

Pain Experience in a US Children's Hospital: A Point Prevalence Survey Undertaken After the Implementation of a System-Wide Protocol to Eliminate or Decrease Pain Caused by Needles

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ABSTRACT

OBJECTIVES: Pain in hospitalized children remains under-assessed and undertreated. With this study, we aim to describe results from a repeat single-day, hospital-wide survey of children's pain and its treatment after the initiation of a hospital-wide quality improvement initiative used to reduce or eliminate pain caused by needle procedures.

METHODS: All patients and parents listed on the inpatient morning census, in emergency department and outpatient surgery registration lists, were invited to participate in a brief single-day point prevalence survey of their experience with pain and its management in the hospital setting. Results were compared with a survey conducted 2 years earlier, before implementation of a system-wide Children's Comfort Promise needle pain treatment and prevention protocol.

RESULTS: A total of 194 children and their parents participated in the current survey. A higher percentage of children reported having no pain compared with the previous survey (33% vs 24%; $P = .07$; not significant) and fewer experienced severe pain (score ≥ 7 out of 10). Fewer children identified pain caused by needles as the cause of the worst pain (21% vs 30%), although it remained the highest reported cause of the most painful experience overall. The number of pain management strategies administered and offered to children with needle pain (distraction, positioning, numbing cream, and sucrose and/or breastfeeding for infants) increased.

CONCLUSIONS: The implementation of a mandatory Comfort Promise protocol used to minimize or prevent pain caused by elective needle procedures was associated with a significant reduction in overall pain prevalence and improved use of evidence-based practices for needle pain management.

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The majority of hospitalized pediatric patients suffer from pain, and, of those, between 24% and 80% experience moderate to severe pain as recorded by self- or parent report.^{1–7} Despite high pain prevalence in hospitalized children, pain is not consistently recognized by clinicians, and when it is, clinicians' pain ratings are frequently lower than patients' and parents' scores.^{4,5}

Children commonly experience needless pain,^{9–10} and unrelieved pain in hospitalized infants and children has serious short- and long-term consequences.^{11–16} Inadequate analgesia during procedures in children diminishes the effects of adequate analgesia in subsequent procedures.¹⁷ Appropriate opioid analgesic dosing after trauma reduces the risk of posttraumatic stress disorder in infants and children.^{18–21} Infants suffer physiologic consequences from untreated pain with global consequences on sensory processing observed as long as 12 years later.^{16,22} Up to 25% of adults have a fear of needles that developed in childhood, resulting in avoidance of health care, including nonadherence with vaccination schedules.²³

In 2013, a hospital-wide staff survey on pain management attitudes and perceived barriers was conducted, followed by a hospital-wide survey of children and parents.⁵ Findings from the staff survey revealed that a majority felt pain management was adequate, that needle sticks were not very painful, and that being quick when giving an injection was important. These findings conflicted with findings from the patient and parent survey, which revealed that pain caused by needle procedures were the greatest source of children's pain while in the hospital.⁵ Findings from the 2 surveys were presented to hospital leadership. They agreed it was important to focus on improving pain management practices. Hospital leadership, including the chief medical officer and chief nursing officer, made a formal commitment to support an organization-wide quality improvement (QI) initiative to improve pain management practices starting with needle procedures.

The initiative was branded as the "Children's Comfort Promise."²⁴ The objective of this

work, as stated in the charter, was to "Design, test and deploy the clinical practices and foster the culture required to eliminate all needless pain, and to minimize all moderate and severe physical pain and distress associated with, anticipated, or experienced by patients and their families through the continuum of care."²⁵ The first priority of this multiyear effort was to reduce or eliminate needle pain. The campaign was successfully rolled out system-wide between 2014 and 2016 in a staggered fashion, eventually reaching >200 000 children annually.²⁵ This allowed for unit-specific customization and facilitation of knowledge transfer from 1 unit to another by using an iterative process. All departments were required to offer all 4 strategies with appropriate education at least 95% of the time.

This large-scale initiative was the first of its kind worldwide to mandate offering 4 evidence-based practices for needle procedures to all patients (topical anesthetics, sucrose and/or breastfeeding [for infants], comfort positioning, and distraction).^{26–35} After rollout in the outpatient laboratories in 2014 (30 000 children annually) and the medical-surgical units, the remainder of the inpatient units, including all critical care areas, joined the campaign in 2015. At the time the current study was conducted, all inpatient units had implemented the initiative, but were in various stages of adoption. By the end of 2016, the mandatory needle pain protocol for blood draws, intravenous cannulations, injections, and vaccinations had been rolled out organization wide, including ambulatory clinics. Further details about the Children's Comfort Promise initiative and outcomes are available.^{25,36}

Our aims with this article are to (1) report findings from a single-day, hospital-wide point prevalence survey of patients and families assessing their experiences with pain and its management at a time when the Comfort Promise initiative was still rolling out in many areas (in 2015), (2) compare findings to results from our survey 2 years before, and (3) determine if there were changes in needle-related pain

experiences and their management after the initial implementation of a needle pain prevention protocol in the inpatient units. Findings from this survey will inform modifications to the current process for ensuring the consistent offering of the Comfort Promise Initiative needle pain protocol as ambulatory areas were included after this survey. It will also be used for identifying pain treatment opportunities for additional institutional QI initiatives.

METHODS

This descriptive point prevalence survey study was reviewed and approved by the hospital's institutional review board. The children's hospital is a tertiary referral center and one of the largest freestanding pediatric health care systems in the United States, comprising 5020 employees, 429 staffed beds (>50% of those in intensive care), and 29 primary and specialty clinics.

Participants

Patients and parents were approached by an interviewer to participate in a brief hospital-wide, single-day survey of pain and its management. All patients listed on the inpatient census at 08:00 hours, outpatient surgery schedule, or who presented to one of the 2 hospital emergency departments (EDs) between the hours of 08:00 and 22:00 hours on a Tuesday in October 2015 (not previously disclosed to staff) were included in the survey. Children who were at least 5 years of age and able to understand and respond to questions as indicated by their parent(s) or legal guardian, were invited to participate in a survey about their pain and how it was managed in the previous 24 hours, or since admission. If the child was younger than 5 years of age or unable to participate directly, the parent(s) or legal guardian was asked to participate. Language interpreters were used to assist with the survey for non-English-speaking families. Up to 3 attempts were made to locate patients and/or parents during the survey period.

Pain Survey

The pain survey was developed by the authors⁵ on the basis of a survey by Campbell and co-workers.³⁷ Responses were

recorded by trained interviewers by using surveys containing 17 items used to ask about the reason for the child's visit to the hospital, whether (s)he had experienced pain before and since admission, whether (s)he was in pain (and how much) at the time of the survey, the cause of the worst pain since admission to the hospital (eg, needle poke), the numeric pain rating of the worst pain experienced (Faces Scale-Revised [0–10]³⁸ or Numerical Rating Scale-Revised),³⁹ whether they were told their procedure would hurt, what the health care team did to manage the pain (and how helpful those strategies were), satisfaction with how pain was treated, and what was not done well. Children who indicated that needle pain was the most painful experience were asked whether each of the 4 best practices (with sucrose and/or breastfeeding included only for children younger than 12 months old) were offered by health care staff. Survey data were entered by using REDCap research electronic data capture tools hosted at the children's hospital.⁴⁰ All data were double-entered with error check verification to ensure accuracy.

Chart Review

A review of the electronic medical record (EMR) was conducted after the survey to examine administration and prescription of analgesic medications and use of integrative therapies for all children who participated in the survey. The chart review period included up to 24 hours before the survey administration. For outpatients, the chart review included the 2 hours after admission to the ED or 2 hours postanesthesia for surgical patients. The chart review was used to capture pain medication, including basic analgesia (eg, acetaminophen, ibuprofen), multimechanistic “weak” opioids (eg, tramadol), full μ -agonist “strong” opioids (eg, morphine), and adjuvant analgesia (eg, gabapentin).

The pain scores of 0 to 10 out of 10 by self-report or nursing assessment were recorded. Further information about pain assessment and treatment was captured for children with severe pain (at least 1 pain score ≥ 7 out of 10) and at least 2 pain assessments in the previous 24 hours.

All chart reviews were conducted by a research assistant (L.G.) and verified by clinical nurse specialists (B.S. and M.F.).

Analytic Approach

Analyses were performed by using the R language for statistical computing.⁴¹ Descriptive statistics were used to summarize characteristics of the sample and the patients' experience with pain and its management. Hypothesis tests were performed to examine associations of survey day (1 or 2) with certain characteristics by using χ^2 , Fisher's exact, Student *t*, and Mann–Whitney *U* tests when appropriate. To assess the initial impact of the Comfort Promise initiative, logistic regression was used to examine the association between whether patients reported needle pokes as the source of worst pain and survey day (ie, days 1 and 2 correspond to pre- and mid- Comfort Promise implementation, respectively) while adjusting for patient characteristics that differed between the 2 survey dates. A Wald test was used to test the adjusted association.

RESULTS

Sample Characteristics

A total of 123 (41%) of 299 children who were inpatients on the 8:00 AM morning census completed the survey. Seventy-one (33%) of 215 patients registered throughout the course of the day in either of the 2 EDs or short-stay units or who were scheduled for outpatient surgery also completed the survey. Parents completed the survey if the child was unable (eg, too young or nonverbal). One hundred and three (53%) children were female patients and over half (55%) had been in the hospital for >24 hours before completing the survey (Table 1). The most common reason for hospitalization included treatment of acute illness or infection ($n = 80$; 41%), prematurity ($n = 36$; 19%), and surgery ($n = 25$; 13%). The location of care (unit) for the majority of children was the NICU ($n = 53$; 27%), ED ($n = 51$; 26%), and medical-surgical units ($n = 49$; 25%). Compared with the 2013 survey, there were fewer children who had been in the hospital for >24 hours at the time of the survey (55% vs 78%; $P < .001$),

fewer non–English-speaking families (10% vs 21%; $P = .003$), more children were seen for an accident and/or injury, and more children were seen in the EDs (26% vs 4%) (Table 1). Thirty children (28%) older than 1 year of age usually had pain before their hospital visit, similar to the proportion of children in the first survey ($n = 20$; 22%).

Source of Worst Pain

Comparing results for source of pain with results from the original 2013 survey, we found that a higher percentage of children reported having no pain during this second survey (33% vs 24%; $P = .07$; not significant) (Table 2). The leading source of the worst pain was caused by needle procedures. However, the overall percentage of patients reporting needle pokes as the worst pain was significantly lower (21% vs 30%; $P = .03$) for all children in the study regardless of whether they reported pain in the past 24 hours. This association was significant in a logistic regression model ($P = .044$) used to adjust for potential confounding factors between the 2 days (ie, length of time in hospital, language, reason for visit, and location of care). Average pain scores for needle pain were not the highest when compared with other sources of pain (mean = 5.1; SD = 3.1), similar to findings from the first survey (Table 2). The highest average pain ratings were associated with trauma, injury, or other medical issues (mean = 6.4; SD = 2.2), acute illness or infection (mean = 6.3; SD = 2.2), and medical procedures (mean = 6.2; SD = 2.0).

The proportion of children who reported having the worst pain because of acute illness or infection was higher in the current survey (12% vs 3%; $P = .002$). The opposite was true for the trauma, injury, or other medical pain category, identified by fewer children as the source of the worst pain in the current survey (11% vs 26%; $P < .001$). Although the proportion of children with trauma, injury, or other medical issues was relatively low, numeric pain ratings were highest for this group of children at both time points (mean = 7.2; SD = 2.3 for the first survey; mean = 6.4; SD = 2.2 for the current survey).

TABLE 1 Survey Participant Characteristics at Each Survey Administration Time Point

	Survey 1 (2013) <i>N</i> = 178, <i>n</i> (%)	Survey 2 (2015) <i>N</i> = 194, <i>n</i> (%)	Total <i>N</i> = 372, <i>n</i> (%)	<i>P</i> ^a
Length of time in hospital	<i>n</i> = 175			<.001
>24 h	137 (78)	107 (55)	244 (66)	
Respondent	<i>n</i> = 176			.079
Child	45 (26)	56 (29)	101 (27)	
Mother	103 (59)	123 (63)	226 (61)	
Father	23 (13)	14 (7)	37 (10)	
Other	5 (3)	1 (1)	6 (2)	
Sex				.120
Female	98 (55)	103 (53)	201 (54)	
Age	<i>n</i> = 192			.605
<1	84 (47)	85 (44)	169 (46)	
1–2	22 (12)	17 (9)	39 (11)	
3–5	15 (8)	20 (10)	35 (9)	
6–9	16 (9)	24 (12)	40 (11)	
10 or over	41 (23)	46 (24)	87 (24)	
Language				.003
English	140 (79)	175 (90)	315 (85)	
Other	38 (21)	19 (10)	57 (15)	
Reason for hospital visit	<i>n</i> = 170			<.001
Accident and/or injury	6 (4)	21 (11)	27 (7)	
Procedure	1 (1)	3 (2)	4 (1)	
Surgery	30 (18)	25 (13)	55 (15)	
Prematurity	45 (26)	36 (19)	81 (15)	
Acute illness or infection	46 (27)	80 (41)	126 (35)	
Known disease	27 (16)	16 (8)	43 (12)	
Diagnostic workup	3 (2)	13 (7)	16 (4)	
Other medical	12 (7)	0 (0)	12 (3)	
Location of care				<.001
Emergency rooms	8 (4)	51 (26)	59 (16)	
Inpatient, medical or surgical units	76 (43)	49 (25)	125 (34)	
NICU or nurseries	40 (22)	53 (27)	93 (25)	
PICU or CVCC	41 (23)	21 (11)	62 (17)	
Same d surgery	0 (0)	11 (6)	11 (3)	
Short-stay units	13 (7)	9 (5)	22 (6)	
Usually has pain, age >1 y	<i>n</i> = 92			.370
No	72 (78)	76 (72)	148 (75)	
Yes	20 (22)	30 (28)	50 (25)	

CVCC, cardiovascular care center.

^a Hypothesis tests were used to examine associations between surveys 1 and 2 via χ^2 test or Fisher's exact test (when appropriate).

Children With Chart-Documented Severe Pain

The number of children with severe pain (7–10 out of 10) in the current 2015 survey (as documented in their EMR) was lower compared with the 2013 survey. Of the

104 out of 178 (58%) children with available pain documentation in 2013, at least 1 severe pain score was documented for 15 out 104 (14%) children. In the current study, at least 1 severe pain score was documented in the past 24 hours for 14 of

160 (9%) children with available pain documentation (with at least 2 pain assessments documented) (Table 3). Six (43%) of these 14 children were admitted to the hospital for abdominal pain.

Treatment of Needle Pain

The average total number of different needle-specific pain management strategies offered by the Comfort Promise protocol (topical anesthesia, positioning, and age-appropriate distraction) was examined for all children, with the fourth modality (sucrose and/or breastfeeding) examined only for infants 0 to 12 months of age. Topical anesthetic use was not evaluated in the first survey in 2013 and was rarely used for needle pokes in our institution at the time of the first survey, so no comparison was possible. Significantly more of the 3 possible pain management strategies were used with infants in the current survey than in the 2013 survey (mean = 1.5; SD = 0.8 vs mean = 0.9; SD = 0.9; *P* = .02) (Table 4). Use of distraction techniques occurred more often with infants according to parents (38% vs 3%; *P* < .01). Sucrose and/or breastfeeding was used more often according to parents of infants in the current survey, but this did not reach statistical significance (75% vs 48%; *P* = .06). For children older than 1 year of age, we evaluated how often 2 of the 3 possible strategies (positioning and distraction) were used. Children in the current survey received more pain management strategies on average (mean = 1.3; SD = 0.8 vs mean = 0.7; SD = 0.7; *P* = .02), with positioning being offered significantly more often at the time of the current survey (62% vs 24%; *P* = .02). Finally, topical anesthesia was administered to children who reported needle pain as the most painful experience in the hospital for 5 out of 24 (21%) infants and 11 out of 16 (69%) children over 1 year of age (Table 4).

Chart-Documented Use of Analgesics

Chart reviews were conducted for the 192 out of 194 (99%) children who completed the survey, whether they indicated that they experienced pain. Among the children who reported pain on the survey (*n* = 150), the most common basic analgesics administered were acetaminophen (*n* = 44; 29%), followed by

TABLE 2 Comparison of Children's Ratings of the Source of Worst Pain and the Average Pain Score Associated With It

	n (%)			P ^a	Average Pain Score (SD)			P ^b
	Survey 1	Survey 2	Total		Survey 1 ^c	Survey 2 ^d	Total	
Source of worst pain				<.001				—
No pain	43 (24)	64 (33)	107 (29)	.067	—	—	—	—
Acute illness or infection	6 (3)	24 (12)	30 (8)	.002	5.8 (2.8)	6.3 (2.2)	6.2 (2.3)	.67
Needle poke	54 (30)	40 (21)	94 (25)	.032	4.8 (2.9)	5.1 (3.1)	4.9 (3.0)	.68
Procedure	11 (6)	17 (9)	28 (8)	.432	6.7 (3.5)	6.2 (2.0)	6.4 (2.7)	.65
Surgery	14 (8)	22 (11)	36 (10)	.295	7.1 (2.6)	4.2 (3.4)	5.7 (3.3)	.06
Trauma, injury, or other medical issue	46 (26)	21 (11)	67 (18)	<.001	7.2 (2.3)	6.4 (2.2)	7.0 (2.2)	.27
Treatment of known disease	4 (2)	6 (3)	10 (3)	.753	5.3 (3.2)	6.0 (3.2)	5.6 (3.0)	.88

—, not applicable.

^a Fisher's exact test.

^b Mann-Whitney U test comparing d 1 and 2 maximum pain scores.

^c A total of 110 of 135 patients with pain reported a pain score.

^d A total of 101 of 130 patients with pain reported a pain score.

ibuprofen ($n = 22$; 15%). Five (3%) children received tramadol for pain. The most commonly prescribed full- μ opioid agonists were morphine ($n = 14$; 9%), fentanyl ($n = 14$; 9%), and oxycodone ($n = 7$; 5%). Table 5 details a list of scheduled and as-needed analgesia documented for all children in the survey ($n = 192$) and the 150 children who reported experiencing pain in the past 24 hours.

DISCUSSION

This follow-up study, conducted 2 years after our initial cross-sectional survey,⁵ was

undertaken during the early stages of implementing a system-wide protocol in a children's hospital by using Lean QI strategies to prevent or reduce needle pain. At follow-up, fewer children identified pain caused by needle procedures as the cause of the worst pain, and the number of pain management strategies administered or offered to children with needle pain increased. Our study also revealed that a smaller proportion of children reported pain in the previous 24 hours, and fewer children experienced severe pain.

The majority of hospitalized pediatric patients suffer from pain, and up to 80% experience moderate to severe pain.¹⁻⁷ Our data indicate that the implementation of a system-wide needle pain protocol appears to be associated with early improvements in pediatric analgesia. The percentage of children who reported having no pain during the second survey increased (24% vs 33%), the number of children in severe pain (with a pain score between 7 and 10 out of 10) decreased (14%–9%), and the proportion of children reporting needle pain as the source of the worst pain was

TABLE 3 Characteristics of Children With Severe Pain as Documented in the Medical Record in the Past 24 Hours

Patient	Age, y	Time in Hospital, d	Reason for Admission	No. Assessments	No. Assessments ≥ 7	Pain Management Strategies ^a	Pain Consult (Yes or No)	IM Consult (Yes or No)
1	10.3	2.3	Abdominal pain	9	2	SA, AA	No	No
2	0.0	183.8	Prematurity	13	1	AA, SO	No	No
3	10.8	4.8	Abdominal pain	14	6	SA, WO	No	Yes
4	12.0	1.3	Abdominal pain	12	5	SA, AA, SO	No	No
5	8.7	5.5	Fever	7	1	SA, AA	No	No
6	18.6	1.7	Abdominal pain	4	1	SO	No	No
7	20.5	1.0	Headache	5	1	SO	No	No
8	18.8	6.3	Migraine	10	4	SA	No	No
9	9.4	2.5	Sickle cell crisis	7	2	SA, SO	No	Yes
10	13.7	2.7	Abdominal pain	4	3	AA, SO	No	No
11	16.5	1.8	Abdominal pain	4	3	SA	No	No
12	15.7	3.7	Minor trauma, multiarea	6	3	SO	No	No
13	3.0	14.2	Double outlet right ventricle	13	3	SA, AA, SO	No	No
14	15.9	3.5	Motor vehicle accident	16	1	SA, AA, SO	Yes	Yes

A pain score ≥ 7 was considered severe pain. AA, adjuvant analgesia; IM, integrative medicine; SA, simple analgesia; SO, strong opioids; WO, weak opioids.

^a Pain management strategies key.

TABLE 4 Strategies Used for Patients With Worst Pain Source From Needle Stick

	Survey 1	Survey 2	Total	<i>P</i> ^a
Infants, 0–12 mo	<i>n</i> = 29	<i>n</i> = 24	<i>n</i> = 53	
Positioning, <i>n</i> (%)	11 (38)	8 (33)	19 (36)	.78
Distracting, <i>n</i> (%)	1 (3)	9 (38)	10 (19)	.003
Sucrose, pacifier, and/or breastfeeding, ^b <i>n</i> (%)	14 (48)	18 (75)	32 (60)	.056
Topical anesthesia, ^c <i>n</i> (%)	—	5 (21)	—	—
No. strategies, ^d average (SD)	0.9 (0.9)	1.5 (0.8)	1.2 (0.9)	.018
Children, age >1 y	<i>n</i> = 25	<i>n</i> = 16	<i>n</i> = 41	
Positioning, <i>n</i> (%)	6 (24)	10 (62)	16 (39)	.022
Distracting, <i>n</i> (%)	12 (48)	11 (69)	23 (56)	.218
Topical anesthesia, ^c <i>n</i> (%)	—	11 (69)	—	—
No. strategies, ^d average (SD)	0.7 (0.7)	1.3 (0.8)	1.0 (0.8)	.02

—, not applicable.

^a From Fisher's exact test or *t* test.

^b Sucrose, pacifier, and/or breastfeeding are offered to infants.

^c Only collected on second survey.

^d Total of 3 and 2 possible strategies for infants and children, respectively.

lower (30% vs 21%). Although patients and parents did not score needle pain the highest on a 0 to 10 scale, they unsurprisingly identified it as the source of the worst pain illustrating its anxiety-provoking potential.

Interestingly, none of the children (or respondents) who reported needle pain as the worst pain source reported being offered all 4 evidence-based practices for managing needle pain.^{24,25} This is likely due to the fact that this second survey was conducted during early stages of implementation of the Children's Comfort Promise, when staff members were still acquiring new skills and may have had a "pick 1" mentality instead of offering all 4 components of the bundle. Recent audits from 2017 suggest that barriers to offering the bundle of 4 strategies have been successfully resolved (data not shown).

Compared with our first survey, distraction was provided to infants younger than 12 months of age significantly more often, and comfort positioning was used more often for toddlers, children, and adolescents in the current study. Because these data were examined in the early stages of our Children's Comfort Promise, the percentage of health care staff who offered the simplest pain management strategies increased at a higher rate than those strategies requiring ordering and/or stocking or medical record documentation (eg, topical anesthetics).

Our survey adds to the body of literature that reveals a significant proportion of children (28% in our study) who are hospitalized or seen in the ED usually experienced pain or hurt routinely before admission, indicating the possibility of a chronic pain disorder in addition to possible acute or procedural pain.⁴² These children may require a different approach to pain management, including an interdisciplinary rehabilitative outpatient pain clinic.⁴²

The highest average numeric pain scores at both survey administrations (2013 and 2015) were associated with pain from trauma, injury, and other medical issues (eg, developmental condition, respiratory, or digestive dysfunction). Average pain scores for children and parents who indicated that procedural pain and postsurgical pain were the greatest sources of pain during their hospital stay were also high (mean = 6.2; SD = 2.0 and mean = 4.2; SD = 3.4, respectively). These findings, coupled with our hospital's experience with consistently lower pain treatment satisfaction scores and staff-identified practice variability for treating traumatic injuries (not included in this report), have led to the decision to focus the next iteration of our institution-wide Comfort Promise QI efforts in 2017 on postsurgical and trauma pain management.

Parent pain ratings served as a proxy for many children, infants, and young children, but parents may underestimate or

overestimate the extent of their child's pain.^{43,44} This limitation is difficult to overcome when assessing pain in young children because of their cognitive and developmental abilities. To assess this impact, a sensitivity analysis excluded the large number of infants from the NICU. The results of the sensitivity analysis revealed similar trends to the full sample. For example, 80% vs 73% of patients experienced pain in surveys 1 and 2, respectively, and 29% vs 19% of patients identified needle pokes as the worst source of pain in surveys 1 and 2, respectively (*P* = .068). Sample size was determined by surveying as many patients as possible on 2 different days in our hospital, and no a priori power calculations were performed. Thus, our sample may be underpowered to detect true differences. Although 3 attempts were made to interview all families, the response rate was impacted by patients being discharged before the interview, parents being unavailable during the interview period, and limited resources (eg, interpretive services).

Differences emerged in how the 4 bundled pain management strategies were recorded between each survey time point. Our main objective with the first survey was to identify what children perceived as the most painful procedures or conditions during their hospital stay (ie, needle pain had not yet been identified as the source of the worst pain). These data were queried further in the follow-up survey to inform embedding each of the 4 strategies into the EMR to ensure consistency in documentation. Finally, although we did not announce the survey in advance, it is possible that staff behavior changed throughout the course of the day (ie, improved) as people became aware of the survey.

CONCLUSIONS

This point prevalence survey revealed that significant improvements in pediatric pain experience were associated with early stages of implementation of a system-wide protocol to prevent or eliminate needle pain across all inpatient units, EDs, outpatient laboratories, and ambulatory clinics. However, despite having a dedicated inpatient and outpatient pediatric pain

TABLE 5 Scheduled and As-Needed Pharmacologic Pain Management Interventions for Children Who Reported Experiencing Pain in the Past 24 Hours

	All Children, N = 192, n (%)	Children Who Reported Pain, N = 150, n (%)
Basic analgesia		
Acetaminophen	49 (26)	44 (29)
Ibuprofen	23 (12)	22 (15)
Ketorolac	14 (7)	13 (9)
Celecoxib	0 (0)	0 (0)
Naproxen	1 (<1)	1 (<1)
Weak opioids		
Tramadol	5 (3)	5 (3)
Codeine and acetaminophen	0 (0)	0 (0)
Hydrocodone and acetaminophen	0 (0)	0 (0)
Strong opioids		
Morphine	14 (7)	14 (9)
Fentanyl	14 (7)	14 (9)
Hydromorphone	3 (2)	3 (2)
Methadone	2 (1)	1 (<1)
Oxycodone	7 (4)	7 (5)
Adjuvant analgesia		
Amitriptyline	2 (1)	2 (1)
Gabapentin	4 (2)	3 (2)
Low-dose ketamine	1 (<1)	1 (<1)
Dexmedetomidine	0 (0)	0 (0)
Clonidine	3 (2)	3 (2)
Topical lidocaine	22 (12)	19 (13)
Lorazepam	8 (4)	8 (5)
Midazolam	4 (2)	3 (2)
Diazepam	6 (3)	5 (3)

team, there continues to be room for improvement in pain treatment and prevention for patients at a large US children's hospital. Embedding all 4 evidence-based practices for needle pain in the hospital's EMR facilitates consistent compliance with the bundled needle pain protocol and the Children Comfort Promise: "We will do everything possible to prevent and treat pain." Future research will be aimed at assessing the needle pain protocol impact, sustainability, and evidence of culture change after complete system-wide rollout, as well as effective, long-lasting practical pain prevention and treatment intervention in the pediatric hospital setting.

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