



ACS NSQIP[®]

A QUALITY PROGRAM
of the AMERICAN COLLEGE
OF SURGEONS

QUALITY IMPROVEMENT
THROUGH QUALITY DATA

CASE STUDIES

BEST PRACTICES

VOLUME 6 | JULY 2015



AMERICAN COLLEGE OF SURGEONS

*Inspiring Quality:
Highest Standards, Better Outcomes*

100+years



The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP®) Best Practices Case Studies have been developed for quality improvement purposes. The documents may be downloaded and printed for personal use by health care professionals at participating hospitals. The documents may also be used in conjunction with ACS NSQIP-related initiatives or programs. The documents may not be distributed for non-ACS NSQIP-related activities or for profit without the written consent of the American College of Surgeons.

TABLE OF CONTENTS

OVERVIEW OF THE ACS NSQIP.....	4
CASE STUDIES	5
HOSPITALS INSURANCE COMPANY (HIC) SURGICAL SAFETY COLLABORATIVE.....	7
Comanagement of Vascular Patients in an ACS NSQIP	
Collaborative Improves Surgical Outcomes	
PEACEHEALTH SACRED HEART MEDICAL CENTER AT RIVERBEND.....	13
SSI Reduction Strategies	
WEST VIRGINIA UNIVERSITY HOSPITALS	21
A Collaborative Approach to Reduction of Postoperative Pneumonia	
WINTHROP UNIVERSITY HOSPITAL	27
Enhanced Recovery After Surgery (ERAS) Aids in Reduction of Colorectal Mortality and Morbidity	

ACS NSQIP PROGRAM OVERVIEW

The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) is the first nationally validated, risk-adjusted, outcomes-based program to measure and improve the quality of surgical care. The program prospectively collects clinical data to quantify 30-day, risk-adjusted surgical outcomes and allows for external benchmarking of outcomes among participating hospitals. Hospital administrators, quality improvement officials, and their clinical staff are provided with the tools, reports, analyses, and support necessary to make informed decisions about improving the quality of care.

The ACS NSQIP collects data on variables, including preoperative risk factors, intraoperative variables, and 30-day postoperative mortality and morbidity outcomes for patients undergoing major surgical procedures in both inpatient and outpatient settings. The data are collected, validated, and submitted by a trained surgical clinical reviewer (SCR) at each site. Once trained, the SCR submits data to the ACS NSQIP through a secure Web-based system with built-in software checks and prompts to ensure completeness, uniformity, and validity of the data. Data automation tools are also available to lower the data entry burden on the SCRs and to improve the quality of data being captured. In addition, inter-rater reliability (IRR) audits are conducted to ensure the data quality on a routine basis.

Using stepwise logistic regression and hierarchical modeling, 30-day, risk-adjusted morbidity and mortality outcomes are computed for each participating hospital. Outcomes are reported as observed versus expected (O/E) ratios and odds ratios (OR). An O/E ratio or OR less than one indicates the hospital is performing better than expected given the complexity of its patient population and surgical cases. An

O/E ratio or OR greater than one indicates the hospital is not performing as well as would have been expected.

ACS NSQIP hospitals obtain feedback on their performance via two avenues: a comprehensive semiannual report and real-time, continuously updated, online benchmarking reports. Through the ACS NSQIP website, participants can view their non-risk-adjusted data and produce reports by surgical subspecialty and specific procedures. Thus, participants can continually monitor their quality improvement efforts and compare, on a blinded basis, their surgical outcomes with those of peer hospitals and with national averages.

The ACS NSQIP provides feedback and information to participants through IRR audits, support services, online training, and testing. Beyond the technical and data collection elements of the program, the ACS NSQIP supports participants in achieving their quality improvement goals. SCR and surgeon champion conference calls, local and regional collaboratives, and the annual ACS NSQIP National Conference serve as forums for participants to share their impediments to and triumphs in achieving quality surgical care. Through the ACS NSQIP Best Practices Case Studies and Guidelines, the ACS NSQIP presents participants with tools for implementing initiatives in quality improvement. Finally, the ACS NSQIP encourages participants, surgical specialty groups, and other quality improvement organizations to share their experience and expertise so as to advance the quality of surgical care.

For more information regarding the application process, requirements, or benefits of ACS NSQIP, or to apply online, visit our website at acsnsqip.org or e-mail acsnsqip@facs.org.

THE GOAL OF THE ACS NSQIP BEST PRACTICES CASE STUDY

The goal of the ACS NSQIP Best Practices Case Studies is to showcase how participating hospitals have used ACS NSQIP data to improve their performance and outcomes. It is hoped that this sixth volume in a series of ACS NSQIP Best Practices Case Studies publications will allow ACS NSQIP participants to learn from the experience of other hospitals and develop similar quality improvement initiatives within their own facilities.

The idea for this guide was conceived after feedback from ACS NSQIP sites via the annual conference. Additional feedback indicated that some hospitals were looking for information on how to more specifically use ACS NSQIP in their efforts to improve surgical care and outcomes. The ACS NSQIP Case Studies were designed to be one of several initiatives intended to aid hospitals in getting started with local quality improvement efforts. To this end, the Case Studies outline not only the objectives and end results of the improvement effort, but also the planning, development, and troubleshooting process.

Each case study was developed as a collaborative effort between the ACS and the participating hospital's SCR and/or surgeon champion, as well as other surgical and quality improvement professionals. The Case Studies follow a structured outline, including sections on the description of the problem addressed, the context of the quality improvement process, the planning and development process, a description of the activity, the resources needed, the results, and tips for others. ACS staff held an interview with each hospital, loosely following the case study outline. The documents were written by ACS NSQIP hospital staff in conjunction with the ACS staff.

As previously mentioned, the Case Studies are meant to provide easily accessible information to hospitals starting their own quality improvement efforts using ACS NSQIP data. While quality improvement is not an exact science, these examples may provide a starting point to assess what kind of activities could be applied locally. Many times, a successful quality improvement activity can begin by talking to the right people and getting their buy-in and assistance. Each case study provides information on the details of the quality improvement effort that the reader can envision using at his or her own hospital. If necessary, more information can be obtained by contacting the SCR at the hospital where the case study has taken place.

The ACS NSQIP is continually looking for participant feedback on making the program more conducive to the participating hospital's surgical care goals. Please contact us if you have comments or questions regarding the Case Studies, or if you would like information on how to submit your own Best Practices Case Study for publication in a future volume.

ACS NSQIP CASE STUDIES

**HOSPITALS INSURANCE COMPANY (HIC)
SURGICAL SAFETY COLLABORATIVE**

A. GENERAL INFORMATION

1. INSTITUTION NAME: Maimonides Medical Center, Montefiore Medical Center, Mount Sinai Health System; Hospitals Insurance Company (HIC) Surgical Safety Collaborative

2. SUBMITTER NAME AND TITLE: David L. Feldman, MD, MBA, CPE, FACS, Chief Medical Officer and SVP, Hospitals Insurance Company

3. NAME OF THE CASE STUDY: Comanagement of Vascular Patients in an ACS NSQIP Collaborative Improves Surgical Outcomes

B. WHAT WAS DONE?

1. GLOBAL PROBLEM ADDRESSED

Sick postoperative patients who remain in the hospital after surgery are typically cared for by house staff and nurses, as attending surgeons are often busy operating and/or seeing patients in their offices. Because patients are often seen by multiple caregivers at different times, these staff members may not have the full background of the patients. Consequently, care may be inconsistent and fragmented. In addition, these patients have complex medical problems that often fall outside the expertise of surgeons.

2. IDENTIFICATION OF LOCAL PROBLEM

Vascular surgery patients at HIC hospitals were identified as a group for whom augmented postop care could improve outcomes. In addition to the global problems experienced in other locations, many of the vascular patients in HIC hospitals, like those in other big cities, faced the difficulty of having their primary care physicians often not having privileges at the hospital where surgery was being performed. This fact created issues both with in-hospital medical care postsurgery and with posthospital follow-up. Our proposed co-management model is patient-centric, anticipatory, and preemptive, attempting to mitigate the variability of response and the time to intervention.

C. HOW WAS THE QUALITY IMPROVEMENT (QI) ACTIVITY PUT IN PLACE?

1. CONTEXT OF THE QI ACTIVITY

The HIC Collaborative is composed of four large academic medical centers located in New York City that share their professional liability insurer—HIC. Total surgical case volume is approximately 130,000 per year. The program is part of a global safe surgery initiative that also included mandatory preoperative medical evaluations for ASA III and IV patients, TeamSTEPPS training for operating room staff (including surgeons, nurses, and anesthesiologists), and a care map for obese patients having surgery with best practices for before, during, and after surgery.

2. PLANNING AND DEVELOPMENT PROCESS

Physician leaders from each of the hospitals began meeting in early 2011 to develop the four-part initiative, dedicating one full day per week to both meet at HIC offices and spend time in their individual hospitals developing leadership teams to drive the program. Key clinical leadership at the hospital level, including chairs of relevant departments (medicine, surgery) and chief medical officers, were included in initial planning meetings. Focus groups consisting of hospitalist directors, surgical nursing leadership, and thought leaders in vascular surgery were held. They created the format and important requirements for the program to succeed. Materials from the Society of Hospitalist Medicine were used to augment the process and the literature was consulted to determine how comanagement programs succeeded in orthopedics.

D. DESCRIPTION OF THE QUALITY IMPROVEMENT ACTIVITY

Pilot programs began in January 2013 at each institution and included a small group of vascular surgeons that typically practiced together, as well as a small hospitalist service. Each program included a full-time hospitalist whose only responsibility was to advise surgical house staff and provide medical care for a service of eight to 12 postoperative vascular surgery patients. All comanaged patients remained on vascular surgery services. Written agreements were drafted and signed by both hospitalists and vascular surgeons. Nursing and surgical house staff were in-serviced by hospitalists. No significant change was made to the daily care routine of attending vascular surgeons or surgical residents rotating on their services. However, hospitalists assigned to the comanagement service made rounds twice a day on these patients, often with residents from the vascular surgery teams as well as with surgical nurses. In addition, hospitalists were immediately available during the day when issues arose with these patients, particularly those issues that pertained to the patients' medical condition.

E. RESOURCES USED AND SKILLS NEEDED

1. Vascular surgeons participating in the program numbered from three to six per hospital.
2. Two hospitalists were needed to manage the service on a five day per week basis. Night and weekend coverage varied, as some hospitalists took urgent calls from surgical house staff at home, and hospitalist night floats covered in other institutions.
3. The two hospitalists required for the program were supported by a full-time equivalent (FTE) matching grant from HIC. Collaborative meetings were held at HIC offices, centrally located in midtown Manhattan.

F. WHAT WERE THE RESULTS?

Three sources of data were evaluated: surgical outcomes, hospital administrative, and patient surveys.

- Outcomes data** – We calculated odds ratios for surgical morbidity and mortality in vascular patients from October 2011 through December 2012, prior to the comanagement program. These ratios were calculated as such: as (# actual complications/# non-actual complications)/(# expected complications/# non-expected complications (using the NSQIP Surgical Risk Calculator)). From there, the team compared these odds ratios to those of a similar group of vascular patients at the same institutions after the comanagement program had begun from October 2013 through December 2014. Data for vascular surgery patients prior to and after comanagement are in Table I. Improvements were found to be statistically significant in the odds ratios for both overall morbidity (1.04 to .59) and returns to OR (1.00 to .47). Other improvements, though not statistically significant, were noted in overall mortality (1.04 to .45), cardiac complications (1.49 to .55), and pneumonia (.62 to .43). There was no change in the odds ratio for surgical site infection (.73), and an increase in the odds ratio was noted for urinary infection (.69 to .75).

TABLE 1.

Measure	Prior to comanagement Oct 2011 - Dec 2012 (n=432)		After comanagement Oct 2013 – Dec 2014 (n=453)		P<.05
	Observed Rate	Odds Ratio	Observed Rate	Odds Ratio	
Mortality	3.94%	1.04	1.55%	0.45	
Morbidity	23.61%	1.04	16.11%	0.59	*
Cardiac Complication	3.70%	1.49	1.55%	0.55	
Pneumonia	1.39%	0.62	0.88%	0.43	
Urinary infection	1.39%	0.69	1.55%	0.75	
Surgical site infection	2.78%	0.73	3.09%	0.73	
Return to OR	11.57%	1.00	6.62%	0.47	*

- Patient surveys** – Ideally, hospitals could look at changes in CMS-required patient satisfaction surveys. However, since comanaged patients were not co-located on the same floor, doing so was logistically not feasible. A short four-question survey was administered to patients just prior to discharge, but it did not demonstrate significant patient understanding of the comanaged process or whether they liked it.

- **Hospital administrative data** – Most hospitals were able to demonstrate increased case mix indexes (CMI) for all patients of similar groups of vascular surgeons after comanagement as compared with prior to comanagement. The consensus was that this increase was the result of improved documentation rather than sicker patients.

1. SETBACKS

- Hospitalist directors were initially concerned that there would be difficulties in recruiting hospitalists to participate in the comanagement process, as it was perceived as an undesirable assignment. For many hospitalists, managing sick postop patients was not considered as rewarding as managing medical patients on their own services. Once the program began, however, hospitalists realized that they were functioning as second attendings, not additional residents (one of their fears), and they enjoyed working alongside attending surgeons. In addition, they appreciated the educational opportunities afforded them with the opportunity to teach surgical residents about managing complex medical issues in postoperative patients.
- Surgical residency directors were apprehensive about hospitalists assuming too large a role in management of surgical patients to the exclusion of house staff. However, this concern was not realized, and, in fact, house staff surveys showed significant increased satisfaction with vascular surgery rotations due to the decision support and educational opportunities in the medical management of complicated postoperative patients afforded by the comanaging hospitalist.

2. COST SAVINGS

- Not calculated as of yet, but increases in CMI and reductions in morbidity and mortality are likely to result in improved revenue and decreased costs for these patients.

G. TIPS FOR OTHERS

1. Secure buy-in from surgeons. When surgeons see the benefit of having their patients comanaged by hospitalist perioperative specialists, the program is likely to be more successful. Surgeons participating in this pilot were purposely chosen because they understood this benefit, either because they had experienced it elsewhere or were early adopters in a number of patient safety initiatives.
2. Hospitalist directors must have the capacity for assigning their staff to dedicated surgical teams. If they do not, they will need funding to pay for additional FTEs. This step is critical since the premise of the program is that hospitalists are not called away to do consults in the ER or manage medical patients. This program was based on the idea that hospitalists would be dedicated solely to comanaging vascular surgery patients.
3. As more patients are comanaged, consider redistributing funding to management teams that may have originally been allocated to consulting.
4. Include both hospital administrative data, which can be used to make the financial case for the program, and surgical outcomes data using ACS NSQIP as a validated metric.

**PEACEHEALTH SACRED HEART MEDICAL
CENTER AT RIVERBEND**

A. GENERAL INFORMATION

1. INSTITUTION NAME: PeaceHealth Sacred Heart Medical Center at RiverBend

2. SUBMITTER NAME AND TITLE: David R. DeHaas, MD, FACS

3. NAME OF THE CASE STUDY: SSI Reduction Strategies

B. WHAT WAS DONE?

1. GLOBAL PROBLEM ADDRESSED

Among surgical patients, surgical site infections (SSIs) are the most common type of nosocomial infection, accounting for approximately 38 percent of these infections. The highest rates occur after abdominal and colorectal surgery. SSIs are associated with substantial morbidity and mortality, prolonged hospital stay, increased costs, and higher readmission rates.

2. IDENTIFICATION OF LOCAL PROBLEM

At PeaceHealth Sacred Heart Medical Center in RiverBend, facility SSI rates were trending upward, and in the ACS NSQIP July 2012 SAR the hospital was identified as a high outlier for SSI in all cases and colorectal procedures.

C. HOW WAS THE QUALITY IMPROVEMENT (QI) ACTIVITY PUT IN PLACE?

1. CONTEXT OF THE QI ACTIVITY

PeaceHealth Sacred Heart Medical Center at RiverBend is a 379-bed Level II Trauma Center, which admitted 15,060 cases in 2014. This QI project to reduce SSIs was part of a larger Surgical Institute quality program.

2. PLANNING AND DEVELOPMENT PROCESS

- A best practice bundle to reduce SSIs and a colorectal enhanced recovery pathway were concurrently initiated.
- A multidisciplinary surgery quality team was established to improve performance in SSI rates.
- A colorectal stakeholder team was established to develop an enhanced recovery pathway for elective colorectal procedures to standardize perioperative care and reduce length of stay.
- The surgery quality team reviewed the available literature for SSI prevention practices and utilized critical elements from ACS NSQIP Best Practices Guidelines for prevention of surgical site infections. ACS NSQIP Best Practice Case Studies, including the Mayo Clinic Colorectal Surgical Site Infections reduction project presented at the 2011 ACS NSQIP national meeting, were also reviewed.

D. DESCRIPTION OF THE QUALITY IMPROVEMENT ACTIVITY

- Facility added a second SCR in spring 2011 to allow multispecialty expansion in the ASC NSQIP program and 100 percent review of colorectal cases. The QI activity was first implemented in February 2012.
- Facility ACS NSQIP Participation Option changed to Procedure Targeted-General Vascular.
- A hospital-wide hand-washing campaign was initiated. Education was conducted by nurse educators throughout the facility.
- A colorectal perioperative class was created and delivered by nursing staff at the surgeon's office. These classes were regularly scheduled, and goals were reviewed in detail, including emphasis on early feeding, pain management expectations, early frequent ambulation, and discharge expectations.
- Preoperative and postoperative order sets were revised to include the desired measures. Preoperative, intraoperative, and postoperative processes were implemented. Training for staff was conducted by each unit's nurse educators.
- Preoperative elements included SCIP measure compliance (including correct antibiotic selection, timing, and dosage), preoperative patient warming, hair removal with clippers, chlorhexidine showers, and preop chlorhexidine wipes. Surgeons were encouraged to use mechanical bowel prep with antibiotics for patients undergoing colorectal surgery.
- Intraoperative measures included continuous normothermia, chlorhexidine-alcohol surgical prep with reinforcement of correct prep technique and correct number of preps required for site size, use of wound protectors, use of clean closure trays, and gown/glove changes as appropriate. Antibiotics were re-dosed at appropriate time intervals.
- Postoperative measures included standardization of dressing removal, daily chlorhexidine showers, and discontinuation of antibiotics within 24 hours of incision.

 PeaceHealth SSI Prevention Bundle		
Pre-operative Elements	Intra-operative Elements	Post-operative Elements
<ul style="list-style-type: none"> • Chlorhexidine gluconate (CHG) shower x3 prior to surgery • Remove hair with clippers • Cleanse skin with CHG impregnated wipes • Preoperative warming • Observe good hand hygiene • Bowel prep- use of oral antibiotics with mechanical bowel prep 	<ul style="list-style-type: none"> • SCIP acceptable antibiotics • Re-dose antibiotics intra-op per protocol • Chlorprep for skin prep • Use sufficient number of applicators • Correct technique for all port sites • Dura-prep if allergy to CHG • Betadine for stomas • Wound protector • Clean wound closure protocol <ul style="list-style-type: none"> • Clean instruments • Cautery • Suction • Light handles • Change gowns, gloves • Saline irrigation of wound after fascial closure • Dry occlusive dressing • Observe good hand hygiene 	<ul style="list-style-type: none"> • Daily post-op bathing with CHG and discharge with CHG for bathing at home • Maintain dry occlusive dressing, change if needed • Dressing removal within 48 hrs after surgery • Consider wound probing or wicks if dirty or contaminated • Culture wound if concern for infection • Observe good hand hygiene

© 2011 PeaceHealth

E. RESOURCES USED AND SKILLS NEEDED

HOSPITAL RESOURCES

1. Multidisciplinary surgical quality team consisting of
 - ACS NSQIP Surgeon Champion and SCR
 - Surgery and nursing leadership
 - Pharmacy
 - Anesthesia
 - Infection prevention
2. Colorectal Stakeholder Team consisting of
 - Colorectal surgeons, including ACS NSQIP Surgeon Champion
 - Anesthesiologist
 - Surgery leadership
 - ACS NSQIP SCRs
 - Perioperative nurse managers and educators
 - Dietary
 - Pharmacy

COSTS

- Preop warming. Purchase of Bair Paws machines and gowns. Gown follows patient throughout perioperative phase. Cost partially offset by use of fewer bath blankets and shift of cost from forced-air warming blankets previously used in the operating room.
- Purchase of Sage (chlorhexidene) wipes for preop unit and on surgical floor for postop bathing.
- No additional resources utilized. Existing staffing and normal scheduled staff in-service time used for education on process changes and technique reinforcement.

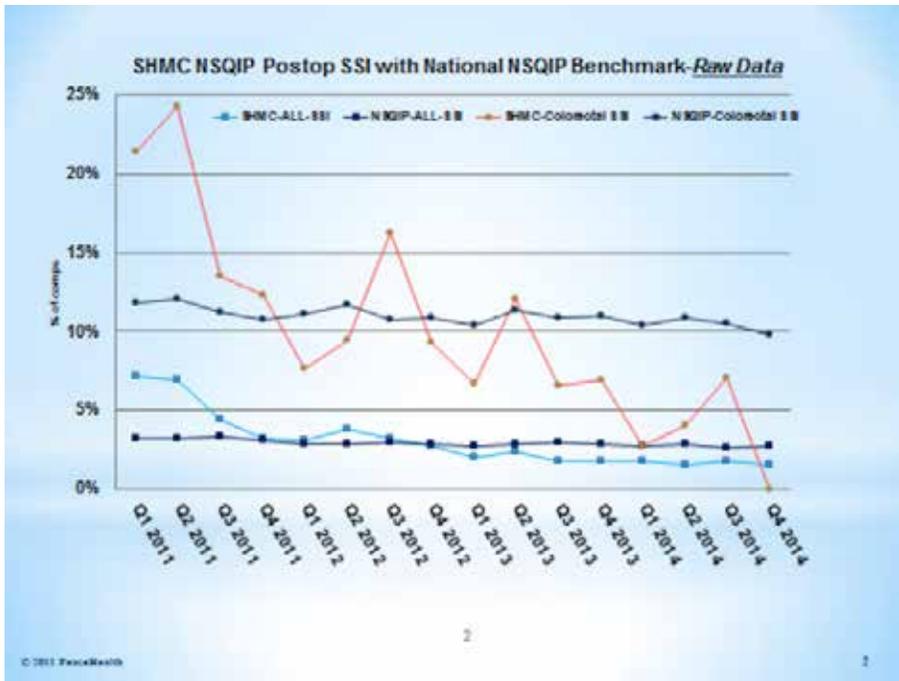
F. WHAT WERE THE RESULTS?

A best practice SSI reduction bundle combined with an ERAS colorectal protocol resulted in a dramatic improvement in SSI rates and postoperative morbidity.

No formal data were collected on patient satisfaction with the ERAS protocol, but surgeons, nursing staff in the surgeon's office, and hospital staff reported positive patient comments on their postop recovery.

Following implementation of these best practice elements, ACS NSQIP results show reduction from overall SSI rate for 2011 of 4.87 percent to 1.71 percent (1st decile/low outlier status) in the January 2015 SAR, and the colorectal SSI rate was reduced from 17.58 percent to 5.11 percent (1st decile/low outlier status) in the same time period.

The SSI rate for all cases in Q4 2014 was 1.38 percent and 0.00 percent for colorectal SSI.



Multimodal interventions to reduce SSI resulted in significant, sustained improvement in the facility's SSI rates. Maintaining gains will require continuous compliance with current measures. Further interventions to consider are full implementation of clean closure procedures, euvoemia, nutritional supplementation, surgical attire requirements, OR traffic reduction, and perioperative glucose control.

1. SETBACKS

Lack of consensus among colorectal surgeons to standardize bowel prep process. Facility correlational study showed that best results were for no bowel prep or for bowel prep with oral antibiotics. Worst results were for bowel prep without antibiotics.

Due to the dynamic nature of process improvement, multiple order set revisions were required. These revisions addressed alignment with the SCIP antibiotic bundle for each surgical specialty. The revisions also aligned perioperative order sets with best practice standards for SSI prevention and the colorectal pathway as new process steps were implemented. Delays occurred while requested modifications were implemented in the facility online order set system, and as training was required for all caregivers on these changes.

- **Solutions to barriers**

Implementation of frequent scheduled meetings of surgery quality team to discuss barriers, review current data, and monitor progress.

- **Revisions in original QI plan due to limitations encountered during the process**

Postponement of perioperative glucose control portion of project. This additional project will require significant resources to implement.

2. COST SAVINGS

Cumulative cost savings for three-year period was approximately \$1,657,860 using ACS NSQIP ROI Calculator.

**Return on Investment- SSI Reduction
(from ACS NSQIP ROI Calculator)**

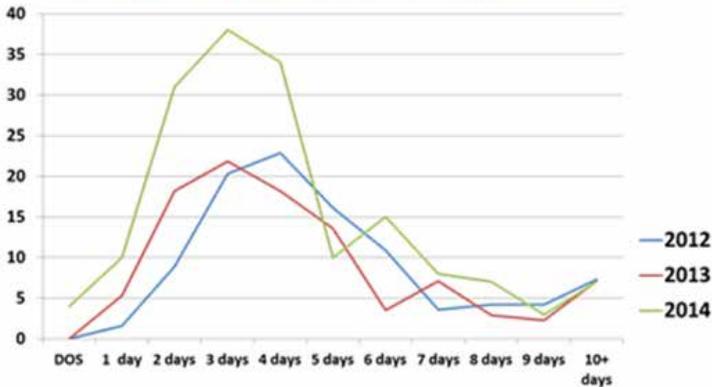
	# SSI decrease from previous year	Cost Savings
2012	-25	\$690,775
2013	-22	\$607,882
2014	-13	\$359,203
		\$1,657,860

3. LENGTH OF STAY

Percentage of patients going home by POD three was increased in elective colorectal surgery patients from 30.7 percent in 2012 to 49.7 percent in 2014, and 70.05 percent were sent home by POD four.

Length of stay of one to five days for elective colorectal patients improved from 69.8 percent in 2012 to 76.04 percent in 2014.

Elective Colorectal LOS 2012-2014



© 2011 PeaceHealth

35

G. TIPS FOR OTHERS

1. Align data from ACS NSQIP with quality improvement activity. Hospital changed participation option to Procedure Targeted in order to collect all colorectal procedures. This change led to more focused QI efforts, and more comprehensive data on colorectal procedures are now available for department-wide quality review.
2. Schedule regular meetings. Surgery quality team meets regularly to monitor progress. In these meetings, ACS NSQIP results are presented to surgeon specialty groups and facility leadership teams for each SAR and interim SAR and additionally as indicated by current trends.
3. Revisit CHG prep technique yearly. Length of prep and dry time, amount of prep required for site size reinforced (one prep stick for each 9"x13" of surface prepped).
4. Monitor wound cultures if concern for infection.
5. Develop a multidisciplinary team. This team is critical to the success in pathway development.
6. Use data and best practice guidelines to drive decision making and continually review data. Improvement across a wide surgical case spectrum was noted as colorectal pathway work progressed.

WEST VIRGINIA UNIVERSITY HOSPITALS

A. GENERAL INFORMATION

1. INSTITUTION NAME: West Virginia University Hospitals

2. SUBMITTER NAME AND TITLE: Stephanie Kish, RN, BSN, CPHQ

3. NAME OF THE CASE STUDY: A Collaborative Approach to Reduction of Postoperative Pneumonia

B. WHAT WAS DONE?

1. GLOBAL PROBLEM ADDRESSED

Best practices are available for postoperative pulmonary complications; however, it can be difficult to find the best practices that will work well for any particular institution. According to ACS NSQIP Best Practices Guidelines, postoperative pulmonary complications may be a more likely predictor of long-term mortality than cardiovascular complications. A recent article by Hartland et al., Alveolar Recruitment Maneuvers: Are Your patients Missing Out, notes the estimated prevalence of atelectasis as high as 100 percent in patients undergoing general anesthesia and a demonstrated correlation between atelectasis and postoperative pulmonary complications. With an estimated annual cost of almost 3.5 billion dollars, pulmonary complications have been found to lengthen hospital stays and increase the cost of health care.

2. IDENTIFICATION OF LOCAL PROBLEM

The identification of postoperative pneumonia as an area for improvement was evident based on the Semiannual Report (SAR) including dates from 7/1/11 to 6/30/12. ACS NSQIP postoperative pneumonia data revealed an odds ratio of 1.8 and high outlier status. Previous attempts to implement best practices strategies were completed; however, they were unsuccessful in achieving buy-in and full implementation.

C. HOW WAS THE QUALITY IMPROVEMENT (QI) ACTIVITY PUT IN PLACE?

1. CONTEXT OF THE QI ACTIVITY

The institution is a 531-bed Level 1 trauma center and academic teaching hospital. Hospital participation in ACS Trauma Quality Improvement Program (TQIP) and ACS NSQIP provided the combined data necessary for the collaboration. As part of ACS TQIP, a trauma pilot study at the institution was completed by a multidisciplinary team to reduce ACS TQIP upgrades in care and provided the motivation for this QI activity.

2. PLANNING AND DEVELOPMENT PROCESS

The first step in planning and developing this QI activity included SCR and Surgeon Champion collaboration with the chair of the trauma department and the trauma program manager, who oversees TQIP, to gain knowledge of the pilot activity and populations targeted. Due to the trauma pilot study's success, a respiratory pathway was available for use in the step-down units, but only for trauma patients. A meeting was then scheduled with the original team who completed the pilot. ACS NSQIP SAR data were shared with the group and an action plan completed. Steps to obtain approval for the house-wide adoption of the pathway were identified as follows:

Nursing service approval—Nurse Advisory Council

- ACS NSQIP SAR results reported (SCR)
- Trauma pilot results and ACS TQIP results reported (RN)
- Obtained nursing approval of house-wide step-down and ICU pulmonary toilet order set

Physician approval—Medical Executive Committee

- ACS NSQIP SAR results reported (SCR)
- Trauma pilot results and ACS TQIP results reported (RN)
- Physician Champions (Surgeon Champion and chair of the trauma department)
- Obtained physician approval of house-wide step-down and ICU pulmonary toilet order set

The planned changes were introduced due to consensus among practitioners within the hospital; the pilot study was later published by the *Journal of Trauma Nursing* (Volume 21, Number 3, May–June 2014).

D. DESCRIPTION OF THE QUALITY IMPROVEMENT ACTIVITY

After receiving approval, a team meeting was called to discuss education and roll out of the house-wide initiative.

- Respiratory therapy—Education completed during initial pilot study, which was only necessary to educate on new locations and populations.
- Nursing education completed by trauma pilot team member for each unit affected by the order set.
- Physician education completed by Surgeon Champion.
- Electronic medical record order sets adjusted for all populations by information technology and the SCR.
- Order set available for all on July 1, 2013.
- Three months post initiation, a 100 percent review of order set utilization and compliance was completed.
- Ongoing assessment completed by utilizing ACS NSQIP.

E. RESOURCES USED AND SKILLS NEEDED

1. Physicians (2)

Matthew Loos MD, FACS, FTE: 0.0072; Alison Wilson MD, FACS, FTE 0.0029

2. Nurses (3)

Amanda Hustosky, BSN, RN, FTE: 0.013; Valerie Hanlon, BSN, CCRN, FTE: 0.0072; Freda White, MBA, MSN, RN FTE: 0.0029

3. Respiratory Therapists (2)

Christopher McCormick, RRT, FTE: 0.0072; Eric Hayes, RRT FTE: 0.0029

4. Trauma Services(1)

Ramona Rodriguez, RN, BSN, FTE: 0.0043

5. Quality Outcomes(1)

Stephanie Kish, RN, BSN, CPHQ, FTE: 0.017

No cost beyond normal hospital operations was identified. FTE Based on four month project timeline.

F. WHAT WERE THE RESULTS?

The ACS NSQIP SAR, which reflected data from 7/1/13 to 6/30/14, noted a decrease in the post-operative pneumonia odds ratio to 1.06 and our facility is no longer a high outlier. This result was an improvement from the SAR that reflected data from 7/1/11 to 6/30/12, which noted an odds ratio of 1.8.

1. SETBACKS

- The results provided from the collaboration of the two databases gained active buy-in throughout the facility and professional divisions. The work and results completed by the team engaged in the pilot study allowed for a hospital-wide transition without push back. The only identified setback was related to the name of the pathway. The pathway was available at the time of the project; however, the name was associated with the original pilot study and had one specific unit identified. The decision was made to maintain the original pathway but to also add a pathway that would be identified house-wide.

2. COST SAVINGS

- According to the ACS NSQIP Return on Investment Calculator, the cost per case of pneumonia is \$22,097. With approximately 16 cases of postoperative pneumonia averted when comparing the SAR dates 7/1/11 to 6/30/12 and 7/1/13 to 6/30/14, the total estimated cost avoidance from this project was \$353,552.

G. TIPS FOR OTHERS

1. To obtain efficiency, combine resources with others within an institution focused on a similar goal. Attempts were made to decrease postoperative pulmonary complications and were unsuccessful. These attempts required time and resources.
2. Collaborate with internal team members. It is necessary to research other projects and teams that are current within your facility. Multidisciplinary collaboration is necessary from key stakeholders. The reduction of ACS TQIP respiratory upgrades in care produced by the multidisciplinary team utilizing the respiratory pathway, combined with the ACS NSQIP data showing room for improvement, provided the evidence to support the house-wide initiative. By combining the teams and data, the presentations to nursing and physicians were more compelling than presenting ACS NSQIP data alone. Representatives from both teams were available to answer questions at every presentation.
3. Provide specific timeframes and project responsibilities. By dividing the responsibilities to each member's strengths and resources, tasks were completed efficiently. Regular monitoring with feedback is necessary to ensure the process is sustained. Official meetings may not be necessary to provide feedback. Utilize e-mail, phone calls, and dashboards to update team members and staff on the latest data

BIBLIOGRAPHY

- Hanlon V D, White F, Hustosky A, McCormick C, Hayes E, Wilson A. (2014). Benefits of Standardizing Additional Airway Clearance in the Trauma Patient Population. *Journal of Trauma Nursing*. Volume 21 (3). Available at: <http://ovidsp.tx.ovid.com>. Accessed April 17, 2015.
- Hartland BL, Newell TJ, Damico N. (2014). Alveolar Recruitment Maneuvers: Are Your Patients Missing Out? *AANA Journal*. Volume 82(4). Available at: <http://web.b.ebscohost.com>. Accessed May 25, 2015.

WINTHROP UNIVERSITY HOSPITAL

A. GENERAL INFORMATION

1. INSTITUTION NAME: Winthrop University Hospital

2. SUBMITTER NAME AND TITLE: Jules E. Garbus, MD, FACS, FASCRS

3. NAME OF THE CASE STUDY: Enhanced Recovery After Surgery (ERAS) Aids in Reduction of Colorectal Mortality and Morbidity

B. WHAT WAS DONE?

1. GLOBAL PROBLEM ADDRESSED

Adverse surgical outcomes lead to excessive health care costs and resource utilization, as well as increased morbidity and mortality. Even though evidence exists that is based on guidelines regarding colon and rectal surgery as a means to reduce and ultimately prevent adverse surgical outcomes, there is difficulty with effective implementation.

2. IDENTIFICATION OF LOCAL PROBLEM

Surgeon and health care personnel compliance continues to be a challenge. There is tremendous variability based upon antiquated “time tested” teaching. In addition, with the increased utilization of minimally invasive colon and rectal surgical procedures (laparoscopy and robotic surgery) there is an additional level of complexity. Upon review of the Semiannual Report (SAR), we noticed that improvements could be made in the outcomes and decrease the adverse events.

C. HOW WAS THE QUALITY IMPROVEMENT (QI) ACTIVITY PUT IN PLACE?

1. CONTEXT OF THE QI ACTIVITY

Winthrop University Hospital, located in Mineola, NY, is a 591-bed hospital whose mission is to provide high-quality, safe, culturally competent, and comprehensive health care services in a teaching and research environment. The institution began to participate with ACS NSQIP in 2010. Minor changes were initially made to the processes, but in 2013 the institution planned to develop and implement Enhanced Recovery After Surgery (ERAS) protocols for colon and rectal surgery. The goals of ERAS protocols are to reduce the response to surgical stress, decrease adverse outcomes, shorten hospital stay, and improve patient satisfaction with health care.

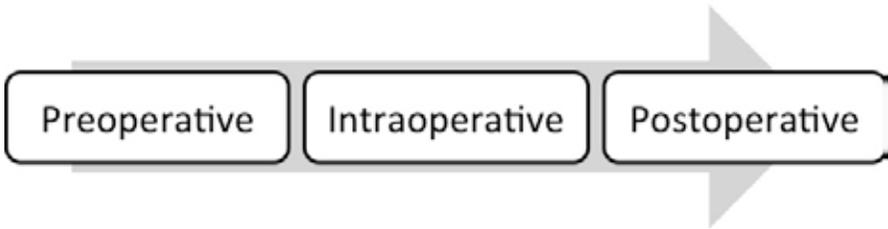
2. PLANNING AND DEVELOPMENT PROCESS

One of the most important aspects is developing the ERAS task force inclusive of a representative from every phase of care.

- Established subcommittees: preadmission testing, case management, nutrition, physical therapy, nursing, pain management, and information technology.
- Involved surgeons currently performing colon and rectal surgical procedures to draft proposals.

D. DESCRIPTION OF THE QUALITY IMPROVEMENT ACTIVITY

The colon and rectal procedures to be included were identified from operating room scheduling



records. All phases of care were carefully examined:

Based on a literature review, the key elements for ERAS were identified, and subcommittees were created to address these points.

Preoperative	Intraoperative	Postoperative
<ul style="list-style-type: none">• Patient Education• Discharge Care Plan• Mechanical Bowel Prep (selective)• Short Fasting Duration• Carbohydrate Drink• Antibiotic Prophylaxis• VTE Prophylaxis	<ul style="list-style-type: none">• Minimally Invasive Surgical Technique• Goal Directed Fluid Administration• Normothermic Monitoring• Nausea and Pain Management• Selective use of Drains and Nasogastric Tube	<ul style="list-style-type: none">• Early Oral Feeding• Chewing Gum• Early Ambulation and Mobilization• Early Removal of Urinary Catheter and Drains/Tubes• Nausea and Pain Management• Daily Discharge Plan Review

REVIEW OF SUBCOMMITTEE RECOMMENDATIONS

SURGEON OFFICE/CASE BOOKING

- Once the patient is identified as an ERAS patient, this notation should be part of the OR booking when the office calls to schedule the procedure.
- The education of the patient regarding ERAS protocols is initiated in the surgeon's office.
- The office provides the educational tool and checklist. Initially, the necessary documents are provided at preadmission testing as well.
- At the time of booking a patient's procedure, a follow-up postoperative office appointment is scheduled for one week to 10 days from the surgery date.

PREADMISSION TESTING (PAT)

- All elective colorectal patients go to PAT, where they are identified as ERAS patients when the chart is initiated.
- They will be educated using the created ERAS tools/information and will sign a form that they received this education, received various materials, and that they understand the expectations of surgery and their hospital stay.
- A “goodie bag” that contains the Chlorhexidine scrub and appropriate beverages is provided, and the patient will be instructed to purchase sugar free gum to bring to the hospital.
- The PAs at PAT will order appropriate preoperative antibiotics, Heparin 5000u SUB-Q, pain meds, and Alvimopan.

CASE MANAGEMENT

- A Home Health Care (HHC) questionnaire will be completed by the patient while at PAT.
- A case management nurse will call the patient prior to surgery to evaluate the patient’s needs. (in other words, transportation home after discharge, the need for rehab or home care, ostomy care, and so on).
- If a patient is assessed for possibly needing rehab, a list of facilities is given to the patient prior to his or her surgery so that choices can be given to the case manager they meet during the hospital stay.
- Case Management will follow the patient from PAT to discharge. They will be aware of the target discharge date and the patient specific needs.

NUTRITION

- Patients will no longer be NPO after midnight prior to surgery. According to anesthesia guidelines, the patient is allowed clear liquids until two hours prior to surgery.
- Clear Fast, which was given at PAT, will be drunk up to two hours prior to surgery on the way to the hospital. Clear Fast is a carbohydrate-rich drink created particularly for ERAS patients. Due to cost and availability of the beverage, it will be provided for the patient in order to promote compliance.
- In addition, the patient will receive one container of Ensure Clear with an eight-ounce cup. The Ensure will be consumed followed by eight ounces of water the night before surgery. The institution believes that giving the patient the cup with the Ensure will promote compliance.
- Patients will not have an NG tube placed (unless deemed absolutely necessary).
- Clear liquids will be started POD #0 and advanced to regular diet as tolerated on POD #1 (flatus not necessary to advance diet).

NURSING

- Nurses will help the patient adhere to their care plan checklist in terms of pain management, ambulation, and diet.
- It is the expectation that the patient will be out of bed POD #0 and walking as tolerated.
- The patient is not to eat in bed and will be out of bed for all meals sitting in a chair.
- The educational tool, surgery checklist, and PowerPoint slides will be shared with all staff and future hires.
- The nursing walking program is valuable to ERAS patients to promote early and continuous ambulation.

PHYSICAL THERAPY (PT)

- Patients identified as having a new deficit in ambulation will receive a physical therapy consult and be identified as an ERAS patient when the order is placed in the computer.
- When a PT consult for an ERAS patient is received and acknowledged, they are evaluated in a timely manner.

INFORMATION TECHNOLOGY (IT)

- ERAS standardized order sets are easily accessible in the computer system.
- ERAS patients are identified/flagged and appropriate orders are in place for post-op antibiotics and post-op analgesia to streamline standardized care.

PAIN MANAGEMENT

Preoperative patient to receive the following:

Celebrex 200mg PO
Neurontin 300mg PO

Intraoperative patient to receive the following:

Epidural or TAP block suggested at request of surgical team when available

Postoperative patient to receive the following:

Celebrex 200mg PO daily x 3 days
Neurontin 300mg PO every 12 hours x 3 days
Acetaminophen 1000mg IVPB q6 x 6 doses (including intraoperative dose)

E. RESOURCES USED AND SKILLS NEEDED

- ERAS Task Force held multiple meetings to review and revise recommendations.
- Confirmed buy-in from physicians, as well as periodic informed consent and discussions and plans for surgical operative procedures.
- Hospital IT team developed the pop-up checklist electronically based on recommendations from individual subcommittee within ERAS task force.
- Material distributed to involved staff, including final order sets and implementation plan created by the Task Force.

Winthrop Hospital created the following Colorectal Surgery Checklist based on evidence based data. This protocol was designed specifically to enhance ERAS compliance, while encouraging patient accountability and engagement in the care provided. The checklist was given to patient, and nurses reviewed the checklists in detail with each patient.

COLORECTAL SURGERY CHECKLIST

DAY PRIOR TO SURGERY:

- Only drink clear fluids: water, Jell-O, juice without pulp, popsicles, clear broth, Gatorade, tea, or coffee. *No milk or milk products. *No solid foods.
- Take the bowel prep according to provided instructions as prescribed by my surgeon
- Take a shower with the provided sponge.
- Drink the Ensure drink and an eight-ounce glass of water that was provided to me prior to going to bed.
- Follow the instructions that were provided about medications, including blood thinners and diabetic medicines.

DAY OF SURGERY, BEFORE THE OPERATION:

- Take any medication that I was instructed to the morning of surgery.
- Take a shower with the provided sponge.
- Drink the BevMD Clearfast bottle on the way to the hospital. Once I arrive at the hospital drink nothing more.
- Bring my CPAP machine to the hospital if I have one.
- Bring an updated list of medications.

DAY OF SURGERY, AFTER THE OPERATION:

- Walk outside the hospital room within two hours of arriving to the floor.
- Discuss with the nurse what medications will be used to manage postoperative pain and demonstrate understanding of the pain scale.
- Do deep breathing and coughing exercises.
- Use the incentive spirometer 10 times an hour while awake.
- Sit in the chair for all meals.
- Get up and walk the hallway as much as possible, with the goal being at least two times. If assistance is needed, please ask the nurse.
- Use the PCA pump to keep my pain at a comfortable level.
- Tell the nurse if my pain is greater than 4/10 on the pain scale.
- Begin drinking clear fluids as tolerated.
- Begin chewing but NOT swallowing the gum that I brought to the hospital.

POSTOP DAY 1:

- Continue deep breathing and coughing exercises.
- Use the incentive spirometer 10 times an hour while awake.
- Get up and walk the hallway as much as possible, with the goal being at least three times. If assistance is needed, please ask the nurse
- Be out of bed on and off throughout the day as much as possible, with a goal of eight hours.
- Sit up in the chair for all meals.
- The urinary catheter that was inserted during the surgery will be removed.
- Tell the nurse if my pain is greater than 4/10 on the pain scale.
- The PCA pump will be removed today.
- Eat solid foods as tolerated.
- Continue to drink liquids.
- Continue to chew gum.
- Tell the nurse if I begin to pass gas.
- Meet with the case manager to discuss discharge plans

POSTOP DAY 2:

- Continue to do all of the things from yesterday (get up and walk, do breathing exercises, eat and drink, and so on).
- Tell the nurse if my pain is greater than 4/10 on the pain scale.
- The urinary catheter will be removed if not done so yesterday.
- If I have an ostomy, watch the video on TV and participate in ostomy care.
- Identify the plan for ostomy care after discharge with the case manager.

POSTOP DAY 3:

- Continue to do all of the things from yesterday (get up and walk, do breathing exercises, eat and drink, and so on).
- Tell the nurse if my pain is greater than 4/10 on the pain scale.
- Review discharge plans with the case manager and the nurse.
- Verbalize understanding of signs and symptoms of infection and the appropriate action to take if I suspect an infection.
- Identify actions to prevent dehydration.
- Demonstrate understanding of how to empty and record ostomy output.
- Identify the actions to take for low and high ostomy output.
- Plan to go home tomorrow.

POSTOP DAY 4:

- Continue to do all of the things from yesterday (get up and walk, do breathing exercises, eat and drink, and so on).
- Tell the nurse if your pain is greater than 4/10 on the pain scale.
- Review written discharge instructions with the nurse.
- Leave the hospital with a prescription for pain medication and a follow-up appointment with my doctor.
- Ensure that I have all of the supplies that I need for discharge.

F. WHAT WERE THE RESULTS?

The ACS NSQIP Semiannual report Colorectal Morbidity and Mortality results were analyzed from 2011-2014. Compliance to ERAS protocols resulted in improved outcomes as protocols were implemented throughout the hospital at large.

Colorectal Mortality odds ratios were 0.96->0.79

Colorectal Morbidity odds ratios were 1.22->0.77

SETBACKS

- ERAS protocols challenge traditional surgical teaching and long-standing management based upon personal experiences and represent a shift in surgical practice. Consequently, buy-in can be problematic.
- Coordinating communication between practitioners is difficult.

OVERALL ADVANCEMENTS

- Decreased Average Length of Stay (ALOS). ALOS decreased from 8.61 days before the protocols were implemented were reduced to 7.28 days after implementation.
- Improved patient satisfaction with healthcare based on cumulative patient satisfaction surveys administered 30 days after surgery.
- Less adverse outcomes based upon NSQIP Risk-Adjusted data calculated in SAR as noted above. Results showed a direct correlation between compliance rates to adapted ERAS checklist and improved patient outcomes.
- Cost savings due to decreased hospitalization time by individual patients, and decreased resource utilization.

G. TIPS FOR OTHERS

- Involve representatives from all phases of patient care in establishing ERAS protocols.
- Due to the multidisciplinary nature of comanagement, comply strictly to ERAS protocols. Compliance to ERAS protocols has a direct correlation to improved outcomes.
- Provide education and coordinate communication. Through appropriate education and coordinating communication between practitioners, this valuable tool can be effectively utilized.
- Continue staff education through Grand Rounds, departmental conferences, and distribution and review of current literature to reinforce ERAS protocols at all stages of patient care.
- Audit 100% of the ERAS cases and revise the protocols as new evidence based data becomes available.
- Utilize lessons learned to establish protocols for other surgical procedures in the abdomen.
- Make the patient and family an accountable part of the healthcare team.
- Develop tailored ERAS protocols that are applicable in your geographic area and patient population.

BIBLIOGRAPHY

Adamina M, Kehlet H, Tomlinson G, Senagore A, Delaney C (2011). Enhanced recovery pathways optimize health outcomes and resource utilization: a meta analysis of randomized controlled trials on colorectal surgery. *Surgery*. 149:830-840.

Basse L, Hjort Jakobsen D, Billesbolle P, Werner M, Kehlet H (2000). A clinical pathway to accelerate recovery after colonic resection. *Ann Surg*. 232(1):51-57.

Gustafsson U, Scott M, Schwenk W, Demartines N, Roulin D, Francis N, McNaught C, Macfie J, Liberman A, Soop M, Hill A, Kennedy R, Lobo D, Fearon K, Ljungqvist (2013). Guidelines for Perioperative Care in Elective Colonic Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations. *World J Surg*. 37:259-284.

Lee L, Li C, Landry T, Latimer E, Carli F, Fried G, Feldman L (2014 April). A Systematic review of economic evaluations of enhanced recovery pathways for colorectal surgery. *Ann Surg*. 259(4):670-676.

Nygren J, Thacker J, Carli F, Fearon K, Norderval S, Lobo D, Ljungqvist O, Soop M, Ramirez J (2013). Guidelines for Perioperative Care in Elective Rectal/Pelvic Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations. *World J Surg*. 37:285-305.

Wilmore D, Kehlet H (2001 February). Management of patients in fast track surgery. *BMJ*. 322(7284):473-476.

Zhuang C, Ye X, Zhang X, Chen B, Yu Z (2013 May). Enhanced recovery after surgery programs versus traditional care for colorectal surgery: a meta-analysis of randomized controlled trials. *Dis Colon Rectum*. 56(5):667-678.

acsnsqip.org

**633 N. Saint Clair St.
Chicago, IL 60611-3211
Phone 312-202-5213
Fax 312-202-5062
E-mail acsnsqip@facs.org**