New York State Partnership for Patients

Advanced Colon Surgery Bundle
Resource Guide

	RESOURCE	SUMMARY	FINDINGS	COMMENTS
Bundled Elements (2B)	Reducing Colorectal Surgical Site Infections (The Joint Commission Center for Transforming Health Care)	Collaborative to reduce the rate of colorectal surgical site infections using data derived from the American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) across seven tertiary care academic hospital systems.	• After implementation of all solutions identified in the Collaborative, SSIs were reduced by 32% and the number of observed SSI was less than expected after adjusting for age, sex, BMI, and other factors. • Superficial incisional SSIs were reduced by 45%. • Reductions in average length of stay and costs were also noted.	• Large number of interventions that achieved sustained change in a number of academic tertiary centers. • Single Collaborative combining multiple evidence-based practices.
	Colorectal Surgery Surgical Site Infection Reduction Program: A National Surgical Quality Improvement Program-Driven Multidisciplinary Single-Institution Experience (Cima R., et al.)	Implementation of: • patient cleansing with Hibiclens, • antibiotic administration, • closing protocols, • patient and staff hand hygiene, • weight-based intra-operative dosing and re-dosing of cefazolin, and • discharge instruction on wound care and post-discharge follow-up phone calls.	Significant decline in SSI rate—overall SSI rate dropped from 9.8% to 4.0%, and superficial SSI declined 1.5%.	• Results from single academic tertiary care center. • Sustained decline in SSI after bundle implementation. • Interventions successfully built into work flow. • Mechanical bowel preparation use was mixed among the participating surgeons. Pre-operative oral antibiotics were not used.
Oxygenation (1A)	Perioperative Supplemental Oxygen Therapy and Surgical Site Infection: A Meta-Analysis of Randomized Controlled Trials (Qadan M., et al.)	• Meta-analysis of five RCTs. • Control FiO_2 .30–.35; Study FiO_2 .80 for two to six hours postoperatively. • 30-day follow-up. • Three studies colorectal; two studies multispecialty.	• Surgical site infection rates 12% control; 9% hyperoxic. • Relative risk reduction. • Greater benefit in colorectal procedures.	• Variable use of antibiotics and blood loss among studies. • No standard definition of infection. • Significant improvement in all but one study, where SSI rate increased.
Normothermia (1A)	Perioperative Normothermia to Reduce the Incidence of Surgical Wound Infection and Shorten Hospitalization (Kurz, A., et al.)	Double-blind RCT demonstrating triple the incidence of SSI and prolonged hospitalization in patients undergoing colectomy with intraoperative hypothermia.	Surgical site infection in 19% of patients with intra-operative hypothermia and 6% of patients with intra-operative normothemia.	Standard pre-operative preparation, where cases were risk-adjusted for smoking, BMI, wound class, and length of surgery.

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Glucose Control (1B)	Scientific Principles and Clinical Implications of Perioperative Glucose Regulation and Control (Akhtar, S., et al.)	Review article evaluating glucose control in the pre-operative, intra-operative, and post-operative periods.	Though there are unresolved questions regarding appropriate control, it is prudent to maintain glucose levels < 180 mg /dL.	The authors cite heterogeneity in many of the included studies as a limitation to the analysis; post-operative control appears to have the most significant effect on post-operative complications.
	Risk Factors for Surgical Site Infections After Colorectal Resection in Diabetic Patients (Sehgal, R., et al.)	Retrospective review of 183 patients with DM analyzing risk factors associated with SSI.	Higher-than-normal glucose control at all post-operative time intervals was associated with SSI. The data suggests glucose < 200 may not be low enough.	Other risk factors for SSI in diabetic patients were identified, including stoma placement, obesity, and prolonged postoperative antibiotics.
	Hyperglycemia Is Associated with Increased Risk of Morbidity and Mortality After Colectomy for Cancer (Jackson, R.S., et al.)	Retrospective review of 9,638 colectomies with recorded blood glucose levels; relationship of blood glucose to post-operative outcomes was assessed with multivariable logistic regression.	Operative day mild hyperglycemia was associated with surgical site infection. Study suggests a perioperative blood glucose target of 80–120 mg/dl might be appropriate.	Diabetics had higher incidence and increased severity of hyperglycemia compared with non-diabetics. However, for both diabetics and non-diabetics, the majority of patients experienced both operative and post-operative day one hyperglycemia. Hyperglycemia also associated with increased risk of respiratory complications, MI, and operative re-intervention.
Antimicrobial Prophylaxis (1B)	Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery (Bratzler, D.W., et al.)	The American Society of Health-System Pharmacists' Therapeutic Guidelines on Antimicrobial Prophylaxis in Surgery.	Optimal prophylaxis ensures that adequate concentrations of an appropriate antimicrobial are present in the serum, tissue, and wound during the entire time that the incision is open and at risk for bacterial contamination.	• Weight-based dosing of antimicrobial prophylaxis with re-dosing based on length of surgery as compared to half-life of the agent used from timing of initial dose or if there is significant blood loss. • Generally, antimicrobial prophylaxis should be continued for no more than 24 hours and can typically be stopped when the procedure is completed and the surgical site is closed. • For most patients, a mechanical bowel preparation combined with oral neomycin sulfate plus oral erythromycin base, or with oral neomycin sulfate plus oral metronidazole, should be given in addition to IV prophylaxis.

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Oral Antibiotic Prophylaxis/ Mechanical Bowel Prep (MBP) (2B)	A Statewide Assessment of Surgical Site Infection Following Colectomy: The Role of Oral Antibiotics (Englesbe, M.J., et al.)	Michigan Surgical Quality Collaborative Colectomy Best Practices Project.	The evidence suggests the combination of oral antimicrobials with MBP reduces the rate of post-operative infections.	Process- and outcomes-based on NSQIP surveillance. Observational study to evaluate clinical practice and related outcomes with respect to mechanical bowel prep with or without oral antibiotic regimen. Note: Cochrane review (Guenaga, K.F., et al. [2011]) is equivocal about use of MBP and ability of MBP to reduce wound infection and anastomotic leakage rate.
Skin Preparation (1A)	Chlorhexadine-Alcohol Versus Povidone-Iodine for Surgical-Site Antisepsis (Darouiche R., et al.)	Prospective RCT at six hospitals. Total of 849 patients undergoing clean contaminated surgery were assigned to have skin pre-operatively scrubbed with CHG Alcohol or povidone-iodine.	Rate of superficial and deep incisional SSIs were significantly lower in the chlorhexadine-alcohol group.	Standard of care practices, such as prophylactic antibiotics and clipping of hair enforced at all hospitals. However, hospitals were allowed to continue with practices without proven efficacy, such as pre-operative showering, effects of these practices were controlled for using hospital-stratified randomization to match the study groups.
	Effects of Pre-operative Skin Preparation on Post-operative Wound Infection Rates: A Prospective Study of Three Skin Preparation Protocols (Swenson, B.R., et al.)	Three skin preparations were compared by means of sequential implementation. Each agent was used as the preferred modality for a six-month period for all general surgical cases. Solutions compared were: • povidone iodine scrub with isopropyl alcohol application in between, • chlorhexadine and isopropyl alcohol (Chlorprep), and • iodine povacrylex isopropyl alcohol (duraprep).	• Lowest infection rates were seen with iodine-povacrylex in isopropyl alcohol. • No differences in SSI rate were seen between patients prepared with povidone-iodine scrub and iodine povacrylex. • Highest SSI rate seen in patients prepared with chlorhexadine-isopropyl alcohol.	Large sample size in a single large academic medical center.

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Wound management (2B)	Reducing Colorectal Surgical Site Infections (The Joint Commission Center for Transforming Health Care)	• Standardize intra-operative application of wound dressing to reduce risk of contamination and maximize wound healing. • Standardize orders for post-operative wound dressing, such as continuation of wound dressing for 48 hours and dressing removal on POD 2.	Standardization of wound management for different surgical wounds was shown to affect the rate of colon SSI in six of seven centers.	Few good studies available to demonstrate how impact of timing will affect SSI rate. However, practices advocated in The Joint Commission Collaborative are in line with many best practices guidelines. Additionally, a Cochrane review (Dumville et al., 2011) of wound dressings indicates there is insufficient evidence to recommend one type of dressing over another, but notes that current accepted practice for surgical wounds healing by primary intention involves placing a dressing over the closed wound before the patient leaves the OR. This assumes the risk of SSI will be reduced by providing a barrier to environmental contamination and managing wound exudates, protecting the wound and their staples and sutures.
Standardized Wound Closing Procedures (2B)	Reducing Colorectal Surgical Site Infections (The Joint Commission Center for Transforming Health Care)	Standardized wound closing across all surgical teams with new closing trays, instruments, and gloves at time of wound closure.	Inconsistent surgical site closing process, particularly if dirty instruments or contaminated gloves and gowns were used at time of wound closure, were found to be strongly associated with the occurrence of SSI at all seven hospitals in the collaborative.	Collaborative conducted in seven academic hospital systems.
Hand Hygiene (1A)	• Guidelines on Hand Hygiene in Health care (World Health Organization) • Guidelines for Hand Hygiene in Health Care (Centers for Disease Control and Prevention)	Strict adherence to hand hygiene between each patient care task for staff, patient, and family.	Adherence to hand hygiene guidelines prevents micro-organism transmission and cross contamination.	Hand Hygiene required between patient tasks and/or contact with equipment or surfaces, even if tasks are on same patient.

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Environmental Cleanliness (1B)	Guidelines for Environmental Infection Control in Health-Care Facilities (Sehulster, L., et al.)	Standardize infection control and ventilation measures for operating rooms (ORs).	• Guidelines recommend that OR doors remain closed except for passage of equipment, personnel, and patients and entry be limited to essential personnel. • UV light should not be used to sterilize equipment. • Flash sterilization is not recommended as a routine method of sterilization.	• Prevent contamination from outside the OR, organize needed equipment with prevention of contamination in mind. • Encourage closed aseptic OR environment by reducing traffic and equipment from outside OR.

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Key to Grading of Evidence

1a. Systematic reviews (with homogeneity) of randomized controlled trials
1b. Individual randomized controlled trials (with narrow confidence interval)
1c. All or none randomized controlled trials
2a. Systematic reviews (with homogeneity) of cohort studies
2b. Individual cohort study or low quality randomized controlled trials (e.g. <80% follow-up)
2c. "Outcomes" research; ecological studies
3a. Systematic review (with homogeneity) of case-control studies
3b. Individual case-control study
4. Case-series (and poor quality cohort and case-control studies)
5. Expert opinion without explicit critical appraisal, or based on physiology, bench research or "first principles