

# BEST PRACTICES CASE STUDIES

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# BEST PRACTICES CASE STUDIES





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# ACS Quality and Safety Conference Best Practices Case Studies

Through the Best Practices Case Studies, hospitals participating in ACS NSQIP, ACS NSQIP Pediatric, MBSAQIP, COT, and Cancer Programs are provided with an opportunity to share their expertise in implementing surgical quality improvement initiatives within their facilities. The overall goal is to showcase how participating hospitals have utilized programmatic data to improve their performance and outcomes. It is hoped that the Best Practices Case Studies publication will allow program participants to learn from the experience of others and develop similar quality improvement projects within their own organizations.

The idea to publish the Best Practice Case Studies originated through feedback from ACS NSQIP sites via the ACS NSQIP annual conference. Hospitals were looking for information on how to utilize ACS NSQIP data to improve their surgical care and outcomes. Hence, the Best Practices Case Studies initiative was created to provide program participants with examples of quality improvement projects, designed by hospitals and implemented within their own facilities.

The 2018 Best Practices Case Studies were selected from a bank of more than 400 abstracts submitted for the 2018 ACS Quality and Safety Conference. All abstracts were reviewed and vetted by a panel of program experts, and the authors of the studies chosen were asked to further develop their case study and share their accomplishments.

Each case study was developed by quality improvement professionals at participating hospitals (for example, Surgical Clinical Reviewers, Metabolic Surgical Clinical Reviewers, Surgeon Champions, data analysts, program directors, and so on) and describes the objectives and end results of the quality improvement effort, as well as the planning, development, and troubleshooting process.

# QUALITY & SAFETY PROGRAMS



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Each Best Practices Case Study includes:

- Description of the problem addressed
- Context of the quality improvement process
- Planning and development process
- Description of the activity
- Resources needed
- Results
- Tips for others

Quality improvement is not an exact science; however, these examples may serve as a starting point to assist others in developing their own quality improvement initiatives, as each case study provides details of the quality improvement effort that hospitals may envision at their own facility.

ACS NSQIP, ACS NSQIP Pediatric, MBSAQIP, COT, and Cancer Programs are continually looking for participant feedback on making our programs more beneficial to hospitals striving to meet surgical care goals.

Please contact us if you have comments or questions regarding these studies, or if you would like information on how to submit your own Best Practices Case Study for publication in the future.





■ BEAUMONT CHILDREN'S/BEAUMONT HEALTH

## Implementation of Pediatric Trauma Cervical Spine Clearance Pathway

## General Information

**1. Institution Name:** Beaumont Children's/Beaumont Health

**2. Submitter Name:** Jennifer Cirino, MD

**3. Name of the Case Study:**

Implementation of Pediatric Trauma Cervical Spine Clearance Pathway

## What Was Done?

### 1. Global Problem Addressed

Pediatric cervical spine (c-spine) injuries are rare events with an incidence of about 1 to 2 percent and potentially devastating consequences.<sup>1-3</sup> Differences exist in the incidence, characteristics, and severity of cervical spine injuries between adult and pediatric populations; however, pediatric patients are generally subjected to the same traumatic workup of their cervical spine as adult trauma patients.<sup>4</sup> Until recently, the cervical spine workup at many institutions, including ours, involved obtaining multiple cervical spine films and, often, a complete cervical spine computed tomography (CT) scan. Aggressive imaging in the pediatric patient population can be costly and can expose children to large amounts of radiation, exposing them to potential future malignancies.<sup>5</sup> Injuries cannot be missed, but patients at low risk for injury should not be subject to unnecessary radiation exposure early in their lives. An established algorithm for c-spine evaluation can help balance these conflicting ideals in clinical decision-making. Separate pathways for clearance of the pediatric cervical spine have been found to be effective and reduce radiation exposure.<sup>6-8</sup>

### 2. Identification of Local Problem

At our institution, no guideline was in place, and cervical spine clearance was non-uniform. The decision for imaging often depended on the practice of the physician(s) seeing the patient rather than predefined clinical criteria and risk stratification. Pediatric patients were generally evaluated by using the same workup used in adult patients and, quite often, imaging, including a CT scan was obtained.

## How Was the Quality Improvement (QI) Activity Put in Place?

### 1. Context of the QI Activity

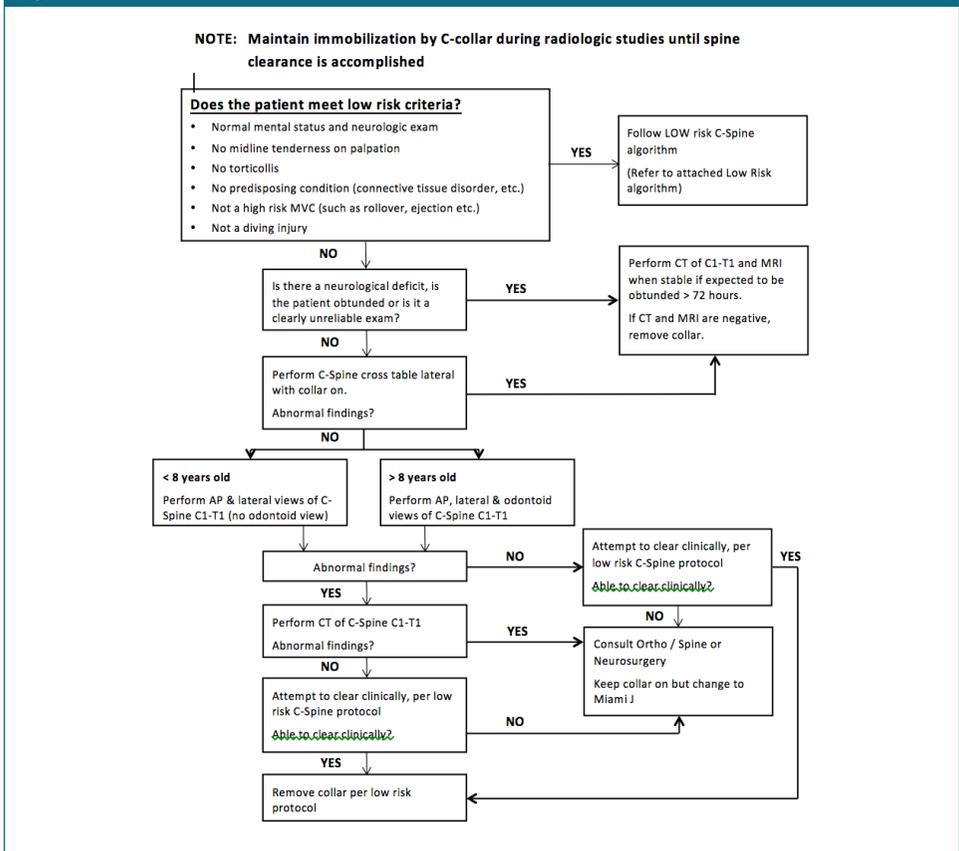
Beaumont Hospital Royal Oak is a 1,100-bed tertiary care and Level 1 adult trauma center in Royal Oak, MI. Beaumont Children's is a Level 2 pediatric trauma center within Beaumont Hospital's Royal Oak Campus. There are pediatric specialists on staff in the areas of pediatric surgery, pediatric emergency medicine, pediatric

orthopaedic surgery, pediatric neurosurgery, and pediatric radiology among multiple other subspecialties. Pediatric patients 12 and younger are managed by the pediatric surgery trauma team, and there are about 200 pediatric trauma admissions yearly.

## 2. Planning and Development Process

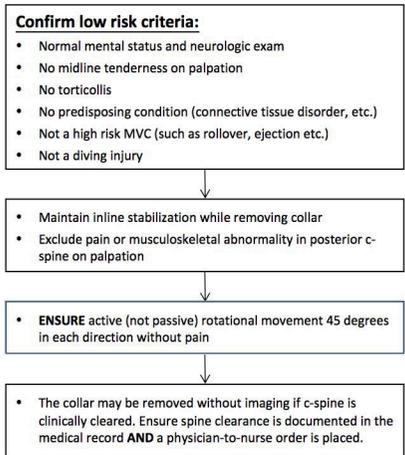
A multidisciplinary group that included pediatric trauma surgeons, pediatric emergency medicine physicians, pediatric orthopaedic spine surgeons, pediatric neurosurgeons, and pediatric radiologists developed the cervical spine clearance pathway through discussion and a thorough review of the literature and other available guidelines.<sup>6-7</sup> We first held multidisciplinary journal clubs to review characteristics of pediatric cervical spine injuries, including mechanisms of injury, imaging findings, and types of injuries.<sup>9-11</sup> These activities and reviews then led to development of algorithms for low-risk patients and high-risk patients by the pediatric trauma surgeons. These were then presented again to the entire group for review and approval. Once we obtained consensus from all these specialty groups, we then presented the pathway at our hospital’s medical executive board for final approval.

Figure 1.



**Figure 2.**

**NOTE: Revert to high risk guidelines if ANY of the following conditions are not clearly favorable**



## Description of the Quality Improvement Activity

Prior to implementation, the pediatric trauma surgeons provided detailed education of the pathway to the surgical and emergency medicine groups, as they are present during the initial trauma evaluation. This step included providing education to all trauma surgeons, general surgery residents, and pediatric emergency physicians and fellows. The information was provided during educational conferences, and digital copies of the pathway were widely distributed. It was also posted in the trauma bay for quick reference during trauma activations. Furthermore, the algorithm was strategically placed into our electronic medical records by inserting it into our history and physical templates, which allowed for documentation of the pathway's utilization by the evaluating trauma team.

### **Date when the QI activity was first implemented:**

We implemented the pathway in August 2016 and began collecting data in September 2016.<sup>12</sup>

## Resources Used and Skills Needed

1. Staff: The project required four pediatric trauma surgeons, eight pediatric emergency medicine physicians, approximately 36 general surgery residents, and six pediatric emergency medicine fellows.

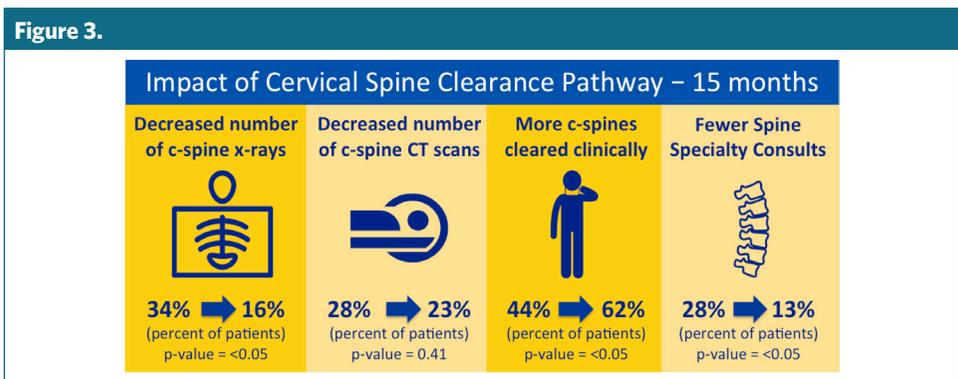
- Costs: There were no additional costs beyond the normal hospital operations to implement and maintain the project. There was no additional funding for this project.

## What Were the Results?

To evaluate the efficacy of our Cervical Spine Clearance Pathway (CSCP), we initially reviewed patient charts six months before and after implementation, and then again at 15 months before and after implementation. Statistical analysis was performed using  $\chi^2$  test, Fischer's exact test, and the Mann-Whitney U test. A p-value less than 0.05 was considered statistically significant.

At six months, there were 53 patients in our pre-implementation group and 30 patients in our post-implementation group. Patients treated using the CSCP received fewer c-spine radiographs (39.6% versus 6.7%, p-value < 0.05) despite higher injury severity scores (average ISS 4.0 versus 9.5, p-value < 0.05). Additionally, in the CSCP group there was a trend towards fewer CT scans and more patients were cleared clinically (20.8% versus 53.5%, p-value < 0.05). Overall, length of stay (LOS) also decreased (p-value < 0.05). Although LOS changes may have been statistically significant, we feel these are likely multifactorial and not clinically or cost significant. There were no missed injuries in either group.

We then looked at 15 months before and after pathway implementation. Our pre-implementation (n=119) and post-implementation (109) groups were similar when comparing age, sex, mechanism of injury, and injury severity score. Patients treated using the CSCP received fewer plain c-spine radiographs (34% versus 16%, p<0.05). In the CSCP group there was a trend towards fewer CT scans (28% versus 23%, p>0.05), more patients were cleared clinically (44% versus 62%, p<0.05), and fewer spine specialty consults were placed (28% versus 13%, p<0.05). There were again no missed injuries in either group.



## 1. Setbacks

One of the biggest challenges in this study was ensuring compliance with the CSCP. Several education sessions occurred with the surgical and emergency medicine residents and attending physicians, and the algorithm was widely distributed. However, initially, there was no way to tell for sure whether or not there was compliance with our pathway. Documentation of the markers for low-risk criteria that lead to being able to clear the patient's cervical spines clinically was lacking in the reviewed charts. Documentation of timing of clinical clearance was also lacking.

To address these barriers, we inserted the pathway into our trauma history and physical templates. This template acted as documentation of cervical spine evaluation and clearance. It also served as a reminder to use the clearance pathway, as there were specific questions that required input by the physician to complete the documentation. We also posted the pathway on the wall of our trauma bay in an attempt to remind physicians evaluating the patients to use the pathway.

Furthermore, some patients were transferred from outside hospitals that do not use or have access to our pathway. Many of these patients already came with imaging studies that may or may not have been performed had our pathway been used. Thus, patients who were transferred with cervical imaging already completed were not included in our data analysis.

## 2. Cost Savings

By decreasing the number of imaging studies obtained in these patients, there was a decrease in cost associated with evaluation of our patients at both intervals. When using cost data obtained from our imaging department, we were able to roughly calculate these cost savings. At six months, the number of c-spine X rays decreased from 30 to two, and the number of c-spine CT scans decreased from 24 to 13. When combining both imaging modalities, this represented a cost of \$2,325 before pathway implementation and \$865 after pathway implementation, which represents a 63 percent reduction in imaging cost.

At 15 months, there were 65 c-spine X rays and 33 c-spine CT scans performed prior to implementation and 28 c-spine X rays and 25 cervical CT scans after implementation. The total combined cost for X rays and CT scans was \$3,853 prior to implementation and \$2,332 after implementation, which represents approximately a 40 percent reduction in imaging cost.

## Tips for Others

### 1. Getting Started

Existing literature does support the use of pathways driven by clinical criteria when evaluating pediatric cervical spines.<sup>4,6-7</sup> Funding is not necessary, but multidisciplinary support is critical for development of a usable and accepted pathway. We recommend meetings of the various services involved in pediatric trauma care to review the existing literature and develop a pathway that works best for their institution. No universally used and validated set of guidelines for cervical spine evaluation exist for children, thus a pathway like ours can be developed or modifications of adult NEXUS criteria can be used. By including all groups in the development of the pathway, buy-in and adherence is more likely.

### 2. How to Sustain the Activity

Sustaining the activity is best done by making the pathway a consistent part of the initial trauma evaluation. By including it in our EMR documentation, we were able to clearly document utilization on every patient. We were also able to document reasons for deviation from the pathway (in other words, trauma transfers). Regular monitoring through IRB-approved reviews of charts and data collection can also show effectiveness and benefit, which should help maintain adherence and improvement moving forward. Finally, feedback during monthly trauma task force and QI meetings can help address any concerns or issues with the pathway.

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■ DUKE UNIVERSITY HOSPITAL

## A Multidisciplinary Approach Reduces Clostridium Difficile Infections in Adult Surgical Patients

## General Information

**1. Institution Name:** Duke University Hospital

**2. Submitter Name and Title:** Megan C. Turner, MD, General Surgery Resident, Regina Woody Performance Services, and Christopher R. Mantyh, MD, FACS, Professor of Surgery

**3. Name of the Case Study:**

A Multidisciplinary Approach Reduces Clostridium Difficile Infections in Adult Surgical Patients

## What Was Done?

### 1. Global Problem Addressed

Latrogenic Clostridium Difficile (CD) is a preventable infection leading to morbidity and mortality in the surgical patient.

CD can be used as a marker of surgical quality, and its prevention requires a multidisciplinary approach.<sup>1,2</sup>

### 2. Identification of Local Problem

Duke University Hospital was identified as a high outlier for CD in the 2017 ACS NSQIP Interim Semi-Annual Report for all cases (data from October 2015 to September 2016) and for general, vascular, and urologic cases (data from January 2016 to December 2016).

## How Was the Quality Improvement (QI) Activity Put in Place?

### 1. Context of the QI Activity

Duke University Hospital is a tertiary academic medical center with more than 900 beds. The surgical volume is 70,000 cases per year.

Following identification as a high outlier for CD, the department of surgery initiated a CD task force that included representation from surgeons, infectious disease specialists, pharmacy, and performance services.

Prior implementation of enhanced recovery protocols and surgical site infection prevention bundles had been successful in improving postoperative outcomes.<sup>3</sup>

This task force is not concurrent with any larger initiative.

A parallel initiative in infection control is in place to decrease perceived penicillin allergies through confirmatory skin testing.<sup>4</sup> This has been shown to decrease the use of antibiotics associated with CD.

## **2. Planning and Development Process**

Experts in CD prevention were identified as clinical champions and recruited for the task force.

- Surgeons
- Infectious Disease
- Pharmacy
- Administration
- Performance Services

Purpose of the CD task force:

- Analyze available data
  - ACS NSQIP CD occurrences July 2015–December 2016
  - NHSN CD rates
  - Institutional audits:
    - CD rates by ward
    - Antibiotic stewardship
    - Environmental cleaning
    - Hand hygiene
    - Personal protective equipment (PPE)
    - Testing/diagnostics
- Identify opportunities for improvement
- Implement strategies for reduction<sup>5</sup>
  - Collated from the literature by clinical champions
  - Proposals were presented to the group and decisions were made by consensus

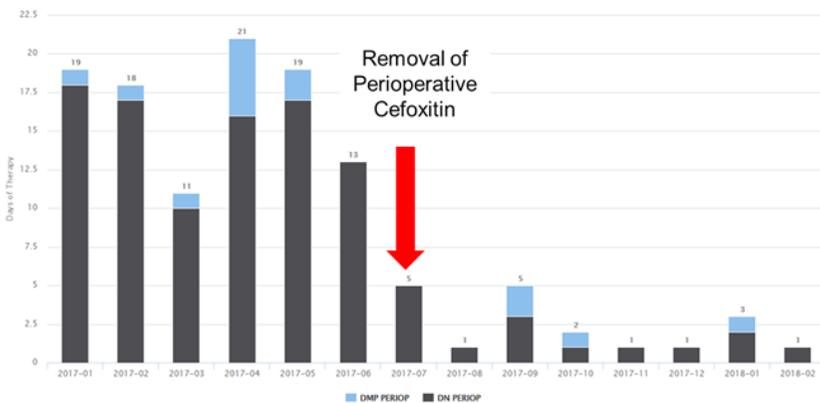
Protected time and financial incentives were not offered for this project.

## Description of the Quality Improvement Activity

Following three meetings of the task force, the following interventions were initiated:

1. Antibiotic Stewardship: Pharmacy, Infectious Disease, Technology Services, and Surgery
  - a. Two complex procedures, pancreatectomy and cystectomy, were identified as associated with non-guideline-adherent antibiotic practices and were high outliers for CD infection at our institution.
  - b. Electronic, evidence-based, perioperative antibiotic order sets were created
    - i. Consensus from Surgery, Infectious Disease, and Pharmacy
  - c. Electronic prescription defaults were implemented (Figure 1)
    - i. Cue prescribing physicians in real time to guideline-adherent antibiotic coverage and duration
  - d. Reduction in unnecessary fluoroquinolone exposure in the inpatient setting<sup>6</sup>

**Figure 1. Reduction in perioperative use of Cefoxitin following removal from preoperative order sets.**



DMP Periop: Duke Medical Pavilion Perioperative Unit. DN Periop: Duke North Perioperative Unit. These units represent the two bays of operating rooms used at our institution.

2. Environmental Cleaning: Surgery, Administration, Infection Control, Performance Services, Environmental Services<sup>7</sup>
  - a. Additional environmental service staff were requested through traditional hiring processes
  - b. Audits of the quality of terminal room cleans were implemented in 15 percent of rooms
  - c. Increased use of TRU-D<sup>®</sup>, an ultraviolet light disinfection system was implemented for all rooms with a known CD positive occupant (Figure 2)
    - i. Targeted unit use of TRU-D will include rooms on high-risk units once per month regardless of occupant CD status

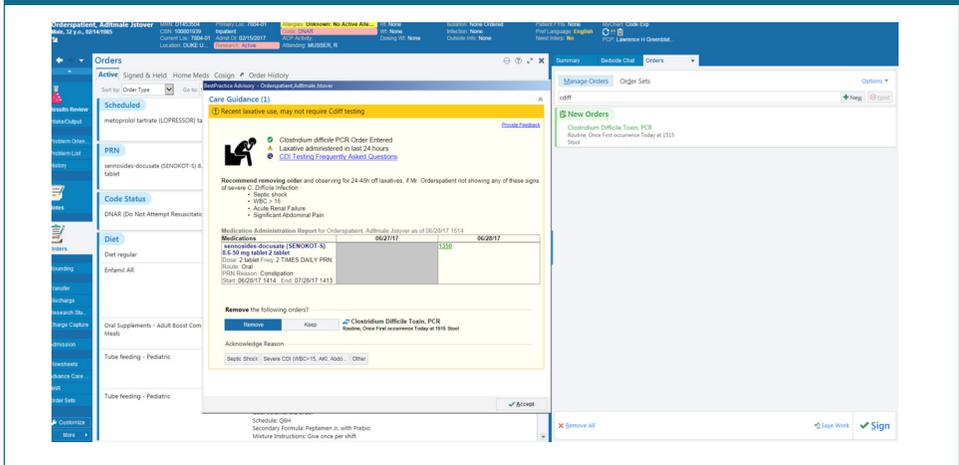
**Figure 2. Tru-D visualization of terminal room cleaning.**



3. Hand Hygiene: Soap and water handwashing is the best method of prevention of human to human transmission; Infection Control, Performance Services
  - a. Improved signage for enteric precautions, with instructions for soap and water hand hygiene, were made available on surgical wards
  - b. Auditing of hand hygiene is completed with in-person monitoring
    - i. Increased monitoring was established in high-risk CD areas
      1. Intensive care unit and surgical wards

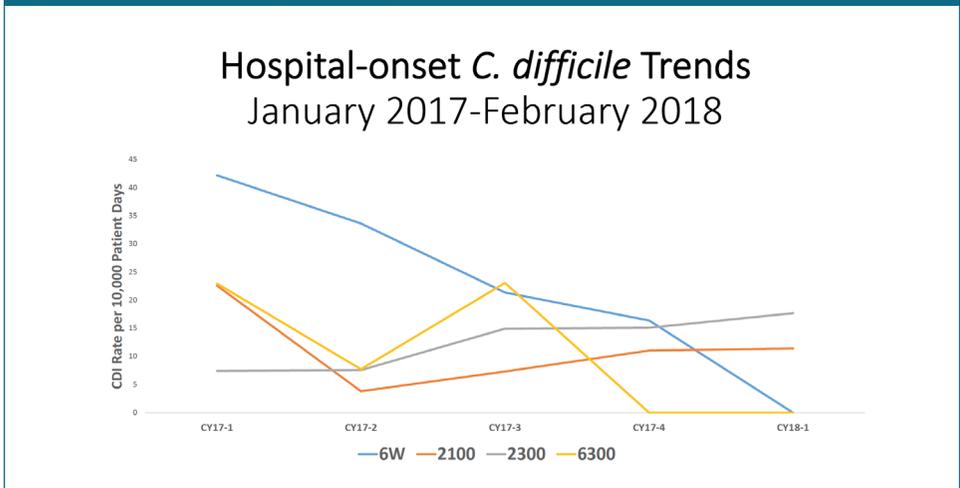
4. Personal Protective Equipment (PPE): Infection Control, Performance Services
  - a. Disposable gowns and gloves are made available outside CD patient rooms
  - b. Auditing of compliance by providers is done on high-risk units
5. Diagnostic Stewardship: Infectious Disease, Laboratory Services, Surgery, Technology Services
  - a. Prior to the intervention, all stool samples sent for diagnosis were tested with polymerase chain reaction (PCR)
  - b. Alternatives exist, including antigen and antibody testing
    - i. Our institution elected to continue a PCR-based diagnostic practice
    - ii. An electronic best practice advisory pop-up was established to reduce unindicated CD testing (Figure 3)
    - iii. The pop-up is triggered when a CD diagnostic test is ordered when the patient has been receiving laxatives

**Figure 3. Best practice advisory pop-up for CD diagnostic request in patients taking laxatives.**



6. Routine Data Feedback: Performance Services, Surgery
  - a. ACS NSQIP and NHSN CD infection reports
    - i. Disseminated to surgical division heads
  - b. Audit systems are in place:
    - i. Hand hygiene
    - ii. PPE use
    - iii. Quality of terminal room cleans.
  - c. These scores are disseminated to surgical and quality leadership
  - d. Performance services organizes data representation and visualization for improved interpretation and dissemination (Figure 4)

**Figure 4. Data feedback by unit from performance services disseminated to stakeholders.**



6W: Surgical Intensive Care Unit, 2100, 2300, 6300 surgical wards.

7. Education: Pharmacy, Surgery, Infectious Diseases, Performance Services
  - a. Surgical Grand Rounds, Urology Grand Rounds (Figures 5 and 6)
    - i. Surgeon champions, ACS NSQIP surgeon champion
    - ii. Infectious disease specialists
    - iii. Pharmacy
    - iv. Performance services

Figure 5. CD testing algorithm as presented to the surgical grand rounds.

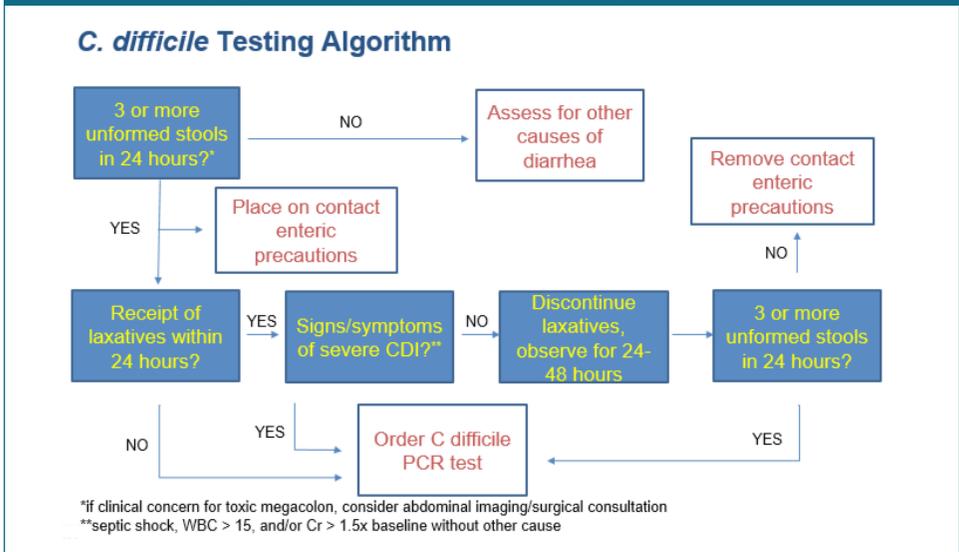


Figure 6. Antibiotic stewardship key points as presented during surgical grand rounds.

## Antibiotic Stewardship



1. Utilize cefazolin + metronidazole rather than Cefoxitin for intra-abdominal surgeries
2. Do not use antibiotics post closure for clean or clean- contaminated surgeries
3. Fluoroquinolone use is highly associated with CDI
  - Use should be avoided as much as possible

- b. The department of surgery grand rounds is attended by more than 100 members of the surgical staff.
- c. Urology grand rounds is attended by more than 30 members of the urology staff.

## Resources Used and Skills Needed

### 1. Staff:

Surgeon Champions

Christopher R. Mantyh, MD, surgical champion

Megan Turner, MD, data collection and analysis

Wendy Webster, MBA, data analysis

Infectious Disease and Infection Control

Becky Smith, MD, infectious disease expert

Rebekah Wrenn, PharmD, antibiotic expert

Kirk Huslage, MSPH, BSN, RN, data collection, infection control specialist

Performance Services

Regina Woody, RN, SCR data source and analysis

Task force members attend quarterly meetings and provide feedback to their respective divisions.

- ### 2. Costs:
- Costs incurred have been absorbed within the operations budget of each department. No additional funding has been used in this quality initiative.

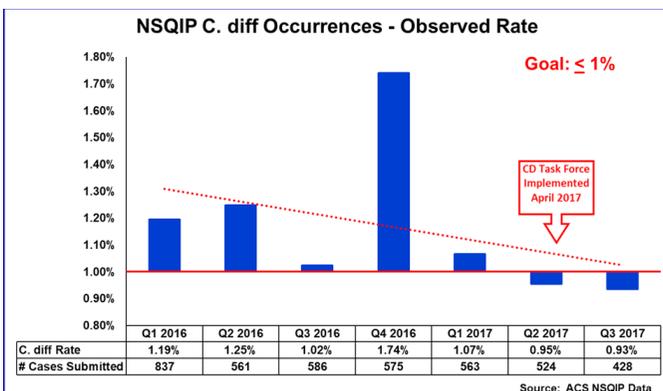
## What Were the Results?

### 1. Overall Results

The primary metric of success following the implementation of the quality initiative was the ACS NSQIP observed CD rate.

- Initial high-outlier status at 1.19 percent in October 2016
- Reduced to 0.93 percent in September 2017 (Figure 7)

**Figure 7. ACS NSQIP CD occurrences—Observed Rates.**



## Secondary Outcomes

- Decreased fluoroquinolones prescriptions and number of days of therapy by 9 percent
- Decreased CD testing for patients on laxatives from 23 percent prior to the BPA initiation to 7 percent
- 58 percent increase in terminally cleaned rooms with the TRU-D technology

## 2. Setbacks

Given the multidisciplinary nature of this quality initiative, several barriers occurred in implementation.

### Environmental Services

- Established contractual agreements
  - Limited flexibility with increasing staff numbers and hours as well as overall work distribution
  - Difficulty purchasing additional TRU-D® technology

### Microbiologic Laboratories

- Current policy is to not speciate mixed flora urine samples
- Unable to narrow antibiotic coverage
  - Specific barrier to antibiotic stewardship on urologic service
  - Ongoing conversations are being held between stakeholders to improve policies and support work flow

NHSN data is by default reported by admitting service.

- Transitioning to reporting formats by surgical ward, intensive care unit versus stepdown versus ward, has been essential to create a heat map of locations for targeted resource allocation

Next steps:

### Outpatient antibiotic use

- Monitoring
- Improving electronic defaults

### Creation of CD prevention dashboard

- Display quality measures in one electronic location
- With easy to interpret graphics

As with all quality initiative implementation projects, consistent feedback to stakeholders by champions is essential to maintain gains achieved over the last year.

Developing a pathway to sustainability includes automating data feedback, managing defaults to reflect current literature and practice patterns, and fostering innovation for adherence to established protocols.

### **3. Cost Savings**

Cost savings have not been a measured outcome for this quality initiative. Estimates based on the literature are available as described below; however, data specific to our institution were not collected.

- New diagnoses of CD are estimated to generate \$24,205 in costs in six months of follow-up<sup>8</sup>
- CD diagnosis is estimated by CMS to generate \$5,682–\$8,096 in non-chargeable costs<sup>1</sup>

Specific costs for antibiotics as well as cost savings are variable pending reimbursement metrics. The ultraviolet device costs are variable based on use within a study and total number of staff trained to use the device. The environmental services budgets are not publicly available.

## Tips for Others

- Identification of areas of improvement is important in creating and implementing targeted interventions for management of CD.
- Use of ACS NSQIP and NHSN metrics are essential.
- Institutional level data can provide increased granularity by which to direct interventions.
- Identify multidisciplinary champions by department and division with support from departmental leadership.
- Targeted feedback by division is essential for supporting changes in work flow, changes to defaults, and developing a culture of evidence-based medicine and guideline adherence.
- Data visualization services are instrumental in helping busy providers deficiencies and implementation success.
- Using these mechanisms, institutions can implement a CD reduction quality initiative to improve the care of the patients they serve.

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■ FRESNO HEART AND SURGICAL HOSPITAL

## Reduction of Opioid Use after Implementation of Enhanced Recovery after Bariatric Surgery (ERABS)

## General Information

**1. Institution Name:** Fresno Heart and Surgical Hospital

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**3. Name of the Case Study:**

Reduction of Opioid Use after Implementation of Enhanced Recovery after Bariatric Surgery (ERABS)

## What Was Done?

### 1. Global Problem Addressed

The rising use of opioid prescriptions to treat pain has led to significant chronic opioid use and abuse, which has led to significantly increased rates of morbidity and mortality, prompting concern at local, national, and global levels to enact measures to address this epidemic.<sup>1</sup>

In the last 20 years, prescribers using opioids to treat non-malignant pain has gradually increased. Using opioids routinely for postoperative pain management is common; however, opioid-related adverse events after surgery are costly to the hospital and potentially increase length of stay.<sup>2</sup>

However, exposure to narcotics in opioid-naïve patients has potential consequences. In one study recently published in *JAMA*, opioid-naïve patients undergoing a surgical procedure exposed to opioids postoperatively can have a significantly increased risk of developing chronic opioid use.<sup>3</sup>

Bariatric patients are especially at risk for developing opioid addiction, especially since bariatric patients have a higher incidence of chronic pain, depression, and potential for cross addiction after surgery leading to substance abuse. In a recent *JAMA* study, chronic opioid use after bariatric surgery was found to be 13 percent higher the first year after bariatric surgery and 18 percent higher three years after surgery. The study suggested that chronic pain management in bariatric patients needs a better multimodal regimen, as weight loss in chronic pain patients may not be directly correlated to amount of weight loss.<sup>4</sup>

Measures to initiate reduction of non-narcotic analgesic practices have been emerging to address this issue. Especially in postoperative patients, pathways have been developed to initiate pain control in preoperative phase.

Enhanced Recovery after Surgery (ERAS) or Enhanced Recovery Pathways (ERPs) after colorectal surgery has been well documented in literature to improve patient

outcomes, reduce length of stay, and reduce hospital costs.<sup>5</sup> These pathways focus on optimizing pain control, reducing narcotic use, facilitating early ambulation, and gastrointestinal recovery with early ambulation and oral intake.

Although the success and standardization of ERAS in colorectal surgery suggests this would be easily duplicated in other surgical disciplines, implementation of ERAS in bariatric surgery has not been as consistent and is relatively new to the field. Protocols vary widely among bariatric institutions in terms of perioperative and post-operative care. Defining ERAS can mean changing intraoperative measures such as routine placement of drains during surgery, or organizing specifically dedicated nursing floors for bariatric patients. The majority of the literature about ERAS in bariatric surgery (ERABS) focuses on length of stay with minimal complications.<sup>6-9</sup> This manuscript addresses the implementation of ERABS at a community hospital and reduction of opioid requirements after bariatric surgery.

## **2. Identification of Local Problem**

Opioid overdose rates in the Central Valley are found to be higher than California state averages, which prompted local community actions to address this epidemic. As our bariatric patients are followed long term after their operation, the concern within this higher-risk population to minimize opioid exposure and potential chronic opioid use was driving concern to develop an ERABS program to eventually become an opioid-free center after bariatric surgery. Prior to implementation of our ERABS protocol, almost all patients undergoing bariatric surgery required narcotics during their hospital stay and generally prescribed opioids for home after discharge.

## How Was the Quality Improvement (QI) Activity Put in Place?

### **1. Context of the QI Activity**

Fresno Heart and Surgical Hospital has been an accredited bariatric center since 2009 with Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) accreditation. Approximately 11,500 primary bariatric and revisional surgeries have been performed since 2006 to a majority of the Central Valley of California. Fresno Heart and Surgical Hospital is a relatively small specialty hospital with 57 inpatient and 12 intensive care unit beds and two primary service lines of bariatric and cardiac surgery. The hospital is ranked within the top 5 percent in the nation for patient experience.

At our facility, the length of stay after bariatric surgery is already below national average; therefore, we chose to implement best recommended practices of ERABS at our facility to decrease overall narcotic requirements. Additional motivations were to see if protocol could reduce number of hours in length of stay for higher bed turnover and decrease the percentage of postoperative bariatric patients who stayed greater than one midnight, and decrease already low readmission rates.

ERABS was the first ERAS protocol implemented within the hospital system with the hopes to expand these practices to other service lines and become a larger initiative.

## Description of the Quality Improvement Activity

### 1. Hospital and Staff Involvement

A critical component to the success of this QI initiative was staff buy-in and participation, which extended all the way from ancillary staff to the chief nursing officer and vice-president of the hospital. Without this global support, implementation of the program could not be successful. Success cannot rely solely on physician changes in protocols and order sets.

ERABS subcommittees were created to including nursing and ancillary staff from the bariatric office, preoperative, postoperative recovery, and medical surgical units, along with operating room staff, bariatric dieticians and psychologists, and pharmacy staff. These subcommittees would meet monthly, and representatives from each subcommittee would meet with physician champions from anesthesia and surgery departments. Review of current literature on ERABS and ERAS was discussed to develop best practices with consensus from staff. Hospital administration was also involved with data analysis to identify potential savings with decreased length of stay, tracking patient satisfaction scores, and analyzing the amount of narcotic use. Global involvement of each department in the project was key to buying into the protocol and staff training of pain management in each department. Generally, the training was spearheaded by nursing supervisors after developing a consensus on how to direct patient expectations and staff efforts to try adjunctive therapies for pain control. Particularly, emphasis of reassurance, ambulation, and other usage of non-narcotic medications to decrease anxiety and distinction of postoperative laparoscopic gas pain versus incisional pain was directed to staff in recovery and night shift staff on the medical surgical unit floors.

After multiple meetings, we implemented a four-week trial period with staff, gradually implementing changes in protocol to work with nursing medication schedule administration and pharmacy formularies. ERABS protocols were gradually developed, as depicted in Figure 1.

## **Preoperative Phase**

During the preoperative phase, patients are seen by the operating surgeon during the preoperative office visit, and a nurse provides specific instructions along with informational handouts emphasizing pain management and initiation of use of gabapentin and acetaminophen the night before and morning of the surgery.<sup>10</sup> A clear liquid diet was allowed up to two hours prior to surgery.

In preoperative holding, patients received the combination of medication decided on consensus from anesthesia and surgeons to decrease postoperative nausea and pain. Melatonin was administered to improve sleep and pain control, as seen in bariatric surgery case reports.<sup>11</sup>

## **Intraoperative Phase**

Prior to initiation of ERABS, injection of bupivacaine and Exparel<sup>®</sup>, liposomal bupivacaine, was being used routinely for either laparoscopic port site injection or transversus abdominus plane block. Anesthesia limited narcotic administration to less than 150 mcg of IV fentanyl. Otherwise, anesthesia administration protocol was per anesthesia provider.

Goal directed fluid therapy was emphasized. There was no routine administration of indwelling urinary catheters and intraoperative intraabdominal drain placements.

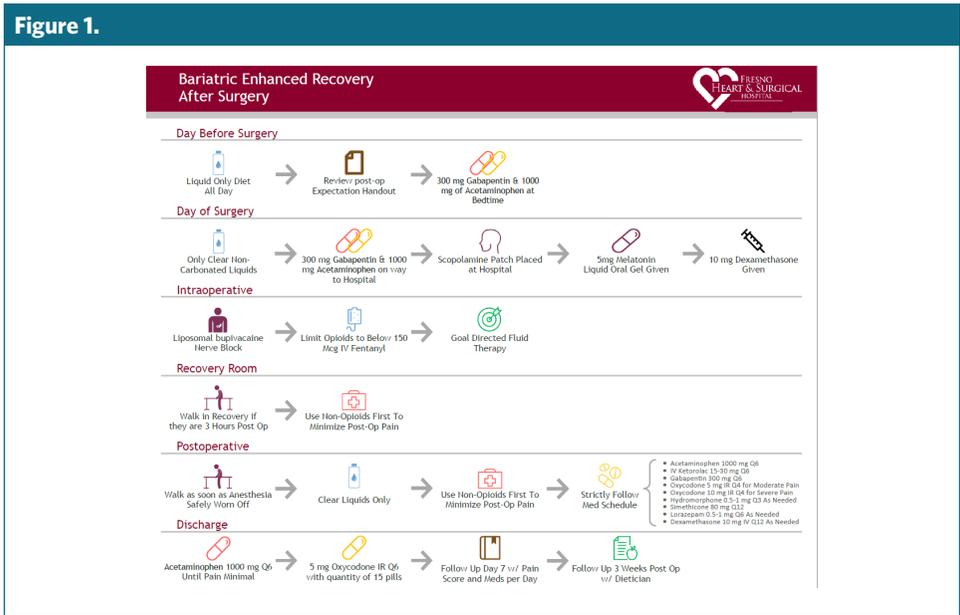
## **Recovery Phase**

Postoperative medications were ordered by anesthesiologists, with emphasis of early mobilization and adjunctive support measures for laparoscopic gas pain versus incisional pain.

## **Postoperative Phase**

Patients were admitted to the medical-surgical unit floor with bariatric-dedicated, surgery-trained nursing staff. Standardized protocols included early mobilization, scheduled non-narcotic oral and IV analgesics ordered, and as-needed medications for anxiety. Discharge criteria included adequate oral intake of liquids, pain and nausea control, dietician visit, and requirement of hospital/ bariatric educational videos on pain management and postoperative care. Follow-up is within one week of surgery at the bariatric surgeon's office, and a pain journal was provided to document daily pain assessment. At time of discharge, a printed card is given to each patient with his or information listed, type of operation, surgeon's name, and an emergency phone number for 24-hour access.

**Figure 1.**



**Date when the QI activity was first implemented:**

February 2017 with full initiation of ERABS protocol in July 2017.

**Resources Used and Skills Needed**

1. Staff: ERABS committee members included hospital administrators, bariatric surgeons, anesthesiologists, bariatric dieticians and psychologists, pharmacy, and nursing and ancillary staff from the bariatric office, preoperative units, postoperative recovery units, medical surgical units, and operating room. Approximately 24 committee members with three physician champions of surgeons and anesthesiologists and two administrative co-chairs were included.
2. Costs: No additional costs were required beyond normal hospital operations to implement and maintain the QI program.

## What Were the Results?

Retrospective review of patients who underwent laparoscopic primary bariatric surgeries of either Roux-en-Y gastric bypass or sleeve gastrectomy between June 2016 and October 2017.

Three groups were examined. The Control/Pre-Exparel group was defined as without any protocol changes. The Exparel group was without ERABS, just the addition of intraoperative injection of liposomal bupivacaine (Exparel). The ERABS/Exparel group used the implemented ERABS protocol. Postoperative course, narcotic use, and 30-day outcome rates were analyzed using a combination of t-test and Mann-Whitney U.

A total of 1,314 patients were analyzed. Table 1 describes the addition of Exparel without ERABS. Narcotic requirements were measured as morphine equivalent units (MEU). Overall MEU was decreased, patient experience improved, and pain level scores were better. With the addition of ERABS, a significantly greater response was found even when compared with the Control/Pre-Exparel group. Even the Exparel group showed a 60 percent reduction in narcotic use in the hospital, with more patients (10 percent versus 0 percent of patients in the Control/Pre-Exparel group,  $p < 0.05$ ) not requiring any narcotics postoperatively.

**Table 1.**

	PRE EXPAREL	EXPAREL	EXPAREL/ERAS	% Difference	t/z value	df	p-value
<b>PAIN LEVEL</b>							
Avg Pain Level Entering PACU	6.3	4.9	2.6	-58.73%	6.02	48	0.0000
Avg Pain Level Exiting PACU	4.3	4.4	3	-30.23%	2.78	42	0.0041
Avg Pain Level POD 1	2.7	2.7	1.6	-40.74%	2.39	44	0.0106
<b>LOS</b>							
Average LOS (Hours)	37.1	38.3	35.5	-4.31%	1.00	551	0.1583
Percent of Patients > 1 Midnight	21.30%	25.90%	15.96%	-25.07%	1.62		0.0524
<b>NARCOTIC ADMINISTRATION</b>							
AVERAGE MEU							
Total MEU's Intraop	11.24	16.13	9.36	-16.73%	1.02	30	0.1589
Total MEU's PACU	11.33	7.64	5.95	-47.48%	2.23	30	0.0167
Total MEU's Floor	36.04	17.05	8.36	-76.80%	4.25	30	0.0001
<b>TOTAL MEU's</b>	<b>58.61</b>	<b>40.82</b>	<b>23.67</b>	<b>-59.61%</b>	<b>4.64</b>	<b>30</b>	<b>0.0000</b>
<b>MEU per Day</b>	<b>40.26</b>	<b>25.58</b>	<b>16.00</b>	<b>-60.25%</b>	<b>4.33</b>	<b>30</b>	<b>0.0001</b>
% Pt's NO Narcotic in PACU	20.0%	19.6%	19.5%	-2.50%	0.06		0.4754
% Pt's NO Narcotic on Floor	0.0%	13.3%	45.7%	N/A	-4.64		0.0000
% Pt's NO Narcotic in PACU/Floor	0.0%	4.9%	10.2%	N/A	-1.83		0.0340
<b>PATIENT EXPERIENCE (HCAHPS)</b>							
How Well Pain Controlled	66.7	78.0	76.1	14.09%	-1.05		0.1467
Overall Hospital Rating	87.7	93.8	90.4	3.08%	-0.44		0.3309

Table 2 describes changes from in pain scores of one to 10, length of stay, and total narcotic requirements. Decreased readmission rates, reoperation rates within 30 day outcomes were also examined between groups in Table 3.

**Table 2.**

PAIN LEVEL	Control to Exparel			Exparel to Exparel/ERABS			Control to Exparel/ERABS		
	Avg Δ	Δ%	p-value	Avg Δ	Δ%	p-value	Avg Δ	Δ%	p-value
Avg Pain Level POD 1	0.00	0.00%	0.951	-1.1	-40.74%	0.000	-1.1	-40.74%	0.002
<b>LOS</b>									
Average LOS (Hours)	1.2	3.23%	0.140	-2.8	-7.31%	0.001	-1.6	-4.31%	0.115
<b>NARCOTIC ADMINISTRATION</b>									
TOTAL MEU's	-17.8	-30.35%	0.011	-17.2	-42.01%	0.000	-34.9	-59.61%	0.000
MEU per Day	-14.7	-36.47%	0.034	-9.6	-37.44%	0.000	-24.3	-60.25%	0.000

**Table 3.**

30 Day Outcomes	Control	Exparel	Exparel/ERABS	Control to Exparel		Exparel to Exparel/ERABS		Control to Exparel/ERABS	
	n=269	n=768	n=214	Δ%	p-value	Δ%	p-value	Δ%	p-value
Readmission Rate	7.06%	4.56%	1.90%	-2.51%	0.056	-2.66%	0.073	-5.16%	0.009
Reoperation Rate	2.60%	1.69%	0.63%	-0.91%	0.175	-1.06%	0.091	-1.97%	0.034
Complication Rate	5.58%	4.56%	3.80%	-1.02%	0.251	-0.76%	0.413	-1.78%	0.246

**1. Setbacks**

Barriers encountered during the QI activity implementation included initially getting patient acceptance for going narcotic free and addressing unrealistic pain expectations, as some patients wanted a pain score of 0 after surgery.

The initial cost of using Exparel was a concern for hospital administration. However, early results regarding outcomes, length of stay, reduction after the use of narcotic medication with discontinuation of patient controlled analgesics resulted in benefits outweighing the cost of drug administration. In addition, we are currently undergoing a randomized control trial looking at the use of Exparel versus bupivacaine intraoperative injection to see if there is a difference in postoperative pain control under ERABS.

Other revisions included working with nursing and pharmacy to ensure medications were given in a timely fashion and stocking medications in an automated medication dispensing system for ease of nursing access.

## 2. Cost Savings

At this time, calculations for cost savings are minimal for the hospital, as the slightly decreased length of stay and less readmissions/reoperations have yet to show the offset with use of Exparel. An additional benefit was the savings from discontinuing routine use of patient-controlled analgesia pumps.

## Tips for Others

A reduction in opioid use must have buy-in from not just the physicians and nursing staff but also from hospital administration. Changes in physician order sets and following a set protocol may not exact similar changes unless global support and champions from hospital departments are found. An open dialogue during monthly meetings with nursing, staff, and physician champions allows a smooth transition to ERABS. The support from the administration was key to empowering the nursing staff and pharmacists to go forward with ERABS with appropriate allocation of the pharmacy budget with use of Exparel. Hospital analysts are necessary to objectively show reduced narcotic usage, increased patient satisfaction scores, decreases in length of stay and readmission rates and, therefore, increased productivity from increased bed availability to allow more cases to be performed. The implementation and success of ERABS allowed further exploration of implementing similar ERAS protocols in other service lines.

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■ GOLISANO CHILDREN'S HOSPITAL

Successes Achieved and Lessons Learned from Participation in the American College of Surgeons National Surgical Quality Improvement Pediatric (ACS NSQIP-P) Appendectomy Pilot

## General Information

**1. Institution Name:** Golisano Children's Hospital

**2. Submitter Name and Title:** Kori Wolcott, BSN, RN, CPHQ

**3. Name of the Case Study:**

Successes Achieved and Lessons Learned from Participation in the American College of Surgeons National Surgical Quality Improvement Pediatric (ACS NSQIP-P) Appendectomy Pilot

## What Was Done?

### 1. Global Problem Addressed

Use of the computed tomography (CT) scan as a diagnostic step when acute appendicitis is suspected in children has generated several concerns.<sup>1,2</sup> The unwanted effect of radiation on future cancer risk is a particular concern in childhood, in part because exposure is cumulative and lifelong and in part due to the increased sensitivity of the young patient to ionizing radiation.<sup>1,2</sup> Other concerns about the CT scan include the common practices of administering oral contrast, which is both time-consuming to allow the contrast to reach the appendix and noxious to the patient who is suffering an acute gastrointestinal illness.<sup>1,2</sup> Also, the often-used intravenous contrast has risks, including allergic reaction and contrast-induced neuropathy.<sup>1,2</sup> Finally, sedation is sometimes required to obtain adequate images from pediatric patients, which further increases the risk of performing CT scan, especially in the setting of an acute gastrointestinal illness with the potential for aspiration of gastric contents.<sup>1,2</sup>

PICC for prolonged IV antibiotic administration can cause discomfort for children, is associated with higher costs, and exposes patients to the potential for catheter associated complications, including thrombosis, infection, or line breakage.<sup>3-5</sup> Extrapolation from evidence-based guidelines has suggested that in well-nourished patients older than one year, the risks associated with postoperative parenteral nutrition (PN) outweigh its benefits unless specific criteria have been met, including (1) the presence of gastrointestinal dysfunction preventing adequate oral or enteral intake of nutrients for longer than seven days and (2) a duration of PN therapy for longer than five days.<sup>6</sup>

### 2. Identification of Local Problem

Golisano Children's Hospital began participation in the American College of Surgeons (ACS) National Surgical Quality Improvement Program Pediatric (NSQIP-P) appendectomy pilot in December 2012. This pilot focused on resource utilization in the care of pediatric appendicitis patients. Through participation

in this pilot, we were identified as a high utilizer of preoperative CT scans and total parenteral nutrition (TPN). The first appendectomy pilot report released in July 2014 indicated that our CT utilization was 30 to 35 percent in comparison with the aggregate rate of 21.9 percent. TPN utilization was noted to be 60 percent in comparison with the aggregate rate of 19.1 percent. In December 2014, the second report was released; our PICC line utilization was 25 percent in comparison with the aggregate rate of 19.7 percent. Of note, our PICC line utilization was above the aggregate rate but was not a high outlier.

## How Was the Quality Improvement (QI) Activity Put in Place?

### **1. Context of the QI Activity**

Golisano Children's Hospital (GCH) is a 124-bed facility located in Rochester, NY. The hospital serves as the referral center for all seriously ill or injured children in the 17-county Finger Lakes regions. With more than 200 pediatric specialists, GCH has a spectrum of care that spans more than 40 specialty areas, which serve more than 85,000 children and their families each year. Approximately 21,300 surgeries per year are performed covering numerous subspecialties, including the only Western New York (WNY) center offering pediatric cardiac surgery. GCH also has the largest pediatric ICU in western and central New York, which averages 825 admissions per year.

In 2010, GCH began participating in ACS NSQIP-P as one of the beta sites. ACS NSQIP-P provides GCH with the ability to benchmark with other ACS NSQIP Pediatric hospitals and identify areas for quality improvement as well as network with participating hospitals to identify best practices.

As ACS NSQIP-P is our primary pediatric surgery benchmarking tool, a high CT and TPN utilization ranking in the ACS NSQIP-P appendectomy pilot was the motivation that drove our QI efforts to improve and standardize the care of pediatric patients undergoing appendectomies at GCH.

### **2. Planning and Development Process**

Key stakeholders (radiology, general surgery, pediatric surgery, quality professionals, and the emergency department) were identified, and the first meeting was scheduled. This meeting entailed review of the appendectomy pilot data as well as discussion regarding the importance of beginning a QI project to reduce CT utilization. During this meeting the group found that there were varying opinions and thoughts on who was ordering CTs and why CTs were being ordered. The follow-up meeting focused on retrospective analysis of appendectomy cases that were performed, and group agreement on the need

to develop an appendectomy pathway to standardize care of appendectomy patients. Of note, reduction of CT utilization was the main focus of this group. Although GCH has also demonstrated a decrease in TPN and PICC utilization in this study, neither of these areas were specifically targeted.

The appendectomy pathway GCH chose to adopt, modify, and utilize was the pathway in use at Intermountain Primary Children's Hospital.<sup>7</sup> The current appendectomy pathway utilized at GCH was modified to include obtaining ultrasound of ovaries when indicated on females older than 11, PAS and ultrasound scoring combined for total score, and whether to consider acute appendicitis, perforated appendicitis with abscess, or perforated appendicitis based on total score.

The radiologist reporting template was adopted from the template in use at Seattle Children's.<sup>8</sup> This template was also modified and included visualization of the appendix, size of appendix, compressibility, inflammatory change present, fluid present, hyperemia present, presence of lymph nodes, and abnormal bowel loops observed.

There was consensus among all practitioners involved to adopt the use of the modified appendectomy pathway, pediatric appendicitis and ultrasound scoring and radiologist reporting template.

## Description of the Quality Improvement Activity

The appendectomy pathway was developed based on evidence-based literature and included the pediatric appendicitis score (PAS) and the ultrasound score (USS). The PAS is a scoring tool that had already been developed and proven to be an effective tool for evaluating rule out appendicitis patients.<sup>9</sup> The USS tool was developed through the retrospective review of appendectomy patients and is scored based on secondary appendicitis signs visualized on ultrasound. The pathway was then sent out to the group for review and approval. Following approval of the pathway, a template for the ultrasound scoring was developed by radiology and implemented into the electronic medical record (EMR). This template provided a standardized tool for documentation of ultrasound reads and facilitated the scoring as well. Education was provided to emergency department (ED) staff, surgical residents, and radiology staff. The quality improvement professionals provided education to the ED staff and surgical residents, including in-person PowerPoint presentations and review of the pathway and scoring tool. The radiologist in the group provided education to the radiology staff via in-person review of the ultrasound scoring tool and communication via e-mail. The appendectomy pathway was then initiated in April 2016. Data were prospectively analyzed and education and feedback were provided to the group.

## Resources Used and Skills Needed

1. Staff: The preoperative appendectomy CT utilization work group consisted of 10 staff members, all of whom were identified as key stakeholders in this project. Participants of this group reviewed the appendectomy pilot and retrospective appendectomy data during meetings and regular business hours. Quality improvement professionals, pediatric surgery, general surgery, and ED providers were key stakeholders in implementing the preoperative appendectomy pathway and scoring tool.
2. Costs: No costs beyond normal hospital operations were necessary. Value analysis approval was not required for any portion of this project. No additional funding was utilized.

## What Were the Results?

Comparing the pre-pathway phase (2014–2015) with the post-pathway phase (2016–November 2017), there was a 43 percent reduction in preoperative CT utilization in the post-appendectomy pathway phase. There was a decrease in peripherally inserted central catheter (PICC, 36%) and total parenteral nutrition (TPN, 54%) utilization after implementing our appendectomy pathway. Both CT and TPN utilization reductions were statistically significant with a p-value < 0.05. These reductions are equivalent to a cost savings of \$62,317 (Table 1).

Results were measured by utilizing and retrospectively reviewing appendectomy data found for the specified time period (2014–November 2017) in the Case Details and Custom Fields Reports found on the ACS NSQIP-P database as well as prospective case-by-case review performed by the pediatric general surgery quality assurance liaison. Aggregate rates provided in the appendectomy pilot reports were used for benchmarking and measuring success of the appendectomy pathway in reducing preoperative CT utilization.

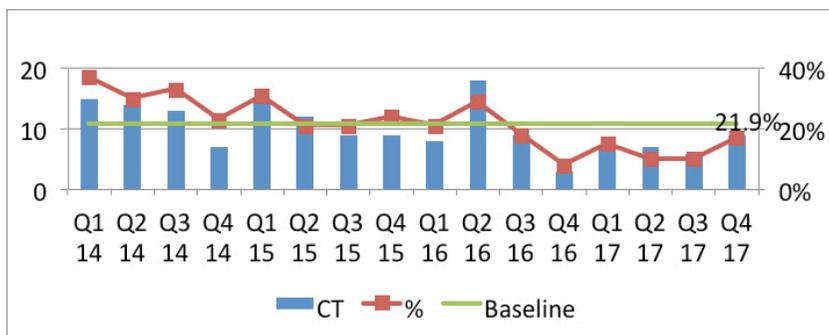
As mentioned previously, CT utilization reduction was the primary goal of the appendectomy pathway. However, in analyzing the appendectomy data for this project, we also noted a decrease in PICC and TPN utilization. As providers at GCH provide evidence-based care to patients, it can be speculated that the decrease in PICC and TPN utilization during this project may be attributed to this. Current literature supports transitioning patients from IV to oral antibiotics prior to discharge, which is the current practice at GCH, may have attributed to the decrease in PICC utilization as well as the decrease in TPN utilization.<sup>10</sup> Length of stay (LOS) in appendectomy patients has also decreased at GCH, which may also be attributed to the reduced resource utilization.

**Table 1. Appendectomy outcomes and cost analysis.**

	Pre	Post	% Reduction	p-value	Estimated Cost per Occurrence (\$)	Cost Savings (\$)
<b>CT in appendectomy</b>						
Case volume, n	340	425				
Occurrences, n (%)	94 (27.6)	67 (15.8)	43%	<0.001*	\$1,675	45,225
<b>PICC Utilization</b>						
Case volume, n	340	425				
Occurrences, n (%)	17 (5.0)	14 (3.2)	36%	0.270	\$2,172	6,516
<b>TPN Utilization</b>						
Case volume, n	340	425				
Occurrences, n (%)	18 (5.2)	10 (2.4)	54%	0.034*	\$1,322	10,576

Statistical significance (p-value < 0.05) is noted with \*

**Figure 1. Preoperative CT utilization.**



**1. Setbacks**

- Belief that decreased CT utilization would lead to increased negative appendectomy rate.
  - Solution to barrier: Negative appendectomy rates were tracked prospectively along with CT utilization data. The data were then presented to all group members utilizing a dashboard/run chart. Of note, not only did the negative appendectomy rate not increase, but at times it decreased and remained well below the average.

- Disbelief that the appendectomy scoring tool would accurately predict appendicitis.
  - Solution to barrier: Retrospective data analysis of CT utilization, scoring, and pathology was completed and provided to group members. The data demonstrated that the majority of patients with a score of seven or greater had appendicitis, which was confirmed with pathology and did not require a CT.
- Performance of initial scoring was completed on paper, which led to variation in score documentation in the EMR and made auditing the process challenging.
  - Solution to barrier: PAS and ultrasound scoring were incorporated into the pediatric surgery history and physical template in the EMR. This led to increased compliance with documentation of scoring as well as improved ability to audit accuracy of scoring.
- Prior to the initiation of the appendectomy pathway, there were other ultrasound templates in use. Some of these templates continued to be utilized following the implementation of the pathway, which made auditing the data challenging.
  - Solution to barrier: The radiologist re-educated the radiology staff via face-to-face and e-mail reminders, which led to increased use of the appendectomy pathway ultrasound scoring tool.
- Currently, there have been no revisions to the original QI plan due to limitations encountered in the process.

## 2. Cost Savings

- Determining the amount invested in this project would be challenging, as it would involve analysis of the salaries of each individual group member and time spent by each on the project as well as the amount invested in the ACS NSQIP-P and the Surgical Clinical Reviewer who reviews and enters all of the data.
- The following are cost savings per case:
  - i. CT = \$1,675/case
  - ii. PICC= \$2,172/case
  - iii. TPN= \$1,322/case

Total savings for this project was \$62,317.

## Tips for Others

1. Always include the key stakeholders in a project. If you are unsure who the key stakeholders are, it may be helpful to reach out to administration. This may be the head of the quality department, surgeon champion, or chief of surgery. When organizing the first meeting, provide clear information (why would you like to organize a meeting, what is the importance of the meeting, and so on). Be prepared. Know your data and why it is relevant. Agendas and meeting minutes are highly recommended, as this allows group members to reference the information and know what to expect for the next meeting. Incorporate data into the EMR that will require auditing.
2. Encourage all group members to participate. Establish an environment that encourages feedback and constructive criticism. Once the project has been initiated, regular feedback is necessary to monitor progress and determine the need for process changes if goals are not being achieved. Share accomplishments with the group and thank them for their involvement. Once the process is established, further meetings and updates can be done on an as needed basis. It is the responsibility of the group to determine how long the meetings should continue and how long data should be collected, analyzed, and shared. For this particular project, two meetings were organized at the beginning of the process. Feedback to all involved continues, as variation in the scoring between the ED staff, surgical residents, and the pediatric surgery quality assurance liaison continues.
3. Standardization of care improves outcomes and decreases resource utilization.

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■ HENRY FORD ALLEGIANCE HEALTH

## Low-Dose Lung Screen Impact on Patient Care and System Financial Vitality

## General Information

**1. Institution Name:** Henry Ford Allegiance Health

**2. Submitter Name and Title:** Karen Yacobucci, Executive Director

**3. Name of the Case Study:**

Low-Dose Lung Screen Impact on Patient Care and System Financial Vitality

## What Was Done?

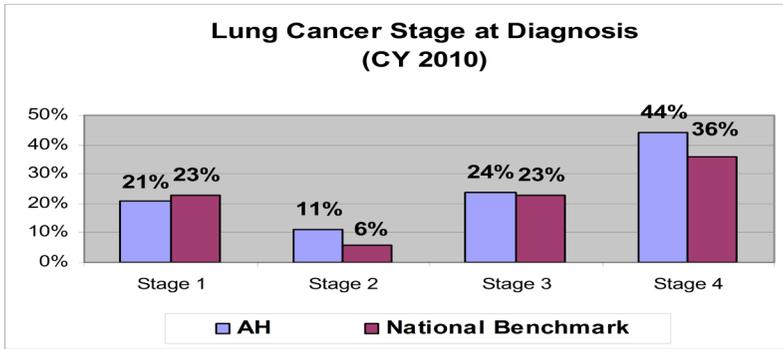
### 1. Global Problem Addressed

Lung cancer is the leading cause of cancer-related deaths in the U.S. The signs and symptoms of lung cancer do not usually appear until the disease has reached late stages and is often incurable. Smoking is the number one risk factor for lung cancer according to the Centers for Disease Control and Prevention (CDC). In the U.S., cigarette smoking is associated with 80 to 90 percent of lung cancers. According to the National Comprehensive Cancer Network (NCCN), cancer screening can help detect lung cancer at an early stage when it is more likely to be cured. Low-dose computed tomography (LDCT) is the only screening test proven to reduce the number of lung cancer-related deaths.

### 2. Identification of Local Problem

Henry Ford Allegiance Health decided to launch a lung cancer-screening program in 2014 based on the recommendation of our Thoracic Disease Site Team (DST), which identified the community need for a lung-screening program. The Thoracic DST team is a physician-administrator co-led committee composed of a multidisciplinary team that oversees the strategy, quality, patient satisfaction, financial vitality, and community outreach for thoracic cancer patients in our service area. The purpose of the team is to achieve our system's vision related to thoracic patient care by facilitating collaboration of subject matter experts. The initial goals were to increase the identification of lower-stage lung cancer and to decrease the mortality of lung cancer in the community. In 2010, 44 percent of the lung cancers identified were diagnosed at Stage IV, according to the Cancer Registry. In addition, the smoking rate for Jackson County was 29.8 percent, with communities such as the city of Jackson being as high as 35 percent. The high smoking rate coupled with the high percentage of patients being diagnosed in late stages of cancer confirmed the need for a lung-screening program in our community. Late-stage diagnoses often lead to poor outcomes and, in many cases, death; therefore, it was imperative for Henry Ford Allegiance Health to address the health concerns of our community.

**Table 1.**



## How Was the Quality Improvement (QI) Activity Put in Place?

### 1. Context of the QI Activity

Henry Ford Allegiance Health (HFAH) is a 475-bed health system in Jackson, MI. It is one of six hospitals in the Henry Ford Health System (HFHS) headquartered in Detroit, MI. It is comprised of more than 40 different facilities and reaches residents in the counties of Jackson, Hillsdale, Branch, Lenawee, Ingham, Calhoun, Washtenaw, and beyond. Henry Ford Allegiance Health is committed to long-term lung health in our community. We are proud to be designated as a Lung Screening Center of Excellence by the Lung Cancer Alliance. With this designation, the Lung Cancer Alliance recognizes Henry Ford Allegiance Health's ongoing commitment to responsible, high quality screening practices. The American College of Surgeons' Commission on Cancer (CoC) has designated Henry Ford Allegiance Health as an accredited cancer center. These distinctions are granted only to those facilities that have voluntarily committed to provide the best in cancer diagnosis and treatment and are able to comply with established CoC standards.

### 2. Planning and Development Process

Our Thoracic DST was established in 2009. This team includes physicians and leadership from the following areas: medical oncology, pathology, pulmonology, radiology, radiation oncology, and thoracic surgery. The team closely reviewed the literature on lung screening and was responsible for outlining the program standards, utilizing best practices and guidelines from the American College of Radiology (ACR), the Advisory Board, the Centers for Medicaid and Medicare (CMS), and the NCCN. A project management algorithm was completed outlining responsibilities and timelines for key tasks that needed to be implemented, including but not limited to process flow, qualifying criteria,

costs, compliance, education, staffing, and marketing. A sub-committee of the Thoracic DST met offline to ensure progress through the work plan. This team included representatives from each area that would be impacted by the program. Buy-in from key stakeholders was relatively easy, as each area had a representative at the Thoracic DST/sub-committee meetings and had a voice in the decision-making process. Physician and staff education prior to the program launch was vital. Numerous multi-faceted educational efforts were deployed to ensure that stakeholders and staff throughout the system were informed on the vision, patient indications, and overall program goals. These included articles in the medical staff and employee newsletters, direct education to physicians and staff, huddles, and quality outcome reviews with the executive team and board of trustees. Following the launch of the lung-screening program, the Thoracic DST continued its responsibility to monitor quality measures and aid in resolution for areas of opportunity.

## Description of the Quality Improvement Activity

Benchmarking for the quality indicators for the lung-screening program was determined by utilizing the ACR's National Radiology Data Registry (NRDR), NCCN Guidelines, and Medicare Local Coverage Determination criteria. A team comprised of members from multiple areas, including business management, finance, medical oncology, nursing, patient experience, quality, radiology, and radiation oncology worked to design and populate specific quality and finance metrics to include in the Thoracic Disease Site Team's overall balanced scorecard. This scorecard continues to be reviewed at every Thoracic DST meeting for continued monitoring of program financial vitality, patient satisfaction, quality, and learning and innovation. The areas tracked on the scorecard for the lung-screening program include, but are not limited to, the following quality indicators:

- Lung screening appropriateness
- Lung rad category—total number, percent of the population, and percent at highest risk
- Smoking status and cessation
- Lung screening findings—tracking of incidental findings, lung cancer findings, and other cancer diagnosis findings
- Lung cancer detection rate
- Lung cancer stage at diagnosis—total number and percent

As areas of opportunity arise, the Thoracic DST provides guidance for action planning and monitors the progress. These items remain under review as long as the committee deems appropriate.

## Resources Used and Skills Needed

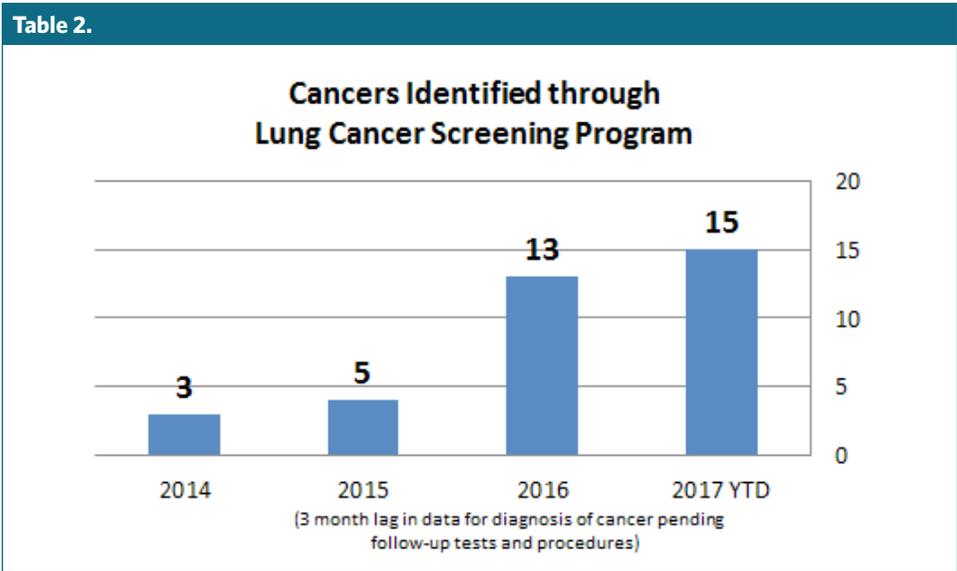
1. Staff: Henry Ford Allegiance Health's Lung Cancer Screening Program is a patient-centered model. Our dedicated team includes a lung nodule navigator, dedicated radiologist, thoracic surgeon, tobacco cessation counselor, service line scheduler, and our radiology department. It was crucial to have the backing and support of the Thoracic DST in order to ensure engagement of all the areas impacted within and outside of the health system.
2. Costs: Investment in the dedicated support of a lung nodule navigator was a critical piece in the program's success. During the program's development phase, an oncology-certified nurse completed research and gathered best practices for the team's discussion. She also researched and implemented key regulatory and program components to ensure that the methodologies being deployed were based on sound generally acceptable practices.
3. Funding: Recognizing the passion of the Thoracic DST co-leadership and believing in the efficacy of the concept, the Jackson-based Tony Open Fundraiser generously donated \$31,000 to Henry Ford Allegiance Health for the lung cancer-screening program in 2014. This support enabled our cancer program to provide 164 free screenings. On October 2, 2015, Medicare and private payors began covering low-dose lung screenings and a reimbursement model was adopted, causing the program to expand to meet a greater need in the community. In January 2017, Medicare decreased their payment by 46 percent; however, private commercial payors increased their reimbursement, leading to a sustainable program.

## What Were the Results?

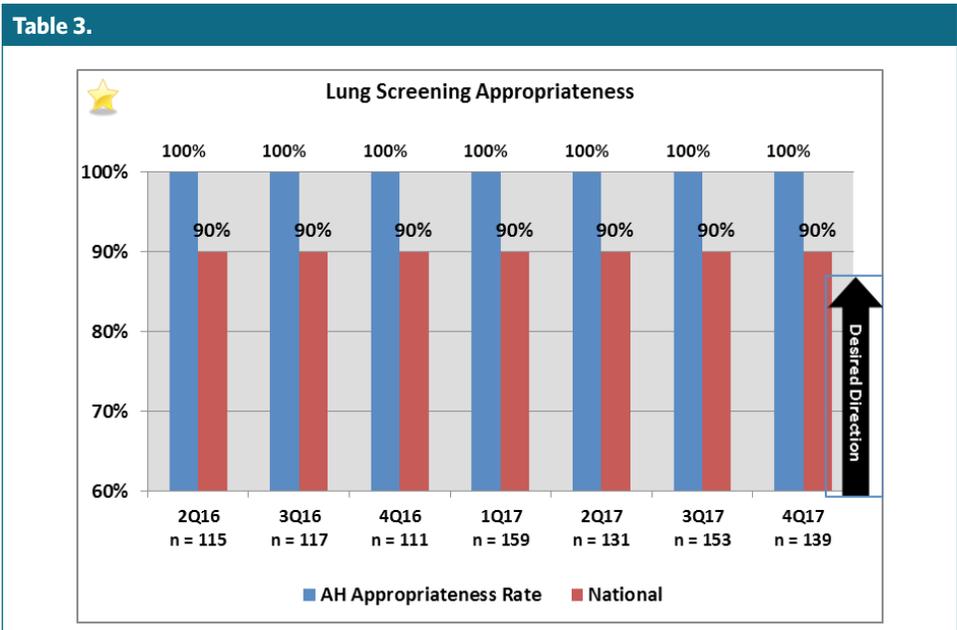
Since initiating the lung-screening program and as of December 31, 2017, there have been 1,228 screenings, resulting in a diagnosis of 36 cancers, 30 of which were lung cancer. The 2017 national lung cancer detection rate according to the Lung Cancer Screening Registry was 1.9 percent.\* Our cumulative detection rate was 2.9 percent. Screening volumes have shown growth from 220 screenings in CY15 to 582 screenings in CY17. Henry Ford Allegiance Health has consistently met the lung screening appropriateness criteria based on a rigorous education of providers, a review process of referrals, and a user-friendly referral form and process. The Lung Rad Category 4 at screening has decreased from 67 percent in 2015 to 9.1 percent in 2017. Smoking cessation counseling at the time of screening has been an effective addition to our program. The quit rate for patients

who had a negative screening has increased from 8 percent of patients in 2016 to 14 percent of patients in 2017. The overall quit rate for all screening patients also increased from 13 percent in 2016 to 15 percent in 2017. Program outreach resulted in the following distribution of physician referrals: 29 percent employed, 34 percent pulmonary clinic, and 37 percent independent in 2017. The overall downstream net revenue for 2016 was \$3 million, suggesting that introduction to the system resulted in fuller health system loyalty.

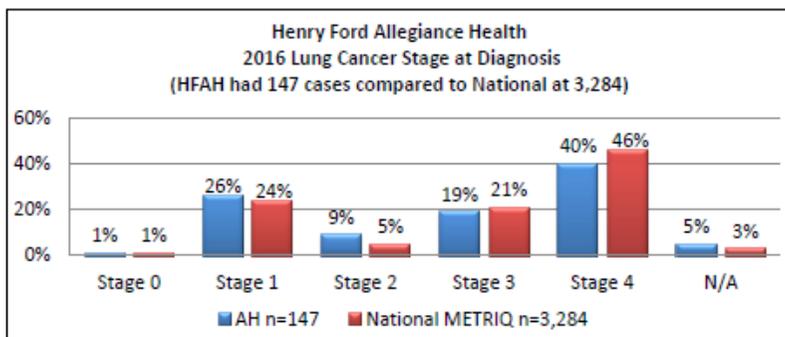
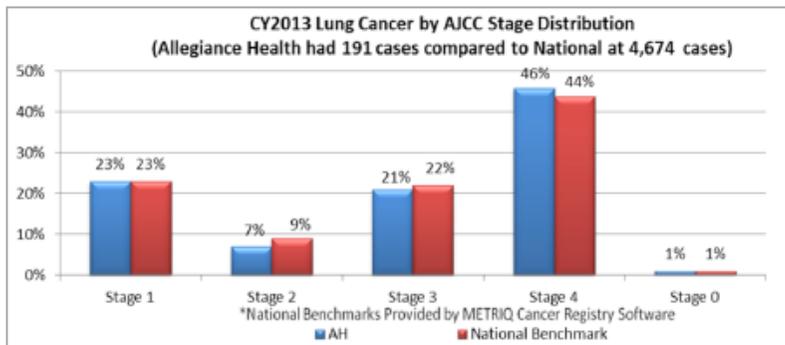
**Table 2.**



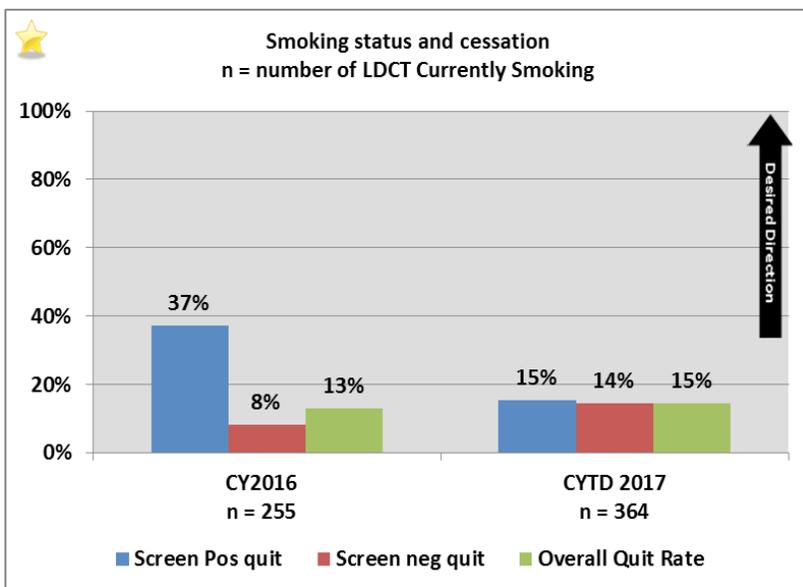
**Table 3.**



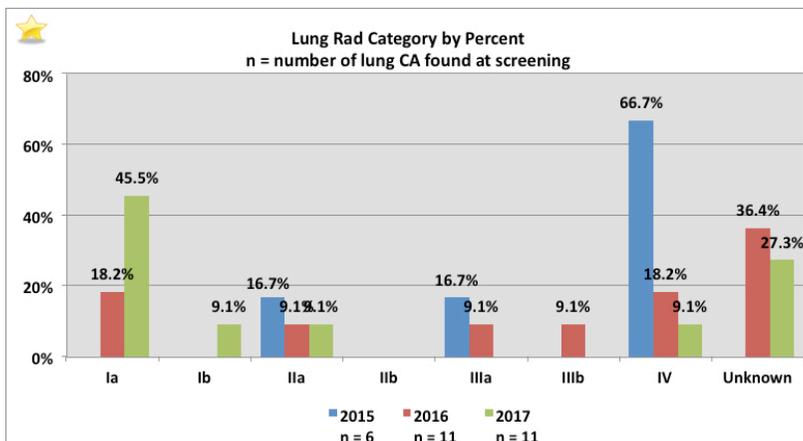
**Table 4.**



**Table 5.**



**Table 6.**

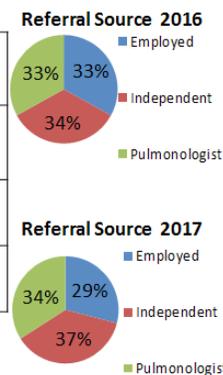


**Table 7.**

## Lung Referral Sources

Year	Total	Diagnosed Cancers*	Employed Physicians	Pulmonary Clinic	Independent and Out of Area
2016	436	13	142	145	149
2017	582	15	172	197	213

\* 3 month lag in data for diagnosis of cancer pending follow-up tests and procedures.



### 1. Setbacks/Response

- The primary barrier encountered during the QI activity implementation was the lack of funding. This was a challenge for the providers and the community.
- Solutions to barriers were sought through board of trustees education and philanthropy until the screening was covered by Medicare and commercial insurance companies. Advocacy efforts were deployed as available to support the coverage of the screen by Medicare and commercial payors.
- There were no revisions in the original QI plan due to limitations encountered during the process.

## 2. Cost Savings

The net revenue for screenings in 2016 was \$118,000. The overall downstream net revenue for 2016 was \$3 million, suggesting that introduction to the system resulted in fuller health system loyalty.

## Tips for Others

To successfully launch a lung-screening program:

- At least one to two physician champions need to be recruited and empowered to work with the oncology administrator. The alignment of the medical and administrative dyad is critical to ensure all aspects of the program are addressed.
- Detailed project management ensures all the critical pieces are identified and tracked during the program development, launch and post-launch periods.
- NCCN compliance, appropriate ACR accreditation, and Medicare local coverage determination requirements are essential for a successful program. Hardwiring these checkpoints is critical.
- Starting with a small population sample size is helpful in working out the system barriers.
- Blocking time for scheduling these patients in collaboration with radiology is essential.
- A strong preauthorization process improves efficiency and effectiveness.
- Applying for Lung Screening Center of Excellence designation through the Lung Cancer Alliance provides a framework of sound objectives to work toward a strong program.
- Sharing early results and celebrating progress ensures that the momentum of the team's commitment to the program objectives remain strong.
- Hardwiring the Lung Screening Program evaluation into standing meetings of the Thoracic DST, senior executive, and board meetings provides the opportunity to highlight the strong impact the program makes on the community.
- Monthly monitoring and an effective standardized tracking mechanism for new screening patients and returning screening patients enable the program to run efficiently.
- Ongoing education on appropriate referral through EPIC or paper processes assists the health care providers in being advocates for lung cancer screening.

## Reference

1. National Radiology Data Registry (2017) - *Lung Cancer Detection Rate* (American College of Radiology)



■ LEVINE CHILDREN'S HOSPITAL

Fast-Track Pathway for Non-Complicated Pediatric Appendicitis Utilizing a Single Dedicated Pre- and Postoperative Unit

## General Information

**1. Institution Name:** Levine Children's Hospital

**2. Submitter Names and Titles:** Angela M. Kao, MD

**3. Name of the Case Study:**

Fast-Track Pathway for Non-Complicated Pediatric Appendicitis Utilizing a Single Dedicated Pre- and Postoperative Unit

## What Was Done?

### 1. Global Problem Addressed

Acute appendicitis is the most common surgical indication in the pediatric population, yet there remains wide variability in its perioperative management.<sup>1</sup> Analysis of such variations in surgical management has introduced opportunities for quality improvement through standardization of care. Numerous studies have shown initiation of standardized protocols has led to more efficient resource utilization and decreased in-hospital costs, and compared with traditional practices, use of enhanced recovery after surgery (ERAS) has been shown to reduce recovery time by as much as 30 percent.<sup>2,3</sup>

Although enhanced recovery after surgery has been well-published in the adult literature, multidisciplinary fast-track protocols in pediatric surgery have been slow to generate the same enthusiasm. Recently, studies have demonstrated the feasibility of same day discharge (<24 hours) following laparoscopic appendectomy in children with non-complicated appendicitis.<sup>4-7</sup> However, few pediatric studies have utilized a standardized protocol that is comprehensive and adopts components from ERAS bundle described in the adult population.<sup>8</sup> This quality improvement initiative developed an enhanced recovery protocol for non-complicated pediatric appendicitis that was comprehensive (preoperative, intraoperative, postoperative) and took advantage of a dedicated recovery unit. Our goal was to provide a framework for implementation of a multidisciplinary standardized pathway.

### 2. Identification of Local Problem

Prior to implementation of our quality improvement initiative, there was no standardized perioperative management for appendicitis at our institution, leading to a wide range of hospital and postop length of stay (LOS). Preoperative antibiotics were based on provider preference while postoperative pain regimens, time to mobilization, and initiation of enteral nutrition were widely nurse driven. Beginning with a common pediatric surgical diagnosis, our goal was to create a

standardized perioperative pathway that would reduce interprovider variability, increase compliance with high-quality and evidence-based practices, and ultimately reduce patients' length of stay.

## How Was the Quality Improvement (QI) Activity Put in Place?

### **1. Context of the QI Activity**

Levine Children's Hospital (LCH) is a 235-bed children's hospital in Charlotte, NC, that is affiliated with Atrium Health. As the largest pediatric hospital between Washington and Atlanta and the only pediatric Level 1 trauma center in the region, it serves as the tertiary referral center for pediatric care in North Carolina. In 2017, more than 14,000 perioperative cases were performed. LCH participates in ACS NSQIP Pediatric.

Recent emphasis has been placed on the delivery of value-based care through quality improvement initiatives. At our institution, adult ERAS protocols have been implemented in the divisions of colorectal and HPB surgery, among others, serving as motivation to providers to initiate a similar protocol in the pediatric patient population. In an effort to respond to changing health care needs, we adopted the first pediatric surgery fast-track pathway at Levine Children's Hospital and introduced a multidisciplinary bundle of initiatives to streamline and standardize high-quality surgical care.

### **2. Planning and Development Process**

A multidisciplinary team of physicians and nurses was formed, including members of the divisions of pediatric surgery, perioperative nursing, anesthesia, and emergency medicine. During initial planning meetings, team members identified potential areas for intervention based on evidence-based practices as well as perceived barriers to discharge. Current guidelines, such as those for antibiotic regimen, were also used during the planning process. A standard fast-track pathway for non-complicated appendicitis was created with initiatives to standardize care in each perioperative phase, from diagnosis to discharge. The effectiveness and feasibility of implementing each initiative was discussed by the multidisciplinary team prior to reaching a consensus on fast-track pathway components. A preexisting physical unit adjacent to the operating room was newly designated as the dedicated preop and postop recovery unit. Additionally, the initial driver of culture change and nursing leadership to implement the pathway was under the direction of a single clinical nursing educator, who was critical during the planning process.

## Description of the Quality Improvement Activity

<b>Table 1. Cases reviewed annually.</b>		
	<b>Preimplementation practices</b>	<b>Fast-track pathway strategies for improvement</b>
Preoperative patient/caregiver education	<ul style="list-style-type: none"> <li>• Informally provided by pediatric surgery team</li> </ul>	<ul style="list-style-type: none"> <li>• Patient education brochures/visual guides provided to family about appendicitis and fast-track pathway expectations</li> </ul>
Standardization of preoperative antibiotic therapy	<ul style="list-style-type: none"> <li>• Variable antibiotic selection and dosage</li> <li>• Duplicate antibiotics doses given by ED and upon arrival to floor/OR</li> <li>• High use of Ertapenem</li> <li>• Delay in transfer from emergency department to OR due to patients waiting on medication</li> </ul>	<ul style="list-style-type: none"> <li>• Standardized regimen/dose of ceftriaxone (75mg/kg IV Q24h; 2000mg max per dose) and metronidazole (10mg/kg IV Q8h)</li> <li>• Ertapenem indicated for penicillin allergy</li> <li>• Antibiotics given by pre-op nurse or anesthesia, none given in ED</li> </ul>
Intraoperative urinary catheter	<ul style="list-style-type: none"> <li>• Inconsistent use of urinary catheterization in OR</li> </ul>	<ul style="list-style-type: none"> <li>• Patient voids in preoperative area</li> <li>• No intraoperative urinary catheters</li> </ul>
Dexamethasone prior to induction to reduce post-op nausea	<ul style="list-style-type: none"> <li>• Rarely administered</li> </ul>	<ul style="list-style-type: none"> <li>• 4mg given by anesthesia on induction</li> </ul>
Ondansetron prior to anesthesia awakening to reduce post-op nausea	<ul style="list-style-type: none"> <li>• Frequently administered</li> </ul>	<ul style="list-style-type: none"> <li>• Administer in all patients upon awakening from anesthesia</li> </ul>
Multimodal pain regimen <ul style="list-style-type: none"> <li>• Use of local anesthesia</li> <li>• Ketorolac prior to anesthesia awakening</li> <li>• PO Acetaminophen</li> <li>• PO/IV NSAIDs</li> <li>• PO/IV narcotics</li> </ul>	<ul style="list-style-type: none"> <li>• Frequently administered</li> <li>• Inconsistently given</li> <li>• High rate of post-op IV narcotics</li> </ul>	<ul style="list-style-type: none"> <li>• Administer in all patients</li> <li>• 15–30mg given by anesthesia upon awakening from anesthesia</li> <li>• Post-op pain management according to stepwise approach</li> </ul>
Dedicated pre-/post-op recovery unit	<ul style="list-style-type: none"> <li>• Additional patient handoffs if patient admitted to floor prior to pre-op area</li> <li>• Inconsistent nursing care</li> </ul>	<ul style="list-style-type: none"> <li>• Creation of dedicated pre/post-op recovery unit staffed by ERAS trained nurses</li> </ul>

<p>Early mobilization</p> <p>Early feeding</p>	<ul style="list-style-type: none"> <li>Inconsistent, varied based on nurse</li> </ul>	<ul style="list-style-type: none"> <li>Within 1 hour of surgery, patient transfers to PACU phase II (no beds); patient moved OOB to chair</li> <li>Within 2 hours of surgery, patient starts PO feeding or earlier as tolerated</li> </ul>
<p>Nursing-driven discharge</p>	<ul style="list-style-type: none"> <li>Patient assessed for discharge by pediatric surgery team</li> <li>Delays in discharge if MD in OR</li> </ul>	<ul style="list-style-type: none"> <li>Discharge orders entered by MD on admission</li> <li>Nurses assess for discharge readiness at least Q2 hours</li> <li>Nurses initiate standing discharge power plan once discharge criteria met</li> <li>If unable to be discharged at 6 hours post-op, MD notified to assess patient</li> </ul>
<p>Follow-up</p>	<ul style="list-style-type: none"> <li>Routine clinic follow-up at 2 weeks; low-yield for complications, high no-show rate</li> <li>Significant patient burden from missed school/work hours</li> </ul>	<ul style="list-style-type: none"> <li>Telephone follow-up at 24 hours and 7-10 days after discharge</li> <li>Clinic follow-up only as needed (for example, patient preference, clinical concerns)</li> </ul>

An EMR-compatible order set (power plan) was created to facilitate identification of fast-track pathway patients and standardize preoperative and postoperative medications given. This order set was introduced to all surgery attending and resident physicians, who then entered the power plan for all pathway patients.

Initiating a culture change was critical to the implementation process and sustainability of the pathway. All staff, including nursing/nursing assistants, emergency department providers, patient transfer, patient account representatives, environmental services, and guest relations received a one-hour session on the goals/benefits of enhanced recovery and perioperative phases of the non-complicated appendicitis fast-track pathway. A total of 14 sessions were held and were facilitated by the clinical nurse educator for preop/PACU. During the implementation process, resource tools were provided in the form of education folders and a Q&A board where staff members could easily reach out for additional clarification. Nursing supervisors were also readily available for

questions during the implementation process. After the planning and carrying out phases of pathway implementation, the team met regularly to assess the effectiveness of the QI project and discuss changes to address current barriers (Plan-Do-Study-Act format).

**Date when the QI activity was first implemented:** June 1, 2017

## Resources Used and Skills Needed

1. Staff: Involvement of pediatric surgeons, emergency department physicians, and perioperative staff was critical to the success of the fast-track pathway, thus champions from each department contributed input and feedback during the implementation process. The task force met regularly prior to and during the implementation process to address feedback and troubleshoot obstacles. A clinical nurse educator for pre-op/PACU was instrumental in holding education sessions for approximately perioperative staff, and participating in monthly ED staff meetings and daily huddles prior to implementation.
2. Costs: No additional clinical costs were necessary to implement and maintain the QI program. The designated recovery unit was created from existing space in the PACU area. Although the project did not receive any funding prior to implementation, grants to offset cost of recovery recliners are currently pending.

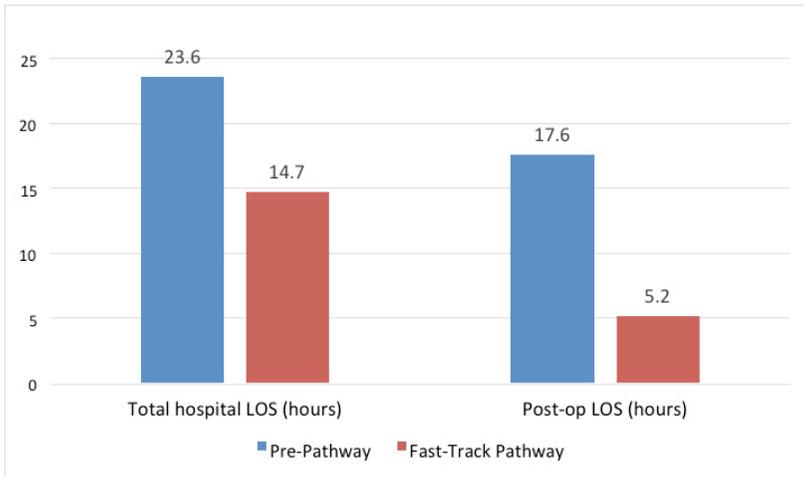
## What Were the Results?

The fast-track pathway was implemented in June 2017. Patients who were found to have ruptured appendicitis intraoperatively were excluded from the pathway. ACS NSQIP Pediatric data and electronic medical records were used to track results and adherence to the protocol, and fast-track patients were compared with a historical cohort of patients prior to implementation.

The reduction in median total hospital LOS and postoperative LOS are illustrated in Figure 1. Following implementation of the protocol, there was a 59 percent reduction in postoperative LOS and a 39 percent reduction in total hospital LOS, without an accompanying increase in postoperative readmissions or complications. Compared with the median average length of stay of two (1.4–3.1) reported by a study looking at practices in more than 30 pediatric hospitals,

our results showed a median hospital LOS of 14.7 hours following protocol implementation.<sup>1</sup> More than 67 percent (67.2%) of fast-track protocol patients were discharged home within eight hours of surgery. An additional 23 percent of patients who had surgery performed after 10:00 pm were discharged home immediately following morning rounds.

**Figure 1. Median length of stay pre- and post-pathway implementation.**

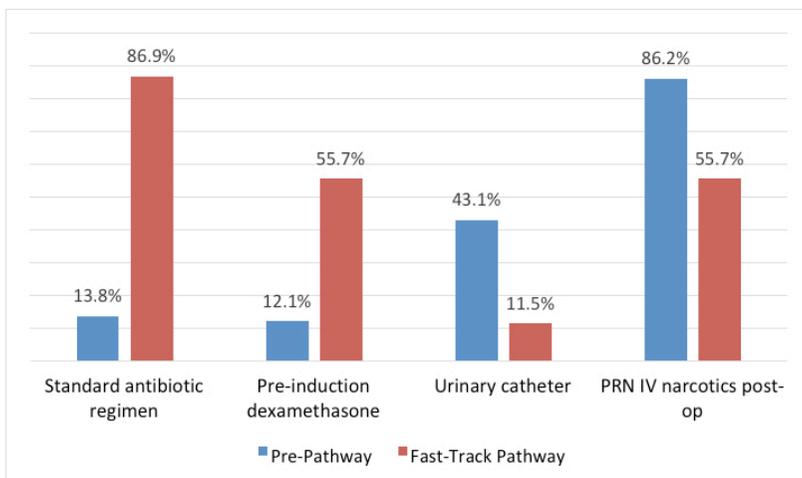


The changes in antibiotic treatment regimen, dexamethasone administration, urinary catheter utilization, and rescue pain medication are illustrated in Figure 2. Compared with historical control patients, 86.9 percent of fast-track patients received the standardized dose of preoperative antibiotics in the preoperative holding area. Use of intraoperative urinary catheter was also significantly decreased by more than 30 percent after protocol implementation.

Coordination with anesthesia resulted in a significant increase in the pre-induction administration of dexamethasone. Similarly, improved compliance with administration of ondansetron and ketorolac also led to a significant reduction in postoperative nausea and vomiting indicated by number of patients requiring PRN antiemetics in the designated postoperative unit. Use of a stepwise multimodal analgesia regimen resulted in a 37 percent reduction in PRN IV narcotics given postoperatively.

Following discharge, 91.8 percent of patients were followed up with nursing phone calls at 24 hours and seven to 10 days. Only 9.2 percent of fast-track pathway patients elected to follow up in the office; in comparison, all pre-pathway patients were scheduled for a postoperative clinic follow-up with a 41.4 percent “no show rate”. Following implementation of our protocol, average direct variable costs per patient decreased from \$3,116 to \$2,982, or a 4.3 percent decrease in patient cost. Over the monitored period, this yielded a net cost savings of \$8,174.

**Figure 2. Changes in perioperative management, pre- and post-pathway implementation.**



### 1. Setbacks

During QI implementation, barriers encountered during the initial phase included ensuring patients were admitted to the designated unit. Patients admitted to other inpatient floors where nurses were not familiar with the fast-track pathway were less likely to be compliant with fast-track initiatives. After identification of the problem, numerous changes, including direct communication with bed management, were taken to address potential contributing factors. Pediatric surgery residents instructed ED charge nurses to admit patients to the fast-track unit while charge nurses in the designated unit monitored the ED board for patients with appendicitis. As staff members became increasingly familiar with pathway components and were able to observe direct benefits in enhanced patient recovery, the culture change and increased provider buy-in led to fewer setbacks over time.

### Tips for Others

1. Find the right team. Assembling a multidisciplinary team with input from key providers was instrumental to the success of our QI intervention. In particular, buy-in from surgeons and perioperative nursing ensured patients with non-complicated appendicitis were started on the fast-track pathway. Team members were also able to educate other staff and help drive the implementation process.

2. Engage patients and providers. In addition to educating providers and ancillary staff, brochures and visual aids provided patients and family members with the goals of enhanced recovery and set patient expectations for postoperative care.
3. Make simple, sustainable changes. In order to implement a pathway with multiple components dependent on the ordering physician, we created a standardized power plan that bundled all nursing orders and medications, including preoperative antibiotics, postoperative analgesia, and antiemetics. The power plan simplified the admission orders for physicians and also minimized interprovider variability at our teaching hospital with different residents rotating on pediatric surgery each month.
4. Regular feedback/communication. Team members met every three months during pathway implementation to troubleshoot setbacks, respond to staff feedback, and evaluate progress. Initial results were shared with perioperative staff to highlight early improvements resulting from pathway changes and further encourage culture change.
5. Nursing-driven discharge. Shifting the culture to a nursing-driven recovery and discharge process was critical. This major change resulted from the recognition that nurses were able to assess patients for discharge readiness more frequently than surgeons, who were limited to seeing patients between cases. Enabling nurses to initiate conditional discharge orders once patients met pre-set criteria allowed for earlier discharge and reduced LOS.

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■ NAVICENT HEALTH/MERCER UNIVERSITY SOM

Revamped Colon Protocol to Include Comprehensive Order Sets and High Compliance Can Decrease Colon SSI

## General Information

**1. Institution Name:** Navicent Health/Mercer University SOM

**2. Submitter Names and Titles:** William M. Thompson, Jr., MD, Associate Professor of Surgery, and Casey Hawes, MD, Surgery Resident

**3. Name of the Case Study:**

Revamped Colon Protocol to Include Comprehensive Order Sets and High Compliance Can Decrease Colon SSI

## What Was Done?

### 1. Global Problem Addressed

Surgical site infection (SSI) in colon surgery has been identified as a significant cause of morbidity and mortality in surgical patients. When outcomes were measured, SSI rates often were in the range of 10 to 20 percent, even at prestigious, high-volume institutions.<sup>1</sup> Mandatory reporting of colon SSI rates ensued and financial penalties have been levied for outlier institutions.<sup>2</sup> Enhanced Recovery after Surgery (ERAS) protocols were developed initially to decrease length of stay (LOS), but ultimately to lower SSI. The extent of the protocols and the compliance required to obtain optimal results is not clear.

### 2. Identification of Local Problem

At our institution we initiated a colon ERAS protocol in 2014 with limited elements and moderate compliance but saw a decrease in our colon SSI. After one year we saw a sharp spike in SSI, and an extensive root cause analysis (RCA) and examination of individual surgeon factors and other retrospective review was unable to identify a cause or decrease the incidence. We then implemented an extensive, evidence-based pre-op, day-of-surgery, and post-op colon protocol with mandatory compliance. This protocol resulted in a rapid decline in our colon SSI.

## How Was the Quality Improvement (QI) Activity Put in Place?

### 1. Planning and Development Process

Our hospital is a 637-bed public/private facility affiliated with Mercer SOM. It is a teaching hospital with an associated Level 1 trauma center, and it serves as a tertiary referral center for much of middle and south Georgia.

Our hospital has had a quality department with infection surveillance programs for many years, and we have been an ACS NSQIP participant for nearly a decade.

A committee was formed with leadership being the ACS NSQIP surgeon champion and nurse. The membership consisted of several other surgeons; the infection control nurse; nurse leadership from the operating room, the pre-op clinic, and the dedicated post-op ward; anesthesia; and representatives from information technology (IT), pharmacy, and nutrition services. An extensive search of the literature was performed, and elements felt to improve outcomes in colon surgery were included. Order sets for the pre-op setting, the day of surgery/ anesthesia setting, and the post-op setting were designed to be comprehensive, and all entities were tasked with being compliant. In particular, all surgeons were brought together for discussion and education on the order sets, and after much deliberation there was consent to use them in spite of some disagreement regarding some of the elements.

## Description of the Quality Improvement Activity

The IT department developed three order sets. The surgical team, including doctors, nurses, and office personnel were educated in the order sets. A colon navigator nurse was utilized to guide patients through all three phases and ensure compliance.

Our go-live date was May 2017.

### Pre-op

- Optimization clinic visit if multiple comorbidities
- Smoking cessation
- Diabetes control, HgbA1c
- Nutrition assessment, pre-albumin, Rx as indicated
- Optimization of medications
- Patient given an incentive spirometer (IS) and instructed in its use
- Five days of immunonutrition shakes
- Mechanical prep of the colon
- Oral non-absorbable antibiotics
- PhisoHex showers

### Day of surgery/anesthesia

- Complex carbohydrate drink two hours before surgery
- Tylenol, Lyrica, Celebrex pre-op
- Alvimopam pre-op
- Maintain glucose 120-180
- Pre-treat for nausea and vomiting
- Maintain temperature > 36 degrees

- Ventilate at 100 percent O<sub>2</sub> and for six hours post-op
- Judicious IVF Rx
- Rocephin/Flagyl IV
- Experienced, consistent OR team with limited breaks
- Emphasize minimally invasive techniques
- Isolation protocol-emphasize sterile technique, wound protector, sterile closing tray/change gown and gloves after anastomosis is closed
- Educate nurse/MD on proper wound classification
- Pre-op deep vein thrombosis (DVT) prophylaxis
- Regional pain blocks

#### Post-op

- Dedicated surgical floor with nurses educated on protocol
- No nasogastric tube/no foley
- Soft diet evening of surgery, regular diet postoperative day (POD)#1
- In chair evening of surgery, ambulate with physical therapy POD#1
- Multimodal pain management with no/limited opioids
- IS every 12 minutes
- DVT prophylaxis
- Alvimopam if on opioids
- Wound nurse to assess wound

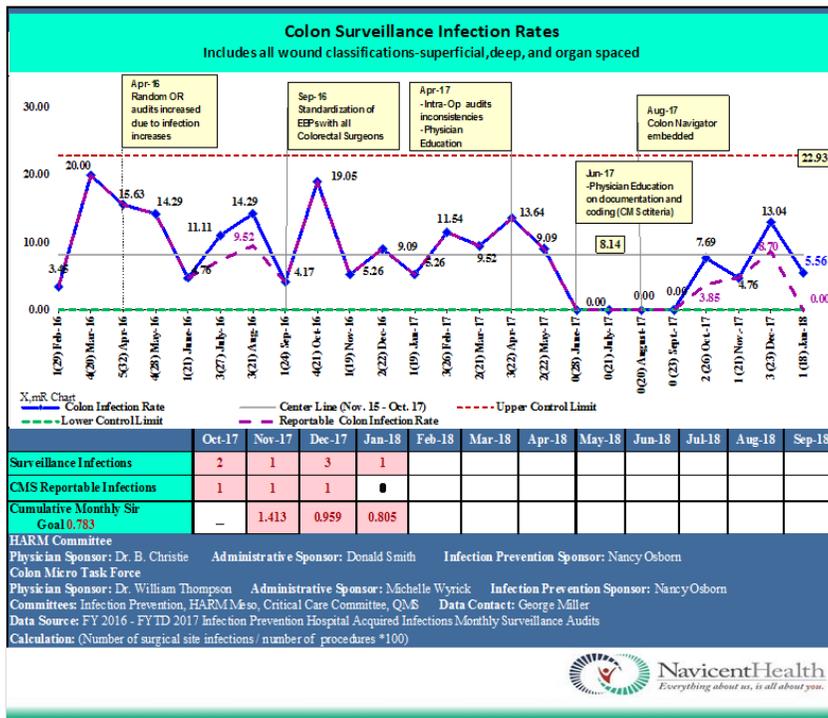
## Resources Used and Skills Needed

Existing office staff, nurses at all levels of care, and anesthesia/surgeon involvement was required. The only new position was the colon navigator nurse who was already employed, but administration committed her to our program at 1/2 FTE.

## What Were the Results?

Colon SSI dropped from 11.3 percent in the preceding 15 months to 2.1 percent in the subsequent nine months. ACS NSQIP raw data showed a 50 percent decrease in mortality, wound occurrence, septic shock, unplanned intubations, and vent > 48 hours in our colon surgery patients.

**Figure 1.**



**1. Setbacks**

At implementation, office nurses and surgery residents were not consistent with the pre-op arm of the protocol, and the in-patient electronic medical record did not communicate with out-patient electronic medical record (EMR), causing problems with compliance. This problem was addressed with extensive education of office staff and surgery residents. The IT department provided a means of communication between the two EMR systems.

Initially, some patients were not compliant with colon prep orders and immunonutrition even though they had been given instruction. Our colon nurse navigator was able to ensure compliance by phone communication instructions in the week prior to the surgery.

**2. Cost Savings**

Total cost for patients with SSI was twice that of patients with no infection, and LOS was twice as long for patients with SSI compared with those without. Estimated cost savings after implementation of our protocol is \$750,000.

## Tips for Others

An out of control colon SSI rate got the attention of all stakeholders and provided the impetus to develop and implement such a comprehensive protocol and insure compliance.

Our colon navigator is critical in ongoing real time compliance and addressing anomalies in the system with any element in the protocol. IT has built in methods to monitor compliance rates with elements to identify individual non-compliance.

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■ NORTHWELL HEALTH NORTH SHORE  
UNIVERSITY HOSPITAL

## The Impact of Bariatric ERAS Protocol on Patient Outcomes

## General Information

**1. Institution Name:** Northwell Health North Shore University Hospital

**2. Submitter Name:** Charmaine Gentles, DNP, ANP, RNFA

**3. Name of the Case Study:**

The Impact of Bariatric ERAS Protocol on Patient Outcomes

## What Was Done?

### 1. Global Problem Addressed

Enhanced recovery after surgery (ERAS) protocols are multimodal approaches used during the perioperative period to achieve faster patient rehabilitation. Significant components of an ERAS protocol include standardized perioperative counseling, nutritional optimization, early ambulation, multimodal analgesia, and anesthetic agents.<sup>1</sup> Multiple specialties, including colorectal, vascular, cardiac, and orthopaedic surgery have demonstrated improved outcomes and shorter length of stay with the use of ERAS protocols.<sup>2,3</sup>

### 2. Identification of Local Problem

Since 2012, the bariatric surgery program at North Shore University Hospital (NSUH) used data collected from their own readmission tracking data spreadsheet and data from the Metabolic and Bariatric Surgery Accreditation Quality Improvement Program (MBSAQIP) database to identify outliers in terms of length of stay and adverse outcomes. These outliers were used to create internal quality improvement projects, which are reviewed at the program's Bariatric Quarterly Taskforce Committee meetings. In 2014, the MBSAQIP established inaugural standards. In particular, Standard 2.1, "Metabolic and Bariatric Surgery Committee," and Standard 7, "Continuous Quality Improvement," require all accredited centers to establish a committee for continuous quality improvement to share best practices and track outcomes based on the Semiannual Reports (SARs) to identify potential areas of improvement. Throughout this time, using data from MBSAQIP, NSUH's quality improvement projects focused on methods to improve resource and process utilization, and the quality of care delivered. From 2009 to 2011, the average length of stay (LOS) for bariatric surgery patients at NSUH was 1 to 3.5 days, and following ERP LOS was reduced in all patients by an average of 0.5 to 2 days. Median reduction in LOS of 3 days has been reported by programs utilizing ERAS protocols.<sup>4</sup>

# How Was the Quality Improvement (QI) Activity Put in Place?

## 1. Context of the QI Activity

- NSUH is one of 23 hospitals in the Northwell Health system. It is an 831-bed tertiary hospital located within a Long Island suburb. NSUH is a comprehensive MBSAQIP facility accredited to perform bariatric surgery. It is a referral center for the other nine bariatric programs within the Northwell Health system, as well as for bariatric patients within the community in the tristate area. There are two verified bariatric surgeons on staff at NSUH.
- There has been a nationwide effort to decrease LOS and adverse outcomes, which was bolstered by the change in the American Medical Association's 2013 reimbursement policies. The average NSUH LOS was 1 to 3.5 days following a primary bariatric procedure, which was noted to be longer than the average LOS at programs using ERAS protocols. In 2012, NSUH bariatric surgery targeted LOS and post-op complication rate for developing a QI program and implemented an ERAS protocol.

## 2. Planning and Development Process

- Patient data is reviewed with the bariatric surgeons, and any outliers are analyzed to find areas for clinical improvement. Action items are created, which are presented for discussion at the quarterly Bariatric Task Force Committee meeting. The Bariatric Taskforce Committee members include hospital administrators, anesthesiologists, bariatric surgeons, unit directors, NPs, PAs, nurses, pharmacists, dietitians, SCR, the MIS Fellow, care coordinators, and social workers. A consensus is reached at the meeting, which is then incorporated into the patient plan of care. All of the key participants are involved in the Bariatric Taskforce Committee and have the opportunity to weigh in on every issue, which facilitates support for new initiatives.
- The action items that are approved by the committee are then implemented in four different phases: (1) patient and provider education, (2) implementation of ERAS evidence-based order sets, (3) monitoring of adherence to ERAS guidelines, and (4) analysis of patient outcomes to sustaining the process as best practice.
- The planned change came from existing literature on the use of ERAS protocols in various surgical specialties and the significant benefits obtained in clinical outcomes and cost in the practice settings.<sup>2</sup>

## Description of the Quality Improvement Activity

1. The specific steps (outlined below) that comprised the QI project consisted of providing education and sharing the protocol to all providers.

### Step 1—Patient and Provider Education

- Patient education: This involves providing comprehensive counseling on the purpose of ERAS and its benefits. Patients are educated about what to expect before and after surgery. This includes the use of incentive spirometry, early ambulation, CPAP, optimization of nutritional status such as correction of vitamin and mineral deficiencies, optimization of current health status, use of standardized multi-modal analgesia, and anti-emetics.
- Provider education: This involves disseminating the approved ERAS protocol via e-mail and during grand rounds to all providers involved in the care of the bariatric patients.

### Step 2—Implementation of ERAS evidence-based order sets

- The bariatric quality lead team (consisting of the bariatric surgeon champion and the bariatric NP) collaborates with the IT department to create a computerized ERAS order set as outlined below.

Table 1.	
Preoperative Management	<p>Formal standardized mandatory pre-op education class</p> <p>Prehabilitation and optimization—multidisciplinary team</p> <p>Review written outline of ERP protocol with patient</p> <p>Patient handouts</p> <p>Avoid bowel prep</p> <p>Post-op follow-up appointment given</p> <p>Scopolamine transdermal patch 1.5mg/72 behind ear if indicated</p> <p>Incentive spirometry education and device given</p> <p>Medication review—clinical pharmacist</p> <p>Tour of the bariatric unit</p>

<p>Morning of Surgery</p>	<p>DVT prophylaxis: Subcutaneous low-dose unfractionated heparin or low-molecular-weight heparin</p> <p>Pre-anesthesia evaluation, CPAP verification and check</p> <p>Meet and greet the surgical team</p> <p>Physician signs H&amp;P</p> <p><b>Bariatric clear oral fluids up to 2 hours before arrival at hospital plus 12-20 ounces carbohydrate drink.</b></p> <p><b>Uncomplicated Type 2 diabetes—take oral hypoglycemic</b></p> <p><b>Patients with known gastroparesis or diabetic neuropathy may drink clear liquids and carbohydrate drink up to 4 hours before arrival time</b></p> <p>Consider Celecoxib 400mg PO (contraindicated in patients with GFR&lt;60); <b>consider Emend 40mg PO for patients high risk for PONV, Scopolamine patch 1 day prior to surgery</b></p> <p>Check FS blood glucose level on all bariatric patients</p>
<p><b>Operative Interventions</b></p> <p>Pre-Anesthesia Medications</p>	<p>SSI prophylaxis: Single-dose antibiotic against both anaerobes and aerobes within 1 hour of incision—Cefazolin 2 or 3gm IV, if PCN allergic Clindamycin 900mg or Vancomycin 1.5gm</p> <p>Acetaminophen (Ofirmev) intravenously 1,000mg at the start of the case</p> <p>Nausea meds.; Dexamethasone 8mg IV before induction; Ondansetron 4mg IV before emergence</p> <p>TIVA using propofol infusion and:</p> <ul style="list-style-type: none"> <li>• Remifentanyl infusion 0.5-.2 mcg/kg/min</li> <li>• Ketamine 0.5 mg/kg bolus at induction then 5mcg/kg/min</li> <li>• Infusion</li> <li>• Precedex 0.5mcg/kg/hr</li> </ul>

<p>During Surgery</p>	<p>Standard anesthetic protocol avoiding long-acting opioids (No Fentanyl, Morphine, or Dilaudid, even during induction)</p> <p>NO esophageal temp probe</p> <p>Use BIS monitor; titrate anesthetics to keep BIS 55-70</p> <p>Use antihypertensive/beta blockers to control high blood pressure/heart rate if necessary</p> <p>IV vasopressors to treat hypotension when necessary</p> <p>Infiltration of port sites with Exparel or Bupivacaine HCL/Exparel mixture (mg ratio 1:2) before incision</p> <p>Ketoralac (contraindicated in patients with GFR&lt;60) during emergence</p> <p>Offirmev 1gm IV during emergence</p> <p>Limit IV fluids to less than 2 L-LR or Plasmalyte at 5-7 mg/kg/hour not to exceed 2.5L for routine cases, do NOT use normal saline, use fluid warmer and Alaris pump for fluid administration</p> <p>Intraoperative glucose control (goal 140-180mg/dl)</p> <ul style="list-style-type: none"> <li>• If patient is diabetic check glucose every hour intraoperatively</li> <li>• If patient is non-diabetic and glucose &gt;120mg/dl, check glucose 1 hour after case start. No rechecks necessary if glucose is &lt;120</li> <li>• If glucose &gt;140mg/dl, start IV regular insulin infusion, 250 units regular insulin into 250 cc NS (1 unit/ml); starting rate in units / hour = <b>(Current BG-60)</b> x 0.02 (where 0.02 is the multiplier) <i>Example: Current BG is 210 mg/dl (210 - 60) X 0.02 = 3 units/hour (3 ml/hour); Adjust multiplier to keep in desired glucose target range (140 to 180 mg/dl), if BG 140-180 mg/dl, no change in multiplier, if BG &gt; 180 mg/dl, increase multiplier by 0.01, if BG 80-99 mg/dl, decrease multiplier by 0.01</i> <i>Example: Current BG is 200 mg/dl, last multiplier 0.02 units/hour and last rate 2 units/hour (200 - 60) X 0.03 = 4.2 units/hour (4.2 ml/hour)</i></li> <li>• If patient is on insulin infusion at end of case, inform PACU and call endocrine consult</li> </ul> <p>Maintain normothermia with upper-body forced-air heating cover</p> <p>No drains</p> <p>Foley insertion</p>
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<p>Postoperative Interventions</p>	<p>Obtain UGI swallow study within 2 to 3 hours after arrival in PACU (BANDS ONLY)</p> <p>Optimize fluid balance</p> <p>Avoid and or minimize use of sedatives especially in those with Moderate and severe OSA</p> <p>Ambulate 1 hour after arrival in PACU</p> <p>Use standard multimodal non-opioid analgesics, antiemetics, anti-spasmodic (ketoralac, IV acetaminophen, hyoscyamine, ondansetron, promethazine, reglan compazine, lorazepam)</p> <p>Assuming Ofirmev, Ketoralac, dilaudid have all been given, Fentanyl 25mg IV x 4 for breakthrough pain</p> <p>Oral Oxycodone if applicable</p> <p>Reassess and document patient comfort level (nausea, vomiting, pain scores)</p> <p>Begin bariatric clear fluid day of surgery</p> <p>Remove foley within 4 hours after arrival to PACU if adequate urine on post-op day of surgery</p> <p>Monitor glucose control as ordered</p> <p>Continue standardized thromboprophylaxis post-op and upon d/c if needed (use MBSC VTE risk tool for post d/c therapy)</p> <p>Standardized perioperative antibiotics: Pre-, intra-, and post-op</p> <p>Patient education with written materials prior to discharge</p> <p>Nutrition, social worker, and pharmacy consults</p> <p>Meet bariatric 8-point discharge criteria checklist</p> <p>Meds to bed : Standardized post-operative bariatric medication based on surgical procedure if not contraindicated (omeprazole, oxycodone suspension, hyoscyamine, ondansetron ODT)</p>
<p>After Discharge</p>	<p>Telephone call 24-48 hours post discharge</p> <ul style="list-style-type: none"> <li>• Review medications</li> <li>• Diet</li> <li>• Review signs and symptoms of adverse events</li> <li>• Verification of follow up appointments</li> </ul> <p>Follow up in surgeon's office in 7-10 days</p>

### **Step 3—Monitoring of Adherence to ERAS guidelines**

- All members of the clinical team worked together to ensure that all parameters of the implemented change are being followed.
- The nurse practitioner and MIS Fellow write all orders for the postoperative care of the bariatric patients to maintain compliance as well as conduct real-time monitoring of this process intraoperatively and postoperatively when the residents provides assistance.

### **Step 4—Analysis of Patient Outcomes**

- The Bariatric Taskforce holds quarterly committee meetings to review patient outcome data to ensure adherence to ERAS protocol.

#### Team Roles

- Bariatric surgery champions (MBS Director and NP) are responsible for creating ERAS order sets, educating the health care providers, and reviewing outcome data.
- Anesthesia providers are responsible for adhering to ERAS protocol within the operating room. The anesthesia residency program director ensures ERAS adherence among the anesthesia providers.
- The quality improvement project was implemented in 2012 and has been sustained throughout the years.

## Resources Used and Skills Needed

1. Staff: The MBS Surgeon Champion and the bariatric program manager/NP led the QI initiative. There were a total of 10 active members involved in the QI project, which included the surgeons, MIS Fellow, NPs, administrators, hospital surgical quality officer, and anesthesiologists.
2. Costs: There were no costs beyond normal hospital operations to implement and maintain the QI program.
3. Funding: No additional funding sources were necessary.

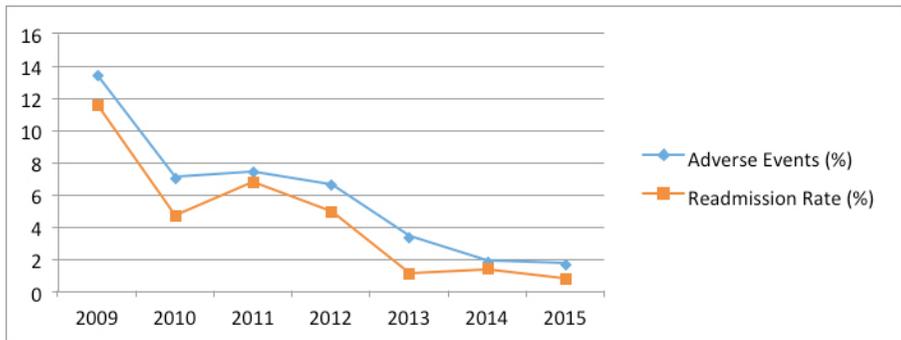
## What Were the Results?

The chi-square test was used to examine the association between time periods (pre/post) and each outcome of interest, namely adverse events (yes/no) and readmission (yes/no). Additionally, the Cochran-Armitage test was used to examine increasing or decreasing trends in adverse events and readmission rates over time (2009–2015). Results were considered significant at a significance level of  $p < 0.05$ . Analyses were conducted using SAS version 9.4 (SAS Institute, Inc., Cary, NC).

There were a total of 1,140 patients; 401 (35.18%) 2009–2011 (pre) and 739 (64.82%) 2012–2015 (post). Adverse events, hospital length of stay, and readmission rates all trended down over time. Adverse events in the post-ERAS period were significantly lower (2.98%) as compared with adverse events in the pre-ERAS period (8.98%,  $P < 0.0001$ ). Readmissions in the post-ERAS period were significantly lower (1.76%) as compared with readmissions in the pre-ERAS period (7.48%,  $P < 0.0001$ ).

Additionally, there was a significant decline in adverse events ( $P < 0.0001$ ) and readmissions ( $P < 0.0001$ ) from 2009 to 2015. For gastric bypass patients, length of stay decreased from 4.2 days to 2 days. Average hospital length of stay for gastric band patients decreased from 1.1 days in 2009 to 0.25 in 2015. Sleeve gastrectomy average length of stay decrease from 2.2 to 1.2 days from 2012 to 2015.

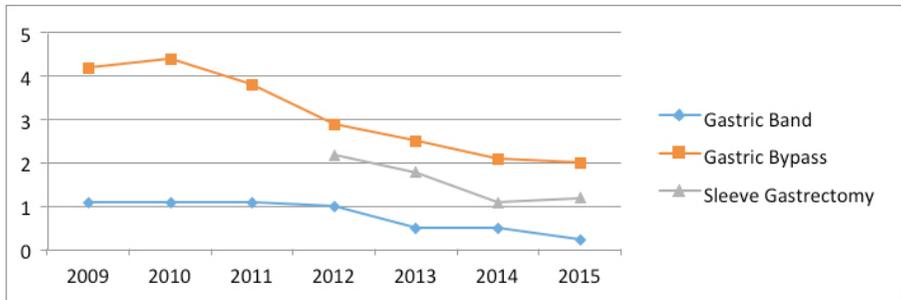
**Figure 1. Adverse events and readmission rates over time.**



### 1. Setbacks

There was hesitation for change in practices by the anesthesia department. However by providing evidence-based education and collaborating, providers were able to update and implement changes in practice.

**Figure 2. Average length of stay (days) by procedure.**



## 2. Cost Savings

There was no money invested in implementing the QI project. Further studies need to be performed on the costs saved by shortening the LOS and improving quality outcomes.

## Tips for Others

- “Play well with others.” At its core, QI is a team process, so it is important to engage the primary stakeholders as early as possible to avoid pitfalls and barriers. In addition, for QI to be effective, there must be a solid infrastructure with the right leadership, policies, and procedures to support and facilitate the work flow. Having the right infrastructure will not only provide the right tools and resources, but will also set clear goals and expectations to help keep the team on track.
- Focus on the data. Data is the foundation for QI. Use the data to identify what is currently happening and the outcomes when changes are implemented. Document the performance (improvement versus no improvement) and check for benchmark comparisons across other programs.
- “A chain is only as strong as its weakest link.” Each individual must contribute and be an active member of the team. Keep the lines of communication open. Have weekly meetings, continuous monitoring, and provide feedback as indicated. Different perspectives from an interprofessional collaboration will sustain improvements.
- “You don’t know where you’re going until you know where you’ve been.” Establish your baseline so you can track what changes you are implementing and their clinical impact.

## Acknowledgements

Achieving the high level of quality outcomes and success at NSUH was based on the dedication and leadership of the bariatric surgeon champion (MBS Director) and the bariatric NP in collaboration with organization leadership, the MBS committee, anesthesiologists, residents, nurses, and the SCR. The MIS Fellow provided great support and deserves acknowledgement as well. Many participated in the quarterly meetings to fulfill the quality plan and integrated the QI changes into the respective clinical areas despite their busy work schedules. Their commitment to the quality plan assisted in delivering safe and quality care, which has ensured that bariatric patients at NSUH achieve excellent outcomes.

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■ RICHMOND UNIVERSITY MEDICAL CENTER

## How TQIP Benchmarking Assisted in and Highlighted a Decrease in CAUTIs over One Year in Trauma Patients

## General Information

**1. Institution Name:** Richmond University Medical Center

**2. Submitter Name and Title:** Akella Chendrasekhar, MD, FACS, Trauma Medical Director; Christopher Ruiz, RN, BSN, TCRN, Trauma Program Nursing Director; and Marisa Easop, EMT-B, PI Coordinator

**3. Name of the Case Study:**

How TQIP Benchmarking Assisted in and Highlighted a Decrease in CAUTIs over One Year in Trauma Patients

## What Was Done?

### 1. Global Problem Addressed

Cather-associated urinary tract infections (CAUTI) are the most frequently occurring hospital-acquired infection (HAI) in the U.S. According to the CDC, CAUTIs make up approximately 75 percent of all urinary tract infections that occur in hospitals. Also, with 15 to 25 percent of hospitalized patients receiving urinary catheters during their stay, there is a large potential for at-risk patients to contract an HAI. This is shown by the approximately 449,334 CAUTI events that are reported each year.

### 2. Identification of Local Problem

As highlighted by the fall 2016 Trauma Quality Improvement Program (TQIP) Risk-Adjusted Complications Report, we found Richmond University Medical Center (RUMC) to have an odds ratio of 6.84. When compared with all other trauma centers enrolled in TQIP, this made RUMC a high outlier for CAUTI complications. As an institution committed to quality patient care and outcomes, we were driven by this data and worked diligently to improve this complication.

## How Was the Quality Improvement (QI) Activity Put in Place?

### 1. Context of the QI Activity

Richmond University Medical Center is a Level 1 adult and Level 2 pediatric ACS TQIP-verified trauma center with 448 licensed beds providing care to an urban/suburban community in Staten Island, NY. The trauma service alone cares for approximately 1,500 adult and 200 pediatric patients per year. Last year, out of 1,751 adults and children evaluated by trauma, 1,194 were admitted.

For this project, there was no hospital-wide oversight. The motivation behind this project was to improve upon our patient management, which would be

reflected in our TQIP scores. But by initiating this conversation, we were able to bring more attention and awareness to the situation at hand. Seeing the success of our nurse-driven policy, the hospital system adopted our practice to assist in the reduction of CAUTIs throughout the institution. Further motivation has encouraged other departments and programs to work collaboratively with trauma and constructively think of other measures to put in place for further improvement of patient management.

## **2. Planning and Development Process**

Based on the 2016 TQIP report, CAUTI was identified as an area of improvement. Once we settled on CAUTIs, we constructed the nurse-driven Foley catheter protocol. The first unit educated on the new policy was the surgical intensive care unit (SICU). The nurses and nurse management staff on this unit were very open to the education and implementation. A discussion regarding all expected outcomes was had at the trauma committee meeting so that all stakeholders throughout the institution were on the same page. Once the staff was educated, we began daily rounding on all trauma patients in all units to see who fit the criteria for removal. After seeing the drastic reduction in CAUTIs from the fall 2016 to spring 2017 report, more units bought in to the project, and we were able to train them as well. Currently, all units that intake trauma patients are trained on this policy.

The Nurse-Driven Foley Removal diagram was created by our trauma medical director and agreed upon among physicians within the hospital (Figure 1). This diagram is one of the crucial elements in this policy.

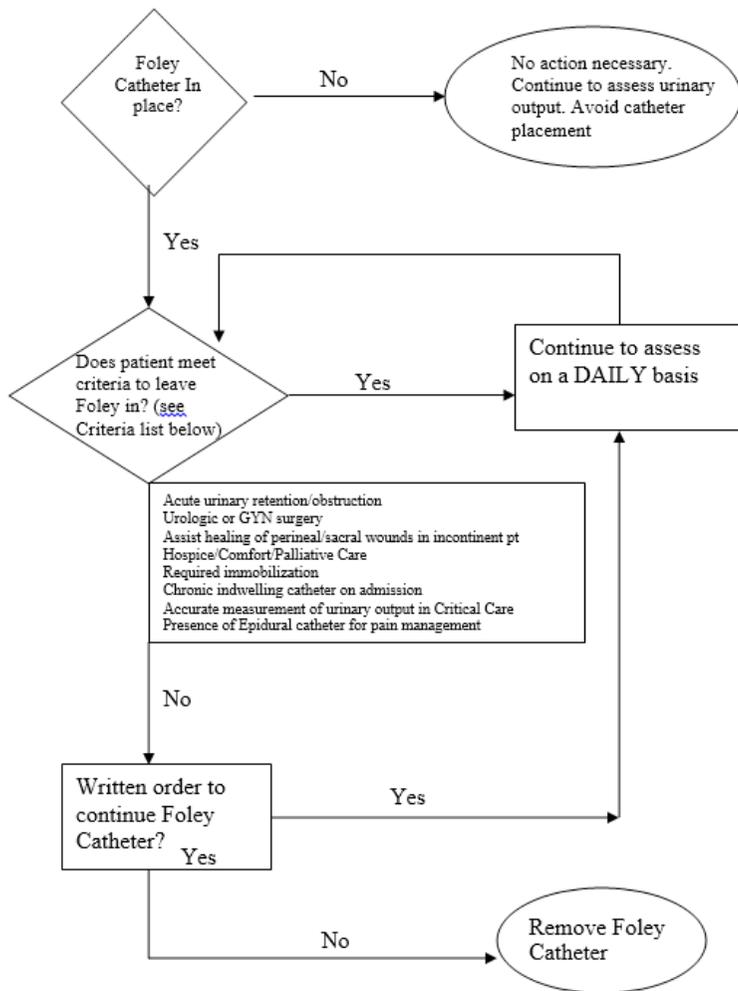
## **Description of the Quality Improvement Activity**

Based on the benchmark findings in the TQIP report, it was evident that a performance improvement measure was needed. A Foley catheter management protocol was constructed to highlight the interventions implemented to manage this complication. Included in the policy is a CAUTI Reduction Bundle, Nurse-Driven Foley Removal protocol, and daily rounding as a method to document and identify patients who no longer need Foleys. In addition, Foleys placed in the emergency department must be changed or exchanged within 24 hours of placement for traumatically injured patients. Also included in the protocol, the trauma and surgical team will utilize a Texas catheter in patients who fit the criteria. Daily morning rounds would be conducted on all trauma patients admitted to evaluate the care plan and see how to improve overall management and care. The education was provided by the trauma director and trauma team.

This policy was implemented on August 1, 2017.

Figure 1.

### Foley Removal Protocol



## Resources Used and Skills Needed

1. Staff: The team to assist in the reduction in CAUTI rate included the trauma/surgical residents, SICU staff, the nurse manager, physician assistants, nurses, medical students, and our trauma team.
2. Costs: The project did not require any additional funds to implement or maintain.

## What Were the Results?

Since the implementation of the protocol on August 1, 2017, there has been a significant decrease of CAUTIs in trauma patients. As initially identified by the fall 2016 TQIP report, our center was a high outlier with an odds ratio of 6.84. After much diligence and commitment to engaging the staff in this new protocol, we saw the number of CAUTIs drop in the spring 2017 report to 3.37. Then, in the fall 2017 report, there was a staggering drop to 0.75 (Table 1).

**Table 1.**

Catheter-Associated UTI					
Fall 2016		Spring 2017		Fall 2017	
Odds Ratio	Outlier	Odds Ratio	Outlier	Odds Ratio	Outlier
6.84	High	3.37	High	0.75	Average

### 1. Setbacks

No barriers to the implementation of this process were encountered.

In August of 2018, we revised the protocol to include SUTI Criterion 1a and 1b. As the population of patients presenting to the trauma service are often elderly and from nursing homes, it quickly became apparent that they possibly came into the institution with a preexisting UTI. After consulting infection control, it was decided this SUTI rationale for obtaining a urine culture should be included in the policy. Now if a patient presents with any of the symptoms listed, we are able to draw a culture and separate preexisting UTIs from CAUTIs.

## 2. Cost Savings

There were no additional costs associated with this project.

According to Hospital Safety Grade, each CAUTI costs an average institution an estimated \$758 per patient. In the fall 2016 report, there were 20 patients with a diagnosed CAUTI. Using the estimate given, those 20 patients cost our institution approximately \$14,960. When comparing the fall 2016 and fall 2017 reports, there was only one patient in the fall of 2017 with a reported CAUTI. Using the same estimates, our hospital saved approximately \$14,202 in one year by implementing this policy.

## Tips for Others

- Additional funds needed for this project were very low, as the supplies were already available and we did not need to obtain any new staff or equipment. In looking for best practices to back up our new standards, we had many discussions with other institutions to see what their success rates were and what principals they were using. This is an excellent way to see what is working in other institutions and if any of that success can be duplicated in your facility. We recently started a pilot of a new external female catheter after several of our colleagues from other institutions recommended them versus the ones we were using. In this pilot period, we also gave the nurses involved in the initiative a survey form in order to evaluate the feedback they have on the new product. This allows us to get information on the ease of use of the product as well as any potential flaws. When nurses and providers feel they have a voice, their willingness and tendency to use a product increases.
- In order to sustain the new best practice, we continue to round daily on trauma patients and participate in morning report. In this way, we are identifying patients with catheters in place and mitigating issues prior to them arising. Also, it is critical to properly train the nursing staff and aides on proper placement and care for these external catheters as well as the criteria for placement. If our staff is educated and comfortable with a new best practice, we see an increase in compliance.
- Evaluate your population to see where they are coming from. In our case, we see a large number of elderly patients coming in from nursing homes. We see this as a red flag when assessing for preexisting UTIs and pay special attention to these patients to ensure they do not acquire a UTI on our watch.

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■ UNIVERSITY OF CALIFORNIA DAVIS

## Implementation of a Clinical Practice Guideline for Postoperative Management of Pediatric Appendicitis

## General Information

**1. Institution Name:** University of California Davis

**2. Submitter Name:** Melissa Vanover, MD

**3. Name of the Case Study:**

Implementation of a Clinical Practice Guideline for Postoperative Management of Pediatric Appendicitis

## What Was Done?

### 1. Global Problem Addressed

Appendicitis is the most common cause of urgent abdominal surgery among children. In the U.S., approximately 53,000 children undergo appendectomy each year for acute appendicitis.<sup>1,2</sup> Despite a substantial amount of research and vigorous debate, there is no consensus regarding the optimal postoperative management of these children. Therefore, wide variation exists amongst pediatric surgeons and presents an opportunity for quality improvement endeavors.<sup>3,4</sup>

### 2. Identification of Local Problem

Appendectomy is a targeted procedure for the ACS NSQIP Pediatric Project, so institution-specific and national statistics are readily available. Following the first year of participation, it was recognized that UC Davis was amongst the highest quartile for length of stay (LOS) despite a lower postoperative complication rate than other institutions. Our patients had an average length of stay of 3.6 days compared with 2.6 days nationally. This was more pronounced for patients with complicated appendicitis who had an average length of stay of 6.5 days compared with 4.7 days nationally. Since postoperative complications could not account for the prolonged average length of hospitalizations, the most likely contributors were variability in postoperative management and inconsistent criteria for discharge.

## How Was the Quality Improvement (QI) Activity Put in Place?

### 1. Context of the QI Activity

The UC Davis Medical Center is a tertiary referral center with a large catchment area that includes parts of Northern California, Southern Oregon, Nevada, and Idaho. It also serves as the primary teaching hospital for the UC Davis Medical School, with a wide range of residencies and fellowship programs. The adjoining UC Davis Children's Hospital offers comprehensive pediatric care, is the region's

only Level 1 pediatric trauma center, and is the only Level 1 children's surgery center on the west coast, as verified by the American College of Surgeons. Over the year prior to the implementation of this initiative, 128 children underwent appendectomy for acute appendicitis, of which 58 (42%) were found to have complicated appendicitis.

The UC Davis Office of Graduate Medical Education encourages quality improvement endeavors, particularly multidisciplinary and interdepartmental projects, and offers grant funding through a competitive application process. Grant recipients are provided both financial and technical support to assist implementation. Intermittent updates are required to ensure progress is being made.

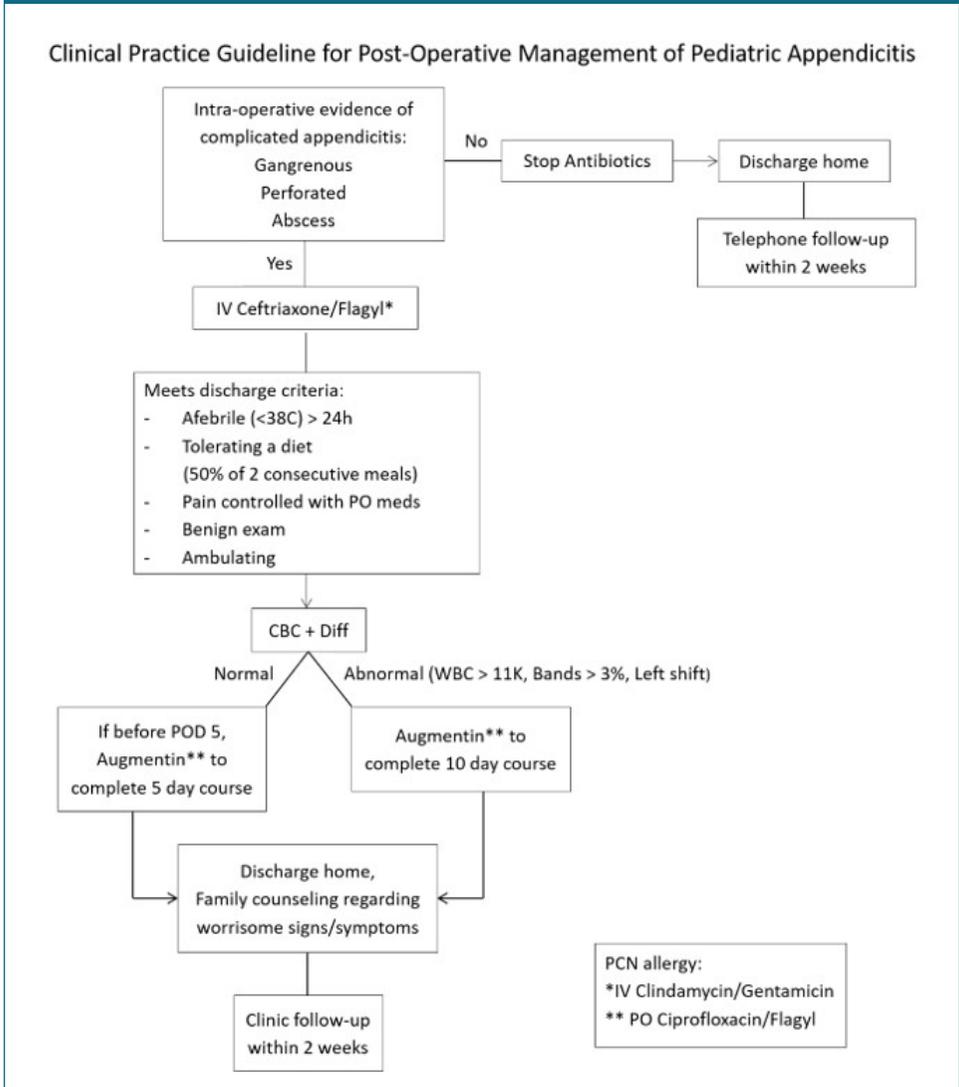
## **2. Planning and Development Process**

Clinical practice guidelines have been described at other institutions and their use, in general, has been endorsed by the American Pediatric Surgical Association.<sup>5</sup> Guidelines used at several other institutions were obtained and a literature review performed to guide development of a unique, local clinical practice guideline. The directors of Pediatric Antimicrobial Stewardship provided recommendations for postoperative antibiotic regimen, taking into consideration the local antibiogram. A first draft of the local clinical practice guideline was presented along with local performance metrics to the pediatric surgery department during a weekly departmental meeting. Individual meetings were then held with each pediatric surgeon to elicit detailed concerns and discuss potential alternatives to specific elements. The guideline was revised based on the accumulated feedback and subsequently received unanimous approval. The final approved guideline defined complicated appendicitis by specific intraoperative findings, established clear discharge criteria, and specified the postoperative antibiotic regimen.

## **Description of the Quality Improvement Activity**

Once the clinical practice guideline was approved, it was disseminated by e-mail to all members of the pediatric surgery team, including surgeons, residents, nurse practitioners, and pharmacists. Laminated badge buddy cards were also distributed, and the guideline was posted in each of the resident work rooms and call rooms. An e-mail explaining the project and its background, along with the current iteration of the guideline, was sent to rotating residents a few days prior to the start of each rotation. Surgeons, rotating residents, and nurse practitioners were primarily responsible for ensuring that the guideline was followed.

**Figure 1. Initial clinical practice guideline implemented for postoperative management of pediatric appendicitis.**



The first iteration of the guideline was implemented on November 1, 2016, and it was periodically updated following the Plan-Do-Study-Act model.<sup>6</sup> Data for all pediatric patients undergoing appendectomy were collected retrospectively from the electronic medical record. Data points of interest included:

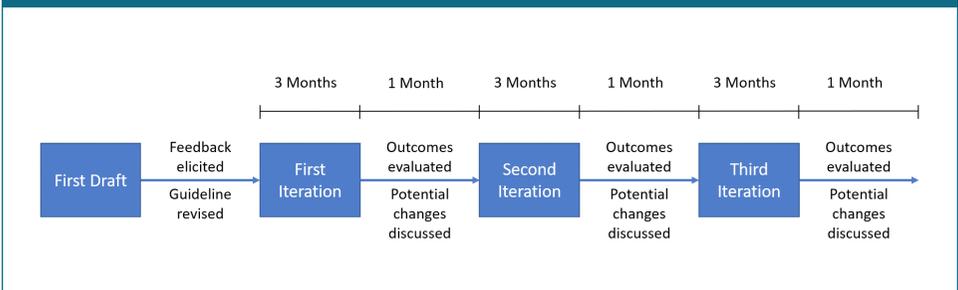
- Patient demographics
- Transfer status
- Diagnostic modality
- Length of stay

- Procedure performed (open vs laparoscopic)
- Operating surgeon
- Intraoperative findings (simple versus complicated appendicitis)
- Pathology results
- Intraoperative culture results (if applicable)
- Peripherally inserted central catheter (PICC) placement
- Total parenteral nutrition (TPN) use
- CBC results prior to discharge (if applicable)
- Antibiotics prescribed at discharge
- Duration of antibiotics (IV, PO, and total)
- Compliance with the guideline
- Infectious complications
- Emergency room visits
- Readmissions
- 30-day follow-up

Children who underwent interval and incidental appendectomies were excluded from further analysis.

Analysis was performed by the lead research fellow after every three months of patient data to assess key outcomes, specifically length of stay and complication rates. Results were presented at the weekly pediatric surgery department meeting and potential changes proposed. Changes were approved by consensus and a new iteration of the guideline released every four months, allowing a month between study periods to assess outcomes and discuss changes.

**Figure 2. Sequential guideline revision following the Plan-Do-Study-Act Model.**



## Resources Used and Skills Needed

1. Staff: The pediatric surgery department is composed of nine pediatric surgeons, including a mix of academic and private practitioners, three to four rotating general surgery residents, and one to two dedicated nurse practitioners. The pediatric infectious disease department was also involved during development. One general surgery research fellow oversaw the development, implementation, data collection, and periodic analysis of the project.
2. Costs: Costs were minimal, limited to printing and laminating for distribution each new iteration of the guideline.
3. Funding: Funding was provided through a grant from the UC Davis Office of Graduate Medical Education.

## What Were the Results?

Over the 12 months following implementation, decreases were seen in the length of stay for all children undergoing appendectomy for acute appendicitis from an average of 3.6 days to 2.6 days. For children with complicated appendicitis, the average length of stay decreased from 6.5 days to 5.4 days. Compliance with the guideline was high, observed in more than 93 percent of patients despite introduction of a new iteration every four months.

**Table 1. Compliance with the clinical practice guideline after implementation.**

	Iteration 1	Iteration 2	Iteration 3	Overall
Compliance	97.6%	92.7%	94.6%	93.9%

### 1. Setbacks

No major setbacks were encountered, which is likely due to buy-in from each pediatric surgeon during development of the guideline.

### 2. Cost Savings

As mentioned, there was minimal direct cost related to implementation of this project. Cost data for the index hospitalization was obtained and the median direct and total per patient costs were calculated. Direct costs per patient decreased from \$6,159 to \$5,917, while total costs per patient decreased from \$10,109 to \$9,748. When these average per-patient savings were extrapolated

out to the total number of patients treated for the year following implementation, there were estimated savings of \$47,432 in direct costs and \$70,756 in total costs. These estimates represent net savings, given the minimal monetary investment required.

## Tips for Others

It was important to identify a dedicated project lead to ensure timely guideline distribution and periodic analysis, as well as a surgeon champion to provide project support. Presentation of performance metrics, particularly areas of poor performance and national statistics, also increased motivation. Inclusion of all involved parties during guideline development was likely a crucial component for post-implementation compliance, as practice patterns prior to implementation were highly variable.

High rate of compliance was maintained through frequent, monthly reminders for new rotating residents, as well as updates to the surgeons every three months regarding outcomes and potential changes.

Distributed copies of the guideline should be numbered or dated to ensure easy identification of the newest iteration when changes are made. Alternatively, older versions could be collected and destroyed with each new release.

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■ WELLSTAR HEALTH SYSTEM

## Reducing GI Surgery Readmissions While Increasing Patient Satisfaction

## General Information

**1. Institution Name:** WellStar Health System

**2. Submitter Name:** Leigh Webb, DrPH, MPH, CTR

**3. Name of the Case Study:**

Reducing GI Surgery Readmissions While Increasing Patient Satisfaction

## What Was Done?

### 1. Global Problem Addressed

The oncology surgeons felt that the number of readmissions, within the first 30 days following surgery, was higher than the national average following GI oncology surgeries.

### 2. Identification of Local Problem

The readmission rate for GI oncology surgeries on 5 South from January 2015 to May 2015 was 14.77 percent, which exceeds the national readmission threshold of 12 percent. The total direct cost for all of the readmissions for the same time period was \$145,355.40.

## How Was the Quality Improvement (QI) Activity Put in Place?

### 1. Context of the QI Activity

WellStar Health System, the largest health system in Georgia, is known nationally for its innovative care models focused on improving quality and access to health care. Staying ahead of the curve in technology has enabled WellStar to be leaders in both the diagnosis and treatment of an extensive array of health conditions. Serving a diverse population, WellStar consistently looks at total patient wellness and works to ensure that all systems support that focus. WellStar is recognized nationally as an Employer of Choice and is featured on FORTUNE 100 Best Companies to Work For® list and Work Mother Magazine's Best Companies list.

Specialists and primary care providers work in a multidisciplinary environment with 20,000 team members throughout our 11 hospitals, 225 medical office locations, outpatient centers, health parks, a pediatric center, nursing centers, hospice, and homecare. By working through a patient-centered model of care, WellStar places enormous value on quality and safety with many accolades to support our work.

WellStar's senior leadership, board of trustees, authority, regional, and foundation boards evaluate our community's emerging needs to equip our facilities with the best new technology. We know that healthy patients come from healthy neighborhoods, and finding ways to deliver better care in metro Atlanta is a big part of who we are. As a not-for-profit, WellStar continually reinvests into the health of its communities through new treatments, services, and facilities.

## **2. Planning and Development Process**

The team was developed based on subject matter experts in oncology, surgical services, physician offices, and experience with Six Sigma. A SIPOC was created to make certain all members who should be involved were part of the committee.

### Description of the Quality Improvement Activity

- The project approach used the DMAIC problem-solving methodology.
- Strategic goals were outlined.
  - Decrease re-admission rate for GI oncology surgeries on 5 South to less than 10 percent by December 31, 2016.
  - Decrease the direct cost of readmissions by \$50,000 by December 31, 2016.
- A process map was created to delineate each step of the process after discharge.
- A fishbone diagram was created to determine root cause problems.
- Intervention developed by the team:
- A system for increasing the frequency of phone calls to the patients following surgery by the physician office staff.
  - Develop a post-surgical zones document to be given at surgical discharge to educate patients on symptoms to watch for and when to notify the physician or emergency care.
  - Develop an education booklet in conjunction with a class that explains the pre-op instructions, what will happen during the hospital stay, and what symptoms to look for after discharge. An insert of an illustration of the specific surgery will be included for each patient.
  - Develop an individualized pre/post-op class based upon the patient's surgical procedure to be facilitated by the nurse navigator.

## Resources Used and Skills Needed

### Team members:

Barbara Wilson, Director Oncology Professional Practice

Magali Huertas, GI Oncology Navigator

Nancy Page, GI Oncology Navigator

Kristen Lang-Coleman, 5 South CNL

Leigh Webb, LSS Green Belt

LouAnn Sago, Manager, Summit Surgical

Pam Beckwith, Nurse Manager, 5 South

Anju Nair, LSS Green Belt

## What Were the Results?

During the brainstorming session, the team determined that the appropriate collection of data would be measured by percentage of patients who were readmitted following a GI oncology surgery for a direct surgical postoperative complication.

The team also determined it was important to capture the amount of the direct cost for the admission for these patients, which is not reimbursable by insurance companies/CMS (Table).

**Table 1. Compliance with the clinical practice guideline after implementation.**

Time Frame	Re-Admission Rate	Direct Cost
January-May 2015	14.77%	\$145,355.40
June-December 2015	8.2%	\$71,017.33
CY 2016	5.3%	\$58,862.03
CY 2017	5.8%	\$102,484

### 1. Setbacks

- Developing education material for the education booklet that was appropriate for patients and met copyright license agreements
- Gaining support from physicians to require patients to attend the pre/post op education class with the Nurse Navigator

## **2. Cost Savings**

Since the development of the intervention, WellStar has saved \$100,000 per year as projected based on historical data on non-reimbursable charges for readmissions.

### **Tips for Others**

WellStar secured support from physician and administrative leadership for this project. A detailed project outlining the problem, possible solutions, and projected cost savings and details of increased patient satisfaction should be presented to the decision makers in this process.



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