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Implementation of a Non-Sedated Procedural Pain Management Practice Guideline and Order Set

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Ring, L.M., Rana, M.S., & Deutsch, N. (2023). Implementation of a non-sedated procedural pain management practice guideline and order set. *Pediatric Nursing, 49*(1), 12-20.

Background: Pediatric patients are subject to numerous painful procedures during their hospitalization. These procedures can cause pain and anxiety that may be under-estimated and under-treated. Research shows that patients undergoing painful procedures receive suboptimal relief for pain and anxiety (Bice et al., 2014).

Methods: A non-experimental design used retrospective chart reviews for comparison of patient care before and after implementation of a new nursing practice guideline (NPG) and order set/power plan (PP) on three inpatient units. An assessment of nursing and provider knowledge of pharmacologic and non- pharmacologic analgesia and the non-sedated procedural pain NPG/PP was completed. A nursing satisfaction survey assessed use and feasibility of the NPG.

Findings: After educational implementation, nurses and providers significantly improved their knowledge of peak onset of morphine and oxycodone ($p < 0.001$). Nurses demonstrated significant improvement in reports of NPG utilization and knowledge of pharmacological and non-pharmacological resources ($p < 0.001$). Providers gained familiarity with the NPG/PP ($p < 0.001$). There was no evidence in the electronic health record (EHR) documentation to confirm the transfer of knowledge and compliance related to the NPG/PP.

Discussion: This multidisciplinary quality improvement project improved nursing and provider knowledge of non-sedated pediatric procedural pain pharmacologic and non-pharmacologic resources in our organization. EHR documentation limitations may have contributed to the evaluation of resource application.

Application to Practice: By improving knowledge of resources, we hope to increase compliance, improve pain control, and continue to evaluate their use during these short procedures. Redesign of the EHR is essential to help facilitate and evaluate NPG/PP compliance.

Key Words: Pediatric, pain, procedural, nursing, clinical practice guidelines.

Pediatric patients are subject to numerous invasive, painful procedures throughout their hospital stay. Most patients have at least one painful procedure in 24 hours, with an average of 6.3 (range 1-50) per child (Stevens et al., 2011). These procedures can cause significant pain and anxiety that may be under-estimated and under-treated, potentially leading to adverse physiologic and psychological outcomes (Wells et al., 2008). Despite significant evidence of the importance of adequate pain control in pediatric patients, research shows that patients undergoing painful procedures receive suboptimal relief from their pain and anxiety (Bice et al., 2014; Czarnecki et al., 2014; Stevens et al., 2011; Stevens et al., 2014). Clinical practice guidelines (CPGs) can help support appropriate pharmacologic and non-pharmacologic methods to treat pain and standardize documentation during these procedures (Czarnecki et al., 2011; Lago et al., 2009; Wilson-Smith, 2011).

An interdisciplinary team recognized a knowledge gap and practice variability in pain management during non-sedated painful procedures. The team, therefore, developed a quality improvement (QI) project to implement a comprehensive, evidence-based CPG and unit-based education tool to standardize practice and improve patient care. This initial capstone QI pilot project increased nursing knowledge and provider documentation of interventions for procedural pain management during thoracostomy tube removals (Ring & Watson, 2017). A

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larger multidisciplinary team revised and adapted this initial pilot project for organizational implementation. We describe how we scaled the pilot findings to an organization-wide QI project. We report the results of the initial implementation on three inpatient units.

Background

Pediatric patients in the hospital setting are subject to painful procedures as part of their routine care, including but not limited to the placement of peripheral intravenous (PIV) catheters, surgical dressing changes/wound care, and removal of chest tubes (CTs). These procedures can be painful and produce anxiety and fear with an associated "behavioral response ranging from calm and controlled to flailing" (McCarthy et al., 2010, p. 125). Many studies demonstrate the detrimental effects of inadequate pain treatment in the pediatric population. In neonates, repeated, painful stimuli lead to abnormal somatosensory and stress responses, physiologic instability, and long-term emotional outcomes (Bouza, 2009; Doesburg et al., 2013). Likewise, children who suffer from poorly controlled traumatic pain are more likely to suffer chronic pain as adults (Jones et al., 2009) or hypersensitivity in pain perception (Woolf, 2007). Furthermore, procedures for pediatric patients can cause stress and anxiety for the child and their caregivers (Krauss et al., 2016).

Despite knowledge of these long-term outcomes, there are unique barriers to adequate pain control in pediatric patients (Bice et al., 2014). Using verbal self-reporting of pain is not always possible for younger children. Often, nurses must rely on direct patient observation or reporting from a caregiver (Büttner & Finke, 2000; Riddell & Racine, 2009). Although validated, age-appropriate pain assessment tools exist, nurses face issues related to time constraints, lack of treatment orders, and insufficient experience or knowledge of the options available for the treatment of pediatric pain (Rieman & Gordon, 2007). Factors affecting optimal procedural pain management include the absence of clear guidelines, inadequate or insufficient medication orders, poor communication between team members and patients/families, insufficient pre-emptive medication use, and inadequate time to give analgesic medications before the procedure (Czarnecki et al., 2011; Czarnecki et al., 2014; Czarnecki et al., 2019).

Non-pharmacologic interventions for procedural pain are well established. Distraction therapies can refocus attention from painful stimuli (McCarthy et al., 2014). Other non-pharmacologic strategies that effectively manage acute pain include psychological interventions, such as behavioral, cognitive behavioral, and hypnosis (Association of Paediatric Anaesthetists of Great Britain and Ireland, 2012). Moreover, in a systemic review of using music to reduce pain and anxiety in children undergoing medical procedures, Klassen and colleagues (2008) found music therapy was an effective adjunctive therapy. Quality improvement studies aimed at improving pediatric procedural pain management by providing standardized, evidence-based interventions are of average quality (Lee et al., 2014). Use of comprehensive CPGs that include both pharmacologic and non-pharmacologic tools for pain management could improve the effectiveness and quality of care and decrease adverse events (Habich et al., 2012; Kredo et al., 2016; Lago et al., 2009; Lim & Godambe, 2017; Wilson-Smith, 2011).

Rationale

We used the revised Iowa Model for evidence-based practice to promote excellence in health care to guide this quality improvement project. The original Iowa Model guided promotion of patient outcomes for problem and knowledge-based issues, while the revised model combined the triggering issues and continued identification of opportunities (Buckwalter et al., 2017; Cullen et al., 2019; Titler, 2001; Titler et al., 2007). This model helped develop and implement the new nursing practice guideline (NPG) and a power plan (PP) to optimize pain relief with non-sedated painful procedures. The PP is a provider order set in the electronic health record (EHR). Before the NPG, pain guidelines focused on general, sedated, or post-operative pain management. There was not a specific order set for non-sedated painful procedures.

In their systematic review of the literature, Bice and colleagues (2014) found three main areas to improve the nursing treatment of pediatric procedural pain: increasing nursing knowledge, nursing empowerment, and protocol implementation. A multidisciplinary team used these principles to implement a quality improvement project that integrated nursing and provider education with the development of a new NPG/PP to improve pain management during short, non-sedated procedures. This project was carried out in three designated units to design, develop, and evaluate implementation at the organizational level, building on the previous procedure-specific, unit-based capstone pilot (Ring & Watson, 2017).

Ethical Considerations

This quality improvement initiative at Children's National Hospital does not constitute human subjects research. As such, it was not under the oversight of the Institutional Review Board (IRB).

Aims and Objectives

The quality improvement project aimed to improve nursing and provider knowledge of the non-sedated procedural pain NPG/PP through pre- and post-knowledge tests on three acute in-patient units. It also aimed to establish the use of the NPG/PP through documentation in the EHR of pharmacologic and non-pharmacologic interventions during non-sedated painful procedures (thoracostomy tube removal, PIV placement, and wound care) for patients ages 2 weeks to 18 years; and evaluate nurse satisfaction with the new NPG.

Methods

Setting and Sample

The quality improvement pilot was carried out in a free-standing,

over 300-bed pediatric quaternary care, Magnet®-designated hospital between September 2018 and March 2019. One overarching organizational goal was to improve pain management. This project combined the following Magnet® components: structural empowerment; exemplary professional practice; new knowledge, innovation, and improvements; and empirical quality results (American Nurses Credentialing Center, n.d.). Participants included a convenience sample of clinical nurses, nurse practitioners (NPs), physician assistants (PAs), and surgical, critical care, and cardiology fellows involved in patients undergoing non-sedated painful procedures. Attending physicians were excluded because they are not typically placing orders to provide pain management. As outlined in our IRB policy and procedure for performance improvement, returning the completed de-identified pre- and post-knowledge tests and nurse satisfaction surveys served as implied consent for participating providers and nurses. All participants cared for patients in three inpatient units: The cardiac intensive care unit (CICU); the acute care surgical care unit (SCU); or the acute care heart/kidney unit (HKU).

Project Phases

The project involved four phases: 1) initial capstone project, 2) NPG and PP development, 3) nurse and provider education, and 4) knowledge tests and nurse satisfaction survey.

Initial capstone project. To identify research related to non-sedated procedural pain management and best practice, we conducted a thorough review of the literature and current activities related to procedural pain control across the institution at that time. No specific guidelines focused on thoracostomy tube removal and other non-sedated painful procedures existed in our NPG library or order sets. Pain medications were given; however, non-pharmacologic resources were not consistently utilized. This resulted in a unit-based project that specifically focused on implementing a CPG for non-sedated procedural pain management during thoracostomy tube removal for patients with post-operative congenital heart disease (Ring & Watson, 2017). This CPG included a stepwise description of the procedure adapted from previously published procedures and guidelines (Lago et al., 2009; Preze, 2011; Wilson-Smith, 2011) and defined the specific roles and responsibilities for individuals. Required equipment and routinely given analgesics, their dosages, and time of peak effect were identified and listed. Non-pharmacologic interventions and resources based on developmental age were provided. These resources included the ONE VOICE method (https://onevoice4kids.com), which hospital child life specialists use to create a more child-friendly environment to help decrease stress related to medical procedures (Boles, 2013). This capstone project increased nursing knowledge of available resources for optimal procedural pain management in pediatric patients requiring thoracostomy tube removal. In addition, post-implementation procedures were done during pain medication peak effectiveness (Ring & Watson, 2017).

NPG and PP development. With the success of the initial capstone project (Ring & Watson, 2017), and with further review and analysis by a multidisciplinary team, a new non-sedated procedural pain management NPG was revised from the unit-based CPG. The revision included a variety of non-sedated painful procedures, such as CT removals, wound care, and peripheral intravenous (PIV) placement. The non-sedated procedural pain management NPG was reviewed by the organization system's nursing practice council. This council included clinical nurse experts, educators, and researchers. Pain and cardiac anesthesiology experts and child life specialists also reviewed the NPG. In consultation with a physician (pain, anesthesia, and surgery) and nursing experts, a provider order set/PP was developed for non-sedated pain management. The draft PP was sent for review and approval to the Order Set Oversight Committee (OSOC), an interdisciplinary organizational team of physicians, pharmacists, nurses, and EHR experts.

Nurse and provider education. Two electronic slide show presentations were developed to introduce staff to the new NPG/PP and provide information about pharmacologic and non-pharmacologic interventions for pain management. One presentation targeted providers, including NPs, PAs, and physicians (medical, surgical, and critical-care Fellows); the other was developed for nurses. Nurses, nurse educators, anesthesiologists, and pain anesthesiologists provided expert content reviews.

We converted presentations to self-learning modules housed on the organization's electronic learning platform. We sent the learning module via email to the following care providers: clinical nurses and providers (Fellows and NPs) in the CICU; NPs, a PA, and fellows from the cardiovascular surgery team; and nurses, NPs, and surgical Fellows on the surgical/trauma unit. At unit-based shared nursing leadership meetings, onsite briefing sessions were provided for heart/kidney and surgical care nurses. A session was also given to the critical care and cardiology Fellows during a staff meeting.

Knowledge tests and nurse satisfaction survey. To assess pharmacologic and non-pharmacologic knowledge of non-sedated procedural pain, pre- and post-tests were embedded in the learning module. Unit nurses and intravenous (IV) team nurses completed a 16-item questionnaire and providers completed a 9-item pre- and post-knowledge test. A passing score was not determined because the questionnaire is only used to determine the level of knowledge pre- and post-implementation of the education.

A nurse satisfaction survey adapted from Papa and Zempsky (2010) (previously used in the capstone project) was used to assess nursing satisfaction with the new NPG. After the educational implementation, nursing unit educators from the three inpatient units sent an electronic link via email connecting to the 16-item nursing satisfaction

survey to unit nurses. No personally identifiable information was collected or linked to the survey.

Study of the Interventions

To determine compliance with the NPG/PP, EHR documentation of pain assessment and use of recommended interventions was evaluated for three separate procedures: PIV catheter placement, wound cleaning/dressing changes, and thoracostomy tube removals. To determine if there was an increase in knowledge following the educational intervention for providers and clinical nurses, scores on the knowledge pre- and post-tests were evaluated. We evaluated scores on the nursing satisfaction survey for suggested changes, feasibility, and use of the NPG.

With the assistance of our informatics and EHR team, an EHR review was conducted. First, a request was submitted to our organizational data management system to obtain the incidence of CT removal. Not all providers or units used separate procedure notes to remove CTs; thus, we searched for nursing documentation in the EHR. The following prompts were searched: CT removed or lapsed in 12 hours (no drainage documented), date of discharge, and inpatient unit. Several dates were identified for review for the three units to target specific time points related to the pre- and post-educational training in each unit. Within 30 minutes before and after CT removal, pain screening/assessment and comfort measures were reviewed to obtain relevant documentation. We also assessed pain medication and time of administration. We reviewed procedure notes, if available, for the documentation of pain, comfort measures, and analgesics. To determine the documentation and compliance related to PIV placement and wound cleansing/irrigation, we submitted a separate report request to the Business Intelligence and Clinical Analytics team. We searched the following terms: *date of activity*, *cleansing*, *irrigation*, and *insertion*. The related pain documentation was evaluated. If the pain response documented was "yes," then we reviewed the pre- and post-pain screen, pain scale assessment, and comfort measures taken. Data from the three units were aggregated for the analyses. Collection and analysis of pre- and post-project data included procedural (PIV, thoracostomy tube removal, wound care) pain/comfort measures, medication use, and knowledge assessments.

Using a REDCap® (cri-datacap.org) survey, we collected de-identified pre- and post-test scores from the online learning platform following completion of the education module by practitioners and clinical nurses. Satisfaction survey results were also obtained and analyzed using REDCap® from the electronic platform used to administer the survey.

Table 1.
Procedural Comfort/Pain Assessment for Peripheral Intravenous Insertion Pre- and Post-Implementation of the Nursing Practice Guideline/Power Plan

	Pre *n* (%) (*N* = 345)	Post *n* (%) (*N* = 398)	*P*-Value
Comfort measures taken	253 (73)	294 (74)	0.869
Pre-pain assessment	87 (25)	95 (24)	0.670
Pre-pain assessment within 30 minutes (out of 87 pre-patients and 95 post-patients who had pre-pain assessments)	20 (23)	10 (11)	0.024
Post-pain assessment	74 (21)	87 (22)	0.892
Post-pain assessment within 30 minutes (out of 74 pre-patients and 87 post-patients who had post-pain assessments)	16 (22)	22 (25)	0.705

Table 2.
Procedural Comfort/Pain Assessment for Wound Care Pre- and Post-Implementation of the Nursing Practice Guideline/Power Plan

	Pre *n* (%) (*N* = 1780)	Post *n* (%) (*N* = 1717)	*P*-Value
Comfort measures taken	—	—	—
Pre-pain assessment	146 (8)	99 (6)	0.005
Pre-pain assessment within 30 minutes (out of 146 pre-patients and 99 post-patients who had pre-pain assessments)	36 (25)	6 (6)	< 0.001
Post-pain assessment	134 (8)	88 (5)	0.004
Post-pain assessment within 30 minutes (out of 134 pre-patients and 88 post-patients who had post-pain assessments)	60 (45)	42 (48)	0.666

Analysis

A *p*-value of 0.05 was used to determine statistical significance to compare procedure compliance for PIV placement, wound cleaning/dressing change, and thoracostomy tube removal between pre- and post-educational training. A Chi-square or Fisher's exact test (if any of the expected cell counts were less than 5) was used to compare categorical variables. Responses from nursing and provider pre- and post-knowledge assessments were also compared using a Chi-square test. Likert results of the nursing satisfaction survey were presented as frequencies and percentages of the corresponding responses. The mean score for overall nursing satisfac-

tion was calculated by assigning points to each response: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. *P*-value less than 0.05 were used to determine statistical significance. Statistical analyses were performed with Stata software, version 15.1 MP (StataCorp, 2017).

Results

Procedure Compliance

PIV placement. Table 1 presents pain assessment and comfort measures data on the placement of a PIV. Comparing pre- and post-NPG/PP implementation, no significant difference occurred in the assessment of pain and comfort measures documentation or the use of comfort measures. In addition, after implementation, the number of patients with a pre-pain assessment within 30 minutes of the PIV placement decreased significantly.

Wound cleaning/dressing change. Table 2 lists data on wound cleaning or dressing changes. Compliance in pain assessment and intervention documentation was very poor and decreased significantly after implementation of the NPG/PP. After NPG/PP implementation, fewer patients had a pre-pain assessment within 30 minutes of the procedure.

Thoracostomy tube removal. The analgesic of choice in all three units was morphine. Fentanyl was also frequently given for CT removals in the CICU. In the HKU, the median time between administration of pain medication and removal of the tube did not significantly change when comparing before and after implementation of NPG/PP. However, given the peak onset is 20 minutes for morphine and the half-life is 1.5-4 hours (Lexicomp, 2023), procedures were performed in the peak time of IV analgesic effects. After seeing initial improvements in the capstone project, continuous use of comfort measures and compliance with improved documentation was not sustained.

In the CICU and SCU, there was no significant difference in the use of comfort measures or pain medication before NPG versus after NPG implementation. There was an initial increase in the median time interval between administering pain medication and removing the CT; however, this time decreased at the second post-assessment. Documentation of pain scores pre- and post-procedure on these units was extremely poor, despite the implementation of the NPG.

Knowledge test. Nursing staff demonstrated prior knowledge of the importance of non-pharmacologic interventions and results of ineffective pain management. After NPG/PP implementation, significant increases were found in knowledge about various non-pharmacologic resources available, appropriate medications to use, and their onsets of action. Knowledge about the ONE VOICE technique also significantly increased post-implementation of NPG/PP (see Table 3).

After the educational session, advanced practice providers (APPs) and physicians demonstrated improvements in their knowledge of the NPG/PP and the ONE VOICE technique. Awareness of the peak onset times for the analgesics used in the guideline also improved post implementation (see Table 4).

Nursing satisfaction survey. Forty nurses (about 31% of participants) responded to the satisfaction survey. The overall mean score was 4.23 (*SD* = 0.63), indicating nurses agreed the NPG was feasible and helped improve the consistency and appropriate timing of analgesics for non-sedated painful procedures.

Discussion

Following the success of the thoracostomy tube removal CPG project (Ring & Watson, 2017), we developed a new non-sedated procedural pain management NPG/PP to address multiple procedures, including but not limited to CT removals, wound care, and PIV placement. Our findings indicate nursing and provider knowledge of specific analgesics, peak onset times, and non-pharmacologic interventions had increased. However, knowledge did not seem to translate into a change in practice concerning the placement of PIVs or wound dressing changes as documented in the EHR. Moreover, improvements after the initial CPG project did not continue.

Interpretation

Most patients receiving PIVs before NPG/PP implementation (73%) already received comfort measures. This did not change significantly after NPG/PP, most likely because this practice was already a standard of care in our institution. However, despite the new guideline, the documentation of pain assessments, which was poor at baseline (23%), did not improve. Specifically, documentation in the note for wound dressing changes lacked a prompt related to whether comfort measures are used. Hence, the nurse must return to the pain assessment window to document this.

Removal of thoracostomy tubes was analyzed in three separate hospital units. Preliminary data after the implementation of the initial CPG showed a significant improvement in the documentation of pre- and post-procedure pain scores (Ring & Watson, 2017). However, the documentation was not sustained before or after the organizational NPG/PP implementation. Procedural provider notes were not used in every unit, which contributed to this issue, and it is not conducive for providers to document pain interventions in their current form. Although no formal pain assessments were documented, there was documentation of adequate pain control by providers. Notably, administration of pain medication was within the time of peak action of the pain medication. The lack of PP/order set used in the CICU and SCU could be due to most patients already having pain medication orders as a part of their care in the immediate postoperative period, and the CICU may have increased access to sedative medications compared to the other units. These orders may mean this guideline is less applicable to these patients in the ICU setting.

It is worth noting that among the nurses who answered the posttest, more than 50% had the opportunity to use the NPG/PP. Most nurses answering the satisfaction survey

Table 3.
Percentage of Nurses Correctly Answering Knowledge Survey Pre- and Post-Implementation of the Nursing Practice Guideline (NPG)/Power Plan (PP)

	Pre *n* (%) (*N* = 115)	Post *n* (%) *N* = 121)	*P*-Value
I have utilized the Non-Sedated Procedural Pain Management NPG.	103 (90)	81 (67)	**< 0.001**
I know what my resources are for non-pharmacological management of pain associated with non-sedated procedures.	46 (40)	121 (100)	**< 0.001**
I know which medications to use for pharmacological management of pain related to non-sedated procedures.	95 (83)	121 (100)	**< 0.001**
Non-pharmacological interventions have been shown to decrease procedural related pain.	115 (100)	119 (98)	0.327
There is evidence in the literature that ineffective pain management may cause a higher pain response in subsequent procedures.	114 (99)	121 (100)	0.304
Choose the available non-pharmacological techniques/resources available on your unit for distraction during painful procedures:			
VECTA	62 (54)	88 (73)	**0.003**
Music	106 (92)	116 (96)	0.230
Bear Hugs	62 (54)	113 (93)	**< 0.001**
ONE VOICE	47 (41)	111 (92)	**< 0.001**
Child Life	113 (98)	119 (98)	0.959
I know what ONE VOICE is.	41 (36)	120 (99)	**< 0.001**
Identify the correct definition for the components of the ONE VOICE acronym (choose one answer). During painful procedures:			
O – One voice should be heard	90 (78)	116 (96)	**< 0.001**
N – Nurse provides distraction	5 (4)	4 (3)	
E – Everyone participates	20 (17)	3 (2)	
Each component of ONE VOICE reminds caregivers to be cognizant of the clinical environment we expose patients to during procedures.	111 (97)	119 (98)	0.373
Oral sucrose (Sweet-ease®) has been clinically shown to reduce pain in neonates and infants.	111 (97)	119 (98)	0.160
Medical play (pre-procedural preparation) is important for which patient developmental stages (choose one answer):			
Preschoolers	32 (28)	26 (21)	0.422
School age	11 (10)	18 (15)	
Toddlers	8 (7)	6 (5)	
All of the above	64 (56)	71 (59)	
Correct answers on peak onset of:			
Morphine	33 (29)	111 (92)	**< 0.001**
Oxycodone	36 (31)	104 (86)	

Note: Proportion/percentage of responses said "yes" or "true" pre- vs. post-implementation of NPG/PP.

Table 4.
Percentage of Providers Correctly Answering Knowledge Survey Pre- and Post-Implementation of the Nursing Practice Guideline (NPG)/Power Plan (PP)

	Pre *n* (%) (*N* = 36)	Post *n* (%) (*N* = 40)	*P*-Value
I am familiar with the Non-Sedated Procedural Pain Management PP.	18 (50)	40 (100)	**< 0.001**
I have utilized the Non-Sedated Pain Management PP.	9 (25)	14 (35)	0.343
I am familiar with the Non-Sedated Pain Management NPG.	14 (39)	39 (98)	**< 0.001**
Non-pharmacological interventions have been shown to decrease procedural related pain.	33 (92)	40 (100)	0.062
There is evidence in the literature that ineffective pain management may cause a higher pain response in subsequent procedures.	35 (97)	39 (98)	0.940
I know what ONE VOICE is.	15 (42)	40 (100)	**< 0.001**
Oral sucrose (Sweet-ease®) has been clinically shown to reduce pain in neonates and infants.	31 (86)	37 (93)	0.560
Correct answers on peak onset of:			
Morphine	12 (33)	38 (95)	**< 0.001**
Oxycodone	16 (44)	40 (100)	**< 0.001**

Note: Proportion/percentage of responses said "yes" or "true" pre- vs. post-implementation of NPG/PP.

strongly agreed (20%) or agreed (53%) guidelines were feasible for their unit and would help to improve analgesic management around these procedures. Furthermore, nurses demonstrated increased knowledge of both the medications and non-pharmacologic methods available to help improve patient care.

Translation of science into clinical practice is a complex process (Stevens et al., 2014). Translation of knowledge into clinical practice is not necessarily straightforward or easy to achieve. Project implementation should be carried out systematically and rigorously, and outcomes should be evaluated (Clarke et al., 2005; Wells et al., 2008). In addition, health care professionals may need to modify or let go of usual practices, thereby requiring behavioral change and support from critical organizational stakeholders to successfully implement a best practice CPG (Kredo et al., 2016). In 2000, at the Clinical Research Roundtable of the Institute of Medicine, two transitional blocks inhibiting the application of science to improve health were identified. Specifically, the second defined block focused on the difficulty of converting clinical research into clinical practice. In addition, Sung and colleagues (2003) described that if these obstacles were not resolved, science would not be translated to human benefit. Results of our project are consistent with challenges of implementation of science to improve pain management of non-sedated painful procedures.

We followed the Iowa Model revision when implementing the interventions for this project (Buckwalter et al., 2017), which provided the framework for the translation of pharmacologic and non-pharmacologic interventions to clinical practice by staff and on specific hospital units targeted for intervention. Although project leads were able to identify critical personnel and unit champions for the implementation of education, there was no evidence of knowledge translation into the clinical area upon a review of the EHR pain documentation. Cullen and colleagues (2019) demonstrated success using data-driven precision implementation. This approach uses local baseline data to select the most efficient and effective implementation strategies for targeting patient and clinician's needs (Cullen et al., 2019). Based on our results, we are embarking on further improvements to the system, including providing other targeted organizational education information, contacting professionals and organizational stakeholders to determine opportunities based on units and roles, and revising the EHR.

Limitations

We discovered several limitations during the NPG/PP implementation. The current EHR does not allow for efficient documentation of pain assessment/intervention. It is possible that pain assessment/intervention happened but was not captured in the EHR. In addition, since the initial success with the CPG capstone project, personnel within the surgery and other provider groups have changed, which may have resulted in the lack of sustainability in documentation and provider procedure notes. As the project progresses, these issues are being further analyzed and new personnel are educated.

Another limitation was the low response rate to the satisfaction survey. Participants felt the guidelines would help improve care. We implemented this pilot project on three inpatient units, each with its own practice culture and priority of clinical education needs related to their specialty. The involvement of major

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stakeholders and unit leaders who provided support for this project was inconsistent.

Implications of Findings

Managing a pediatric patient's pain during short, non-sedated procedures can be challenging but is extremely important for the care of these patients. With the input of a multi-specialty team, we implemented an NPG/PP that helps address this issue. We used a multipronged approach to improve the knowledge of the nurses, APPs, and physicians so everyone is fully aware of the specific issues surrounding pediatric patients and the options available to improve their care. Through education, we saw an improvement in knowledge of all levels of providers involved in their care. By improving knowledge of resources and documentation, the goal of our quality improvement project was to translate this knowledge into actual practice change for selected procedures in pain assessment, analgesic administration, and the use of non-pharmacologic interventions. However, the translation of knowledge is not evident in the post-documentation review, nor does it suggest compliance with pain documentation has improved. Our outcomes reflect the difficulty with translational science work as reflected in the literature. We plan to add this education to all new residents, providers, and nursing onboarding education. These modules were added to the newly developed APP orientation and IV team nurse's training.

Conclusion

Pain documentation in the EHR continues to be an obstacle, making it difficult to evaluate the translation effect of this non-sedated procedural sedation project. Efforts to improve the EHR are ongoing to make this documentation more user-friendly for nurses, APPs, and physicians, thereby giving us another opportunity to evaluate compliance.

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