

Reducing Opioid-Induced Constipation Post-Cardiac Surgery



An Improvement Project in a Pediatric Cardiac Intensive Care Unit

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ABSTRACT

Background: Pain management with opioids and underutilization of prophylaxis for constipation can prolong a patient's hospital length of stay and impede pain management efforts.

Problem: In pediatric postoperative cardiac patients, opioid therapy is a common approach to pain management but often places them at greater risk for constipation due to anatomy and age.

Methods: A retrospective review of 50 patients' medical records for baseline data was conducted, and a survey evaluated providers' current knowledge and practice.

Interventions: The intervention was an electronic order set that provided decision support. Additionally, prophylactic measures were supported by a validated assessment tool that created a common language to report constipation risk.

Results: Although not statistically significant, postintervention data demonstrated a 21.5% decrease in postoperative constipation and a 57% increase in ordered bowel regimens.

Conclusion: More focus is needed toward prophylactic bowel regimens to reduce the risk in this already high-risk population.

Keywords: critical care, opioid-induced constipation, pain management, pediatrics

Over the past decade, the awareness of overprescribing and consumption of opioids in the United States has been deemed an epidemic.^{1,2} This concern can easily be translated into the pediatric population as evidenced by an increased number of hospital admissions from opioid exposures nationwide.³ While an effective method for pain control for chronic and critical illness for all populations, these agents are often prescribed with little consideration for commonly experienced adverse effects such as constipation.

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Opioid-induced constipation occurs in more than one-third of all patients receiving opioids.^{2,4-10} Casual utilization of opioid therapy can prolong a patient's hospital length of stay and interfere with pain management efforts.⁶⁻⁸ Evidence suggests that the risk of this type of constipation can be reduced through use of a prophylactic bowel regimen and potentially more effective when assessment tools for constipation are used in conjunction.^{4,9,11,12}

PROBLEM

At baseline, patients with congenital heart disease can have decreased blood oxygenation that results in less than adequate perfusion to organs, such as the bowel. Even more so in the post-cardiac surgery patient, frequency of decreased hemodynamics that occurs as a protection method to healing or blood flow adjustment can reduce tissue and end organ perfusion. Therefore, decreased perfusion in conjunction with opioid therapy places the patient at an even greater risk of constipation.^{5,6,10}

The Texas-based pediatric hospital where this project took place is one of the largest in the

nation and performs over 800 cardiac surgical procedures annually.¹³ Recent focus on pain and sedation management has driven standardization of therapies. As a result, fentanyl has become the most prescribed opioid for intubated patients and morphine the second choice for both intubated and nonintubated patients. Therapy duration varies and is based on factors such as surgical procedure, previous exposure to opioids, and progression in postoperative healing.

Pain management with or without a bowel regimen was noted to be inconsistent among provider practice, and lack of awareness created variability in compliance with ordering a bowel regimen.¹⁴ As a result, patients are often retrospectively treated for constipation, creating a cyclic effect of reducing or stopping enteral feeds, increasing sedation and habituation, and prolonging stay in the intensive care unit (ICU).^{5,6,9-12,15} Other described negative outcomes include ileus, stress on surgical suture lines from straining, and potentially death as a compounding end result.

AIM

We attempted to address the problem of postoperative constipation in the pediatric cardiac ICU (CICU) through a quality improvement (QI) project aimed at an increase in the utilization of a prophylactic bowel regimen and daily assessment of constipation risk.^{4,5,6,12} We hypothesized that achieving these goals would ultimately avoid the complications of opioid-induced constipation in the pediatric post-cardiac surgery patients. The overall aim was to reduce the adverse drug effect of opioid-induced constipation by 50%.

METHODS

A literature review was completed from 3 separate databases: CINAHL, PubMed, and Cochrane. Keywords included *opioid-induced constipation*, *pediatrics*, *cardiac surgery*, and *bowel regimen*. Titles and abstracts of all articles retrieved were reviewed for relevance. Literature that described a pediatric postoperative population and/or management of opioid-induced constipation in any population was the most valued.

Context

The CICU is a 54-bed unit located within a freestanding children's hospital and is equipped

to care for a multitude of medical and surgical patients. On average, 60% of patients admitted to the unit are cardiac surgical patients. Staffing mix includes dedicated cardiac intensive care physicians and advanced practice providers (APPs) who rotate service schedules on a weekly basis as well as approximately 215 registered nurses (RNs) fulfilling 12-hour shifts to support the unit's census. Additional staff such as respiratory, physical, and occupational therapists are assigned to the care of the patients in the CICU. Daily rounds are multidisciplinary in participation, and family members are encouraged to take an active role in their child's care by participating in decision-making and the medical plan.

Inclusion/exclusion criteria

Patients in the CICU can range in age from newborns to adults. Most have some form of congenital heart disease or heart failure of some etiology. Exceptions include patients identified for care in the pediatric ICU, but due to bed availability or staffing support, they are cared for in the CICU until they can be transferred to the pediatric ICU. For the purposes of this project, inclusion criteria consisted of all immediate postoperative patients admitted to the CICU who underwent cardiac surgery via sternotomy with the support of cardiac bypass and prescribed 1 or more opioid as defined by the project. Patients were excluded from the project if they underwent surgery to implant or remove a ventricular assist device, provide cardiac support through extracorporeal membranous oxygenation therapy, other surgical intervention outside of cardiac involvement, or medical admissions without need for surgical repair. Opioids considered for the project were morphine, hydromorphone, fentanyl, oxycodone, and hydrocodone.

Defining constipation

A consensus of the reviewed literature acknowledged that there is not a definitive definition of constipation. However, supported symptoms include less than 3 spontaneous bowel movements per week, the feeling of fullness after a bowel movement, hard stool consistency, difficulty passing a bowel movement, or patient's expressed feelings of bowel habits.^{2,5,14,15} For the purpose of this project, constipation was defined as 3 or more postoperative days without a bowel movement.

Data

The data used to assess and evaluate the interventions were collected by a sole individual through manual chart review. Electronic medical records of patients admitted to the CICU post-cardiac surgery were reviewed, at random, pre- and postintervention. The complete sample size of 100 patients was determined through power analysis. Data were collected for weight, type of surgery, opioid prescribed, bowel regimen ordered, first documented stool postoperative, and resume date of enteral feeds.

Planning

A workgroup was formed that consisted of 2 physicians, a pharmacist, 2 nurses, and the nursing lead for the improvement project. The group established routine meetings throughout the planning and implementation phases of the project. As part of the planning phase, a preintervention survey was designed and distributed to all unit-based physicians, APPs, and RNs. Based on discipline, surveys assessed knowledge of opioid-induced constipation and current practices in the CICU.¹⁴ The results of the survey identified gaps in knowledge on proper utilization, determination of age-appropriate prophylactic agents, and occurrences of constipation related to opioid use post-cardiac surgery. The information obtained guided the development and effectiveness of education. All RNs were required to complete education as part of quarterly training. Physicians and APPs were presented education during a monthly faculty meeting. The information was also distributed via email as a reference for future use. All education was complete prior to any described interventions.

Interventions

In continuation, the workgroup developed an evidence-based bowel regimen for patients receiving opioid therapy.^{4,9,11} The regimen consisted of available agents in the organization and was categorized as either recommended or alternative (see Supplemental Digital Content Figure 1, available at: <http://links.lww.com/JNCQ/A938>). Subcategories divided the agents even further into age groups. Doing so aids the provider in selecting medications that are considered appropriate and safe for the patient.¹⁴ Collaboration with a hospital-

based information service representative led to the finalized evidence-based bowel regimen that was embedded into the existing CICU pain and sedation order set. Selecting a bowel regimen is not mandatory; however, if the provider chooses not to prescribe an agent, then a reason why must be acknowledged from one of the available contraindications.

The Bristol Stool Form Scale assessment tool was also integrated into the electronic documentation.^{6,12} This tool categorizes stool into 7 different types, with 1 described as hard lumps and 7 watery loose. Utilization can assist in determining the need for modifications in bowel regimens prescribed. Additionally, a supporting graphic of the scale was made accessible to the documenter in the electronic medical record to use as a reference. The purpose of selecting a standardized, validated assessment tool for the nurses was to create a common language among providers to discuss bowel patterns and identify risk of constipation.^{4,6,16}

Measures

The outcome-based performance measure consists of a reduction in constipation as an adverse effect of opioid therapy, as defined by the project. To determine this, a query of data was completed by manual review of the electronic medical records for 50 post-cardiac surgery patients admitted to the CICU. This review consisted of the same data extraction pre-intervention. Compliance with bowel regimen and stool assessment tool utilization was measured by the same method of manual chart review. Postintervention surveys consisting of questions assessing knowledge of the problem were redistributed to physicians, APPs, and nurses who previously participated in the preintervention survey. The results were compared to preintervention surveys to determine whether an increase in knowledge related to opioid-induced constipation was achieved.

Statistical analysis

Statistical significance was calculated using an independent sample *t* test with IBM SPSS Statistics for Windows, Version 25 (IBM Corp, Armonk, New York). With the primary outcome measure of constipation, the desired result of the test would demonstrate a significant reduction in mean postoperative days to first stool.

RESULTS

The incidence of postoperative constipation was found in 84% of the sample patients prior to any interventions. Average age was less than 18 months with a mean of 3.78 days to first stool after cardiac surgery. Use of a scheduled stool softener and/or gut motility agent in the setting of opioid therapy was found in only 38% of patients. Postinterventions, the incidence of constipation was found in 66% of the sample patients with an average age similar to those in the preintervention sample. The mean days to first stool after cardiac surgery in the postintervention group was 3.64. No statistical significance was found in the mean days to first stool when comparing the pre- to postintervention groups ($P = .74$). Despite the lack of statistical significance, a 57% increase in ordering a prophylactic bowel regimen and a 21.5% decrease in the incidence of constipation were noted in postoperative cardiac surgery patients (Table).

DISCUSSION

Summary

Due to the complexity of the patient, opioid-induced constipation is not always at the forefront of the care plan post-cardiac surgery. However, its impact can be substantial during

an inpatient stay or the cause of a return to the emergency department after discharge. Particularly in the critical care setting where the complexity of patient care may create oversight to potential adverse effects, like constipation, guidance for prophylactic measures and assessment are beneficial in prevention. Many options exist and unfamiliarity with appropriateness in use can create a barrier to proper utilization due to lack of knowledge and awareness of the problem.¹⁴ The results of this QI project were able to demonstrate an increase in bowel regimen prescribing when a decision tree is offered through a preexisting order set built into the electronic medical management system. Age-based criteria for the pediatric population should also be heavily considered in the success of compliance with ordering prophylactic agents, as this was identified as an area in which the provider was not confident in selecting, especially conjoined agents.

Additionally, developing a common language to communicate among providers using a validated assessment tool aided the bedside nurse in the discussion of bowel regimen management. Prior documentation of stool offered descriptors that could often be vague and loose significance in the lack of detail. As a result, the effort to potentially define adequate bowel motility was

Table. Pre- and Postintervention Data		
Data	Preinterventionn (%)	Postinterventionn (%)
Constipated ^a		
No	8 (16)	17 (34)
Yes	42 (84)	33 (66)
Name of opioid		
Continuous fentanyl	28 (56)	16 (56)
Continuous morphine	1 (2)	5 (2)
Morphine PCA	16 (32)	28 (32)
Other ^b	5 (10)	1 (2)
Scheduled or as needed		
None	13 (26)	11 (22)
Scheduled	19 (38)	27 (54)
As needed	16 (32)	6 (12)
Scheduled and as needed	2 (4%)	6 (12)
Total	50	50

Abbreviation: PCA, patient-controlled analgesia.

^aConstipated: 3 or more days without stool.

^bOther: hydromorphone, oxycodone, and hydrocodone.

often discarded due to translation into true understanding.

Limitations

The QI project had several limitations. Providers in the organization do not routinely use an *International Classification of Diseases (ICD)* code to diagnose constipation; therefore, in the CICU it was not clearly delineated and left subjective to chart documentation. Time constraints of the project did not allow for continued data collection to support desired improvement from interventions. The electronic health record system at the organization is so specialized that it is difficult to create changes. The system does not currently have a manner to document preadmission bowel patterns experienced by the patient.^{6,7,17} Therefore, an assumption must be made that the patient is constipated at the 3-day mark. Unfortunately, this makes it difficult to determine whether the patient's lack of bowel movement is due to opioid therapy or is routine for that patient. Six of the 50 patients postintervention did not have a bowel movement documented prior to discharge potentially resulting in an increased number of patients considered constipated due to missing documentation.

CONCLUSION

The incidence of constipation post-cardiac surgery remains a concern in both adult and pediatric populations. Although we were not able to show a significant reduction in incidence within the timeframe of this project, it did demonstrate that education and decision support through order sets, combined with assessment tools, can be helpful in increasing compliance with integration of a prophylactic bowel regimen. The described interventions focused on the pediatric population post-cardiac surgery, but we believe each can be translated to any inpatient populations to reduce constipation risk related to opioid therapy. Constipation can be a painful health issue, especially in the postoperative setting, more research on defining constipation needs to be developed for future QI efforts.

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