

ACS QUALITY and SAFETY CONFERENCE

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# BEST PRACTICES CASE STUDIES

VOLUME 12 / JULY 2022

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**ACS** / AMERICAN COLLEGE  
OF SURGEONS

# BEST PRACTICES CASE STUDIES

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National Surgical Quality Improvement Program

NSQIP

The ACS  
Quality Verification  
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# QVP

ACS Quality Verification Program

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Quality Verification  
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# MBASQIP

Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program

MBASQIP

# Trauma Programs

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# CSV

Children's Surgery Verification



# NSQIP Ped

National Surgical Quality Improvement Program Pediatric

NSQIP  
PEDIATRIC

# GSV

Geriatric Surgery Verification

Geriatric Surgery Verification

# SSR

Surgeon Specific Registry

SSR™  
SURGEON  
SPECIFIC  
REGISTRY

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HOSPITAL

Reducing Unnecessary  
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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 QVP, ACS NSQIP Pediatric, GSV, CSV, MBSAQIP, Trauma Programs, 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 2022 Best Practices Case Studies were selected from a bank of approximately 400 abstracts submitted for the 2022 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.

Each Best Practices Case Study includes:

- Problem Detailing
- Goal Specification
- Strategic Planning
- Process Evaluation
- Outcome Evaluation
- Cost Evaluation
- Knowledge Acquisition
- End-of-Project Decision-Making

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 QVP, ACS NSQIP Pediatric, GSV, CSV, MBSAQIP, Trauma Programs, 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.

## ACS QUALITY and SAFETY CONFERENCE

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**CSV**

Children's Surgery  
Verification

**NSQIP Ped**

National Surgical Quality  
Improvement Program  
Pediatric

DELL CHILDREN'S MEDICAL CENTER  
OF CENTRAL TEXAS

# Approach to Decreasing Computed Tomography (CT) Utilization for Diagnosing Appendicitis

## General Information

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Dell Children's Medical Center of Central Texas

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**Name of the Case Study:**

Approach to Decreasing Computed Tomography (CT) Utilization for Diagnosing Appendicitis

## Problem Detailing

Reducing radiation exposure in the pediatric population has been a quality initiative nationwide for years. Dell Children's Medical Center (DCMC) joined the Pediatric Surgery Quality Collaborative (PSQC) in 2020. One of the first projects initiated in the collaborative focused on decreasing computed tomography (CT) utilization to diagnose appendicitis. A review of the literature by the collaborative found a study specific to CT utilization for diagnosing appendicitis in the pediatric population that showed a correlation between radiation exposure and increased cancer risk in later adult life.<sup>1</sup> After interviewing participating hospitals that were either high or low outliers, the collaborative created an implementation guideline to assist members in decreasing their CT rates.

Dell Children's NSQIP-P 2020 Semi-Annual Report (SAR) showed an increased CT rate to diagnose appendicitis compared to the previous report. After further historical review, the institution found the CT rate of 30.3% in 2020 was the highest since data collection for the appendectomy variable in the National Surgical Quality Improvement Program—Pediatric (NSQIP-P) started in 2015.

Dell Children's Medical Center is a free-standing pediatric hospital located in Austin, Texas. This 240-bed institution has 50 subspecialties and is a designated magnet hospital with a Level I Pediatric Trauma Center, Level I Children's Surgery Center, and a Level IV Neonatal

Intensive Care Unit. In fiscal year 2021 alone, DCMC had an average daily census of 121 patients, over 39,800 Emergency Department visits, and 7,121 surgeries.

DCMC is affiliated with The University of Texas at Austin Dell Medical School and is part of the Ascension Healthcare Company. Ascension is a faith-based nonprofit healthcare system that includes more than 150,000 associates, 40,000 aligned partners, and operates more than 2,600 sites of care in 19 states and the District of Columbia.

Beginning in May 2021, a project team consisting of two RN coordinators, a nurse manager, project manager, and a surgeon champion met to develop a plan to decrease DCMC's CT rate. The implementation guideline provided by the PSQC encouraged the use of a pediatric appendicitis scoring tool, appendicitis guideline, ultrasound (US) protocol and training, US reporting in electronic health records (EHR), and US strategies for patients with BMI  $\geq$  30. The team noticed that besides magnetic resonance imaging (MRI) utilization, DCMC already had most implementations advised by the collaborative in place but compliance with some of these factors had decreased over time. The project team organized a larger interdepartmental CT Reduction Team and included the addition of 14 representatives:

- *Administration:* Director of Trauma Services (1), Interim Surgical Services Director (1)
- *Surgery:* General Surgeons (2), Surgery Advanced Practice Providers (2)
- *Emergency Department:* Emergency Medicine Physicians (2), RN (1)
- *Radiology Department:* Radiologist (1), Radiology Manager (1)
- *Imaging Departments Leads:* Ultrasound technician (1), CT technician (1), MRI technician (1)

## Goal Specification

### SMART Goal

*Specific:* Using the implementation guideline provided by the Pediatric Surgical Quality Collaborative, DCMC aimed to decrease their CT utilization rate to  $\leq$ 15% while maintaining a negative appendicitis rate of  $\leq$ 1.75%.

*Measurable:* NSQIP-P and Institutional Data (Centricity and EHR)

*Achievable:* PSQC set a goal to have the CT utilization rate decrease to  $\leq 15\%$  by the end of the year 2021. The team discussed this goal and determined it was not obtainable as the project started mid-year (July 2021); therefore, DCMC decided to increase the timeline to one year (June 2022).

*Relevant:* Historically DCMC's CT rates for diagnosing appendicitis have been lower, as low as 12.8% in 2015. DCMC needed to address the changes that have occurred since this time and also determine any new implementations that could be added to the Acute Appendicitis Guideline to decrease the CT rate.

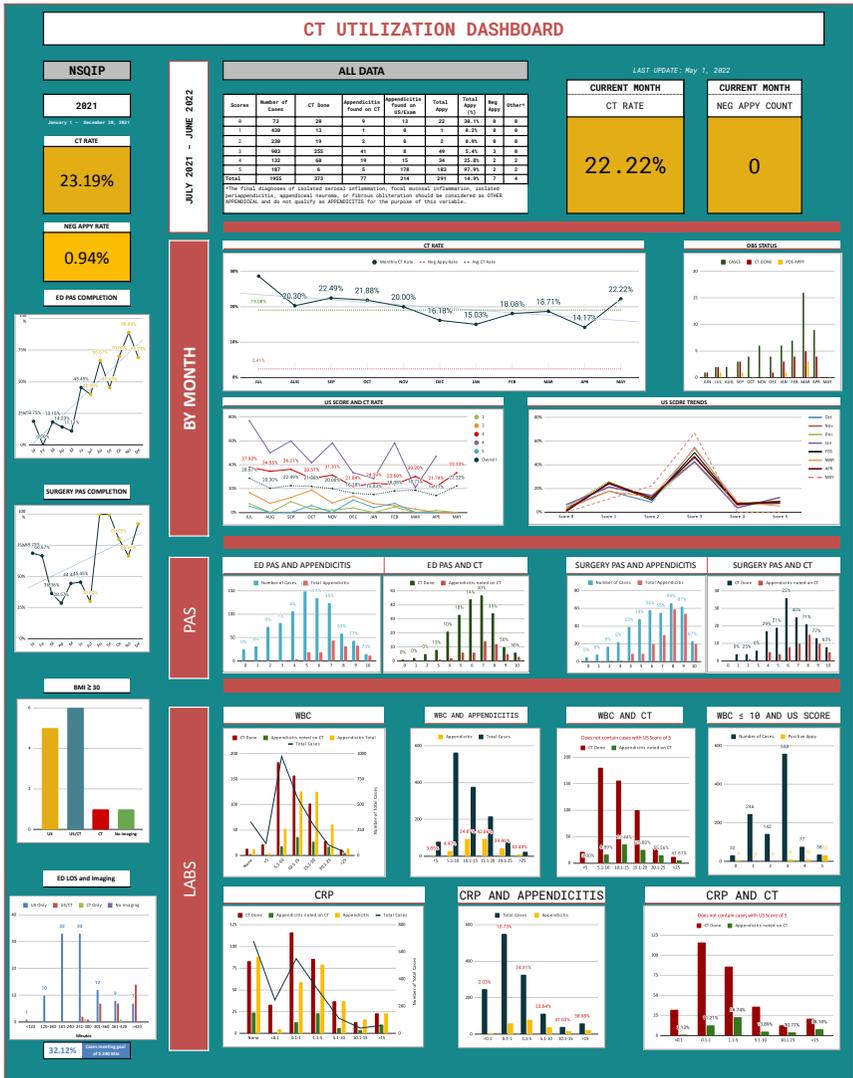
*Timeline:* July 2021–June 2022.

## Strategic Planning

Monthly meetings were scheduled starting in May during which each department was introduced to the project and end goal. Historical NSQIP-P data was reviewed and showed a decrease in compliance with Pediatric Appendicitis Score (PAS) documentation by the Emergency Department and Surgery. The group found that it would be beneficial to also collect data on all patients that were evaluated for appendicitis and received imaging at DCMC. This larger pool of data allowed the team to monitor the success rates of appendix visualization via US and CT in patients who did not have appendicitis as both data points are not collected in NSQIP-P. The additional data was collected via Centricity and hand-pulling from EHRs.

Since MRI utilization would be a new amendment to the current institutional Acute Appendicitis Guideline, the team also conducted a literature review to investigate the effectiveness and cost difference between MRI and CT for diagnosing appendicitis. As the actual cost of these procedures is institution based, DCMC connected with their billing department for the internal costs. The team determined that the fast sequence MRI would be just as effective as CT for diagnosing appendicitis and the long-term benefits of decreased radiation exposure outweighed the cost difference.

A "CT Utilization Dashboard" was created for easy data visualization and ad lib monitoring by the team. Data points on the dashboard included monthly CT rate, PAS completion, US visualization rates, ED duration, admissions for observation, and lab counts.



Many of the implementations involved in DCMC's project were already in place. The institution had an established Acute Appendicitis Guideline, the physicians were using an appendicitis scoring tool, and the ultrasound technicians were trained on visualizing the appendix. Success ultimately came down to focusing on resurfacing these processes and increasing compliance.

## Process Evaluation

The representatives took the information from the monthly meetings back to their respective departments and returned with follow-up interventions and goals.

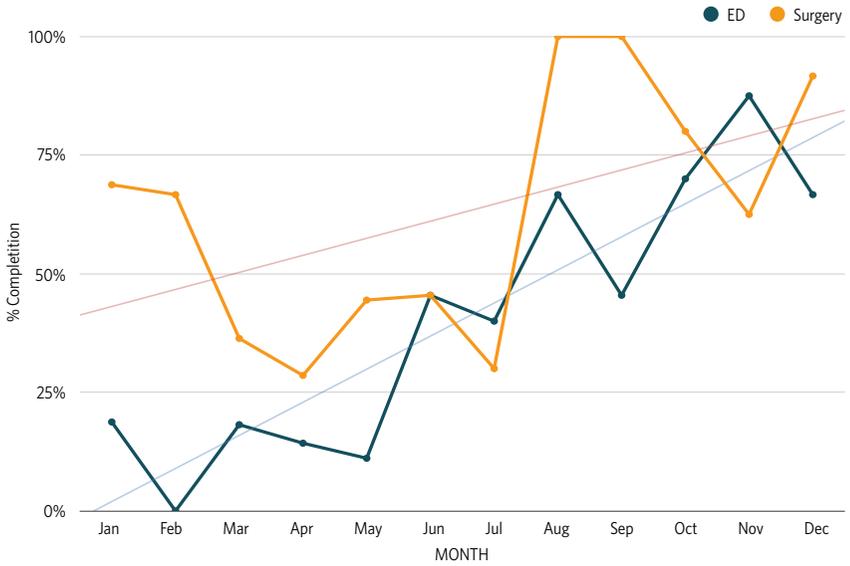
- The Emergency Department stated they will reach 100% compliance with PAS documentation by conducting inservices with attendings and residents, posting reminder flyers at workstations with instructions on simple EHR documentation, and counseling individuals who remained non-compliant at each data review.
- The Radiology Department made it mandatory to scan patients for a minimum of 15 minutes to visualize the appendix and when available, ask another technician to scan the patient if the appendix was not visualized.
- The Surgery Department encouraged their colleagues to give families the option to admit patients with equivocal exams for observation and next-day repeat US in lieu of a CT, held an inservice with their group to complete PAS documentation, and initiated the institutional process to incorporate MRI utilization for diagnosis of appendicitis.

The institutional Acute Appendicitis Guideline is in the process of being amended to incorporate MRI utilization for diagnosing appendicitis. The guideline is under review for approval by the evidence-based outcomes center committee. Currently, the MRI implementation is in the logistics phase, which includes the development of an MRI protocol and navigating how to incorporate the stat MRI orders from the emergency department into the daily MRI schedule.

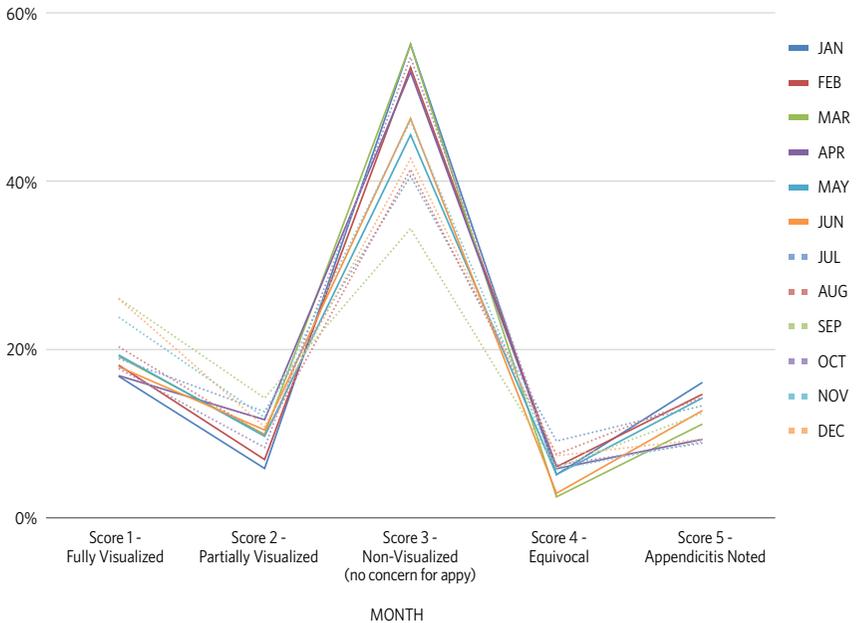
## Outcome Evaluation

The 2020 NSQIP-P data showed DCMC to have a CT rate of 30.3% with a negative appendicitis rate of 0.7%. According to the 2021 NSQIP-P data, the CT rate decreased to 23.2% with a negative appendicitis rate of 0.9%. PAS completion in both Emergency and Surgical departments and US visualization had an increasing trend over the year. DCMC has also shown an increase in hospital admissions for observation since the project began.

### ED and Surgery PAS Completion Rate (2021)



### US Score Trends (2021)



## Setbacks

Visualization of the appendix is highly dependent on the experience of the technician.<sup>2</sup> Staff turnover increased during the coronavirus pandemic, leading to a loss of experienced technicians. The data does show improvement, but the numbers may have been better if staff turnover did not occur.

There was a setback related to visualization of the appendix in patients with a high BMI; the radiology department is troubleshooting to determine if there is anything that can be done differently in these patients besides changing patient position and emptying bladder prior to US scan.

As expected, operationalizing MRI imaging instead of CT brought up some reservations in each involved department. DCMC addressed some of these reservations, such as MRI technician availability and interpretation of results, by seeking advice from other institutions involved in the PSQC who were already utilizing MRI for diagnosing appendicitis. The institutions shared their available resources, some of which included literature supporting MRI utilization, MRI protocol information, and coding. With the knowledge gained from these resources, the team is working through their concerns with hospital administration while emphasizing the importance of reducing radiation exposure to young children.

## Cost Evaluation

No additional costs or funding beyond normal hospital operations were needed to implement or maintain the project at the time this case study was written.

Cost considerations were not the focus of this project. With the unadjusted base cost for an abdomen/pelvis CT with contrast at DCMC being \$7,586, and the goal of significantly reducing the number of CT scans, cost savings may or may not be balanced out with resources committed to other aspects of the abdominal pain workup. Additionally, the MRI implementation pilot may reveal additional costs in the future.

## Knowledge Acquisition

There were several lessons learned from completion of this QI project, including:

- Leadership is very important for change. Having an involved leadership group increases buy-in from other stakeholders and provides the support and encouragement for the team to move forward towards project goals.
- Access to data is vital and presentation matters. Information Systems (IS) involvement was necessary to pull data outside of NSQIP-P that was required for this project. Additionally, the creation of a dashboard to visualize the data allowed stakeholders to review data anytime making meetings more efficient resulting in the Project Team receiving more feedback. Of note, not having a dedicated data analyst led to the Project Team having to take on this extra role.
- PSQC has been an excellent networking resource. The network has been very helpful as DCMC moves forward with MRI utilization for diagnosing appendicitis.

## End-of-Project Decision-Making

Upon project completion, the dashboard will be available to the entire hospital in Tableau. This will allow for sustainability of data dissemination and continuous monitoring.

The Acute Appendicitis Guideline is currently under review to incorporate MRI utilization. Once implemented and if CT rate continues to decline, DCMC does not see any additional changes to be made until the 3-year guideline review mark. DCMC plans to share the guideline and project results with other interested Ascension hospitals in the surrounding area.

## Acknowledgments

Special thanks to Terry Fisher and Dr. Kevin Lally from the PSQC for all your help with this project. The team would also like to thank Dr. Afif Kulaylat and Dr. Michael Moore from Penn State, Dr. Loren Berman from Nemours, and Dr. KuoJen Tsao from Children's Memorial Hermann for all the MRI resources and guidance they have provided. Lastly, to all in the CT Reduction Team, thank you for all the time and hard work you dedicated to this effort.

### References:

1. Lee KH, Lee S, Park JH, et al. (2021). Risk of hematologic malignant neoplasms from abdominopelvic computed tomographic radiation in patients who underwent appendectomy. *JAMA Surg*, 156(4), 343-351.
2. Kim J, Kim K, Kim J, et al. (2017). The learning curve in diagnosing acute appendicitis with emergency sonography among novice emergency medicine residents. *J Clin Ultrasound*, 46(5), 305-310.

## ACS QUALITY and SAFETY CONFERENCE

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### MBSAQIP

Metabolic and Bariatric Surgery  
Accreditation and Quality  
Improvement Program

BON SECOURS ST. FRANCIS HOSPITAL

# Reduction in Postoperative Nausea and Vomiting (PONV) Leads to Decrease in Emesis, Length of Stay, and Opioid Use in Bariatric Surgery Patients

## General Information

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Bon Secours St. Francis Hospital

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**Name of the Case Study:**

Reduction in Postoperative Nausea and Vomiting (PONV) Leads to Decrease in Emesis, Length of Stay, and Opioid Use in Bariatric Surgery Patients

## Problem Detailing

Bariatric surgery is inherently associated with an increased risk of postoperative nausea and vomiting (PONV) compared to other surgical disciplines. In bariatric surgery patients, PONV is cited as one of the most common causes for prolonged lengths of stay (LOS) and unplanned readmissions.<sup>1</sup> A recent position statement published by the American Society for Bariatric Surgery states that “there is an urgent need for more research to address the significant problem of PONV in this special population”.<sup>2</sup> In their position statement, a lack of bariatric specific screening, established management guidelines and appropriate measurement tools are among the greatest needs.<sup>2</sup> This highlights the need for more research.

After our involvement with the ENERGY Project in 2017, and with the implementation of our ERAS protocol, locally, our program observed significant improvement in LOS and drastically decreased use of opioids both in the inpatient and outpatient setting. As

we continued to follow our quality data, we noted a rise in the incidence of PONV within our bariatric surgery patients. Bariatric patients were experiencing more of these occurrences than the rest of our surgical population.

A further review of our 2020 data demonstrated a higher rate of PONV and documented emesis in our bariatric patients. Our patients were having more PONV in the Post-Anesthesia Care Unit (PACU) and on the inpatient nursing unit (SPCU) than other surgery patients.

The goal of this project is to work toward improving the patient experience and decrease PONV and LOS in the bariatric surgery patient in the PACU and on SPCU.

Bon Secours St. Francis Hospital is one of four hospitals in the Roper St. Francis Healthcare system in Charleston, South Carolina. It is licensed for 190 beds and was the Lowcountry's first Magnet Hospital. The hospital was designated in 2010 and redesignated in 2015 and 2020. The hospital specializes in neurosurgery, bariatrics, maternity care, and cancer care. Bon Secours St. Francis Hospital is a leader in image-guided, minimally invasive surgeries and was the first hospital in South Carolina to obtain CyberKnife® and O-arm™. Some of Bon Secours St. Francis Hospital's awards include four stars for overall hospital performance by Centers for Medicare & Medicaid Services; Grade-A rating from Leapfrog; Blue Distinction Center for Maternity Care, Bariatric Surgery, and Spine Surgery; Healthgrades Critical Care Excellence Award (2018-2020); and Healthgrades recognition as one of America's 100 Best Hospitals for General Surgery Award and America's 100 Best Hospitals for Stroke Care Award (2020).

## Goal Specification

### SMART Goal

*Specific:* The goal of this project is to decrease PONV in the bariatric surgery patient, both within the PACU and in the SPCU, by December of 2021.

*Measurable:* Our data was extracted from a combination of the electronic medical record (EMR) and the MBSAQIP database.

*Achievable:* We have the necessary staff to implement this project.

*Relevant:* Eliminating nausea and vomiting should increase patient satisfaction. Decreasing LOS and readmissions is a cost savings for both patients and the hospital.

*Timeline:* January 26 through December 31, 2021.

## Strategic Planning

Our project team leveraged a Plan-Do-Check-Act (PDCA) methodology.

*Plan:* We identified a subgroup of key stakeholders from the Metabolic & Bariatric Surgery (MBS) Committee members and developed a team to evaluate baseline PONV data, review literature, identify opportunities for improvement, and make recommendations for change in our current process. Our team consisted of:

- One General and Bariatric Surgeon, Chief, Department of Surgery, Bon Secours St. Francis Hospital, Medical Director, Roper St. Francis Bariatric Surgery and Metabolic Weight Loss Division
- One Bariatric Surgeon, Bon Secours St. Francis Hospital
- One Lead CRNA, Bariatric and Metabolic Surgery Bon Secours St. Francis Hospital
- One Bariatric Coordinator, Bon Secours St. Francis Hospital
- One Pharmacy Clinical Specialist, Bon Secours St. Francis Hospital
- One Quality Specialist and MBSCR Bon Secours St. Francis Hospital
- One Quality Specialist, Research Nurse Scientist RSFH Department of Nursing Excellence

In addition to our project team, we have an interdisciplinary MBS Committee that meets monthly.

The MBS Committee consists of two bariatric surgeons, two obesity medicine physicians, four advanced practice providers, one program coordinator, five dietitians, four representatives from the Quality Department, four representatives from hospital administration, five anesthesia providers, one pharmacist, and one clinical psychologist. The committee also includes representatives from Endoscopy, Imaging, Physical Therapy, Respiratory Therapy, Infusion Center, Physician Office, the preoperative area, PACU, and the inpatient nursing unit; two representatives from the OR; and four Clinical Educators.

*Do:* The CRNA reviewed all charts for patients undergoing bariatric surgery from October to December 2020 who had PONV in PACU and on SPCU. The presence of PONV was determined by chart review of rescue antiemetics received (ondansetron or promethazine). A literature review was also completed.

The Fourth Consensus Guidelines for Management of PONV, published by the American Society of Enhanced Recovery (ASER) and Society of Ambulatory Anesthesia (SAMBA), highlights the importance of a multimodal approach.<sup>3</sup> Several therapies with various mechanisms of action are cited but there is a significant lack of evidence highlighting the single best approach.<sup>4</sup> Fosaprepitant and aprepitant are Neurokinin 1 (NK1) receptor antagonists and carry a Category A Level 1 recommendation for PONV prophylaxis.<sup>3</sup> The decision to trial fosaprepitant over alternative antiemetics with similar quality of evidence stemmed from NK1 receptor antagonists' proven ability to reduce acute and delayed emesis. In a prospective, double-blind placebo-controlled study of 125 patients undergoing bariatric surgery with Apfel scores  $\geq 2$ , utilization of aprepitant was associated with an absolute risk reduction in incidence of vomiting of 11.9%.<sup>5</sup>

In a retrospective chart review of 338 female patients undergoing bariatric surgery, aprepitant was associated with a cumulative reduction in vomiting episodes at 48 hours ( $p=0.04$ ).<sup>6</sup> In a retrospective database analysis of 4 identically designed, double-blind, randomized controlled studies of 171 female patients with Apfel scores  $\geq 2$ , use of fosaprepitant demonstrated statistically significant reductions in vomiting episodes at 0-2 hours ( $p=0.002$ ), 0-24 hours ( $p<0.001$ ), and 0-48 hours ( $p<0.001$ ) after surgery.<sup>6</sup> The ASER/SAMBA guidelines suggest "NK1 receptor antagonists may be useful when postoperative emesis is highly undesirable, such as in gastric surgery."<sup>7</sup> The literature review indicated that bariatric surgical patients are high risk for PONV, as several variables comprise this risk category, including surgical site, mechanical manipulation of stomach, length of surgery, female predominance, and preoperative smoking cessation requirement.<sup>8,9</sup>

## Process Evaluation

Anesthesia proposed the addition of fosaprepitant to our established ERAS PONV prophylaxis protocol. This consisted of preoperative application of a scopolamine patch, IV dexamethasone 8 mg prior to induction of anesthesia, and IV ondansetron 4 mg within 30 minutes of emergence. After literature review and discussion with pharmacy leadership, fosaprepitant use for bariatric cases was implemented January 2021 with plans for formal review and approval by the Pharmacy and Therapeutics (P&T) committee after a three-month trial period. The PONV subgroup met biweekly to review data in preparation

for P&T committee meeting on April 6, 2021, where key stakeholders were granted formal approval to continue utilization of fosaprepitant. It was added to the preoperative medication order set and was given to all bariatric surgery patients. On December 7, 2021, fosaprepitant was brought back to the P&T committee as a follow-up item to review six months of internal data since its implementation as part of the Bariatric Surgery ERAS protocol.

The team's data gathering approach included:

- We created an Excel spreadsheet for data collection. Metrics included postoperative nausea in PACU and/or SPCU, documented emesis, and drinking within 8 hours of surgery.
- We developed an encounter form to interview each patient. Starting on postoperative day (POD) one, a PACU nurse would evaluate the patient's PACU experience via interview. On POD two, an anesthesia provider would perform a follow-up interview to assess for any painful or noxious stimuli throughout the perioperative period.
- Additional follow-up interviews were performed by phone, typically 24 to 48 hours after discharge, to assess patient's oral intake tolerance.
- All data collected was maintained in an Excel spreadsheet and updated periodically. Members of the PONV project team developed a handout highlighting key components within our ERAS protocol and in-services were provided in May 2021 to the Ambulatory Surgery Unit (ASU), PACU and SPCU staff on the overall goals and Performance Improvement (PI) initiatives.

Several changes were made throughout the project period that could influence outcomes. Effective June 1, 2021, utilization of a preoperative scopolamine patch was discontinued. This decision stemmed from concerns that scopolamine's anticholinergic effects could pose as a barrier to early ambulation, thus contributing more risk than benefit in light of fosaprepitant's implementation. Additional changes included utilization of an 8 mg dose of ondansetron in the OR, rather than 4 mg. In the early stages of data collection, our team noted that several patients were receiving an additional 4 mg dose in the PACU. We thus decided to optimize our initial ondansetron dose and provide a different drug class in the PACU as a rescue antiemetic. Other changes effective June 1, 2021 included implementation of QueaseEASE aromatherapy in PACU and

SPCU, and adjustment of our goal time for postoperative ambulation and oral fluid intake from 8 hours to 6 hours.

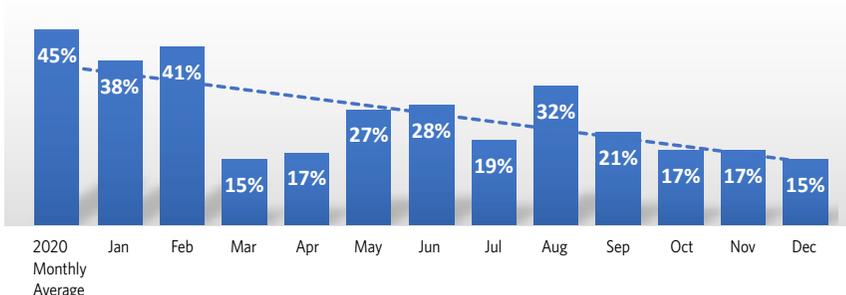
Nurses documented the time that patients left PACU on the SPCU whiteboard as a visual cue to optimize achievement of time-dependent goals. We worked with pharmacy to develop a bariatric-specific ANES Phase 1 order set for the PACU. It provided guidance for first and second-line treatment of postoperative pain to decrease opioid use and treatment of postoperative nausea. Components included ketorolac 15mg IV for pain management, as well as QueaseEASE, promethazine 6.25mg IV, and lorazepam 0.5mg IV for nausea management.

## Outcome Evaluation

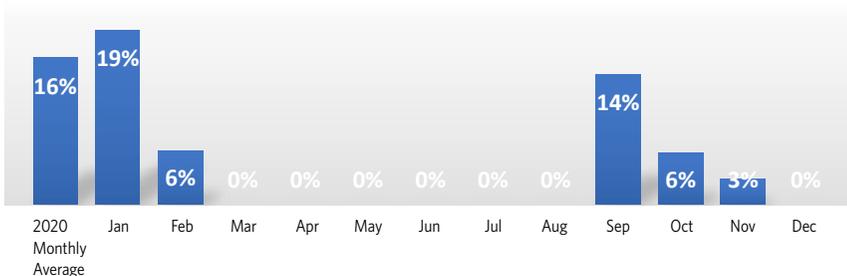
Check: PONV was measured utilizing the documented administration of a rescue antiemetic in PACU or on the inpatient unit in the electronic medical record (EMR). Emesis was measured based on documented emesis volume or emesis occurrences in the EMR. Percentage was calculated based on the number of patients that received a rescue antiemetic or had emesis documented divided by the overall bariatric surgical cases each month multiplied by one hundred.

PONV data was reviewed at the monthly MBS Committee meetings. With the implementation of these process changes, we observed a decrease in PONV in our patient population from an average of 45% in 2020 to an average of 24% in 2021, and a decrease in documented emesis from an average of 16% in 2020 to an average of 4% in 2021.

### PACU Rescue Antiemetic Percentage

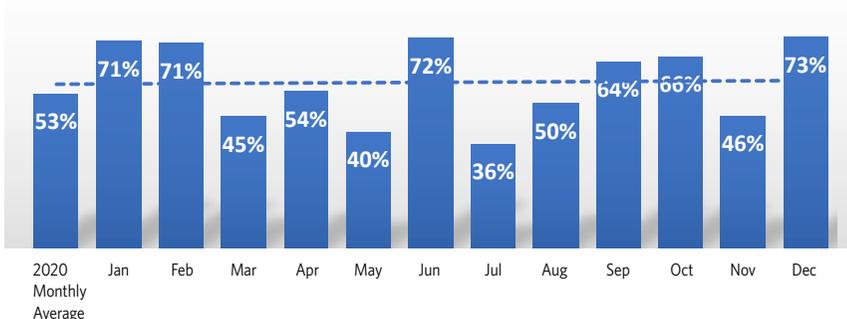


## Emesis Documented Percentage



One surgeon scheduled post-op ondansetron on SPCU instead of on an as-needed basis, which affected the data. As of December 2021, both surgeons prescribe scheduled post-op ondansetron and only promethazine is considered a rescue medication.

## Floor Rescue Antiemetic Percentage



The addition of fosaprepitant and other interventions described has positively contributed to improved patient outcomes.

*Act:* We continue to review monthly PONV data at the MBS committee meetings in 2022 and assess for opportunities for improvement. We share data with the units, posting results and showing the success of our interventions.

## Setbacks

One anesthesiologist was resistant to our strategy to minimize opioids and continued to pursue their use in our cases. All providers are tracked on an Excel spreadsheet. It was decided to exclude this provider from our analysis. Two physicians prescribed promethazine as PRN. We will perform further analysis to determine which orders were given PRN and given to treat breakthrough.

Throughout this PI project, reeducation was performed to address noncompliance with our PONV protocol. One PACU nurse was providing aromatherapy and administering IV rescue antiemetics concomitantly. Some staff members also did not retrieve preoperative orders which prompted repeat education.

There was a delay to updating the order sets in our EMR. This potentially served as a barrier since our order sets were not reflective of our PONV protocol when we began our intervention. To prevent a delay in our go-live, we provided education to the PACU nurses and Anesthesia on the protocol. This allowed us to begin implementation before the official order set was established in the system.

Gold standard assessment of postoperative pain or nausea relies on direct patient communication.<sup>3</sup> Assessing pain and nausea can be challenging due to its subjective nature as well as the varying degrees of sedation seen in the perioperative period. In review of our baseline data, most patients reported high scores on pain and nausea scales, which prompted us to evaluate our process. However, the reliability of this data does serve as a limitation.

The timing of our PONV PI project and the implementation of the da Vinci robotic cases could have also served as a limitation, as this procedure can be associated with increased nausea, vomiting, intraoperative time, and anesthesia requirements. Utilization of da Vinci technology for robotic-assisted surgery began a couple of months prior, in January. We found that patients did not experience increased vomiting so, in spite of the longer cases and the implementation of robotic surgery, we did not see a change in our data.

We cannot be confident fosaprepitant caused the change or if it was one of the other variables implemented during our project. We also implemented the use of aromatherapy June 2021. In review, it would have been better if our project was organized differently, with consistent gaps in between each intervention.

## Cost Evaluation

With an average cost of an RSFH general acute care inpatient day at \$880, by cutting our length of stay (LOS) from 2 days down to 1 day, there was a potential cost savings in 2021 (332 patients) of \$292,160 (calculated based on a cost of \$880 per patient). While we did not reduce our LOS down to our goal of 1 day, we did reduce LOS from 2020 to 2021. Using the same volume of patients from 2020 to 2021 (332) with actual LOS data, our potential cost savings from 2020 to 2021 is as follows:

- Total potential cost savings from 2020 to 2021: **\$111,020.80**
  - Potential cost savings for RNY cases: **\$20,451.20**
  - Potential cost savings for sleeve cases: **\$90,569.60**

The annual medication cost of implementation of fosaprepitant is approximately \$15,000. In selecting a NK-1 receptor antagonist for the Bariatric PONV prophylaxis protocol, the parenteral prodrug formulation, fosaprepitant, was chosen over the active oral formulation, aprepitant, to avoid potential cost constraints that would be incurred directly by the patient and optimize adherence. Since administration recommendations for PONV prophylaxis is 3 hours prior to induction, aprepitant would require patient to purchase as an outpatient and self-administer prior to presenting to the facility for their procedure.

The additional costs associated with PONV were up to one hundred times more expensive compared with prophylaxis with generic antiemetic. The cost of treating vomiting was three times more than the cost of treating nausea.

There was no additional funding for this project.

## Knowledge Acquisition

Lessons learned from this project include:

- **It is beneficial to have a committed team.** For example, the Anesthesia team was very involved; they spoke with patients and physically went to the PACU and talked to the nurses. One of our team members previously worked in the PACU; that was helpful as she knew many of the staff. We worked directly with a PharmD, who was integral to the success of this project, a key stakeholder and part of the committee.
- **It is important to have a consistent care team.** In addition to the anesthesia team and PACU nurses, we had core set of floor nurses that were taking care of the bariatric patients. While we did not experience any issues on this project, we did address

it early on to make sure the project was being implemented across the board in the same way.

- **Always look at your data, as this is important for continuous improvement.** If you find an issue, you could dig further to determine the cause, for example, did an anesthesia provider go off protocol? Is it a one off or a trend?

Our project is unique. Our team is already involved in bariatric patient care and available, so we did not need to pull outside of our resources. Our stakeholders are engaged; the monthly interdisciplinary meetings are well attended. We share our data, and the committee provides feedback to help tweak our process. It is always encouraging when you are trying to make a change and you have interest and support for that change.

## End-of-Project Decision-Making

We are still adjusting our process, and we recently added a postoperative preventative pain medication which might influence the data.

We are currently reviewing our process, taking out steps, and simplifying the data we collect while ensuring we are still on track.

We plan to share our results with other service lines. We have educated indirectly by word of mouth, and this has helped others with an interest in implementation in their programs. We will continue to monitor and review our data on a monthly basis and look for opportunities for improvement.

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## ACS QUALITY and SAFETY CONFERENCE

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TAIPEI MEDICAL UNIVERSITY HOSPITAL

# Reducing Unnecessary One- Unit Blood Transfusion in Orthopedic Surgeries

## General Information

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### **Name of the Case Study:**

Reducing Unnecessary One-Unit Blood Transfusion in Orthopedic Surgeries

## Problem Detailing

Blood transfusion is a common medical practice during treatment. Reducing unnecessary transfusions can reduce the risk of fever, rashes, allergic reactions such as urticaria, hemolytic transfusion reactions, and even the fatal risk of transfusion-related acute anaphylactic shock. What's more, reducing unnecessary transfusions can improve patient safety and reduce the waste of medical resources.<sup>1-2</sup> Research indicates bilateral total knee replacement surgeries have a high blood transfusion rate.<sup>3</sup> In the United States, hemoglobin rate is used to determine if a patient needs a blood transfusion.<sup>3-4</sup>

Through the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) online data, we found that our overall surgical performance was better than international peers, but our transfusion rates (7.98%, 9.66%) were higher than peer hospitals (7.2%) in some months. Further analysis found that certain surgical categories had higher transfusion rates than international peers. The blood transfusion rate of our hospital in 2019 was 9.00%, higher than the 2018 rate of 8.7%.

In phase I (March 2020) the whole-hospital blood transfusion intervention was discussed by the Blood Transfusion Committee. It was determined that it was necessary to communicate that the blood transfusion rate was higher than that of the international peers. We built a Blood Transfusion Power BI dashboard to highlight blood transfusion case list and facilitate clinical case discussion. This was made available to the surgical management committee and hospital executives. The NSQIP blood transfusion rate in our hospital dropped from 6.66% (October 2019–February 2020 average) to 5.38% (March 2020–September 2020 average), and the average blood transfusion rate in the whole hospital dropped from 9.16% to 7.98%. The blood transfusion rate in the whole hospital showed a downward trend (Figure 1).

**Figure 1. Cross-Annual Blood Transfusion Rate of Hospital NSQIP (7.20%) > TMUH 2020 (5.93%) > TMUH 2021 (4.23%)**





Taipei Medical University Hospital (TMUH) was founded in 1976, providing patient-centered comprehensive medical services with over 800 beds, 39 specialty/subspecialty medical departments, and 2,000 medical staff. Since 2009, TMUH has been accredited four times by JCI (Joint Commission International), which recognizes the high-quality services and world-class patient care we provide.

Our commitment to providing the highest quality patient care can best be exemplified by past recognitions awarded to TMUH. ACS NSQIP helps TMUH promote cross-team collaboration, improve surgical quality, achieve patient safety, and realize cost savings through different aspects of analysis.

## Goal Specification

### SMART Goals

*Specific:* In order to avoid unnecessary blood transfusion in orthopedic surgery, we plan to reduce 1U blood transfusion in orthopedic surgery 80% (from 3.9% to 0.78%).

*Measurable:* We will evaluate our progress using NSQIP registry and hospital administrative data.

*Achievable:* The primary issue is administration of unnecessary blood transfusions during surgeries. We will work with the individual departments to improve this process.

*Relevant:* We aim to decrease preventative blood transfusions and reduce early ordering of blood products. This will reduce waste and allow more blood products to be available for other patients. This is especially important now as the COVID-19 pandemic has resulted in limited blood supply. Additionally, there is a risk of infection associated with blood transfusions. These are important issues to address.

*Timeline:* Phase II intervention in September 2020. This project is ongoing. The committee monitors data monthly.

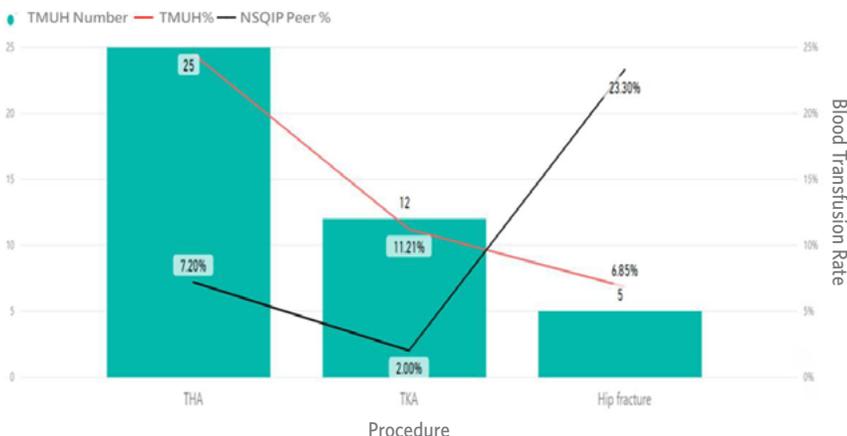
## Strategic Planning

We are a quality improvement team of 8 people including the Director of Orthopedics, Director of Anesthesiology, Chairman of Blood Transfusion Committee, Division Head of Blood Bank, Director and Assistant Director of Medical Quality Department, ACS NSQIP Surgeon Champion, and ACS NSQIP Surgical Clinical Reviewers.

Key stakeholders include all orthopedic surgeons, anesthesiologists, and assistants; operating room nursing staff; blood bank staff; transfer staff; and administrative staff.

The Blood Transfusion Committee monitors quality indicators to ensure the quality of our hospital. The committee discovered a rate of blood transfusion specifically for total knee replacement (TKA) and total hip replacement (THA) higher than NSQIP peer hospitals (Figure 3).

**Figure 3. Peer Comparison in Blood Transfusion Rate**



The team met with the Orthopedic, Anesthesia, Blood Bank, and Surgical Departments to further review the data. We discovered that most of the orthopedic patients in our hospital were elderly and had coronary heart disease. Additionally, the high blood transfusion rate was specific to some orthopedic surgeons who had previously experienced poor surgical outcomes due to delays in receiving intraoperative blood and/or postoperative stroke. Consequently, the orthopedic surgeons began implementing prophylactic 1U blood transfusions for patients undergoing TKA and THA procedures to prevent stroke. We hope that in the future, we can reduce bleeding and unnecessary intraoperative blood transfusion through teamwork.

Based on this review and on our previous experience, we updated our blood transfusion process to include the following:

- Improved protocol for initiating transfusion:** The suitability of blood transfusion is determined by the patient's intraoperative status. The surgeon and the anesthesia team are strengthening communication on the patient's age, preoperative hemoglobin, BMI, medical history (e.g. coronary heart disease),

intraoperative vital signs, operation time, blood loss, and other information during operation.<sup>3-8</sup>

- **Improved timeliness of blood delivery:** We are ensuring timely delivery (within 5–30 minutes) of intraoperative blood to the patient. The blood bank staff randomly checks the time to deliver blood to the surgical patients, including the time when the blood bank staff receives the blood collection request in the operating room, the preparation time of the blood bank, and the blood delivery time.

There were no funding sources or additional costs for this project.

We presented our finalized processes to the Blood Transfusion Committee and received approval to move forward.

## Process Evaluation

The Phase I intervention found that although there was a downward trend in blood transfusion in the whole hospital, intraoperative 1U blood transfusions were more concentrated in the orthopedics department. This led to the initiation of the phase II intervention.

Our hospital improves surgical quality through teamwork. Each team involved in this intervention contributed specific and important work, outlined below.

- **Department of Orthopedics**
  - *Literature review:* The department conducted a thorough literature search for methods to reduce bleeding and high-risk factors requiring blood transfusion for medical team judgement. This review confirmed that there is no literature proving that prophylactic blood transfusion can effectively prevent stroke.<sup>3-8</sup>
  - *Publicity and implementation:* The department agreed to use hemostatic drugs (TRANSAMIN) during and after surgery and did not use tourniquets during operations, and also publicized the approach in the morning meeting of the department.
  - *Individual communication:* The director of the department communicated with specific physicians and used literature research as interview materials to improve the publicity effect.

- **Department of Anesthesiology**
  - *Strategy*: The department discussed the strategy of reducing unnecessary blood transfusion and publicize the decision of the Blood Transfusion Committee in the department and anesthesia nursing meeting.
  - *Operating room support*: Discusses the necessity of blood transfusion with the chief surgeon according to the patient's current vital signs, body temperature, blood loss, etc. during the operation.
- **Blood Transfusion Committee**
  - *Case analysis*: Analyzes 1U blood transfusion cases on a quarterly basis through preoperative and intraoperative case data to confirm whether there are still unnecessary blood transfusions.
  - *Onsite inspection*: Confirms the process of requesting blood from the operating room to the blood bank, preparing blood from the blood bank and sending blood to the operating room to ensure the timeliness of blood delivery.
- **Department of Quality Management**
  - *Accountability*: Continuously reviews medical records to collect blood transfusion events during surgery according to NSQIP specifications. The cross-year trend chart, NSQIP peer comparison chart, and case list (including case number, chief surgeon, intraoperative blood loss, blood transfusion timing, and surgical procedure, etc.) are presented through the Power BI dashboard so that the clinical team can quickly monitor the blood transfusion situation.

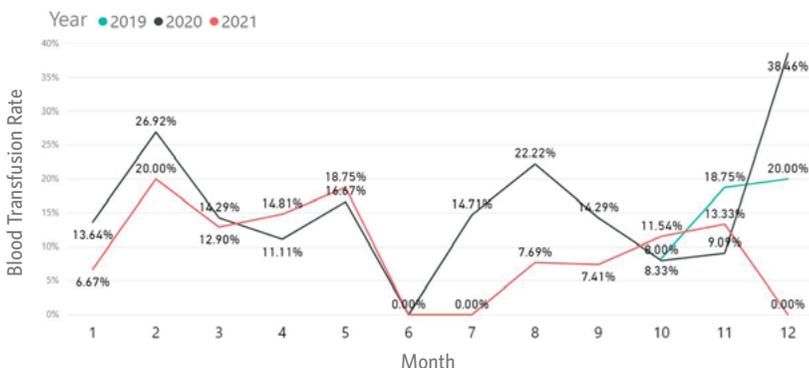
## Outcome Evaluation

We accept cases according to ACS NSQIP guidelines. Patients had to meet criteria which was deemed to be in their best interest to transfuse blood products (specifically red blood cell & whole blood products) or reinfuse autologous red blood cell or cell-saver products, and to quantify the units utilized/initiated during the primary procedure and up to 72 hours from the surgical start time, postoperatively. Exclusion criteria included outpatient procedures, patients under 18 years of age, patients with an ASA score of 6, patients admitted to treat an injury caused by trauma or abuse, and cases involving Hyperthermic Intraperitoneal Chemotherapy (HIPEC). In addition, according to the needs of cross-team experts, we collected

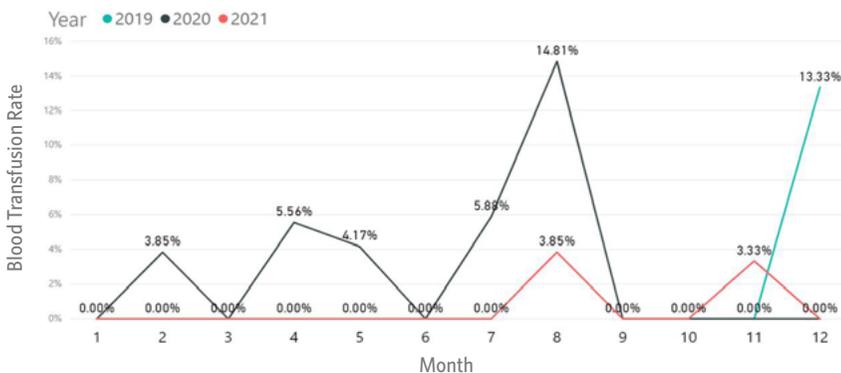
blood transfusion timing (intraoperative and postoperative) and blood loss to facilitate judgment. We used a combination of chart review, automated Power BI dashboards, and drill-down analysis and continuous monitoring of blood transfusion across team members.

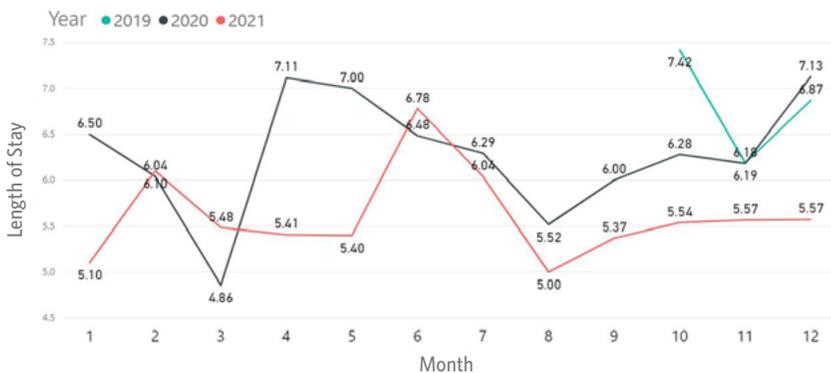
After phase II intervention in September 2020, the intraoperative blood transfusion rate during orthopedic surgery decreased slightly from 14.94% to 11.41% ( $P=0.139$ ) (Figure 4), and intraoperative 1U blood transfusion rate for orthopedic surgery decreased significantly from 3.9% to 0.2957% ( $P < 0.05$ ) (Figure 5). We were pleased to see this substantial reduction in intraoperative 1U blood transfusion rate. Additionally, postoperative length of stay (LOS) of orthopedics decreased from 6.1 to 5.7 ( $P=0.49$ ) (Figure 6).

**Figure 4. Cross-Annual Intraoperative Blood Transfusion Rate of Orthopedics**



**Figure 5. Cross-Annual Intraoperative 1U Blood Transfusion Rate of Orthopedics**



**Figure 6. Cross-Annual Postoperative LOS of Orthopedics**

## Limitations

- This project is focused on our hospital and is a small sample size. It would be useful to conduct a multi-center or larger project on this issue.
- The project is focused on personal experience. We changed our culture and behaviors, but we are unsure if this type of experience has occurred in other hospitals.

## Cost Evaluation

We estimate that we reduced blood transfusions for 126 patients per year. Assuming the average blood transfusion cost per patient is \$219, this intervention may reduce the annual cost of blood transfusions for orthopedic surgery by \$27,594.<sup>9</sup>

## Knowledge Acquisition

- **Communication of data is essential.** The Power BI system is a useful tool. We will continue to utilize this system to monitor patients, identify problems, educate, and share data between colleagues and surgeons.
- **Interdepartmental cooperation is key.** The project involved the cooperation of three departments: Department of Orthopedic Surgery, Blood Bank and Blood Transfusion Committee, and Department of Quality Management. We worked together to review the data, determine the transparency, and develop solutions.

- **Quality improvement enhances patient-centeredness.** This project has encouraged our hospital and surgeons to increase our focus on patients. We have increased our focus on the patient by monitoring their medical condition more closely. This is a valuable lesson; we can do more for patient safety and patient care.

## End-of-Project Decision-Making

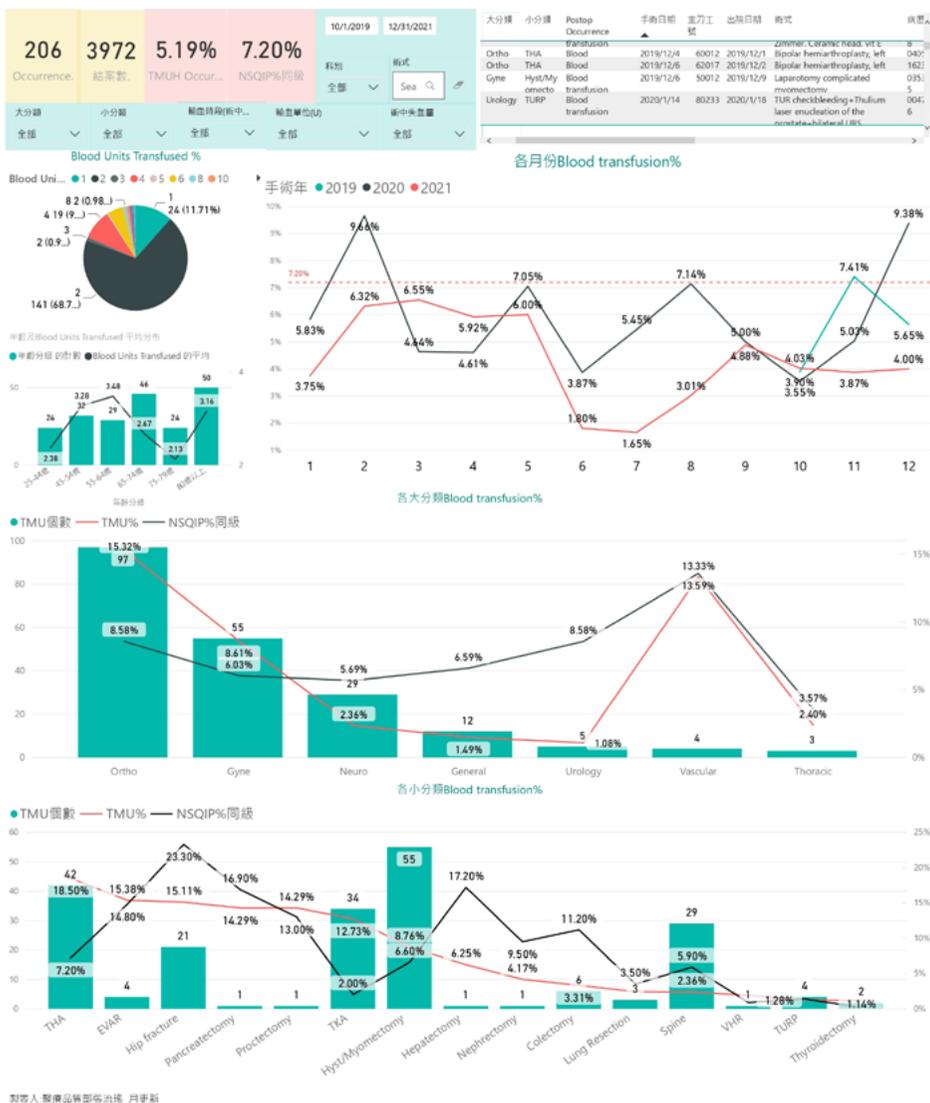
- We have shared our results within our hospital. We would like to communicate our results with other hospitals and hope our example may influence other surgeons or hospitals to share their experiences.
- It would be beneficial to share our concerns with other surgeons and discuss how to reduce surgical risk.
- For this QI project, we focused on monitoring the blood transfusion rate. We plan to drill down into the data to determine if there are additional procedures or issues to monitor. For example, some problems may not be surgical but rather related to the specific patient case.
- This project is ongoing. We will continue to monitor our data in the Power BI dashboard. We will continue to review the suitability of blood transfusion through intraoperative blood loss, blood transfusion time, and procedures. The Blood Bank and Blood Transfusion Committee will continue to conduct discussions based on the NSQIP case list, on a case-by-case basis.

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Figure 7. Blood Transfusion Power BI Dashboard



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