Pain prevalence in a pediatric hospital: Raising awareness during Pain Awareness Week

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BACKGROUND: Despite the evidence and availability of numerous validated pain assessment tools and pain management strategies for infants and children, their use remains inconsistent in clinical practice.

OBJECTIVES: To describe the prevalence of pain, pain assessment and pain management practices at a tertiary pediatric hospital in Canada.

METHODS: The cross-sectional study design involved a combination of interviews with children and/or caregivers, and chart audits in five inpatient units. Information regarding pain intensity, painful procedures and pain management strategies was obtained from children and/or caregivers by interview. Patient charts were reviewed for information regarding pain assessment, pain scores, and pharmacological and nonpharmacological interventions.

RESULTS: Sixty-two children (four days to 17 years of age) participated. Most children or their caregivers (n=51 [84%]) reported that pain was experienced during their hospitalization, with 40 (66%) reporting their worst pain as moderate or severe. Almost one-half reported analgesics were administered before or during their most recent painful procedure. Nineteen (32%) reported sucrose, topical anesthetics or nonpharmacological interventions were used; however, they were documented in only 17% of charts. Pain scores were documented in 34 (55%) charts in the previous 24 h. The majority of the children or their caregiver (n=44 [71%]) were satisfied with pain management at the study hospital.

CONCLUSIONS: Most infants and children had experienced moderate or severe pain during their hospitalization. Analgesics were frequently used, and although nonpharmacological strategies were reported to be used, they were rarely documented. Most parents and children were satisfied with their pain management.

Key Words: *Children; Infants; Pain; Pain assessment; Pain management*

Hospitalized infants and children undergo painful procedures as part of their nursing and medical care (1). Carbajal et al (2) reported that neonates underwent an average of 10 painful procedures daily and 79% of these procedures were performed without specific analgesia. Johnston et al (3) reported that, although pain management for sick infants in neonatal intensive care units (NICU) had improved since the late 1990s, pain management remained suboptimal. In 2011, Stevens et al (1) reported that 78% of the children in a sample of 3822 had undergone at least one painful procedure in the 24 h period preceding data collection, with an average of 6.3 procedures per child. Only a small proportion of children in the study had interventions specifically linked to the painful procedure. Furthermore, a pain prevalence survey undertaken at The Hospital for Sick Children (Toronto,

La prévalence de la douleur dans un hôpital pédiatrique : la faire connaître pendant la Semaine nationale de sensibilisation au problème de la douleur

HISTORIQUE : Malgré les données probantes et l'existence de nombreux outils validés d'évaluation de la douleur et de nombreuses stratégies de gestion de la douleur pour les nourrissons et les enfants, leur utilisation demeure irrégulière en pratique clinique.

OBJECTIFS : Décrire la prévalence de la douleur, l'évaluation de la douleur et les pratiques de gestion de la douleur dans un hôpital pédiatrique de soins tertiaires du Canada.

MÉTHODOLOGIE : L'étude transversale se composait d'une combinaison d'entrevues avec des enfants ou les personnes qui s'occupaient d'eux et de vérification des dossiers dans cinq unités de patients hospitalisés. Les chercheurs ont obtenu l'information relative à l'intensité de la douleur, aux interventions douloureuses et aux stratégies de gestion de la douleur auprès des enfants ou des personnes qui s'occupaient d'eux, dans le cadre d'une entrevue. Ils ont examiné les dossiers des patients pour obtenir de l'information au sujet de l'évaluation de la douleur, de l'indice de douleur et des interventions pharmacologiques et non pharmacologiques.

RÉSULTATS : Soixante-deux enfants (de quatre jours à 17 ans) ont participé à l'étude. La plupart des enfants ou des personnes qui s'occupaient d'eux (n=51; 84 %) ont affirmé que de la douleur avait été ressentie pendant l'hospitalisation, 40 (66 %) précisant que leur douleur la plus intense était modérée ou violente. Près de la moitié ont indiqué que des analgésiques avaient été administrés avant ou pendant l'intervention douloureuse la plus récente. Dix-neuf (32 %) ont déclaré que du sucrose, des anesthésiques topiques ou des interventions non pharmacologiques avaient été utilisés, mais ceux-ci ne figuraient que dans 17 % des dossiers. Les indices de douleur étaient consignés dans 34 dossiers (55 %) au cours des 24 heures précédentes. La majorité des enfants ou des personnes qui s'occupaient d'eux (n=44; 71 %) étaient satisfaits de la gestion de la douleur utilisée à l'hôpital de l'étude.

CONCLUSIONS : La plupart des nourrissons et des enfants ont ressenti une douleur modérée à violente pendant leur hospitalisation. Les analgésiques étaient souvent utilisés, et même si des stratégies non pharmacologiques avaient été utilisées, elles étaient rarement inscrites au dossier. La plupart des parents et des enfants étaient satisfaits de la gestion de la douleur qui leur avait été offerte.

Ontario) in 2008 indicated that 23% of the 290 children surveyed had moderate or severe pain on the day of their study interview and 64% had moderate or severe pain in the previous 24 h (4). Similarly, a study conducted over five consecutive hospital days in a pediatric oncology ward in a hospital in the USA showed that approximately one-half of the 49 children had experienced pain and 33% of those patients had experienced moderate or severe pain (5).

The consequences of unmanaged pain in infants and children are both immediate and long term. Painful procedures performed in infancy such as heel lancing or circumcision correlate with stronger negative responses to venipuncture and intramuscular vaccinations weeks to months later (6-9), and Rennick et al (10) reported that the number of painful procedures was the strongest predictor of poorer

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TABLE 1
Interview tool

Question	Range of possible responses
Worst pain during hospitalization	Four-point numerical rating scale*
Current pain score at rest	Four-point numerical rating scale*
Current pain score with movement	Four-point numerical rating scale*
Pain score obtained by	Child, parents/guardian, nurse
During your last needle stick (or poke) what sort of things did the nurse/doctors/blood collectors/child life specialists do to help you/your child	Sucrose, swaddling, blowing bubbles, encourage breastfeeding during procedures, numbing cream (EMLA [†] , Ametop [‡]), Pain Ease [§] , guided imagery, encourage kangaroo care during procedures, distraction (toy, book, etc), breathing exercises, position for comfort, nothing specific, other
Most recent painful procedure/episode	Blood draw, peripheral intravenous needle insertion, dressing change, lumbar puncture, headache, joint ache, tummy ache, incision pain, other
Were pain medications given prior to the procedure or early in the episode	Yes, no, unsure
Were non-pharmacological strategies used during/prior to the procedure or early in the episode	Yes, no, unsure
Overall satisfaction with pain management	Four-point numerical rating scale*

*No pain = 0; mild pain = 1; moderate pain = 2; severe pain = 3; [†]AstraZeneca Canada Inc; [‡]Smith & Nephew, Canada; [§]Omniderm Pharma Canada Inc

psychological outcomes in hospitalized children. Health professionals have a responsibility to ensure that optimal pain management is provided to hospitalized children.

Studies evaluating treatment for procedural pain in children have increased tremendously over the past decade, resulting in reviews of systematic reviews of pain management interventions for acute procedural pain (11,12). Effective interventions for infants include kangaroo care, facilitated tucking, breastfeeding when feasible, and sucrose with or without non-nutritive sucking (12-15) and, for children, topical anesthetics, distraction and hypnosis (11). Despite well-documented evidence of the benefits of these interventions, their use remains inconsistent in clinical practice (1-3) and hospitalized infants and children continue to experience significant procedural pain.

A previous pain prevalence study at the study hospital published a decade ago (16) indicated that nurses and physicians identified variability in practice as a barrier to good pain management (16). Since that time, an Integrated Pain Service has been developed, comprising nursing, anesthesiology, pharmacy and psychology. In addition, since 1998, there has been an active Pain Resource Nurse (PRN) program in place within the organization. The PRNs act as pain champions and facilitators, are unit-based, and provide education and support to nurses on all inpatient units.

The 2011 National Pain Awareness Week provided an opportunity to examine current pain management throughout the organization to gauge our progress and use the results as a benchmark to compare with other pediatric centers and to ourselves in the future.

The goal of the present study was threefold: to describe the prevalence of pain in hospitalized children at a single point in time during National Pain Awareness Week; to describe pain management practices used at the same single point in time during National Pain Awareness Week; and to provide unit-specific results to participating inpatient units as a quality improvement activity.

METHODS

Design

The study design was prospective and cross-sectional. It included face-to-face interviews with children and/or caregivers of infants and children who were unable to self-report, and chart audits.

Setting and sample

The setting was a tertiary pediatric teaching hospital serving Eastern and parts of Northern Ontario, Western Quebec and Nunavut. It has a catchment area of approximately 600,000 children, ≤18 years of age.

The annual case volume for 2010/2011 was 6529 admissions. The study population included all inpatients in the 165-bed hospital in Eastern Ontario on a single day, with the exception of critically ill unconscious children, children receiving neuromuscular blockers and children nursed in the Mental Health Inpatient Unit. In addition, children whose length of stay in the inpatient unit was <8 h were excluded because data would not clearly reflect the care received from that specific unit.

Measures

The data collection tool developed by the study team consisted of two components: an interview tool (Table 1) and a chart audit tool. The interview tool consisted of seven questions that included asking children, if able, or their caregiver, to rate their current pain intensity at rest and during movement, and their worst pain experienced during the current hospitalization. A four-point scale was used as follows: no pain = 0; mild pain = 1; moderate pain = 2; and severe pain = 3. This simple four-point scale, based on that used by Taylor et al (4), which has been shown to correlate with other pain measures (17), enabled a single, consistent measure to be used with all participating infants, children and/or parents. If children or caregivers reported a score of 2 or 3 (moderate or severe pain) for current pain either at rest or with movement, the study nurses reported this to the child's nurse to ensure appropriate pain management was instituted. Children and caregivers were also asked what their most recent painful procedure or episode was, and what pharmacological or nonpharmacological interventions had been used before or during that procedure or episode. Examples were given of pharmacological interventions (such as morphine, acetaminophen, topical anesthetics, sucrose), and nonpharmacological interventions (such as positioning, non-nutritive sucking, and psychological interventions such as distraction). Finally, children and/or caregivers were asked about overall satisfaction with pain management during their current hospitalization, using the same four-point scale.

The chart audit tool included the following demographic characteristics: age, sex, weight, most recent surgical procedure and whether the child was being followed by the Integrated Pain Service. Data from the previous 24 h related to pain management were extracted from the patient chart including type and dose of analgesic medications administered during the previous 24 h; nonpharmacological interventions documented during painful procedures; documented pain assessment scores; and the pain assessment scales used. The chart audit tool was informed by the Taylor et al (4) study and the larger CIHR Team in Children's Pain study (1) and was deemed to be the most appropriate for the purpose of the present study.

Figure 1) Participant flow chart

Both the interview tool and chart audit tool were piloted for clarity and ease of use for the data collectors. Two PRNs tested the interview tool with three parents and minor modifications were made for clarity. Agreement of the chart audit tool was determined by having two PRNs independently audit the same five charts, before the day of the study. There was high agreement after discussion.

Procedures

The study protocol was approved by the hospital's research ethics board and support was obtained from the Chief Nursing Executive and the Directors of the inpatient units. The study was publicly promoted throughout the hospital, with advertising and flyers in the week leading up to the study.

Before the day of the study, a 2 h training session was conducted to introduce the PRNs to the study aims, data collection procedures and tools. Two patient charts were audited to demonstrate the procedure to the PRN data collectors. The two PRNs who had assisted in the development and pretesting the interview tool and the chart audit tools were available throughout the data collection day to answer any questions or concerns.

Data collection took place on November 7, 2011 – the first day of National Pain Awareness Week. Bedside nurses identified eligible children and their caregivers and asked permission for research nurses to approach them to discuss the study. Explanation of the study was given to the child and caregivers, where appropriate. If they agreed, signed informed consent was obtained from caregivers and signed informed assent was obtained from children who were able to give assent. Interviews were offered in French and English. Data were collected by the PRNs as well as the principal investigator (Harrison) and a coinvestigator (Ellis), and included the administration of the interview tool and a chart audit. Interviews were conducted with children who were able to self-report pain intensity and caregivers of infants or children unable to self-report who spoke and understood either English or French. If both the child and caregiver were able to be interviewed together, only one pain score was recorded for these children, which both parties agreed on. Data collection commenced at 0800 so as to not interfere with change of shift activities.

Analysis

All data were collected on paper and entered into a SPSS database. Descriptive statistics were performed with SPSS (IBM Corporation, USA) (18). Frequencies, ranges, means and their SDs or medians and their interquartile ranges were used to describe the sample depending on the distribution of the data.

RESULTS

Sample

There were 93 patients hospitalized on the day of the study. One inpatient unit (oncology) was excluded (nine children) due to an infection outbreak on that unit. Three children who had been hospitalized for <8 h were not eligible for inclusion, and an additional 13 children were excluded due to no caregivers being available to provide consent (n=9); failure to understand French or English (n=2); one child was on a day pass and one child was in airborne isolation. This left

TABLE 2
Demographic characteristics

Child participant characteristic		n (%)
Age	Newborn – 1 month	11 (18)
	31 days – 12 months	12 (19)
	13 months – 36 months	5 (8)
	37 months – 7 years	6 (10)
	8 years – 12 years	2 (3)
	≥13 years	23 (37)
	Not recorded	3 (5)
Sex	Male	27 (44)
	Female	33 (53)
	Not recorded	2 (3)
Interview respondent	Child	22 (36)
	Caregiver	35 (57)
	Both	4 (7)
	Not recorded	1 (2)
Followed by Integrated Pain Service	Yes	6 (10)
	No	54 (87)
	Not recorded	2 (3)
Surgery during this hospitalization	Yes	17 (27)
	No	42 (68)
	Not recorded	3 (5)

Figure 2) Pain at rest and with movement at time of interview. Number of children (n) represented above bars

68 potentially eligible children. Six children and/or parents (9%) refused consent to participate in the study. A total of 62 patients from five inpatient units including medicine, surgery, neonatal intensive care and pediatric intensive care were enrolled and participated in the study (Figure 1). The majority of interviews were conducted in English (n=59 [95%]), and three interviews were conducted in French.

Demographic characteristics

The majority of the children in the study were infants (<12 months of age) or teenagers (≥13 years of age). There were slightly more females (n=33 [55%]) than males. Six children (10%) were followed by the Integrated Pain Service (Table 2).

Child/caregiver interview

Of the 62 patients interviewed, 51 (82%) reported some pain during their hospitalization and 62 (100%) experienced a painful procedure. Eleven (18%) rated the worst pain experienced during their hospitalization as 'mild', 24 (39%) reported 'moderate' pain while 16 (26%) had experienced 'severe' pain. At the time of the interview, 10 (16%) children stated that they were experiencing either 'moderate' or 'severe' pain during movement and five (8%) children reported 'moderate' or 'severe' pain at rest (Figure 2). The majority of the children (n=46 [75%]) reported that at the time of the

TABLE 3
Pain scales used in previous 24 h

Pain scale*	n (%)
No scores identified	28 (45)
Numerical Rating Scale	19 (31)
Neonatal Infant Pain Scale	8 (13)
Face, Legs, Activity, Cry, Consolability	3 (5)
No scales identified (but score given)	3 (5)
FACES Revised	2 (3)
Modified COMFORT	2 (3)

*Some charts used more than one scale for a child

TABLE 4
Analgesics documented in previous 24 h

Analgesic	n (%)
Acetaminophen	26 (42)
Morphine bolus	7 (11)
Ibuprofen	6 (10)
Gabapentin	4 (7)
Hydromorphone bolus	3 (5)
Ketorolac	2 (3)
Ametop*/Emla†/Pain Ease‡	2 (3)
Morphine infusion	1 (2)
Fentanyl infusion	1 (2)

*Smith & Nephew, Canada; †AstraZeneca Canada Inc; ‡OmniDerm Pharma Canada Inc

interview they felt no pain while at rest. All patients, except one child who reported moderate to severe pain at the time of the interview, had received analgesia in the previous 24 h (n=10 [91%]). As per the study protocol, for the 11 children who had moderate to severe pain, the researcher or PRN reported this to the child's nurse so action could be taken.

All 62 children and/or their caregivers were asked to identify which pain management strategies the nurses, doctors and other health professionals used during their last needle stick. The most common strategies reported by the children or caregivers were sucrose administration (n=16 [26%]); EMLA (AstraZeneca Canada Inc) or Ametop (Smith & Nephew, Canada) topical anesthetic creams (n=14 [23%]); distraction methods (n=14 [23%]); the use of a coolant spray such as Pain Ease (GeBauer Company, USA) (n=9 [15%]); and eight (13%) answered that other techniques were used such as a soother and analgesics. Almost one-quarter of the caregivers or children (n=15 [24%]) reported that nothing specific was used during their last needle stick. The most common pain management strategy used for infants up to 12 months of age (n=23) was sucrose (n=16 [70%]); for toddlers 13 to 36 months of age (n=5) was distraction (n=3 [60%]); for school-age children (n=8) four to 12 years of age was topical anesthetic creams (n=5 [63%]); and for teenagers ≥13 years of age (n=9 [39%]) nothing specific had been used during their last needle stick.

All 62 children and/or their caregivers identified their most recent painful procedure or episode during their hospitalization. The most common recent painful procedures or episodes included blood draw (n=23; 37%); peripheral intravenous insertion (n=7; 11%); abdominal pain (n=7; 11%); nasogastric tube insertion (n=3; 5%); accessing a port-a-cath (n=2); headache (n=2); and physiotherapy (n=2). Twenty-nine (47%) children or caregivers reported that analgesics were given before the painful procedure or early in the painful episode. Analgesics were not used in 29 (47%) of the cases and two (3%) children or their caregivers were unsure if they had received analgesics. The majority of the children and caregivers (n=32; 54%) reported that nonpharmacological strategies had not been used during or before the painful episode or early in the painful procedure; 19 (32%) reported that nonpharmacological strategies had been used and six (10%) were unsure.

Figure 3) Comparison between reported interventions and documented interventions

The majority of the respondents (n=44; 71%) were very satisfied with pain management overall; 15 (24%) were somewhat satisfied, two (3%) were somewhat dissatisfied and one (2%) was very dissatisfied.

Chart audit

A total of 34 children (55%) had at least one pain score documented in the previous 24 h (Table 3). In 17 charts, pain scores were obtained within 1 h of the child being admitted to the unit. Eight (15%) of the scores were obtained within 2 h to 12 h of admission, two (13%) were obtained 12 h after admission and 23 (42%) charts had no pain scores documented. For those patients with pain scores documented, the type of pain scale used varied depending on the unit and the age of the child. The Numerical Rating Scale (19) was used most often (n=19; 31%), followed by the Neonatal Infant Pain Scale (20) (n=8; 13%); Face, Legs, Activity, Cry, Consolability (21) (n=3; 5%); Modified COMFORT (22) (n=2; 3%); and the FACES Pain Scale Revised (23) (n=2; 3%). The median pain score for the Numerical Rating Scale was 5 of 10 and was most commonly used in children aged seven to 17 years (median age 15 years). The median pain score for the Neonatal Infant Pain Scale was 0 of 10 and was most commonly used in infants up to 14 months of age (median age 5.5 months). The median pain score for the Face, Legs, Activity, Cry, Consolability was 0 of 10 and was most commonly used in children 18 to 36 months of age (mean age 23 months). As could be expected, children being followed by the Integrated Pain Service had more frequent pain assessments documented in the previous 24 h. One child's chart had an opioid withdrawal score documented, and two charts had sedation scores documented.

Over one-half of the children (n=33, 53%) had received analgesia in the previous 24 h. As shown in Table 4, the analgesic agent most frequently administered was acetaminophen. Although 14 (23%) children or caregivers reported that topical anesthetic creams were used and 16 (26%) caregivers reported sucrose was used before a painful procedure, these strategies were rarely (topical anesthetics) or never (sucrose) documented in the charts (Figure 3).

Nonpharmacological strategies were recorded as being used in the previous 24 h in only 17 charts. Most commonly documented were positioning for comfort (n=5; 9%), distraction methods (n=3; 5%) and other methods (n=9; 15%) such as family presence and relaxation methods (Figure 3).

DISCUSSION

The present study conducted at a tertiary care pediatric hospital during Canada's National Pain Awareness week provided a snapshot of pain prevalence and pain management. Disappointingly, similar to a study conducted in the same setting one decade ago (16), as well as other studies conducted up to two decades ago (24,25), results indicated that significant numbers of infants and children experienced moderate to severe pain during their hospitalization. Other pain prevalence studies conducted more recently are also comparable (4,26,27). Our results

and those of other recent studies are alarming, highlighting that, despite increasing knowledge of effective pain management strategies for hospitalized infants and children (11,12), an abundance of age-appropriate pain assessment tools aimed at systematic assessment of pain with the aim of improving pain management (27,28) as well as the settings' participation in a nationwide pediatric pain knowledge translation study (1,29), pediatric pain management remains suboptimal.

Some small improvements, however, are evident. Although poorly documented, 26% of parents of infants reported the use of sucrose, a significant improvement to sucrose use in Canadian NICUs in the 1990s and 2007 (3), and 23% of parents and children reported use of topical anesthetics for needle-related procedures. This use of topical anesthetics is a small increase of 4% since an audit of topical anesthetic use for needle-related procedures almost a decade ago in the same setting (30). Only one child in our study who reported moderate to severe pain had not received any analgesia in the previous 24 h, whereas in another Canadian study conducted in 1992, almost one-half of the children who reported severe pain received no analgesia in the previous 24 h (25).

However, consistent effective pain management of needle-related procedures remains a problem. In a large nationwide study examining the management of painful procedures in children in Canadian hospitals, blood draws and peripheral intravenous insertions were commonly performed painful procedures in children (1), and another study indicated that capillary and venous blood draws and peripheral intravenous insertions were the three most common painful procedures performed and were considered to be procedures in the 'moderate to severe pain' category (31). Similarly, in our study, almost one-half of children/caregivers identified blood draws or peripheral intravenous insertion as being the most recent painful procedure they encountered, yet less than one-half of the children or caregivers reported that a pharmacological agent had been administered before the painful procedure and less than one-third reported that nonpharmacological interventions had been used. This is despite high-quality evidence demonstrating effective procedural pain management strategies for hospitalized infants and children (11,12).

With respect to procedural pain management strategies, the results of our study indicate a discrepancy between what was reported by patients/caregivers and what was documented in the charts. Although more than one-half of the patients/caregivers reported that sucrose, topical anesthetics or nonpharmacological interventions had been used before their most recent painful procedure or episode, these interventions were documented only 25% of the time. Similarly, another Canadian study showed that only 15% of hospitalized children had documented evidence of use of nonpharmacological interventions for painful procedures (31). There is a chance that this result and others reporting minimal use of pain management strategies underestimate the actual use of such strategies. This discrepancy between strategies implemented and documented highlights a key challenge when researchers rely on information documented in patient charts as the only means to evaluate pain care provided to hospitalized children. Clearly, documentation is critical for patient safety, monitoring and evaluation of care. The care/documentation gap needs to be addressed through technology or other means such that nurses can efficiently track the care they provide.

Six children were being followed by the hospital's Integrated Pain Service. This team offers services to children with complex pain problems. All of these children had at least one pain score documented in the previous 24 h (mean of seven scores documented) and all of them were receiving either analgesics or adjuvant medications. These results are similar to a study that reported that children being followed by an acute pain service were more likely to receive regular analgesia and more likely to have pain assessments documented (4). However, these findings differ from another study that showed that units who accessed specialist pain services administered analgesia less frequently (1). It is possible that pain assessments were being conducted on a more regular

basis due to the significant and complex pain being experienced by these patients coupled with the staff's awareness that the children were being followed by the Integrated Pain Service for pain management issues.

Despite hospital policy that states that pain assessments should be performed at least once per shift, almost one-half of the children in the present study had no pain scores documented in their chart in the previous 24 h. Previous studies in Canada and elsewhere have also reported that pain assessments were infrequently documented in children's charts (4,27,32). Children in the surgical unit had pain assessments documented more often than children hospitalized in other units, whereas none of the nine infants in the NICU had pain assessments recorded in the previous 24 h. Numerous studies have reported inconsistent documentation using pain assessment measures available in neonatal units (33-35), despite the existence of >40 pain assessment tools suitable for this population (28,36). Much attention by health care professionals and researchers has been devoted to embedding pain assessment into routine pediatric clinical care, yet little overall progress in this respect has been made. A collaborative research effort has been suggested as opposed to further individual implementation studies (28).

Despite the high prevalence of children who either had experienced moderate to severe pain during their hospitalization or reported it during the interview, the majority of the children and/or their caregivers were very satisfied with pain management. These results are similar to a study that reviewed 20 quality improvement studies between 1992 and 2001 and noted that 15 of these studies had reported a high degree of satisfaction with pain management despite many patients experiencing moderate to severe pain during their hospitalization (37). This is consistent with research that suggests there may be factors other than achieving a specific health outcome (such as absence of pain) that contribute to patient satisfaction with health care (38).

Since the present study, a number of strategies have been put in place at the organizational and individual unit level at the study hospital. A new pain management and assessment policy has been introduced, which includes the importance of regular pain assessments and documentation of pharmacological and nonpharmacological interventions. A new medical directive (nurse- and other health professionals-initiated order) and preprinted orders for the use of sucrose and topical anesthetics have been introduced to facilitate the process of initiating, administering and documenting these interventions. The results of the present study were disseminated widely throughout the hospital at all levels of leadership in the form of presentations, an executive summary and via the PRNs, using individual inpatient unit audit and feedback reports of key results for benchmarking against the mean study results. This unit-specific feedback facilitated an opportunity for the units to identify their key pain assessment and management questions to focus on for future quality improvement activities. This type of individualized audit-feedback can be an effective form of knowledge translation to improve practices (39). However, questions remain about whether these strategies are sufficient to systematically improve pain management, and ensure changes are sustainable.

The ongoing knowledge to practice gaps evident in our study and other pain audits conducted in the past five years (4,26,27,40) highlight the need for effective and sustainable knowledge translation strategies at an organizational level. Such initiatives are already in progress or evolving. The study hospital is one of eight participating pediatric hospital in a Canada-wide CIHR Team in Children's Pain, focused on improving pain management in hospitalized children (29). Results will greatly contribute to our understanding about effective knowledge translation and whether improvements in pain management can be sustained. In the future, the global ChildKind initiative will provide an institutional-wide goal of certification as a hospital committed to uniform best practices in pain management (41). Another avenue of systematic improvement in pain management suggested is to consider pain as an adverse event (42). It will be important to evaluate how effectively these knowledge translation projects and strategies systematically change practice in a sustainable manner.

Study limitations

The present study was conducted in a single site with a sample size of only 62 children. A subgroup that was under-represented was children in oncology who were excluded due to closure of the unit. Because children in oncology units undergo large numbers of invasive painful procedures (5) and may experience significant pain as a result of their disease process and treatment, results of the present study may have differed if this population had been included. Furthermore, a very small number of children admitted in the Pediatric Intensive Care Unit were enrolled, making it difficult to draw conclusions regarding this specific population.

Another limitation to the present study was that although children and/or their caregivers were asked whether they had received analgesics before their latest painful procedure or episode or if nonpharmacological strategies had been used, they were not asked whether these methods were effective. Future studies should include this information to determine the effectiveness of pain management methods used. Finally, it is important to note that almost one-half of the children in the present study were preverbal or younger than four years of age; therefore, the majority of the interviewees were caregivers. Although in our study we did not examine congruence between caregiver and child pain scores, some studies have reported close agreement between pain ratings by children, parents and practitioners (16,43), while others have found under-reporting of children's pain severity by parents (44).

Recommendations for further research

Future research evaluating pain prevalence in a pediatric hospital over a longer period of time would provide more in-depth information about pain management over the course of a child's hospitalization. A follow-up study examining the impact of the individual audit feedback reports would help to determine the effectiveness of this unit-based

knowledge translation intervention. Importantly, further research evaluating interventions aimed at sustainable improvements in pain management at organizational and unit-based levels are urgently required.

CONCLUSION

The results of the 2011 Pain Prevalence study conducted on the first day of National Pain Awareness week in a tertiary referral pediatric hospital in Canada demonstrated that many children continue to experience moderate to severe pain during their hospitalization. This is despite growth over the past decade of high-quality evidence to support various pain management strategies. Working at sustainable improvements in pain management at an organizational and individual unit level should be the focus of future research.

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