Patient-Reported Pain Outcomes for Children Attending an Emergency Department With Limb Injury

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Objectives: The aim of this study was to describe patient-reported pain outcomes at various stages of an emergency department (ED) visit for pediatric limb injury.

Methods: This prospective cohort consisted of 905 patients aged 4 to 17 years with acute limb injury and a minimum initial pain score of 4/10. Patients reported pain scores and treatments offered and received at each stage of their ED visit. Multiple logistic regression was used to identify predictors for severe pain on initial assessment and moderate or severe pain at ED discharge.

Results: The initial median pain score was 6/10 (interquartile range, 4–6) and decreased at discharge to 4/10 (interquartile range, 2–6). Stages of the ED visit where the highest proportion of patients reported severe pain (score, ≥8 of 10) were fracture reduction (26.0% [19/73]; 95% confidence interval [CI], 17.1%–37.5%), intravenous insertion (24.4% [11/45]; 95% CI, 13.8%–39.6%), and x-ray (23.7% [158/668]; 95% CI, 20.6%–27.0%). Predictors of severe pain at initial assessment included younger age (odds ratio [OR], 0.92; 95% CI, 0.87–0.97), female sex (OR, 0.58; 95% CI, 0.40–0.84), and presence of fracture (OR, 1.58; 95% CI, 1.07–2.33) whereas, at discharge, older age (OR, 1.14; 95% CI, 1.06–1.23) predicted moderate/severe pain (score, ≥4 of 10).

Conclusions: These results on the location and predictors of severe pain during an ED visit for limb injury can be used to target interventions to improve pain management and patient outcomes.

Key Words: patient-reported outcomes, pain, limb injury

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Musculoskeletal injuries (including limb fractures, sprains, strains, dislocations) represent one of the most common painful conditions resulting in an emergency department (ED) visit for children.[1–3] It is estimated that over 50% of children will fracture a bone by the age of 15.[2] Undertreated pain in a child can cause both short-term and long-term consequences including altered pain processing, heightened pain sensitivity as an adult, and future healthcare avoidance.[3–5] Fortunately, there are effective pharmacologic and nonpharmacologic treatment strategies to treat pain in children.[1,3] Work done in ED settings has demonstrated that prompt treatment of pain is one of the highest priorities for children and families and is a significant determinant of patient satisfaction.[6] Despite the well-documented existence of effective pain treatments, patient and family prioritization of pain treatment, and the adverse consequences of undertreated pain, health data repeatedly show poor pain assessment and management for children during ED visits.[3,7–9]

A comprehensive quality improvement project was initiated at the Alberta Children's Hospital Emergency Department (ACH ED) to identify and address quality gaps in the treatment of pain. The first phase of the improvement effort was to build an understanding of the pain experience for patients with limb injuries. The primary objective was to describe patient-reported pain outcomes at various stages of an ED visit. The secondary objective was to identify predictors of severe pain on ED arrival and discharge.

METHODS

Project Design and Setting

This was a prospective observational cohort. The ACH ED, located in Calgary, Alberta, Canada, receives over 70,000 visits annually. Project participants included patients/parents visiting the ACH ED from August 2014 to April 2016 with a chief complaint of upper or lower limb injury when a project assistant was present to verify eligibility and begin enrollment. Project assistants were available 7 days a week, 14 hours a day. Patients self-reported pain scores, treatments offered, and treatments received at various time points during their visit.

This project was reviewed according to local policies as a quality improvement initiative and was deemed by the Research Ethics Board to be outside of the review mandate.[10] Informed consent was obtained from all parents and assent from patients aged 8 years and older.

Participants

Patients aged 4 to 17 years with acute limb injury (within 3 days) and a minimum initial pain score of 4 on a 10-point scale (or equivalent on the Faces Pain Scale—Revised[11]) who consented to participate were eligible. Exclusion criteria included multiple trauma, inability to complete pain scores owing to developmental or physical disability or limited English proficiency, suspected abuse, and inability to complete a 3-day follow-up.

Pain Scores in ED Stages

Pain was measured by patient self-report using a 6-image face scale (Faces Pain Scale—Revised[11]). For analysis purposes, this was converted to a numerical 10-point pain scale and was divided into 3 categories: (1) no pain/mild pain (score of 0 or 2), (2) moderate (score of 4 or 6), and (3) severe (score of 8 or 10).[12,13]

Pain was assessed at 9 time points during the ED visit including (1) initial pain upon enrollment in the project, (2) in the waiting room, (3) waiting to see a doctor while in the examination room/treatment location, (4) being examined (by a doctor, nurse, or orthopedic technician), (5) during x-ray, (6) during intravenous (IV) insertion, (7) during reduction of a fracture, (8) during casting, and (9) upon discharge from the ED. Patients may have experienced

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some or all of these stages in various orders. Patients were also given the opportunity to write in stages of the ED visit that were not already included in the data collection forms. Demographic data, initial and discharge pain scores, and data on details of the ED visit were collected from the patient/parent and the medical record and inputted directly into REDCap, a secure online database, by the project assistants.[14] Data on pain scores and medications received during all other stages of the ED visit were recorded on a paper record by the patient/parent and entered into REDCap by the project assistants.

Outcome Measures

The primary outcome measures included the median pain score and the proportion of patients with severe pain at various time points in the ED visit. The secondary outcome measures included the predictors of severe pain at initial pain assessment and moderate or severe pain at ED discharge.

Analysis

Analyses were completed using Stata 14.

Median Scores and Severe Pain Proportions

Median pain scores and interquartile ranges (IQRs) were calculated at each ED stage. A Wilcoxon rank sum test was used to compare initial pain scores and pain scores at discharge.

The proportion of patients who reported severe pain (pain score of ≥8) at each stage was calculated with 95% confidence intervals (95% CIs). The proportion of patients who received analgesia in triage, were offered topical anesthetic for IV insertion, received analgesia at x-ray, and who received analgesia before arrival at the ED, was also calculated with 95% CIs.

Predictors of Initial Pain Scores

Patients enrolled in the project must have reported a minimum pain score of 4 at initial pain assessment to be eligible for inclusion; therefore, patients were assigned to either moderate (score, 4 or 6) or severe pain (score, ≥8) categories. Logistic regression was performed to identify predictors of severe pain, with moderate pain used as the baseline. The following variables were assessed as potential predictors: patient age, sex, time of ED visit (day or evening), number of patients in the ED waiting room at time of enrollment, administration of analgesic medication before coming to the ED, diagnosis of fracture, performance of x-ray, reduction of a fracture, and application of a cast.

Predictors of Pain Upon Discharge From ED

Upon discharge, patients could be categorized as reporting no pain/mild (score, 0 or 2), moderate (score, 4 or 6) or severe (score, ≥8) pain. Moderate and severe pain scores were combined ("moderate/severe") to compare with no pain/mild pain. Predictor variables included those listed above for initial pain scores, as well as whether pain medication was offered in triage, whether analgesia was administered at triage, or if analgesia was given at any point during the ED visit. We used the Wilcoxon rank sum test to determine if there was a difference in median age between patients who had a fracture and those who did not. We also used the Wilcoxon rank sum test to determine if there was a difference in median age between patients who did, and did not, receive analgesia during their ED visit.

RESULTS

Figure 1 shows the flow chart of patients enrolled in the project. A total of 905 patients with a median age of 12 years (IQR, 10 years; range, 4–17 years) were enrolled. The median number

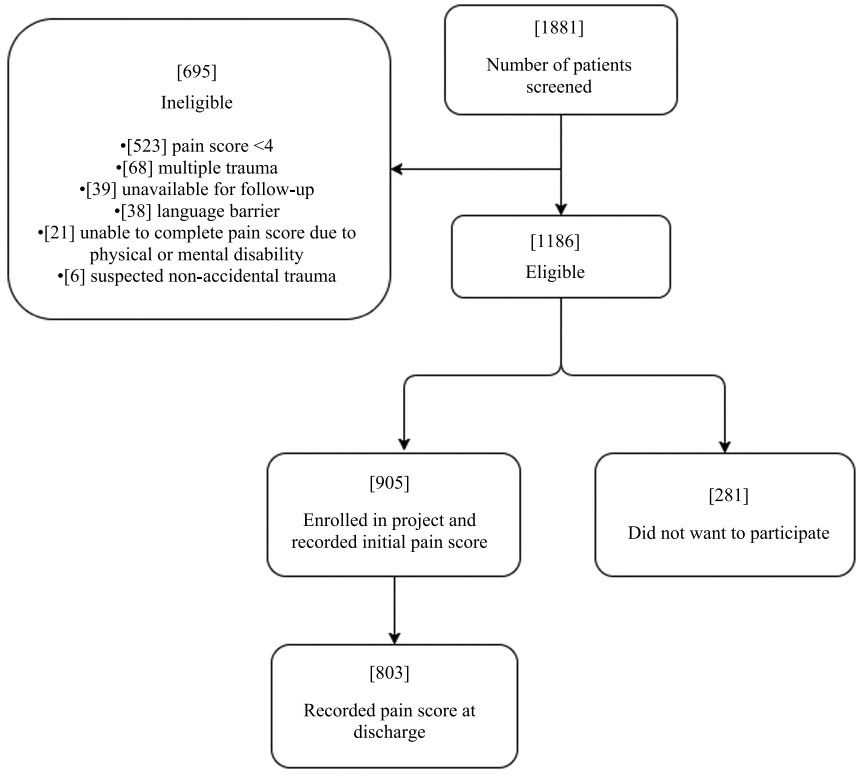


FIGURE 1. Flow chart of patients enrolled in the project.

of patients in the waiting room upon enrollment was 37 patients (IQR, 19 patients; range, 1–90 patients). The demographics for our patient population can be found in Table 1.

Median Pain Scores

Median pain scores at the measured time points are displayed in a pain map (Fig. 2). The initial median pain score was 6/10 (IQR, 4–6) and decreased at discharge to a median pain score of 4/10 (IQR, 2–6). Overall, there was a significant decrease in median pain scores between initial pain scores and the pain scores taken at discharge (N = 802; $P < 0.01$).

Severe Pain Proportions

The pain map displays the proportion of patients with severe pain at each measured stage (Fig. 2). The highest proportion of patients reported severe pain during fracture reduction followed by IV insertion and x-ray. Severe pain was reported least often by patients waiting to see the doctor, during initial pain assessment, and at time of discharge. The proportion of patients who received analgesia in triage was 53.8% (484/900; 94% CI, 50.5%–57.0%). For IV insertion, 42.5% (20/47; 95% CI, 28.9%–57.4%) of patients indicated they were offered topical anesthetic. During x-ray, 4.8% (33/685; 95% CI, 3.4%–6.7%) of patients reported they received analgesia at this stage. In addition, 26.3% (238/905; 95% CI, 23.5%–29.3%) of participants had received analgesia before arrival at the ED.

Additional Time Points Identified by Patients

Patients were given the opportunity to write in stages of the ED visit that were not already included in the data collection forms. The most common painful stages added were during splinting (n = 29), after the x-ray (n = 10), and seeing the doctor a second time (n = 5). Other time points that were mentioned included going to the washroom, during transport/movement within the ED, and when asked to step onto the scale for weight measurement.

Predictors of Initial Pain Scores

When analyzing predictors of initial pain (upon enrollment), it was found that younger age (odds ratio [OR], 0.92; 95% CI, 0.87–0.97; $P < 0.01$), female sex (OR, 0.58; 95% CI, 0.40–0.84, $P < 0.01$), and presence of a fracture (OR, 1.58; 95% CI, 1.07–2.33, $P = 0.02$) were predictors of whether patients rated their pain as severe (Table 2).

Predictors of Pain Scores Upon Discharge From ED

When analyzing predictors of pain upon discharge, it was found that older age predicted moderate/severe pain at discharge (OR, 1.14; 95% CI, 1.06–1.23; $P < 0.01$) (Table 3). The median age for patients who received analgesia was younger than those who did not (Wilcoxon rank sum test, $P = 0.02$). Similarly, the median age of children with a fracture was lower than those who did not have a fracture (Wilcoxon rank sum test, $P < 0.01$).

DISCUSSION

To maximize the clinical usefulness of our findings, a pain map was developed to describe 9 stages of an ED visit. Overall, there appeared to be a significant decrease in pain scores between initial assessment and discharge. Without evaluating additional time points, one could assume that pain gradually declines from arrival to departure in the ED. However, we noted that the proportion of patients reporting severe pain increases while children are undergoing various procedures and at different time points in the ED, thus supporting the importance of frequent pain assessments and anticipation of painful time points.

Severe Pain Proportions

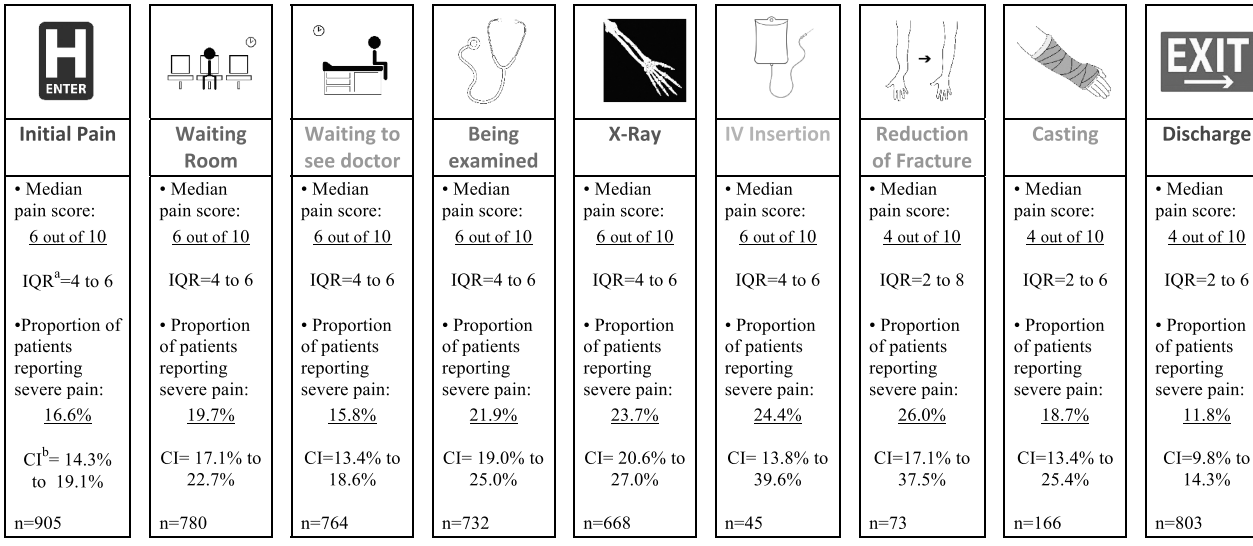
Severe pain was reported most often when patients were having a fracture reduced. This is an interesting result, as the vast majority of pediatric patients who undergo fracture reduction at the ACH ED receive procedural sedation and should feel minimal pain; therefore, the events just before or after the reduction may be affecting the pain scale reported. Most patients who undergo

TABLE 1. Demographic Characteristics of Project Participants (N = 905)

Item	Numerator	Proportion	95% CI
Sex			
Male	473	52.3%	(49.0–55.6)
Triage category*			
CTAS 5	32	3.5%	(2.5–5.0)
CTAS 4	529	58.5%	(55.2–61.7)
CTAS 3	278	30.7%	(27.8–33.9)
CTAS 2	57	6.3%	(4.9–8.1)
CTAS 1	0	0.0%	–
Not charted	9	1.0%	(0.5–1.9)
Time of arrival			
Day (8 AM to 4 PM)	374	41.3%	(38.1–44.6)
Night (4:01 PM to 12 AM)	521	57.6%	(54.3–60.8)
Not charted	10	1.1%	(0.6–2.1)
Proportion of children who sustained a fracture	350	38.7%	(35.5–41.9)
Proportion of children who received analgesia in triage	484	53.8%	(50.5–57.0)
Proportion of children who received an x-ray	750	82.9%	(80.2–85.2)
Proportion of children who received analgesia during x-ray	33	4.8%	(3.4–6.7)

*CTAS—level 5 is least severe and level 1 is most severe.

CTAS, Canadian Triage and Acuity Scale.



[a]IQR = interquartile range
[b]CI= 95% confidence interval

FIGURE 2. Pain map of the ACHED that displays median pain scores and proportion of patients reporting severe pain (pain score of ≥8) for 9 stages of the ED visit. Patients may have experienced some or all of these stages in various orders.

procedural sedation in the ACH ED receive ketamine, which is a dissociative anesthetic but does not provide lasting analgesia. It is possible that children become aware of pain after emerging from sedation. We did not standardize the precise time point at which children rated their pain at the fracture reduction stage. It is also possible that psychological factors such as anxiety contribute to the high ratings of pain around the time of fracture reduction. It would be valuable to further investigate the pain experience of children with limb injuries before, during, and immediately after reduction of a fracture.

Second to fracture reduction, the next highest proportion of patients reporting severe pain occurred during IV insertion. This may be due both to the procedure itself and to the fact that children often fear needles.[8] Less than half of the patients in our sample were offered an analgesic cream or spray before IV insertion. Ali et al[15] discussed an evidence-based approach to minimizing procedural pain in the ED and recommended fast-acting topical anesthetics for patients undergoing skin-breaking procedures. The American Academy of Pediatrics and the Canadian Association of Pediatric Health Centres provide guidelines and online resources for reduction of acute procedural pain including IV insertion.[16,17] Our study highlights the importance of managing needle pain in ED patients, as even children with a painful limb injury consider IV insertion to be the most painful aspect of their ED visit.

X-ray was the stage with the third highest proportion of patients reporting severe pain. There is limited research on pain experienced during x-ray procedures for children with limb injuries. Only 4.8% of patients in our project reported that they received pain medication at this stage. Although it is important to note that pain medication may have been provided at an earlier stage, only 53.8% of patients in our cohort received medication at triage, indicating that many patients did not have analgesia before radiography. This finding should encourage ED staff to reassess pain and anticipate analgesia needs before radiography.

The lowest proportion of patients with severe pain was recorded at discharge, the initial pain score, and waiting to see the doctor. The pain scores at discharge indicate that patients with limb injuries experience an improvement in their condition upon

TABLE 2. Results of Logistic Regression for Patients Reporting Severe Pain (≥8 pain score) Compared With Moderate Pain (4 or 6 pain score) for Their Initial Pain Score (N = 905)

Predictor Variable	OR	Lower Bound 95% CI	Upper Bound 95% CI	*P*
Intercept	0.54	0.19	1.53	0.25
Age	0.92	0.87	0.97	<0.01
Sex	0.58	0.40	0.84	<0.01
Time of day	1.06	0.71	1.56	0.78
Number of patients in waiting room	0.99	0.97	1.00	0.13
Prehospital analgesia	0.96	0.63	1.47	0.85
Presence of fracture*	1.58	1.07	2.33	0.02
Undergoing x-ray	1.63	0.83	3.19	0.15

*There was colinearity with patients who sustained a fracture, patients who were placed in a cast, and patients who had a fracture reduction; therefore, casting and reduction were removed from the analyses.

TABLE 3. Results of Logistic Regression for Patients Reporting Moderate/Severe Pain (≥4 pain score) Compared With No Pain/Mild Pain (0 or 2 pain score) at Discharge (N = 803)

Predictor Variable	OR	Lower Bound 95% CI	Upper Bound 95% CI	*P*
Intercept	0.38	0.09	1.53	0.17
Age	1.14	1.06	1.23	<0.01
Sex	0.67	0.41	1.07	0.09
Time of day	1.02	0.63	1.67	0.92
Number of patients in waiting room	1.01	0.99	1.03	0.43
If patient took medication for pain relief before coming into ED	1.98	0.99	3.97	0.05
Presence of fracture*	0.77	0.48	1.24	0.28
Undergoing x-ray	1.48	0.70	3.13	0.30
Receipt of analgesia during ED visit	1.08	0.63	1.83	0.79
Receipt of analgesia at triage	1.14	0.64	2.04	0.65

*There was colinearity with patients who sustained a fracture, patients who were placed in a cast, and patients who had a fracture reduction; therefore, casting and reduction were removed from the analyses. There was also colinearity with patients who were offered any pain medication at triage, so this was removed from the analyses.

visiting the ACH ED. Although this is reassuring, our results highlight that there are many opportunities to improve the pain experience before discharge. With respect to the initial pain score, we are unable to comment on the effect of prehospital analgesia because we did not study patients who had only mild pain upon arrival or ask participants to estimate prehospital pain scores. In our cohort of patients with moderate or severe pain, only 26.3% had received analgesia before arrival. A study by Spedding et al[18] found that 74% of children did not receive pain relief before arriving at the hospital and that most parents thought that giving pain relief could be harmful. It was also found that parents underestimated the amount of pain their child was experiencing.[18] Spedding et al[18] concluded that there would be benefits to educating parents about appropriate prehospital pain relief. Of note, the proportion of patients with severe pain was higher in the waiting room than when waiting to see the doctor after being moved out of the waiting room. Longer wait times can lead to increased pain and anxiety for patients.[19] Overcrowding in EDs has been associated with delayed treatment, particularly for patients with severe pain.[20] Future work should focus on the impact of ED waiting time and the waiting room environment on patient-reported pain outcomes. Anxiety is another factor reported to affect perceived pain of both children and parents.[17] Anxiety can be mitigated by the type of environment and distractions available, and a study by Fein et al[17] encouraged EDs to create a calming and child-friendly environment.

Predictors of Higher Pain Scores

It was found that younger children, females, and participants with a fracture were more likely to report higher pain scores at the time of initial enrollment.

Undertreatment of pain among young children has been previously reported[3,7–9]; however, it was interesting that, at discharge, higher pain was associated with older age. Three possible factors may explain this. First, it is possible that younger children preferentially choose the faces at the extreme ends of the scale to rate their pain. Drendel et al[12] reported this finding and explained that many young children use dichotomous thinking and tend to report only the lowest and highest pain scores when asked to rank their pain. This may explain the difference we observed in pain with respect to age. Second, in our sample, the presence of a fracture was more common in younger children. It is possible that younger children who had a fracture treated with immobilization could have experienced more pain relief than older children who received less definitive treatment for a soft tissue injury. Prior research has shown that immobilization decreases the intensity and duration of pain in pediatric limb injury.[21,22] Casting could also have a helpful psychological effect on the pain experience by providing a distraction or by causing the child to perceive their injury as repaired. Our results further highlight the importance of early immobilization as a nonpharmacologic modality of pain management in pediatric limb injury. Third, it was found that younger patients were more likely to receive analgesia overall during their ED visit.

Many studies have shown that males are less likely to report severe pain, which is consistent with our results. One study focused on pediatric oncology patients,[23] and another examining chronic and severe pain in children[24] showed that girls tend to report more pain compared with boys. A large study by Ruau et al[25] found elevated pain scores for women with a variety of underlying medical conditions, including musculoskeletal injuries, compared with pain scores for men. It is still not clear why sex differences exist for reported pain; however, various studies have suggested hormones, genetics, and psychological or cultural factors as potential explanations.[25]

Limitations

The inherent nature of pain as a subjective experience influenced by social, experiential, and psychological factors must be considered as a limitation to this project.[17] Specifically, anxiety is a major factor reported to affect perception of pain. Therefore, we report on the pain experience as described by our patients, and not as a purely physiologic experience. This project excluded patients with a pain score less than 4 of 10 upon enrollment. This exclusion helps narrow the analysis to the experience of children who have painful injuries; however, this limits the ability of the analysis to identify factors that predict pain at the time of project enrollment. As the objective of this project was to inform local improvement work, we did not seek to determine findings that would be generalizable to other EDs. Although it is possible that patients in other EDs may have a similar pain experience to that described in our cohort, other sites should evaluate the experience of patients in their own department to best understand improvement opportunities.

CONCLUSIONS

Severe pain was reported most frequently during x-ray, IV insertion, and fracture reduction. Female sex, younger age, and fracture were predictors of higher reported pain on initial assessment; older age was a predictor of higher reported pain at discharge. These results can be used by clinicians to optimize ED pain management. We are using these results in our local ED and are focusing our improvement efforts on reducing pain due to the injury as well as procedural pain associated with assessment and treatment. Our results also highlight a number of areas for future research including more detailed exploration of the pain experience of children with limb injuries before, during, and immediately after reduction of a fracture as well as explanatory factors for sex differences in pain reporting.

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REFERENCES

1. Ali S, Drendel AL, Kircher J, et al. Pain management of musculoskeletal injuries in children: current state and future directions. *Pediatr Emerg Care*. 2010;26:518–524; quiz 25–8.
2. Morris L, Stulberg D, Stevermer JJ. Fracture pain relief for kids? Ibuprofen does it better. *J Fam Pract*. 2010;59:273–275.
3. Stinson JN, McGrath P. No pain - all gain: advocating for improved paediatric pain management. *Paediatr Child Health*. 2007;12:93–94.
4. Czarnecki ML, Turner HN, Collins PM, et al. Procedural pain management: a position statement with clinical practice recommendations. *Pain Manag Nurs*. 2011;12:95–111.
5. Weisman SJ, Bernstein B, Schechter NL. Consequences of inadequate analgesia during painful procedures in children. *Arch Pediatr Adolesc Med*. 1998;152:147–149.
6. Magaret ND, Clark TA, Warden CR, et al. Patient satisfaction in the emergency department—a survey of pediatric patients and their parents. *Acad Emerg Med*. 2002;9:1379–1388. [published Online First: 2002/12/04].
7. Brown JC, Klein EJ, Lewis CW, et al. Emergency department analgesia for fracture pain. *Ann Emerg Med*. 2003;42:197–205.
8. MacLean S, Obispo J, Young KD. The gap between pediatric emergency department procedural pain management treatments available and actual practice. *Pediatr Emerg Care*. 2007;23:87–93.
9. Probst BD, Lyons E, Leonard D, et al. Factors affecting emergency department assessment and management of pain in children. *Pediatr Emerg Care*. 2005;21:298–305.
10. Hagen B, O'Beirne M, Desai S, et al. Innovations in the ethical review of health-related quality improvement and research: rhe Alberta Research Ethics Community Consensus Initiative (ARECCI). *Healthc Policy*. 2007; 2:e164–e177.
11. Hicks CL, von Baeyer CL, Spafford PA, et al. The Faces Pain Scale—Revised: toward a common metric in pediatric pain measurement. *Pain*. 2001;93:173–183.
12. Drendel AL, Kelly BT, Ali S. Pain assessment for children: overcoming challenges and optimizing care. *Pediatr Emerg Care*. 2011;27:773–781.
13. Tsze DS, von Baeyer CL, Bulloch B, et al. Validation of self-report pain scales in children. *Pediatrics*. 2013;132:e971–e979.
14. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42:377–381.
15. Ali S, Chambers AL, Johnson DW, et al. Paediatric pain management practice and policies across Alberta emergency departments. *Paediatr Child Health*. 2014;19:190–194.
16. Acute Procedural Pain: Paediatric Recommendations and Implementation Toolkits. Available at: http://ken.caphc.org/xwiki/bin/view/Paediatric+Pain/Acute+Procedural+Pain%3A+Paediatric+Recommendations+and+Implementation+Toolkits. Accessed March 16, 2017.
17. Fein JA, Zempsky WT, Cravero JP, et al. Relief of pain and anxiety in pediatric patients in emergency medical systems. *Pediatrics*. 2012;130: e1391–e1405.
18. Spedding RL, Harley D, Dunn FJ, et al. Who gives pain relief to children? *J Accid Emerg Med*. 1999;16:261–264.
19. Barua B, Esmail N, Jackson T. *The Effect of Wait Times on Mortality in Canada*. Fraser Institute. 2014. Available at: https://www.fraserinstitute.org/sites/default/files/effect-of-wait-times-on-mortality-in-canada.pdf. Accessed March 16, 2017.
20. Pines JM, Iyer S, Disbot M, et al. The effect of emergency department crowding on patient satisfaction for admitted patients. *Acad Emerg Med*. 2008;15:825–831.
21. Oakley E, Barnett P, Babl FE. Backslab versus nonbackslab for immobilization of undisplaced supracondylar fractures: a randomized trial. *Pediatr Emerg Care*. 2009;25:452–456.
22. Plint AC, Perry JJ, Correll R, et al. A randomized, controlled trial of removable splinting versus casting for wrist buckle fractures in children. *Pediatrics*. 2006;117:691–697.
23. Matziou V, Vlachioti E, Megapanou E, et al. Perceptions of children and their parents about the pain experienced during their hospitalization and its impact on parents' quality of life. *Jpn J Clin Oncol*. 2016;46:862–870.
24. Perquin CW, Hazebroek-Kampschreur AA, Hunfeld JA, et al. Pain in children and adolescents: a common experience. *Pain*. 2000;87:51–58.
25. Ruau D, Liu LY, Clark JD, et al. Sex differences in reported pain across 11,000 patients captured in electronic medical records. *J Pain*. 2012;13: 228–234.