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Structures of paediatric pain management: a PERUKI service evaluation study

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ABSTRACT

Background Pain is very common in childhood emergency department (ED) attendances, but is under-recognised and undertreated. Sequential national paediatric analgesia audits demonstrate suboptimal outcomes in several domains. The Donabedian framework examines the structures, processes and outcomes to evaluate quality of care. To date there has been no network-level exploration of structures supporting analgesic practices or attempts to address failure to attain national standards.

Objective To benchmark current variation in assessment and management of childhood pain at network level.

Methods Online survey distributed between December 2016 and January 2017 exploring health system structures including pain score tools, pain assessment/protocols, training, practice guidelines and analgesic agent usage. We explored structures, processes and outcomes to identify interventions, and their potential effectiveness and feasibility.

Results In total 95% (38/40 sites) responded, including 25 tertiary (66%) and 13 secondary hospitals (34%), with a total annual paediatric ED census of 1 225 000 (range 11 500–65 000). Availability of analgesics varied included topical wound anaesthesia in 29/38 sites (76%), oral diclofenac sodium in 22/38 sites (58%) and tramadol in 16/38 sites (42%). Pain assessment was mandatory in initial assessment in 34/38 sites (89%), and 18/38 sites had a policy on frequency of pain assessment (47%). Local guidance aligned with national guidance in 21/38 sites (55%). There was no staff training at induction/orientation in 14/38 sites (37%) and no mandatory competencies in pain management in 23/38 sites (61%). Play specialist services were available in 21/38 sites (55%).

Conclusion Despite national guidance and recommendations from multiple audits, there are substantial variations in structures relating to pain assessment and management across sites. The lack of uniformity is a likely root cause for the persistent suboptimal practices identified by serial national audits. A whole system and person-centred approach to improving pain outcomes by utilising effective interventions seeks to improve paediatric pain outcomes.

What is known about the subject?

- Multiple prior UK audits of pain assessment and management in children demonstrated deficiencies in optimal analgesia practices most notably in adequate timely analgesia administration and the reassessment after intervention.
- Minimal progress to address the deficiencies highlighted in the audits has been demonstrated to date.

What this study adds?

- Uniform health system structures and guidance to support optimal analgesic practices were lacking in the frequency of pain assessment, training and competencies in pain management and paediatric sedation.
- A uniform system for paediatric pain management is needed. Potential opportunities for network-wide improvement include mandated early pain assessment with timely analgesia administration and mandated reassessment.

INTRODUCTION

Pain is present in most childhood trauma presentations,[1] and in over 60% of all patients presenting to emergency departments (EDs).[2] The extensive short and long-term consequences of inadequately treated acute pain have led to universal acceptance that pain management should begin at the earliest opportunity.[3] Current standards, therefore, recommend simple, timely, sequential processes of recognition, assessment, intervention, reassessment and maintenance of pain relief.[4]

The Royal College of Emergency Medicine (RCEM) identified pain management as a key indicator of quality of care in EDs;[5] it has subsequently published and revised guidelines on pain management in children[4] and developed clinical standards for EDs,[6] also incorporated into 'Facing the future: Standards for children in emergency care settings' by the Intercollegiate Committee.[7] This approach to standardising and improving care is reflected in other national and international guidelines.[3] Seven successive national audits of ED childhood pain management since 2003 have demonstrated some improvement in prehospital analgesia

(29% in 2017/2018 audit), and in recording of pain score on arrival (national median of 12% in 2003 to 55% in 2017/2018).[8] However, continued deficiencies persist in timely management of pain in patients with moderate and severe pain,[8] and most notably a near complete absence of pain re-evaluation after administering analgesia. The three components approach (structures, processes and outcomes) for evaluating quality of care[9] underpins measurement for improvement. Structures (physical and organisational characteristics where healthcare occurs) affect process measures, which affects outcome measures.[10] Understanding structures is fundamental in driving improvement. To date there has been no network-level exploration of structures supporting analgesic practices, or attempts to address failure to attain national standards.

Paediatric Emergency Research in the United Kingdom and Ireland (PERUKI) identified acute pain as a research priority.[11] The vision of this collaboration is knowledge creation and implementation to improve emergency care of children through robust multicentre research, and knowledge translation in the emergency care system. Any such research or translation in the quality of paediatric pain management can only be delivered once existing structures, processes and outcomes are well described.

The aim of this study was to describe system structures relating to management of acute pain in children presenting to EDs.

METHODS

Study setting

This study was completed between 16 December 2016 and 16 January 2017 across PERUKI, a research collaborative representing a mix of tertiary and district general hospitals in urban and rural settings. Site lead investigators completed an online survey which explored service structures for acute childhood pain management in their ED, with content also pertaining to local guidelines and pathways for pain management. Survey content was developed iteratively based on existing recommendations and published literature, with consensus derived in the study team where necessary.

The survey consisted of 27 questions including contact details, institution characteristics, pain assessment and scoring tools, analgesic pathways, medications available, information given to patients and carers, education, audit and quality improvement performed and other aspects of pain management. The survey included single and multiple-answer questions to establish the presence or absence of relevant elements within each ED. Likert 5-point scales on frequency, as well as open questions to solicit further comments, were used. The full survey is available in the online supplemental appendix 1, and results are reported in line with the CHERRIES statement (online supplemental appendix 2).[12]

Table 1 Respondent characteristics, n=38

	No of sites (%)
Country	
England	30 (79)
Scotland	3 (8)
Ireland	3 (8)
Wales	1 (2.5)
Northern Ireland	1 (2.5)
Hospital characteristics	
Tertiary centre	25 (66)
District general hospital	13 (34)
Trauma centre	20 (53)
Trauma unit	12 (32)
Neither trauma unit or trauma centre	6 (15)
Mixed adult/paediatric hospital with separate paediatric ED	15 (39)
Mixed adult/paediatric hospital with a combined ED	11 (29)
Paediatric hospital	12 (32)

ED, emergency department.

Data collection and statistical analysis

The survey was distributed using Online Surveys (JISC, https://www.onlinesurveys.ac.uk/) and was open for 1 month; reminders were sent 2 weeks and 1 week before the survey closed. Data were analysed using Excel (Microsoft Office 365) and responses are presented using descriptive statistics, including number and proportion, or median as appropriate to the underlying distribution. Free-text answers were themed and then described volumes in each theme are presented.

Patient and public involvement

Patients were not involved in the design, recruitment and conduct of the study.

RESULTS

Study responses

Thirty-eight sites responded to the survey from forty surveyed (95% response rate). The total annual paediatric attendance across all participating sites was 1 225 000, ranging from 11 500 to 65 000 (median 30 000); site characteristics are described in table 1.

ED pain assessment and management

Pain assessment and scoring during initial assessment were mandatory in 34 sites (89%). Pain assessment tools used are detailed in figure 1. A median of 3 tools were used in each site (range 1–4); the 'other scale' category comprised assessment tools that were unique and used in single sites.

Additional processes or pathways to promote/obligate analgesia administration and/or pain score reassessment were integrated within 18 sites (47%). They included

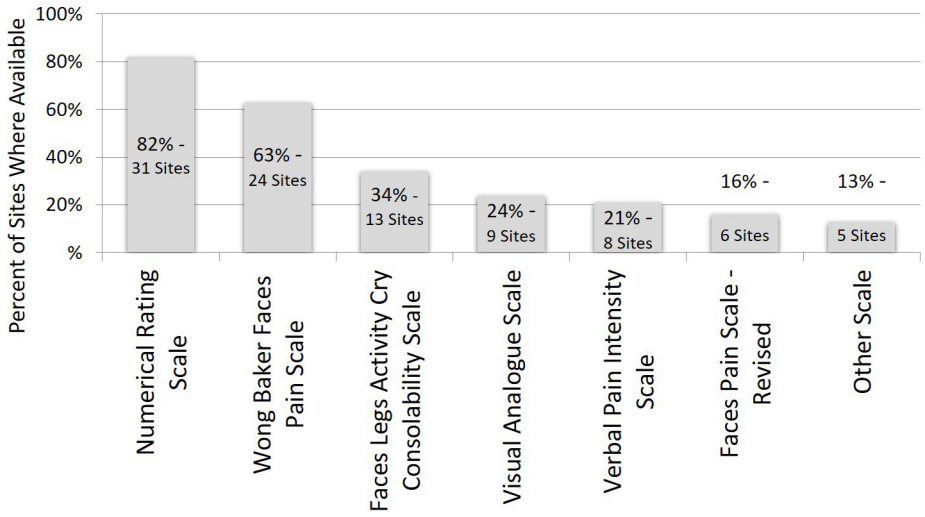


Figure 1 Pain assessment tools used across different sites.[14]

mandatory pain scoring as a routine observation in seven sites (18%), prompts on patient charts to score and manage pain in three sites (8%), patient group direction (PGD) administration of medication in three sites (8%), regular analgesia audits in two sites (5%), mandatory pain assessment in triage in two sites (5%) and specific guidelines or pathways in two sites (5%).

Guidelines

Twenty-nine sites (76%) had a guideline, 21 (72%) of these were in line with RCEM guidance as reported by the site lead. Aspects of pain management covered by the guidelines are summarised in tables 2 and 3. Eight sites (21%) had no current (local) pain management guideline; two sites with an annual paediatric census over 50 000, six sites were tertiary centres, two were district general hospital and five were paediatric trauma centres. In sites with local guidance, the number of relevant documents at each site varied from 1 to 6, and the length of document ranged from 1 to 134 pages (median length 8.5 pages).

Pharmacology availability is detailed in table 4. Variation existed in the availability of medications such as oral diclofenac sodium, tramadol and topical wound anaesthesia. There was access to ED point-of care ultrasound to aid with procedures (eg, nerve blocks) in 34 sites (89%). Digital nerve blocks were performed in 37 sites (97%) and femoral nerve blocks in 34 sites (89%). Paediatric procedural sedation was available in 14 sites (37%).

Table 2 Aspects covered in local guidelines in sites where guidelines were in line with RCEM,[4] n=21

	No of sites (%)
Dosages for different ages groups	21 (100)
Use of pain scales	18 (86)
Use of a standardised pain ladder*	18 (86)
Contraindications to specific analgesic agents	18 (86)
Monitoring of vital signs with opioid analgesia	17 (81)
Non-pharmacological management of pain	15 (71)
Monitoring of sedation level with opioid analgesia	14 (67)
Preferred analgesia for specific conditions	12 (57)
Frequency of pain assessment	11 (52)
Discharge criteria after opioid analgesia	11 (52)
Referral process based on pain score	7 (33)

*Pain ladder: contains objective and/or subjective descriptions with a numerical scale to quantify pain.
RCEM, Royal College of Emergency Medicine.

Patient group directions

PGDs existed in 35 sites (92%). The number of PGDs for analgesia at each site varied between 2 and 6 with a median of 3. PGDs for paracetamol and ibuprofen existed in over 90% of sites, topical anaesthesia in 75%, and nitrous oxide/Entonox in 34%. The frequency of PGDs for topical wound anaesthesia gel, codeine, oral morphine and lidocaine were 11%, 5%, 3% and 3%, respectively.

Patient and carer empowerment

At 19 sites (50%), strategies were used to empower patients/parents to request analgesia. Parents were encouraged either verbally or through visual prompts to seek additional analgesia in 18 sites (47%) when required. Three sites (8%) gave written information on pain/analgesia to paediatric patients and five sites (13%) gave information to parents/carers for use while in the ED. In 15 sites (39%) written information on pain/analgesia was given to parents/carers on discharge.

Audit, governance and education for pain management

Nine sites (24%) audited pain management in children during the preceding year, and 24 sites (63%) within the last 5 years. Seventeen sites (45%) made changes based on audit results; these focused on reassessment

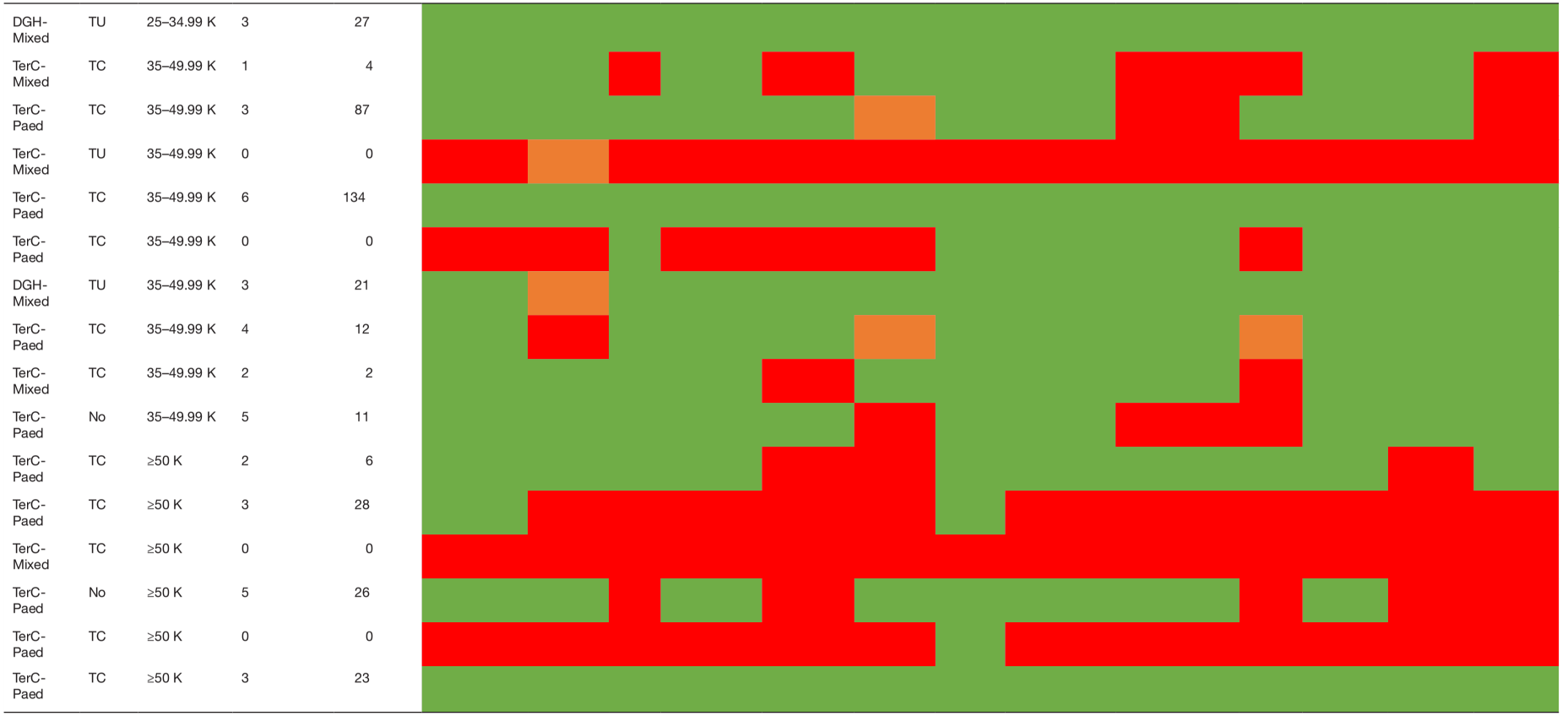
Table 3 Aspects covered in local guidelines/policies for each site, n=38

Hospital type and patient groups seen in ED	Trauma centre or trauma unit	Annual attendances	No of guideline documents on paediatric pain management	No of pages in guideline documents	Current policy/ guideline support best practice in pain management	Which items are covered by your policy/guideline:										
						Guidelines in line with RCEM	Use of pain scales	Standardised pain ladder	Frequency of pain assessment	Preferred analgesia for specific conditions	Dosages for different ages groups	Contradictions to specific analgesic agents	Non-pharmacological management of pain	Referral process based on pain score	Opioid analgesia—monitoring vital signs	Opioid analgesia—monitor levels of sedation	Opioid analgesia—discharge criteria
TerC-Mixed	No	<15 K	5	17													
DGH-Mixed	TU	<15 K	2	17													
DGH-Mixed	TC	<15 K	0	0													
DGH-Mixed	TU	<15 K	2	2													
TerC-Mixed	TC	15–24.99 K	2	6													
TerC-Paed	TU	15–24.99 K	4	78													
TerC-Mixed	TC	15–24.99 K	2	21													
DGH-Mixed	TU	15–24.99 K	1	1													
DGH-Mixed	TU	15–24.99 K	3	8													
TerC-Mixed	TC	15–24.99 K	0	0													
DGH-Mixed	TU	15–24.99 K	1	11													
TerC-Mixed	TC	25–34.99 K	2	24													
TerC-Mixed	No	25–34.99 K	0	0													
TerC-Mixed	TC	25–34.99 K	1	6													
TerC-Mixed	TC	25–34.99 K	4	9													
TerC-Mixed	TC	25–34.99 K	1	6													
DGH-Mixed	No	25–34.99 K	4	12													
DGH-Mixed	No	25–34.99 K	1	25													
DGH-Mixed	TU	25–34.99 K	2	7													
DGH-Paed	TU	25–34.99 K	0	0													
TerC-Mixed	TC	25–34.99 K	3	29													
DGH-Mixed	TU	25–34.99 K	1	8													

Continued

Table 3 Continued

Hospital type and patient groups seen in ED	Trauma centre or trauma unit	Annual attendances	No of guideline documents on paediatric pain management	No of pages in guideline documents	Current policy/ guideline support best practice in pain management	Guidelines in line with RCEM	Which items are covered by your policy/guideline: Use of pain scales	Standardised pain ladder	Frequency of pain assessment	Preferred analgesia for specific conditions	Dosages for different ages groups	Contradictions to specific analgesic agents	Non-pharmacological management of pain	Referral process based on pain score	Opioid analgesia—monitoring vital signs	Opioid analgesia—monitor levels of sedation	Opioid analgesia—discharge criteria
DGH-Mixed	TU	25–34.99 K	3	27													
TerC-Mixed	TC	35–49.99 K	1	4													
TerC-Paed	TC	35–49.99 K	3	87													
TerC-Mixed	TU	35–49.99 K	0	0													
TerC-Paed	TC	35–49.99 K	6	134													
TerC-Paed	TC	35–49.99 K	0	0													
DGH-Mixed	TU	35–49.99 K	3	21													
TerC-Paed	TC	35–49.99 K	4	12													
TerC-Mixed	TC	35–49.99 K	2	2													
TerC-Paed	No	35–49.99 K	5	11													
TerC-Paed	TC	≥50 K	2	6													
TerC-Paed	TC	≥50 K	3	28													
TerC-Mixed	TC	≥50 K	0	0													
TerC-Paed	No	≥50 K	5	26													
TerC-Paed	TC	≥50 K	0	0													
TerC-Paed	TC	≥50 K	3	23													



Not covered in guidelines, Unknown if in guidelines, Covered in guidelines.

DGH, District General Hospital; ED, emergency department; K, 1000; Mixed, Mixed Adult and Paediatric Hospital; Paed, Paediatric Hospital; RCEM, Royal College of Emergency Medicine; TC, trauma centre; TerC, tertiary centre; TU, trauma unit.

Table 4 Pharmacology availability

Medications	No of sites (%)
Oral route	
Ibuprofen	38 (100)
Paracetamol	38 (100)
Morphine	38 (100)
Sucrose	32 (84)
Codeine	26 (68)
Diclofenac sodium	22 (58)
Tramadol	16 (42)
Dihydrocodeine	3 (8)
Intravenous route	
Morphine	38 (100)
Paracetamol	35 (92)
Ketamine	30 (79)
Propofol	24 (63)
Fentanyl	24 (63)
Rectal route	
Paracetamol	38 (100)
Diclofenac sodium	29 (76)
Other routes	
Intranasal—diamorphine/fentanyl	38 (100)
Inhaled—nitrous oxide/entonox	38 (100)
Topical anaesthesia (eg, tetracaine, lidocaine±prilocaine)	38 (100)
Topical wound anaesthesia (eg, lidocaine, epinephrine and tetracaine gel, tetracaine, epinephrine and cocaine gel)	29 (76)

and documentation in 11 sites (29%), improving access to assessment tools in two sites (5%), new guidance in two sites (5%), new patient leaflets in one site (3%), increased PGD administration of medication at triage in one site (3%) and mandated pain assessment after triage in one site (3%).

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%). Quality improvement processes relating to pain assessment or management were in operation in 18 sites (47%). These included regular audits of pain scoring and analgesia administered, the development of new guidelines/policies/protocol to improve areas of practice and increased training of staff.

Non-pharmacological management

There was restricted access to a play specialist in 21 sites (55%); the remaining sites had no access. The median number of items for distraction or entertainment was 3.5 (range 1–8, figure 2). Other items reported included different modalities for light and/or sensory distraction in nine sites (24%).

Immobilisation strategies employed for traumatic injuries prior to clinician assessment varied. Arm slings were applied very frequently/frequently in most sites (29 sites, 76%), though Futura splints were not applied/infrequently applied in most sites (32 sites, 84%).

DISCUSSION

We have described the structures relating to paediatric pain management across an international paediatric emergency network, and identified significant variations contributing to processes and outcomes in paediatric pain management.[10] Variations included guideline availability and content, staff education, pain reassessment, pain scale usage, pharmacological accessibility, PGD usage and procedural sedation availability. Variation

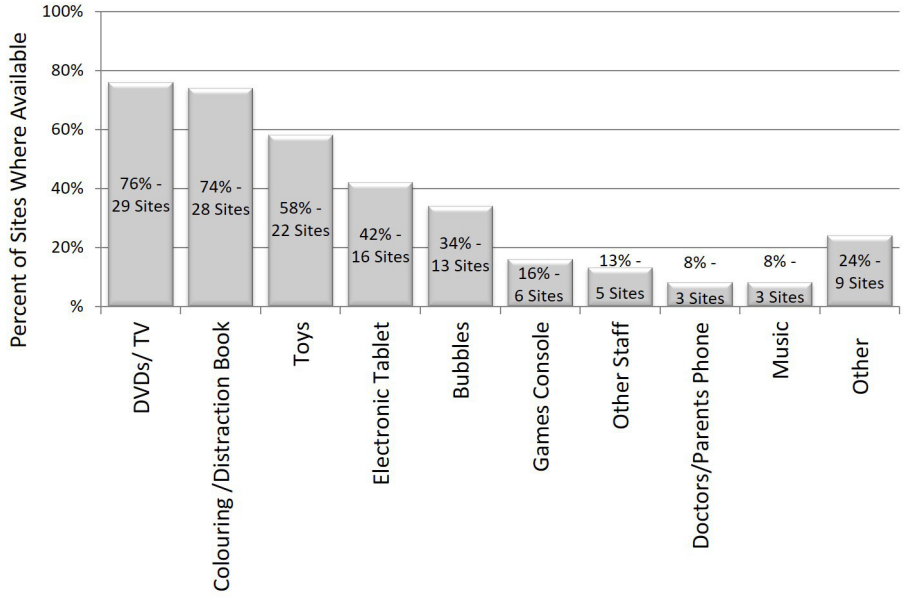


Figure 2 Amenities and equipment available to assist with non-pharmacological analgesia. DVD, digital video disc; TV, television.

existed in non-pharmacological approaches, including distraction amenities, parental empowerment and access to play services.

The aim of timely, efficient and adequate pain management is not being achieved in EDs despite multiple sequential audits, with deterioration in timeliness of treatment being demonstrated in the most recent national audit of patients with moderate and severe pain.[8] A recent UK study identified that other ED tasks were prioritised over pain management if this was not aligned with department core priorities, and not perceived as a key organisational priority for which staff were held accountable.[13] When recommending interventions one must consider a hierarchy of effectiveness, and each solution's level of feasibility. A systematic review and narrative synthesis of ED interventions to improve pain management revealed it was impossible to estimate effectiveness of interventions, or identify which had the greatest impact.[14] A hierarchy of intervention effectiveness in EDs has been described, with forcing functions having highest effectiveness, and education or personal initiative/vigilance having the lowest.[15] Medication safety literature demonstrates system based interventions are the most effective, with highest leverage, but are the least feasible; conversely, person-based interventions are least-effective, with lowest leverage, but are most feasible.[16]

Results demonstrated that 1/4 of paediatric hospitals and trauma centres, and 1/3 of hospitals with an annual paediatric ED attendance over 50 000, did not have local guidance to support best practice in paediatric pain management. In previous studies, introducing pain protocols and education in EDs have improved analgesia provision, including usage of intravenous analgesia.[17] National guidance[4] and standards[6] which promote optimised pain assessment and management need to be implemented uniformly, as failure to do so commonly leads to oligoanalgesia.[18] In EDs, this should be interdisciplinary, with clear lines of responsibility for achieving and measuring pain control. Multimodal pain management strategies are needed to minimise pain and discomfort that incorporate a combination of pain control strategies, such as opioids, non-steroidal anti-inflammatory drugs and non-pharmacological interventions.[19] The uniform implementation of a single national guideline is a potentially moderately effective intervention, through simplification and standardisation of pain management across the health system.

Education varied in content, availability and strategy across sites. Under half delivered formal professional training in pain management, or mandated pain/analgesia competencies, implying that pain education is a low priority for over 50% of responding sites. Education and training are essential in enabling effective pain management,[18] and knowledge acquisition through mandated training could be targeted at a national or network level. This intervention is likely moderately effective, and highly feasible, especially if delivered from postgraduate training institutions. To optimise the feasibility of such a strategy, it is essential to simplify practices and content. For example, ten different pain scales were in use, a factor which is a potential threat to any national training package given the lack of translation between institutions. Simplifying by reducing the volume, and standardising pain tool usage, is a medium leverage and moderately effective intervention. Coupling these strategies align well with existing literature, as previous evidence-based knowledge translation interventions demonstrates sustained improvement in paediatric pain practices.[20]

Assessment and reassessment of pain are central to optimising pain management, but given current constraints on healthcare systems, reassessment of any condition or symptom in stable patients, including pain, is often the most challenging element of care. Pain is reassessed in only 15% of ED patients nationally.[8] There is significant positive association between documentation of a pain score and subsequent use of any analgesic,[21] and the converse is also true.[18] One moderate to highly effective system-based intervention is alerts using the electronic triggers in ED information systems for pain reassessment. Using technology to engage parents in acute pain care, including reassessment, may improve the child's experience, increase parental satisfaction and reduce anxiety.[22]

A large difference in the quantities of non-pharmacological analgesia resources across sites existed. Level 1 evidence from systematic reviews/meta-analysis of relevant randomised trials demonstrated that non-pharmacological analgesia reduces pain,[3] and Intercollegiate guidelines therefore state all EDs that treat children should employ a play specialist.[7] This method of pain control is often overlooked, and sites should prioritise incorporating this as a priority. The forcing function of mandating such an intervention is most effective in achieving a successful change and may not be a huge burden when one considers the cost and availability of smart devices.

Local accessibility to medications, practices, and attitudes effect optimal practice.[18] There was widespread access to intranasal opioids and nitrous oxide/Entonox. Intranasal opioids have gained increased popularity over intravenous opioids due to their fast onset, safety and ease of administration.[23] RCEM guidelines advocate diclofenac sodium, codeine or oral morphine for moderate pain.[4] Since 2013, this has become more limited as codeine is contraindicated in children under 12 years due to the risk of toxicity.[24] Morphine can require incremental dosing with frequent pain reassessment to achieve optimal analgesia due to the risk of respiratory depression. Barriers to the routine use of morphine include opiophobia and monitoring requirements.[24] Intranasal fentanyl is equivalent to intravenous/intramuscular morphine in reducing pain associated with acute paediatric fracture in the ED and internal evidence where it was incorporated into a triage protocol demonstrated earlier onset analgesia compared with intravenous opioids.[3] We suggest bodies producing national guidance include drugs suitable for

Box 1 Suggested Solutions (with effectiveness and feasibility) to improve paediatric pain management in emergency department (ED)

- Reprioritise paediatric pain management as a core principle in each ED aiming to reduce patient distress through pharmacological and non-pharmacological interventions (least effective, most feasible).
- Integration of mandated pain assessment and reassessments using electronic triggers in an ED information system (moderately to highly effective, moderately to highly feasible).
- Simplification and standardisation of pain management to support best practice including a concise number of pain scales (moderately effective, highly feasible).
- Choice of medications available, route of administration and consideration of the intranasal route for moderate pain (moderately effective, moderately feasible).
- Incorporate training on acute pain management at induction and developing pain management competencies (least effective, highly feasible).
- Expand the number of medications available through patient group directions (PGDs) and single check PGDs (moderately effective, highly feasible).
- Expand access to play specialist services and non-pharmacological interventions (uncertain effectiveness and feasibility).
- Empower patients/parents to request analgesia (least effective, most feasible).
- Expand access to paediatric procedural sedation for all sites (moderately effective, least feasible).
- Regular local audits of pain management to monitor practices and highlight areas for improvement with frontline staff. (least effective, most feasible).

intranasal administration for moderate to severe pain. Other alternatives including inhaled methoxyflurane[3] may become future additions following completion of randomised controlled trials.

Modifying organisational infrastructure to remove barriers is crucial. The universal implementation of PGDs could yield a moderately effective solution. These enable administration of specified prescription-only medicines to groups of patients under an overarching prescription, removing the need for individual-level prescription every time, with consequent reductions in time to analgesia.[25] Single-checked PGDs are used successfully in many paediatric EDs without increasing rates of medication errors.[25] Broadening their use and incorporating nurse-led protocols are likely to reduce time to analgesia and improve pain assessment.[21]

We have described current pain management structures in paediatric emergency care at a network level, and provided an insight into acute paediatric pain management. Variation is high, which likely contributes to poor pain outcomes identified in national audits. We, therefore, recommend person-centred and whole system interventions, of varying effectiveness, addressing these structural variations, to improve pain outcomes for children attending EDs which are summarised in box 1.

LIMITATIONS

This survey relied on accurate reporting by one clinician at each site based on our designed survey. These reports are unverified and are a single person's views of each department which may over-report or under-report certain aspects. The results of compliance of guidelines to RCEM standards are reported based on the site leads interpretation and the guidelines sent to the study team were not analysed to verify this. Our approach allowed us to gain insight into many sites across the network, and our response rate means we are confident we identified key variations. We identified variation in practice, but we cannot determine best practice. We did not seek information on the prehospital management of pain, the qualifications of staff who assess and administer analgesia, staff motivations regarding pain assessment and management or documentation in medical records in our survey. This limits the ability to fully evaluate the structures of healthcare in the sites.

CONCLUSIONS

Controlling pain is a cornerstone of compassionate care. There has been serial and widespread documentation of the substandard pain outcomes currently provided in the management of acute pain in children. A revised and effective approach is needed. This survey has identified an opportunity for structural improvements to support the current national guidance for the management of pain in children.[4] Potential opportunities for network-wide improvement include uniform guidance to mandate early pain assessment with timely effective analgesia administration and mandated reassessment. Other key areas for improvement include staff training and competencies, non-pharmacological analgesia and increasing the number of PGD medications and single-checked PGDs.

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Patient consent for publication Not required.

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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. All data relevant to the study are included in the article.

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PERUKI Site Survey of Pain Assessment & Analgesia Practices

Page 1: PERUKI Site Survey of Pain Assessment & Analgesia Practices

Thank you for completing this survey, designed to explore differences in practice between emergency departments in the United Kingdom & Ireland in the management of pain in children. Results will inform future research in this area. It should take no more than 10-15 minutes to complete.

Data Protection

For the purposes of this survey PERUKI is the data controller. All data collected in this survey will be held securely by the survey software provider (University of Bristol) under contract and then retained by PERUKI in accordance with the Data Protection Act (1998). Data from the survey will only be used by PERUKI team for the purposes of research prioritisation. Cookies (personal data stored by your Web browser) are not used in this survey.

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Page 2: About your Emergency Department

1. Your Full Name ✱ *Required*

2. Your Email Address *(for contact in the event of any queries, or regarding any future output from this survey)* ✱ *Required*

Please enter a valid email address.

3. Please select your PERUKI site

3.a. If you selected Other, please specify:

4. Please select which of the following applies to your hospital?

- Tertiary centre
- District general hospital

5. Please select which of the following applies to your hospital/ED?

- Mixed adult/paediatric hospital – separate paediatric ED
- Mixed adult/paediatric hospital – combined ED
- Paediatric hospital

6. Please select which of the following applies to your hospital/ED?

- Trauma Centre
- Trauma Unit
- Neither

7. Annual paediatric attendance

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Page 3: Pain Assessment in your Emergency Department

8. Is pain assessment and scoring mandatory during the initial nurse assessment/triage process in your ED?

- ○ Yes
- ○ No
- ○ Unknown

8.a. Optional free text

9. Which pain tool(s) does your ED utilise to assess pain? ✱ *Required*

- ☐ Verbal Visual Analogue Scale (VAS)
- ☐ Visual Analogue Scale (VAS)
- ☐ Numerical Rating Scale (NRS) (on scale 0-10 rating score)
- ☐ Verbal Pain Intensity Scale (no pain, mild pain, moderate pain, severe pain, very severe pain, worst possible pain)
- ☐ Faces Legs Activity Cry Consolability Scale (FLACC)
- ☐ Faces Pain Scale - Wong Baker
- ☐ Faces Pain Scale - Revised
- ☐ Other

9.a. If you selected Other, please specify:

10. Are any additional processes/pathways integrated within your ED patient journey to promote/obligate analgesia administration and/or pain score reassessment? ✱ *Required*

- Yes
- No
- Unknown

10.a. Please describe these processes/pathways

Page 4: Guidelines & Protocols for ED Pain Assessment & Management

11. Does your ED have a current policy/guideline(s) to support best practice in pain management? ✱ *Required*

- Yes
- No
- Unknown

If yes, please email electronic version to stuart.hartshorn@bch.nhs.uk, or post paper version to Dr Stuart Hartshorn, Emergency Department, Birmingham Children's Hospital, Steelhouse Lane, Birmingham, B4 6NH

12. Which of the following are covered by your policy/guideline(s)? ✱ *Required*

	Yes	No	Unknown
Use of pain scales	☐	☐	☐
Standardised pain ladder	☐	☐	☐
Frequency of pain assessment	☐	☐	☐
Preferred analgesia for specific conditions	☐	☐	☐
Dosages for different ages groups	☐	☐	☐
Contradictions to specific analgesic agents (e.g. with comorbidities)	☐	☐	☐
Non pharmacological management of pain	☐	☐	☐
Referral process based on pain score	☐	☐	☐
Opioid analgesia - monitoring vital signs	☐	☐	☐
Opioid analgesia - monitoring levels of sedation	☐	☐	☐
Opioid analgesia - discharge criteria	☐	☐	☐

13. Are your departmental guidelines/policies in line with the College of Emergency Medicine "*Best Practice Guideline on the Management of Pain in Children*"? (*click here to view these guidelines*)

- Yes
- No
- Unknown

13.a. Are your departmental guidelines in line with any other national/institutional guidelinespolicies (please specify if so)?

Page 5: Drugs for Analgesia in your ED

14. Which of the following pharmacological analgesic options are available for use in your ED? ✱ *Required*

	Yes	No	Unknown
PO - Codeine	☐	☐	☐
PO - Diclofenac	☐	☐	☐
PO - Ibuprofen	☐	☐	☐
PO - Morphine sulphate	☐	☐	☐
PO - Paracetamol	☐	☐	☐
PO - Sucrose	☐	☐	☐
PO - Tramadol	☐	☐	☐
PR - Diclofenac	☐	☐	☐
PR - Paracetamol	☐	☐	☐
Inh - Entonox	☐	☐	☐
Inh - Nitrous oxide	☐	☐	☐
Intranasal Diamorphine	☐	☐	☐
Intranasal Fentanyl	☐	☐	☐
IV - Fentanyl	☐	☐	☐
IV - Ketamine	☐	☐	☐
IV - Morphine sulphate	☐	☐	☐
IV - Paracetamol	☐	☐	☐
IV - Propofol	☐	☐	☐
Topical anaesthesic (e.g. Ametop, EMLA, LMX4)	☐	☐	☐
Topical wound anaesthesic (e.g. LAT/LET gel)	☐	☐	☐
LA - Bupivicaine	☐	☐	☐
LA - Lidocaine	☐	☐	☐
Nerve block - digital	☐	☐	☐
Nerve block - femoral	☐	☐	☐

Nerve block - other	☐	☐	☐

14.a. Please list any other ***pharmacological*** analgesic options, not mentioned above, that are available in your ED

15. For which analgesic agents are Patient Group Directions (PGDs) used in your ED?

- ☐ Entonox
- ☐ Ibuprofen (pain)
- ☐ Paracetamol (pain)
- ☐ Topical anaesthetic (e.g. Ametop/EMLA/LMX4)
- ☐ Topical wound anaesthetic (e.g. LAT/LET gel)
- ☐ Other
- ☐ None of the above

15.a. If you selected Other, please specify:

Page 6: Patient/Parent Information

16. Does your ED provide written information on pain/analgesia to paediatric patients, for use whilst in the department? ✱ *Required*

- Yes
- No
- Unknown

17. Does your ED provide written information on pain/analgesia to parents/carers of paediatric patients, for use whilst in the department? ✱ *Required*

- Yes
- No
- Unknown

18. Does your ED provide written discharge information on pain/analgesia to parents/carers when they leave your department? ✱ *Required*

- Yes
- No
- Unknown

19. Does your ED use any strategies to empower patients/parents to take the lead in requesting analgesia? ✱ *Required*

- Yes
- No
- Unknown

19.a. Please describe

Page 7: Education, Audit & Quality Improvement

20. Has your ED audited the management of acute pain in children within the last 5 years? ✱ *Required*

- ○ Yes
- ○ No
- ○ Unknown

20.a. When was this audit conducted (month/year)?

20.b. Did any changes to pain management in children result from the audit?

- ○ Yes
- ○ No
- ○ Unknown

20.b.i. If yes, please describe the changes that resulted

21. Which of the following educational programmes are in place within your ED? ✱ *Required*

	Yes	No	Unknown
Mandatory pain/analgesia competencies for staff	☐	☐	☐
Induction/orientation training - pain management	☐	☐	☐

Professional development training - pain management	☐	☐	☐
Paediatric sedation program	☐	☐	☐

22. Are any quality improvement processes relating to pain assessment/management currently in operation within your ED? ✱ *Required*

- ○ Yes
- ○ No
- ○ Unknown

22.a. If yes - please outline these quality improvement processes

Page 8: Other Aspects of Pain Management

23. For paediatric patients attending your ED with upper limb injuries, how often are the following modes of immobilisation applied ***prior to clinician assessment****?*

Please don't select more than 1 answer(s) per row.

	Never	Rarely	Occasionally	Frequently	Very Frequently
Broad arm sling/collar & cuff (or equivalent)	☐	☐	☐	☐	☐
Futura splint (or equivalent)	☐	☐	☐	☐	☐

23.a. Please describe, if applicable, any other modes of immobilisation utilised in your ED prior to clinician assessement, and their frequency of use.

24. What access to play specialist services do you have for formal patient distraction during painful procedures?

	Any time	Restricted hours	None
Resident in your ED	☐	☐	☐
Available in your hospital	☐	☐	☐

25. Aside from formal play specialist services, what other facilities/amenities/equipment are available in your ED for non-pharmacological pain management/distraction? *For example: departmental iPads/tablets, games consoles, colouring kits, etc.* ✱ *Required*

26. Do you have access to point-of-care ultrasound technology within your ED to aid with procedures, e.g. nerve blocks ✱ *Required*

- Yes
- No
- Unknown

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Page 9: Additional Comments

27. If you wish to leave any additional comments about this survey, please do so here

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Page 10: Thank You!

Thank you for completing this survey. Your answers are now submitted.

Please remember to send any guidelines/policies or care pathways on pain assessment/ management to the study team:

Via email:
stuart.hartshorn@bch.nhs.uk

By post:
Dr Stuart Hartshorn
Emergency Department
Birmingham Children's Hospital
Steelhouse Lane
Birmingham
B4 6NH

If you have any queries about this survey or want more information, please contact the study team by email at stuart.hartshorn@bch.nhs.uk

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Key for selection options

3 - Please select your PERUKI site

Addenbrooke's Hospital
Alder Hey Children's Hospital
Barts & The London
Birmingham Children's Hospital
Bristol Royal Hospital for Children
Chelsea and Westminster Hospital
Children's Hospital for Wales
Cork University Hospital
County Durham & Darlington NHS Foundation Trust
Crosshouse Hospital
Derriford Hospital
Evelina Hospital
Forth Valley Royal Hospital
Great North Children's Hospital
Hull Royal Infirmary
James Cook University Hospital
King's College Hospital

Leeds General Infirmary
Leicester Royal Infirmary
Morriston Hospital
Musgrove Park Hospital
North Manchester General Hospital
Nottingham Children's Hospital
Ormskirk & District General Hospital
Our Lady's Children's Hospital, Crumlin
Queen Alexandra Hospital, Portsmouth
Queen Elizabeth Hospital, Woolwich
Royal Aberdeen Children's Hospital
Royal Alexandra Children's Hospital, Brighton
Royal Belfast Hospital for Sick Children
Royal Derby Hospital
Royal Devon and Exeter Hospital
Royal Free Hospital
Royal Hospital for Children, Glasgow
Royal Hospital for Sick Children, Edinburgh
Royal Manchester Children's Hospital
Royal United Hospital, Bath
Salford Royal
Sheffield Children's Hospital
Southmead Hospital
St George's Hospital
St Mary's Hospital
Sunderland Royal Hospital
Tallaght Children's Hospital, Tallaght
Temple Street Children's University Hospital
University College Hospital
University Hospital Lewisham
University Hospital Southampton
Watford General Hospital (West Herts NHS Trust)
Western Sussex Hospitals NHS Trust
Other

Checklist for Reporting Results of Internet E-Surveys (CHERRIES)*

Item category	Checklist item	Description
Design	Study design	The target population were consultants working in Emergency Medicine caring for paediatric patients in the UK and Ireland who were identified through the Paediatric Emergency Research in the UK and Ireland (PERUKI) network; a collaboration of clinicians and academics from Emergency Departments in England, Ireland, Northern Ireland, Scotland and Wales who share the passion of improving the emergency care of sick and injured children through research. One participant was sought per institution covered by PERUKI.
Ethics	Ethics approval	This study was reviewed in line with the Healthcare Regulatory Authority framework by the Research department of the lead site (Birmingham Children's Hospital NHS Foundation Trust, Birmingham, UK) prior to commencement, and was deemed to be service evaluation utilising routinely collected data. Formal ethical approval was therefore not required.
	Informed consent	Informed consent for the survey was obtained from all those agreeing to complete a survey, with participant information displayed on the welcome page. This included that the survey would take approximately 10 minutes to complete, that all responses were confidential, and that data would be stored and analysed on password protected encrypted computers at BCH, accessed only by the study team, and deleted 5 years after the study was accepted for publication. A Privacy Notice was also available to download, and contact details were displayed for the research team. Consent was indicated when respondents clicked the 'I consent' button at the bottom of this page.
	Data protection	Personal information was collected including the respondents name, email address and institution. This enabled the respondent be acknowledged for their input. Data was pseudo anonymised prior to analysis. Survey data are stored on a secure server at BCH and the survey platform 'Online Surveys' (JISC) for data security.
Development and pre-testing	Development and testing	Survey content was developed iteratively based on existing recommendations and published findings from primary research and audit. Prior to finalising the survey content, it was reviewed by PERUKI site leads, and additional questions raised were incorporated with consensus derived in the study team where necessary.
Recruitment Process	Open vs closed survey	This was a closed survey.
	Advertising the survey	The survey was not advertised; as above, PERUKI sent the survey link via email.

Item category	Checklist item	Description
Survey administration	Web/email	This was a web-based survey, hosted by the survey platform 'Online Surveys' (JISC).
	Context	'Online Surveys' (JISC) is an online survey platform.
	Mandatory/ voluntary	Voluntary.
	Incentives	Survey respondents were offered acknowledgement in any publication from the survey results.
	Time/date	Responses were collected between December 2016 and January 2017.
	Item randomisation	No randomisation of items was used.
	Adaptive questioning	Adaptive questioning was not used.
	Number of items	A maximum of 28 items were displayed on any one survey page.
	Number of screens	The full survey was distributed over 9 pages. A progress bar was shown at the top of the page, as the respondent were completing the survey.
	Completeness check	All survey items were deemed to be mandatory, and respondents prompted to complete outstanding items before leaving the survey page on which the item was contained. Most items, except screener items and those items required for adaptive questioning included a 'Don't know/ none of the above' option.
	Review step	Respondents were able to change their responses using a "Back" button at the bottom of each screen.
Response rates	Unique site	Determination of unique visitors was handled by checking that each hospital site only had one response.
	View rate	Not applicable; respondents were invited through PERUKI.
	Participation rate	Not applicable; respondents were invited through PERUKI.
	Completion rate	All respondents who commenced the survey, completed it, giving a completion rate of 100%.
Preventing multiple entries from same individual	Cookies used	Not used.
	IP check	Not used.
	Log file analysis	Not used.
	Registration	A login was not used - entry to the survey was via a web link emailed to eligible participants. No duplicate entries were found through the survey question detailing the institution.

Item category	Checklist item	Description
Analysis	Handling of incomplete questionnaires	Only completed questionnaires were included in the final dataset.
	Questionnaires with atypical timestamp	No respondents were removed from the survey for completing the items too quickly.
	Statistical correction	No weighting scheme was used for the analysis of results.

* Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J Med Internet Res 2004;6:e34.