BRIEF REPORT

Linking Pediatrics Patients and Nurses With the Pharmacy and Electronic Health Record System Through the Inpatient Television: A Novel Interactive Pain-Management Tool

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ABSTRACT

OBJECTIVES: Implement a novel pain-management interface that is used to bring real-time, patient-reported pain assessments to the inpatient television and evaluate the impact of implementation on the pain-management clinical workflow, patient engagement, and nursing pain reassessments.

METHODS: We developed a pain-management tool interfacing 4 stand-alone technologies: a television-based, interactive patient care system; electronic health record system; nursing call system; and pharmacy inventory–management system. The workflow is triggered when pain medications are dispensed by sending an automatic pain assessment rating question via the patient's television at a predefined time. To measure the effects of implementation, we calculated patient and/or parent use rates and pain reassessment timely documentation rates. Data were extracted from the electronic health record for a period of 22 months and covered pre- and postimplementation.

RESULTS: A total of 56 931 patient records were identified during the study period, representing 2447 unique patients. In total, 608 parents and/or patients reported their pain through the tool. Use rates were 6.5% for responding to the pain rating prompt and 13.3% for the follow-up prompt, in which additional nonpharmacologic strategies to eliminate pain were offered. A modest increase was found in the mean timely documentation rates on the basis of nursing documentation standards (26.1% vs 32.8%, a percentage increase of 25.7%; $P < .001$) along with decreased median time to pain reassessment documentation (29 minutes versus 25 minutes, a percentage decrease of 13.8%; $P < .001$).

CONCLUSIONS: With this novel tool, we offer a potentially scalable approach in supporting the pain-management clinical workflow, integration of technologies, and promoting of patient and/or parent engagement in the inpatient setting.

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Ms Aldekhyyel conceptualized and designed the study, developed the methodology, identified the study data set and analysis needs, interpreted the data, and drafted the initial manuscript; Dr Melton revised and contributed to the conception and design, acquisition of the data set, and analysis and interpretation of data, coordinated access to the study site, and reviewed and revised the manuscript; Dr Wang extracted the study data set from the clinical data repository and reviewed the manuscript; Mr Lindgren performed the statistical analysis and reviewed the manuscript; Dr Pitt made substantial contributions to the conception and design, interpretation of data, and critical revision of the manuscript for important intellectual content; and all authors approved the final manuscript as submitted.

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Hospitals increasingly rely on stand-alone health information technology (HIT) systems to conduct complex clinical workflows.[1–8] Because failure of these systems to work together can affect patient safety and quality measures, integrating stand-alone technology systems to improve workflows has become an emerging focus of many health care systems.[9]

The workflow surrounding inpatient pain management is emblematic of many inpatient clinical workflows; it is complex, patient focused, and involves multiple disciplines, including providers, pharmacists, and nurses.[10] Accurate and timely documentation of pain assessments is essential to improving the overall quality of patient care[11] and is explicitly laid out as a clinical standard by different hospital regulatory bodies,[12–16] including those specifically focused on pediatric hospitals.[17,18] Additionally, current national recommendations are focused on strategies to reduce the prescription of opioids for patients and increase the use of nonpharmacologic therapy for pain.[19]

In this article, we describe the implementation of a novel pain-management interface (PMI) at a large pediatric hospital built to engage patients and/or parents, support automatic pain assessment documentation in the electronic health record (EHR), and help ensure a patient-centered experience. By demonstrating the feasibility of successfully integrating multiple HIT systems to address inpatient pediatric pain and, notably, including real-time patient and/or parent feedback directly into the workflow, we provide a proof of concept for other hospitals to consider as they look to make the best use of existing inpatient technologies.

METHODS

PMI Development

The University of Minnesota Children's Hospital is a 246-bed, free-standing, quaternary-care mother and children's hospital. In 2011, we implemented a stand-alone television-based pediatric interactive patient care (IPC) system that is used to help inpatients and/or parents interact with their health care providers through their bedside television screens.[20] This system serves as the primary gateway for patient entertainment; standardized, disease-specific patient education; and care communication. In 2014, our hospital's EHR vendor allowed for bidirectional communication with the IPC system, which provided the opportunity to develop new integrations. To determine the feasibility of integrating these technologies, we chose to create a new pain-management workflow that would allow us to pilot and evaluate the integration capabilities using patient-facing real-time feedback.

Before the implementation of the PMI, the pain-management clinical workflow involved the patient and/or parent reporting pain to the nurse directly, either by pressing the nurse call button or during routine assessments. The nurse would reassess the patient at a predefined time (depending on the route of medication) and document this reassessment in the EHR.

Our new PMI workflow integrated 4 independent inpatient technologies (the IPC system, EHR system, nursing call system, and pharmacy inventory–management system) to allow for time-triggered patient reporting of pain assessments. To set the PMI triggers, we adopted the hospital's nursing pain reassessment policy, in which it is indicated that nurses are required to document patient response to specific medication interventions within the onset to peak effect period for the medication given in the past 24 hours (ie, between 15 minutes and 35 minutes for intravenous pain medications and between 30 minutes and 65 minutes for oral pain medication).[21]

The new PMI workflow (Fig 1) was designed to work as follows:

1. A pain medication is dispensed from the pharmacy inventory system;
2. This triggers a timer based on the medication route (ie, 15 minutes for intravenous pain medications and 30 minutes for oral pain medications);
3. After this time has elapsed, a pop-up window appears on the patient's television screen that reads, "A little while ago, you got medication for pain. Please tell us how you're feeling now: (a) hurts more, (b) hurts the same, or (c) hurts less";
4. After the patient and/or parent responds to the question, results are immediately communicated to the nurse's phone and automatically documented in the EHR. Nurses then perform a required hands-on pain reassessment and document accordingly in the EHR; and
5. The system then displays a follow-up message linking the patient and/or parent to other nonpharmacologic standardized resources embedded within the IPC system.

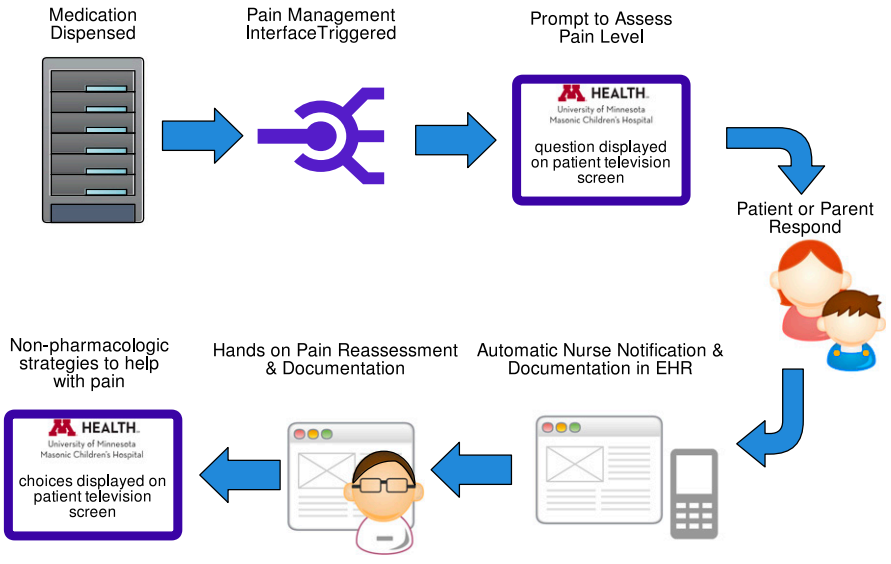

FIGURE 1 Overview of the interactive PMI clinical workflow.

Evaluation

With institutional review board approval, we employed a retrospective data set analysis to calculate patient and/or parent use rates and nursing pain reassessment documentation rates by extracting records from the University of Minnesota Research Clinical Data Repository.

The data set included all pediatric inpatient records stored in an institution-based EHR covering a 22-month period (the pre-PMI implementation period was from January 1, 2014, through November 29, 2014, and the post-PMI implementation period was from January 1, 2015, through November 29, 2015). To allow for an initial startup period and for analysis purposes, December data were not included.

To calculate patient and/or parent use rates, we calculated the number of responses to the 2 questions triggered by the IPC system after medication is given. These include (1) the level of pain and (2) other nonpharmacologic strategies to help with pain. To measure the nursing pain reassessment documentation compliance rates, we calculated (1) frequency (ie, did nurses document a reassessment at all?) and (2) timeliness (ie, was compliant documentation occurring within the hospital's pain reassessment time frame standards?).

To measure nursing pain reassessment documentation frequency, we examined the data set to identify the presence or absence of nurse documentation values stored in the EHR. To measure timeliness of documentation, we compared the time stamps of nursing pain reassessment documentation against the standard documentation time frame. Records were deemed to be compliant if they had a nursing pain reassessment documentation value present and were within the documentation standard time frame.

Analysis

We calculated frequencies and percentages on the basis of the presence or absence of nurse documentation values and patient and/or parent pain-rating responses and calculated medians and ranges for time measurements. We used the χ^2 test to compare the nurse documentation frequency rate and documentation compliance rate to other categorical factors. P values $<.05$ were considered statistically significant. Statistical analysis was performed by using SAS version 9.3 (SAS Institute, Inc, Cary, NC).

RESULTS

During the study period, 56 931 records (2447 unique patients) revealed at least 1 pain medication administration (29 707 pre-PMI implementation and 27 224 postimplementation).

Patient and/or Parent Use Rates

A total of 608 unique patients and/or parents engaged with the PMI by responding 1767 of the 27 224 times a television prompt for pain assessment was triggered (6.5%). Forty-five percent of the users were adolescents between the ages of 10 and 18 years, 54% were males, and 75% identified as white. Additionally, there were 3632 patient and/or parent responses of 27 224 follow-up nonpharmacologic prompts (13.3%; Table 1).

Changes in Nursing Timely Pain Reassessments

In Table 2, we summarize the frequency and timeliness of nursing pain reassessment documentation, comparing pre- and post-PMI implementation. There was a modest increase in nursing documentation (3.1% relative increase; $P < .001$) in the postintervention period; however, overall nursing documentation rates remained low at 53.4%. When documentation was present, the median (min;max) time of documentation was 29.0 min (1;120) pre-PMI and 25.0 min (1;120) post-PMI ($P < .001$). There was a relative 25.7% increase in compliance rates during the post-PMI period ($P < .001$). Nurses were more likely to document pain reassessments when patients and/or parents reported pain using the tool, with documentation occurring 63.4% of the time when the PMI had been used versus 52.7% of the time when it had not, a relative difference of 18.4% ($P < .001$).

DISCUSSION

In our pilot, we describe an innovative approach to patient and/or parent engagement in the management of pain in a pediatric inpatient hospital setting. To our knowledge, little has been explored in the use of IPC systems to assist in pain management, particularly in the context of inpatient pediatric care.[22]

Beyond the successful proof of concept that 4 free-standing HIT systems could be integrated successfully, our study revealed 3 key findings. First, although overall pain reassessment documentation rates remained relatively low, documentation rates post-PMI implementation revealed a slight, statistically significant improvement. Although a modest gain in documentation alone would not be a reason to implement this integrated PMI, pairing it with other nontechnology interventions may be used to facilitate and address documentation barriers.

TABLE 1 Patient and/or Parent Responses to the Helping With Pain Question

In Addition to Medicine, There Are Other Things That Can Help With Pain	Responses ($N = 3632$), n (%)
Things I can do right now	3557 (97.9)
Use ice or heat	3483 (97.9)
Try different resting positions	15 (0.4)
Practice deep-breathing techniques	14 (0.4)
Relax using aromatherapy oils	13 (0.4)
Ways I can find comfort	32 (0.9)
Things I can sign up to do later	75 (2.1)
Things that help me focus away from pain	60 (80.0)
Integrative health and wellbeing	6 (8.0)
Guided imagery	1 (1.3)
Energy therapies	8 (10.7)

TABLE 2 Nursing Pain Reassessment Documentation Rates (Documentation Frequency and Timeliness)

	Pre-PMI, *n* (%)	Post-PMI, *n* (%)	% Change	*P*
Documentation frequency				
Documentation present				
No	14 322 (48.2)	12 690 (46.6)	−3.3	<.001
Yes	15 385 (51.8)	14 534 (53.4)	+3.1	
Total	29 707	27 224	—	
Documentation timeliness				
Noncompliant	11 371 (73.9)	9762 (67.2)	−9.1	<.001
Compliant	4014 (26.1)	4772 (32.8)	+25.7	
Total	15 385	14 534	—	

—, not applicable.

Second, the ability to capture the nonpharmacologic pain-management needs of our hospitalized patients may prove valuable for future pain-management initiatives to engage patients and/or parents in their care[23,24] and meet regulatory compliance.[25] Lastly, although the implementation of the PMI revealed relatively low use by patients and/or parents, PMI use by patients and/or parents was associated with a significant 20.3% relative increase in pain reassessment documentation rates. This reveals that the intervention may be used to assist nurses in timely documentation. Efforts to increase the PMI's use among patients and/or parents may lead to further increases in documentation compliance.

Our study has several limitations. The PMI workflow relies on several assumptions, including that the television is on, the viewer is awake, is literate in English, and is comfortable navigating the bedside remote. If any of these assumptions is not valid for a particular encounter, the workflow would revert to reliance on the nurse to reassess without a patient trigger. Additionally, our study was performed at 1 facility with a focus on a specific population, which may reduce the generalizability of the findings.

CONCLUSIONS

We demonstrated that integrating 4 stand-alone inpatient technologies was feasible for developing a novel clinical workflow for supporting the pain-management process at our children's hospital and can be used to engage patients and/or parents in the workflow. Because pediatric hospitals aim to meaningfully engage patients and/or parents, integrations such as this may prove beneficial in supporting real-time, patient-driven communication that is used to interface with existing technologies.

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