 1 (Primary Injury)	*Dropdown list – Level 1*	*Dropdown list – Level 2*

Injury Type	**Location/Severity**
Fracture – buckle	*Dropdown list - Bones*
Fracture – non-buckle	*Dropdown list - Bones*
Fracture – clinical suspicion (not evident radiographically)	*Dropdown list - Bones*
Dislocation	*Dropdown list - Joints*
Sprain	*Dropdown list - Joints*
Burn	*Dropdown list – TBSA %*
Scald	*Dropdown list – TBSA %*
Laceration	*Dropdown list – surface anatomy*
Contusion/abrasion	*Dropdown list – surface anatomy*
Other: _____ (please specify)	N/A

Location/Severity – Bones	**Location/Severity – Joints**
Clavicle	Sternoclavicular
Humerus	Acromioclavicular
Radius	Shoulder (glenohumeral)
Ulna	Elbow
Scaphoid/Other carpal	Wrist
Metacarpal	Metacarpophalangeal (MCP)
Phalanx (finger)	Interphalangeal (thumb/finger)
Pelvis	Hip
Femur	Knee
Tibia	Ankle
Fibula	Metatarsophalangeal (MTP)
Calcaneus	Interphalangeal (toe)
Navicular/other tarsal bone	Other: _____ (please specify)
Metatarsal	
Phalanx (toe)	
Other: _____ (please specify)	

Location/Severity – TBSA %	**Location/Severity – Surface anatomy**
< 1%	Head/scalp
1 to ≤ 3%	Eye/eyebrow
3 to ≤ 5%	Nose
5 to ≤ 10%	Mouth/dental
10 to ≤ 15%	Face/chin
> 15%	Shoulder
	Upper arm
	Elbow
	Forearm
	Wrist
	Hand
	Thumb/Finger
	Buttock
	Hip
	Thigh
	Knee
	Lower leg
	Ankle
	Foot
	Toe
	Other: _____ (please specify)

Section 8 – Treatment Data

1) **Interventions or treatments during ED attendance**

- ☐ Cleaning of wound/burn
- ☐ Dressing of wound/burn
- ☐ Wound closure
- ☐ Splint application
- ☐ Plaster application
- ☐ Manipulation of fracture/dislocation
- ☐ Other: _____ (please specify)
- ☐ No treatment

Enter "X" in the appropriate cell(s)

2) **Was procedural sedation performed (during initial ED attendance)?**

- ○ Yes
- ○ No

3) **If yes, time of start of procedural sedation**

HH:MM

4) **Regional nerve blocks performed?**

- ○ Femoral nerve block
- ○ Fascia iliaca block
- ○ Digital (ring) block
- ○ Other block
- ○ None

Section 9 – Disposition

NB. For the purposes of this question, please consider time spent in an ED Observation Ward (or equivalent) to be part of the overall ED journey, and report the discharge time from this unit.

1) **Date of ED discharge**

DD/MM/YYYY

2) **Time of ED discharge**

HH:MM

3) **Discharge destination**

- ○ Home
- ○ Inpatient admission

4) **Planned follow-up**

- ☐ ED review
- ☐ Fracture/orthopaedic clinic
- ☐ Hand trauma/plastics clinic
- ☐ Burns/plastics clinic
- ☐ Returning for definitive surgery
- ☐ Other outpatient clinic at your own hospital
- ☐ Physiotherapy
- ☐ Referred to other hospital
- ☐ GP/practice nurse appointment advised
- ☐ Other: _____ (please specify)
- ☐ No follow-up

Enter "X" in the appropriate cell(s)

5) **Discharge medications supplied/prescribed from ED**

- ☐ Paracetamol
- ☐ Ibuprofen
- ☐ Oral morphine sulphate solution
- ☐ Other (analgesic): _____ (please specify)
- ☐ Other (non-analgesic): _____ (please specify)

☐ No discharge medications provided

Enter "X" in the appropriate cell(s)

6) **During this ED attendance, were any of the following applicable?**

☐ Critical or limb-threatening condition requiring immediate management
☐ Administration of oxygen to patient (for any reason)
☐ Altered level of consciousness (due to any cause)
☐ None of the above

Enter "X" in the appropriate cell(s)

Section 10 – Additional Notes

1) **Additional notes for this patient** *(optional)*

Free text

Appendix 2

Framework to evaluate the practise of paediatric pain management in ED		
STRUCTURES	PROCESSES	OUTCOMES
Type of department Availability of pain assessment at triage Pain assessment tools Skilled/trained staff Information systems/alerts/ reminders Guidelines Standards Education programme for staff and parents/patients Medications Non-pharmacological interventions	For the recognition of pain Use of assessment (tools) Use of treatment (route, pharmacology/ non-pharmacological) Continuity of care which is inclusive of reassessment and downstream interventions Maintaining pain control Communication between providers and patient/parent Use of parental/patient education Use of information systems to record pain related data	Quality of pain management: Pain score improvement Timeliness of pain management % patients receiving standard of care Patient/parent satisfaction

Adapted from Donabedian A. Evaluating the quality of medical care. Milbank Q 2005;83:691. doi:10.1111/j.1468-0009.2005.00397.x

Appendix 3

Age of patients and primary injury type (n=3888)

Primary injury type	Number of patients by age group						
	0 - less than 6m	**6m - less than 1y**	**1y - less than 2y**	**2y - 5y**	**6y - 10y**	**11y - 15y**	**Total (%)**
Sprain	1 (2.1)	0 (0)	12 (3.9)	50 (5.4)	237 (24.3)	477 (31.5)	**777 (20.0)**
Laceration	3 (6.3)	8 (7.1)	79 (25.9)	346 (37.2)	162 (16.6)	133 (8.8)	**731 (18.8)**
Contusion or abrasion	14 (29.2)	28 (25.0)	62 (20.3)	155 (16.6)	200 (20.5)	255 (16.8)	**714 (18.4)**
Fracture	2 (4.2)	7 (6.3)	26 (8.5)	101 (10.8)	177 (18.1)	352 (23.2)	**665 (17.1)**
Non-specific soft tissue injury	4 (8.3)	5 (4.5)	20 (6.6)	62 (6.7)	85 (8.7)	159 (10.5)	**335 (8.6)**
Minor head injury	12 (25.0)	25 (22.3)	40 (13.1)	73 (7.8)	43 (4.4)	38 (2.5)	**231 (5.9)**
Burn or scald	6 (12.5)	18 (16.1)	28 (9.2)	42 (4.5)	16 (1.6)	17 (1.1)	**127 (3.3)**
Pulled elbow	1 (2.1)	3 (2.7)	23 (7.5)	49 (5.3)	0 (0)	0 (0)	**76 (2.0)**
Other*	0 (0)	2 (1.8)	7 2.3)	13 (1.4)	17 (1.7)	18 (1.2)	**57 (1.5)**
Dislocation	0	0	1	3	7	29	**40**

	(0)	(0)	(0.3)	(0.3)	(0.7)	(1.9)	**(1.0)**
Fingertip/nailbed	0	1	3	9	8	4	**25**
injury	(0)	(0.9)	(1.0)	(1.0)	(0.8)	(0.3)	**(0.6)**
No injury identified	5	9	3	25	19	26	**87**
	(10.4)	(8.0)	(1.0)	(2.7)	(1.9)	(1.7)	**(2.2)**
Unknown/not	0	6	1	3	5	8	**23**
documented	(0)	(5.4)	(0.3)	(0.3)	(0.5)	(0.5)	**(0.6)**
Total (%)	**48**	**112**	**305**	**931**	**976**	**1516**	**3888**
	(1.2)	**(2.9)**	**(7.8)**	**(23.9)**	**(25.1)**	**(39.0)**	**(100)**

Appendix 4

Factors influencing repeat of pain assessment (where any assessment made, n=2235)

		Total patients	Single pain score [n=2097] (%)	Repeat pain score [n=138] (%)
Initial Pain Score	0 or "no pain"	916	876 (95.6)	40 (4.4)
	1-3 or "mild pain"	688	643 (93.5)	45 (6.5)
	4-6 or "moderate pain"	456	428 (93.9)	28 (6.1)
	7-10 or "severe pain"	160	142 (88.8)	18 (11.3)
	Pain reported but not scored	4	2 (50.0)	2 (50.0)
	Performed but not recorded	11	6 (54.5)	5 (45.5)
ED analgesia given after 1st score	Yes	991	908 (91.6)	83 (8.4)
	No	1244	1189 (95.6)	55 (4.4)