



Washington
State
Hospital
Association

Preventing Surgical Site Infections--Colon: Toolkit®



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“Surgery without Complications”

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EXECUTIVE SUMMARY

Leadership and Culture

Surgical site infections (SSIs) are the second most common healthcare-associated infection (HAI). SSI rates are disproportionately higher among patients following colorectal surgeries. Resulting SSIs are known to have significant patient complications with adverse clinical and economic impact.

In order to successfully prevent SSI Colon, a multidisciplinary and collaborative team approach is essential. An effective SSI prevention program requires collaboration across departments which includes engaged executive leadership, perioperative clinical providers, infection prevention, pharmacy, nursing, and quality personnel.

Interventions

- Gain consensus on bundle elements that all stakeholders agree to implement.
- Design processes to ensure a high level of compliance and reliability with the implementation of each selected bundle element.
- Actively monitor compliance with the process steps and share SSI Colon prevention best practices and data in postoperative unit(s).

This bundle and toolkit are comprised of evidence based practices and logical, common sense measures which are recommended to be used by members of the peri-operative team. Each section contains crucial interventions with links to additional online resources that can be used at any stage of implementation to effectively combat this infection.

Background

In the US, an individual who undergoes a major operation carries a 2% to 5% risk of surgical site infection. Approximately 160,000–300,000 SSIs occur each year in the United States. This rate is substantially higher if the patient undergoes colorectal surgery, with reported rates of 5% to 30%.

In a recent claims study by Wick et al. with more than 10,000 colorectal surgery patients, the 30-day readmission rate was 11.4%, the 90-day readmission rate was 23.3%, and the 30-day SSI rate was 18.8%. The mean readmission length of stay was 8 days, and the median cost for an SSI readmission was \$12,835. These reports support the concept that interventions that reduce SSIs are likely to reduce length of stay and costs.

Patients with an SSI have a 2–11-times higher risk of death compared with operative patients without an SSI. Seventy-seven percent of deaths in patients with SSI are directly attributable to SSI. Through the implementation of the below identified evidence-based bundle elements and strategies, SSIs can be reduced, while decreasing morbidity and mortality.

SSI Colon Prevention Toolkit and Bundle

Goals, Definitions and Measures

Goal: To reduce the incidence of Colorectal Surgical Site Infections by **20%** by September 28, 2017.

Measurement	Outcome	Numerator	Denominator
Surgical Site Infection (SSI)- Colon	From CDC NHSN measure, SSI rates per 100 operative procedures.	Total number of SSIs, deep incisional or organ space. Exclusions Superficial SSIs.	Total number of specific operative procedures.
Measurement	Process	Numerator	Denominator
Appropriate hair removal	Percent of surgical cases with appropriate hair removal.	Total number of surgical cases with appropriate hair removal.	Total number of specific operative procedures.
Timeliness of antibiotics	Percent of surgical cases with prophylactic antibiotic administration started, but not necessarily completed, within 60 minutes of surgical incision.	Total number of surgical cases with prophylactic antibiotic administration started, but not necessarily completed, within 60 minutes of surgical incision.	Total number of specific operative procedures.
Appropriate selection of antibiotics	Percent of surgical cases receiving prophylactic antibiotics consistent with the current guidelines.	Total number of surgical cases receiving prophylactic antibiotics consistent with the current guidelines.	Total number of specific operative procedures.
Correct duration of antibiotics	Percent of surgical cases receiving prophylactic antibiotics whose antibiotics were discontinued when patient left the OR.	Total number of surgical cases receiving prophylactic antibiotics whose antibiotics were discontinued when patient left the OR.	Total number of specific operative procedures.

Prevention of hyperglycemia	Percent of surgical cases maintaining glycemic control (\leq 160mg/dL).	Total number of surgical cases maintaining glycemic control (\leq 160mg/dL).	Total number of specific operative procedures.
Treatment of hyperglycemia	Percent of surgical cases in which an intravenous insulin infusion was initiated for any patient with a blood sugar \geq 160mg/dL.	Total number of surgical cases in which the patient had a blood sugar \geq 160mg/dL and an intravenous insulin infusion was initiated.	Total number of specific operative procedures in which the patient had a blood sugar \geq 160mg/dL and an intravenous insulin infusion was indicated.
Maintenance of normothermia	Percent of surgical cases with appropriate temperature maintained ($>36^{\circ}\text{C}$ or 96.8°F).	Total number of surgical cases with appropriate temperature maintained ($>36^{\circ}\text{C}$ or 96.8°F).	Total number of specific operative procedures.

Resource: Dellinger, E. P., Hausmann, S. M., Bratzler, D. W., Johnson, R. M., Daniel, D. M., Bunt, K. M., Sugarman, J. R. (2005). Hospitals collaborate to decrease surgical site infections. *The American Journal of Surgery*, 190(1), 9-15. doi:10.1016/j.amjsurg.2004.12.001; Kwon, S., Thompson, R., Dellinger, P., Rogers, T., & Flum, D. (2012). Importance of perioperative glycemic control in general surgery: A report from the surgical care and outcomes assessment program. *Journal of Surgical Research*, 172(2), 274. doi:10.1016/j.jss.2011.11.457.

Definitions: Deep incisional infection occurs within 30 days after elective colon resection and involves deep soft tissues of the incision, e.g. fascial and muscle layers. Organ/Space SSI infection occurs within 30 days after elective colon resection and involves any part of the body (excluding skin incision, fascia or muscle layers) that is opened or manipulated during the operative procedure.

INTERVENTIONS FOR SSI PREVENTION

Pre-Operative Period

1. Patient Education on SSI Prevention

Providing patient and family education in SSI prevention is the first step towards impacting outcomes. There are various pre and post-operative elements a patient should understand in order to optimize surgical outcomes and prevent infections.

Interventions

- Provide written materials to the patient and family and answer questions to validate their understanding of their role in SSI prevention.
- Supply educational videos to patients and families to reinforce SSI prevention elements.
- Encourage the patient to speak with the surgeon about any medical or health problems which exist, such as diabetes, and whether he or she smokes.

- Instruct the patient there should be no shaving of the skin before surgery as this increases the chances of infection.
- Ensure the patient understands the importance of adherence to pre-surgical showering pre-operatively with the appropriate skin cleanser.
- Verify the patient understands the importance and value of Mechanical Bowel Prep (MBP) and oral antibiotics.
- Educate the patient on the risks of hyperglycemia and SSI, how this issue is not limited to individuals diagnosed with diabetes and the importance of glycemic control. Assure the patient that increased blood sugar is a normal physiological response to surgical stress and an elevated blood sugar does not mean the patient is diabetic.
- Educate the patient on the impact of preoperative carbohydrate loading beverages in improving surgical outcomes.
- Explain to the patient the purpose and positive impact of preoperative warming. Patients often state they don't feel "cold" and may misunderstand if not informed of the science behind the intervention.
- Promote the patient and family's participation in effective hand hygiene practices, including empowering the patient to speak up when a caregiver is observed to not wash their hands upon entering the room and then, asking them to do so.
- Remind family and friends to wash their hands with soap and water or an alcohol-based hand gel as part of SSI prevention efforts.

Resource: CDC patient education flyer at http://www.wsha.org/wp-content/uploads/1_CDC_SSI.pdf; WSHA link to patient educational brochure from Johns Hopkins Hospital, "Your Guide to Colorectal surgery." http://www.wsha.org/wp-content/uploads/2_Johns_Hopkins_Guide.pdf.

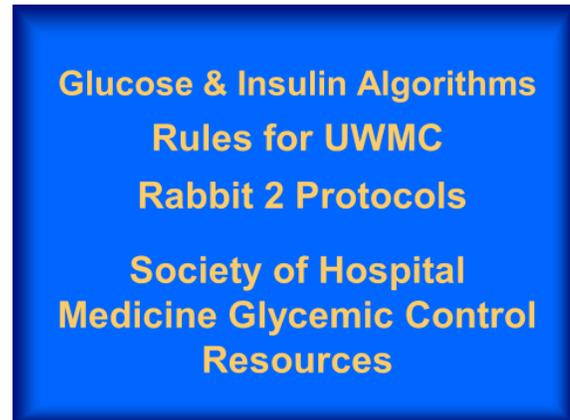
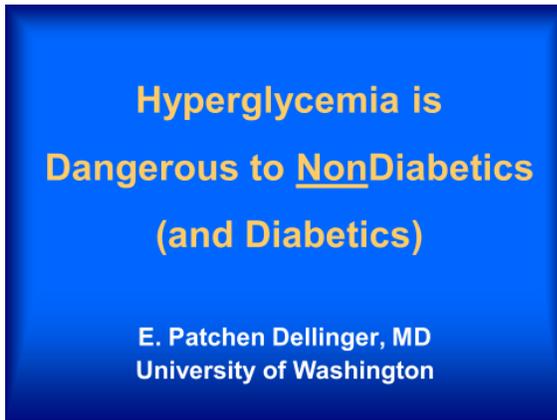
2. Screening and Identification of Patients at Risk for Hyperglycemia

Hyperglycemia may be the most important risk factor for SSI. Early glycemic control should reduce the incidence of SSI. Monitor blood glucose level one hour after initial incision and maintain level < **160 mg/dL** on the day of surgery and throughout the postoperative period.

Interventions

- Engage with out-patient clinics and physician offices to coordinate assessment of risk for perioperative hyperglycemia.
- Select a risk assessment tool and implement consistently for ***diabetics and non-diabetics***.
- Identify known diabetics and patients who could potentially experience hyperglycemia pre-operatively.
- Establish glucose control protocols for use throughout perioperative process. There are various algorithms available. Select and implement an effective, evidence-based glucose control protocol once buy-in is obtained by physicians, nurses and administrators.
- Work with primary care physician, endocrinologist and/or hospital glycemic control team to reduce HbA-1C for known diabetics. HbA-1C does not predict infection if intraoperative hyperglycemia is controlled. If patient has a high HbA-1C, the patient is more prone to perioperative hyperglycemia, deserves more attention and needs vigorous attempts at controlling glucose.

Resource: WSHA link to educational tools from the University of Washington http://www.wsha.org/wp-content/uploads/3_Hyperglycemia_UW.pdf and http://www.wsha.org/wp-content/uploads/4_Insulin_Algorithms_UW.pdf; WSHA links to Insulin Infusion Protocol Orders from the University of Washington http://www.wsha.org/wp-content/uploads/5_OR_Insulin_Algo_UW.pdf; http://www.wsha.org/wp-content/uploads/6_Standard_Insulin_Algo_UW.pdf; http://www.wsha.org/wp-content/uploads/7_Hi_Dose_Insulin_Algo_UW.pdf; Portland Protocol at <http://oregon.providence.org/our-services/p/portland-diabetes-protocols/forms-and-information/portland-diabetes-project-frequently-asked-questions/>.



3. Nutritional Enhancement

A patient's nutritional status significantly impacts surgical outcomes, especially those patients deemed high risk, such as diabetics and malnourished individuals. ***Strong for Surgery*** is an initiative aimed at disseminating best practices to improve clinical outcomes and prevent infections. One of the *Strong for Surgery* approaches is to screen a patient's nutritional status prior to surgery and intervene as appropriate to promote healing. There is evidence which demonstrated the use of "arginine supplemented diets" was associated with a 41% reduction in risk of infectious complications.

The ***Enhanced Recovery after Surgery*** (ERAS) protocol consists of multiple evidence-based interventions designed to promote early recovery for patients after surgery and without complications. Surgery can disrupt physiologic and metabolic homeostasis due to stress resulting in an endocrine response and increased post-operative complications.

There are several ERAS interventions which impact insulin resistance and promote healing. These elements address various aspects of the patient's journey through surgery and to be effective, require well-coordinated efforts by a multi-disciplinary team. By using the ERAS pathway, it has been demonstrated patients' length of stay was reduced by 30% and post-operative complications reduced by up to 50%.

Pre-operative oral carbohydrate loading in lieu of traditional fasting after midnight has been shown to raise insulin sensitivity by 50% and the effect continues through the post-operative period resulting in 50% less insulin resistance. There is less risk of hyperglycemia and improved retention of protein for healing purposes. There is evidence of better outcomes with pre-operative complex carbohydrates given orally up to 2 hours before surgery, which has been approved by the American Society of Anesthesiologists (ASA). It is also suggested that in major abdominal surgery there is evidence of a faster recovery, reducing length of stay up to 1.5 days.

Interventions

- Engage with out-patient clinics and physician offices to coordinate pre-operative nutritional screening of patients.
- Select a nutritional screening tool and implement consistently for all pre-surgical patients.
- Important considerations in determining whether a patient is at risk for malnutrition include a Body Mass Index (BMI) less than 19, low albumin, unintended weight loss, decreased appetite and inability to tolerate food intake.
- Through this approach, the surgical team can identify patients who might benefit from nutritional counseling and improvement, if the diagnosis allows the surgical procedure to be postponed and it is clinically appropriate.
- Beginning 5-6 days pre-operatively, provide at-risk patients with a pre-op nutritional supplement containing arginine, omega 3 fatty acids and nucleotides to strengthen a patient’s immune response and prevent infections.
- Give colorectal surgery patients a carbohydrate-rich clear liquid beverage 2 hours before surgery to reduce pre-operative thirst, dehydration, hunger, anxiety, nausea and hyperglycemia. The ASA has approved the intake of clear liquids up to 2 hours before elective procedures requiring anesthesia.

Resource: Strong for Surgery at http://www.becertain.org/strong_for_surgery/hospitals/nutrition; WSHA link to educational tools from the University of Washington http://www.wsha.org/wp-content/uploads/8_PreOp_CHO>Loading_UW.pdf; ERAS at <http://www.erassociety.org/index.php/eras-care-system/eras-protocol>; American Society of Anesthesiologists Practice Guidelines for Preoperative Fasting at <http://www.asahq.org/quality-and-practice-management/standards-and-guidelines/search?q=NPO>.

STRONG for Surgery
Nutrition Screening Checklist

Screening for Malnutrition

Is BMI less than 19?
 Yes No

Has the patient had unintentional weight loss of over 8 pounds in the last 3 months?
 Yes No

Has the patient had a poor appetite – eating less than half of meals or fewer than two meals per day?
 Yes No

Is the patient unable to take food orally (ex. dysphagia, vomiting)?
 Yes No

If YES to any of the questions:
Refer to Registered Dietitian for evaluation unless currently receiving nutrition therapy

Lab Tests for Risk Stratification

Is the patient having inpatient surgery?
 Yes No

If YES then:
Check albumin level to assess complication risk after surgery

Supplementation

Is the patient having complex surgery (example: GI anastomosis)?
 Yes No

If YES then:
Give evidence-based immune modulating supplementation

IMPORTANT NOTICE: These sample checklists are provided for informational purposes only and should NOT be used in the care of a patient outside of a comprehensive perioperative program such as Strong for Surgery. Patients should be only administered this checklist as an adjunct to medical care from a doctor or other professional healthcare provider. The logo on this checklist are registered trademarks of Strong for Surgery and ©2017. To find out how you can start using the Strong for Surgery checklist at your clinic, please contact us at info@strongforsurgery.org

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Preventing Surgical Site Infections
-
Glucose Control and Pre-Operative Carbohydrate Loading

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4. Pre-Admission Skin Cleansing and Pre-Operative Skin Antisepsis

Because the patient's skin is a major source of pathogens, preoperative skin cleansing has been of great interest in the prevention of SSIs. Patients' skin at the operation site is routinely cleansed with antiseptic solutions in the operating theatre before surgical incisions are made. This skin cleansing with an antiseptic

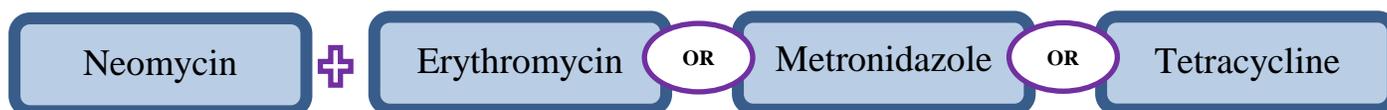
aims to reduce the microorganisms present on the skin and therefore reduce the risk that the surgical wound will become infected.

Interventions

- Provide patient with chlorhexidine gluconate (CHG) bathing products to reduce bacterial colonization of the skin with instructions on how and when to use.
- Maximize the antiseptic effect of chlorhexidine gluconate by maintaining adequate levels on the skin. This can be achieved by allowing CHG to dry completely on the skin or utilizing pre-impregnated cloths.
- Use chlorhexidine gluconate with isopropyl alcohol to prepare skin prior to surgery.

Resource: WSHA link to patient education example http://www.wsha.org/wp-content/uploads/9_CHG_Pt_Instructions.pdf.

5. Mechanical Bowel Prep and Oral Antimicrobial Prophylaxis Pre-Operatively



The day before surgery, Oral Antibiotics and Mechanical Bowel Prep are administered to the patient to prevent potential infections due to contaminated bowel contents during surgery and anastomotic leakage following surgery. Mechanical cleansing of the large intestine decreases the total volume of stool in the colon but does not change the concentration of bacteria. For this reason, in addition to the intravenous antibiotics routinely given immediately before and during surgery, it is beneficial to prescribe oral antibiotics the day before colon surgery.

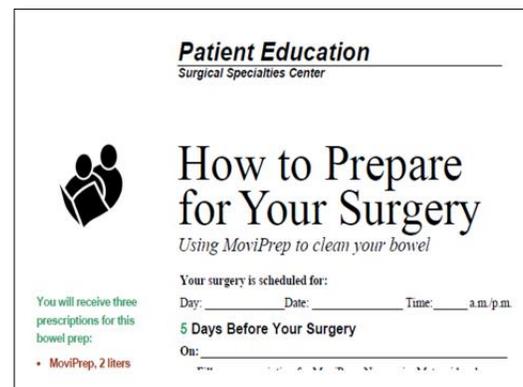
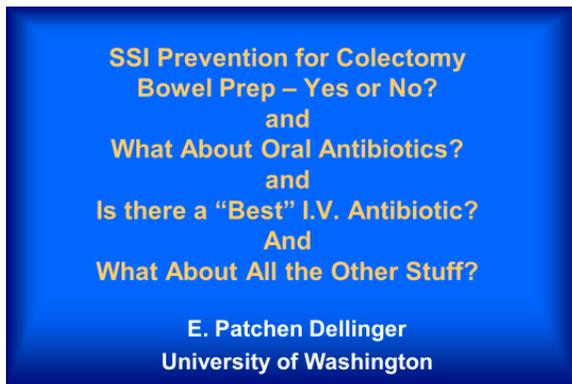
It is agreed that antibiotics used should be effective against both aerobic and anaerobic microorganisms. A common oral antibiotic regimen is the *Nichols-Condon bowel prep* which consists of **neomycin** and **erythromycin** given the day before surgery. Decreased infection rates have been reported when oral antibiotics are added to intravenous antibiotics and Mechanical Bowel Prep.

Interventions

- Consider working with gastroenterology providers who likely already have an established mechanical bowel prep protocol for colonoscopy procedures to standardize approach across the hospital or health care system.
- Standardize prophylactic oral antibiotic protocols.
- Ensure the patient understands and adheres to the timing of the pre-operative oral antibiotics to be taken the day before surgery.

Recommended Doses-- Oral Antimicrobial Prophylaxis Pre-Operatively			
Neomycin	1 gm x 3	Total 3 gm	Given at 1400, 1600 and 2400 day before surgery
Erythromycin	1 gm x 3	Total 3 gm	Given at 1400, 1600 and 2400 day before surgery
Metronidazole	1 gm x 3	Total 3 gm	Given at 1400, 1600 and 2400 day before surgery
Tetracycline	250 mg x 3	Total 750 mg	Given at 1400, 1600 and 2400 day before surgery

Resource: WSHA links to educational tools from the University of Washington http://www.wsha.org/wp-content/uploads/10_MBP_OralAB_UW.pdf; http://www.wsha.org/wp-content/uploads/11_BowelPrepOralAb_UW.pdf; Nichols, R. L., Broido, P., Condon, R. E., Gorbach, S. L., & Nyhus, L. M. (1973). Effect of preoperative neomycin-erythromycin intestinal preparation on the incidence of infectious complications following colon surgery. *Annals of Surgery*, 178(4), 453-462. doi:10.1097/00000658-197310000-00008; Lewis, R. T. (2002). Oral versus systemic antibiotic prophylaxis in elective colon surgery: a randomized study and meta-analysis send a message from the 1990s. *Can J Surg* 45(3): 173-180; Washington, J. A., 2nd, Dearing W, Judd E, Elveback L. (1974). Effect of preoperative antibiotic regimen on development of infection after intestinal surgery: Prospective, randomized, double-blind study. *Ann Surg* 180(4): 567-572.



6. Appropriate Hair Removal

Preoperative shaving of the surgical site is associated with a significantly higher SSI risk due to microscopic cuts in the skin that later serve as foci for bacterial multiplication. Clipping hair immediately before an operation has been associated with a lower risk of SSI.

Interventions

- Standardize processes for hair removal prior to surgery.
- If hair removal is required, use clippers outside of the OR.
- Clippers fitted with a vacuum-assisted hair collection device has resulted in significant reduction in clipping time and cleanup of residual hair, which can contaminate the operative field with an increased microbial burden.

7. Normothermia

Maintaining patient normothermia perioperatively is a critical element of preventing surgical site infections. Patients undergoing colorectal surgery have a decreased risk of SSI if they are not allowed to become hypothermic during the perioperative period. Maintain core temperature > **36°C (96.8 °F)** during the perioperative period.

Interventions

- Standardize warming interventions and protocols in both the pre-operative holding area, OR, and PACU.
- Surgical team members coordinate efforts to keep patient covered and warm during the preoperative and postoperative phases with the use of warm blankets or warming devices.
- Ensure active warming of patients (e.g. forced air, hot air blanket) in the holding area to reduce risk of early temperature drop at the onset of anesthesia. (**Note:** To save on costs, the hospital can standardize the use of one disposable forced air heating blanket initiated in the pre-op area and following the patient in the OR as well.)
- Check patient's temperature prior to entering the operating room. Check every 15 minutes intra-operatively. Check immediately upon arrival in PACU and every 30 minutes until discharge from PACU
- Use warmed IV fluids in the OR.

Intra-Operative Period

8. Glycemic Control

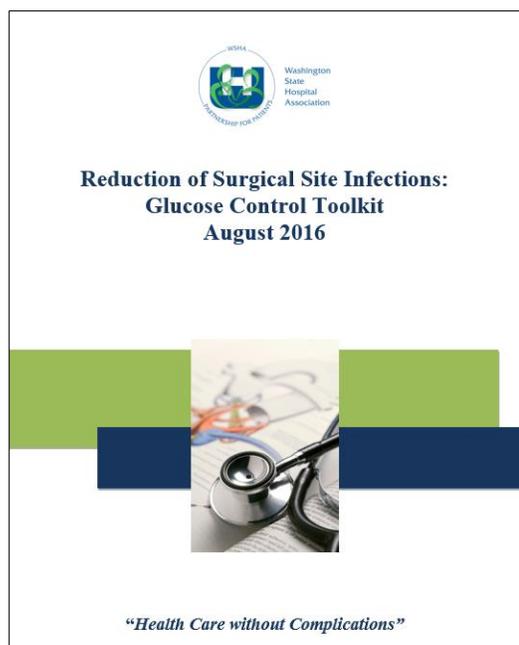
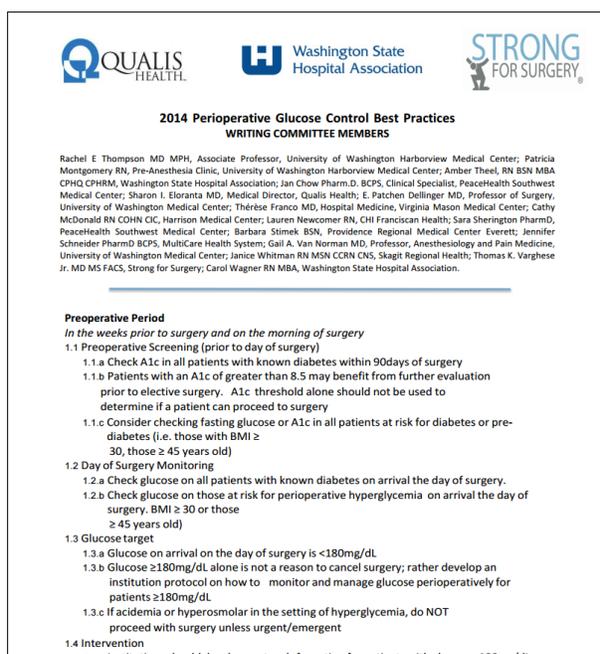
Hyperglycemia significantly increases the risk of infection, re-operative interventions and death in patients with or without diabetes. Perioperative glucose evaluation and insulin administration in patients with hyperglycemia are important quality targets to reduce SSI incidence. Achieving euglycemia in colorectal surgical patients requires collaboration amongst surgeons, anesthesiologists, endocrinologists, hospitalists, pharmacy, unit nurses and nurse diabetes educators.

Interventions

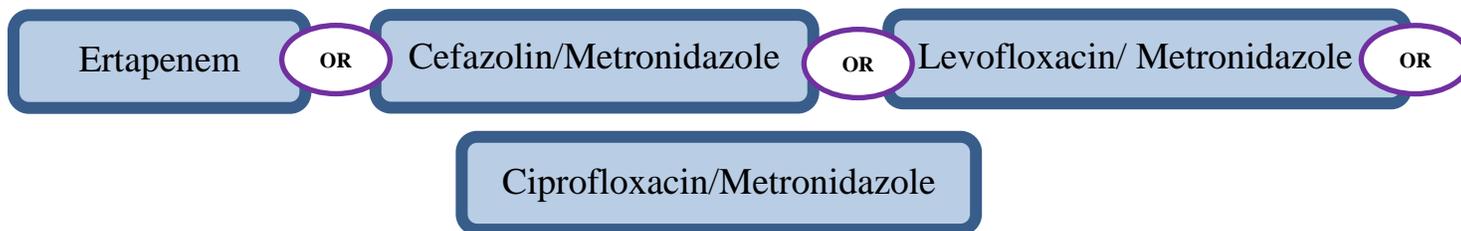
- Develop a multidisciplinary glycemic work group that will support the development and implementation of perioperative glycemic control and insulin infusion protocols.
- Consider giving a complex carbohydrate drink 2-3 hours before the operation to increase insulin sensitivity.
- Maintain a glucometer on every anesthesia station and to have blood glucose data automatically download into the Electronic Medical Record (EMR) for ease of monitoring and analysis by anesthesia providers.
- Check blood glucose when patient arrives in Pre Op holding.
- Ensure frequent monitoring of blood glucose, such as hourly, on all patients, ***both known diabetics and non-diabetics***, in the OR.
- Institute glucose management protocol (e.g. Basal bolus or standard protocol intravenous insulin delivery for blood glucose > 160 mg/dL at any time in the perioperative period).

- Explore incorporating insulin protocols into Computerized Provider Order Entry (CPOE) and the EMR to support decision making in a reliable manner.
- The precise best target of glucose control is not known. Different institutions reach different conclusions, however, a lower value is always better, as long as hypoglycemia is avoided. It is important for the perioperative team to have a target it is working towards for these patients.

Resource: WSHA link to Randomized Study of Basal Bolus Insulin Therapy in the Inpatient Management of Patients With Type 2 Diabetes Undergoing General Surgery (RABBIT 2 Surgery) http://www.wsha.org/wp-content/uploads/12_Rabbit2_Surgery_DiabetesCare.pdf; WSHA link to Glycemic Control toolkit at http://www.wsha.org/wp-content/uploads/13_GlycemicControl_Toolkit.pdf; http://www.wsha.org/wp-content/uploads/14_Best-Practices-Perioperative-Glucose-Control.pdf.



9. Weight-Based IV Antimicrobial Prophylaxis and Re-dosing in the OR



It is critical to maintain therapeutic levels of the prophylactic antimicrobial agent in the serum and tissues throughout the operation, using **weight-based dosing** and **re-dosing** as appropriate. Obesity increases the risk of SSI twofold to sevenfold when compared to healthy weight. Adipose tissue is poorly vascularized, and as a result, obese patients typically have decreased tissue oxygenation. Because of this, lower concentrations of antibiotic in the blood and other tissues occur. Surgical time correlates with risk of

infection: the longer the operative time, the higher the risk of SSI. As a result, health care providers should re-dose prophylactic antimicrobials during long surgical procedures (i.e. > 3 hours).

Interventions

- Standardize prophylactic antibiotic protocols, with additional guidance on weight-based dosing and re-dosing for long cases based on the half-life of the selected antibiotic and/or obese patients. (**Note:** Cefazolin/ Metronidazole are compatible and may be administered in the same one bag.)
- Include surgical antibiotic prophylaxis as part of the surgical time out. The pre-procedural pause includes confirming the appropriate timing of antibiotics administered and documented.
- Consider modifying the EMR so that only approved and appropriate antibiotics could be chosen for prophylaxis and are given in the appropriate time frame before surgery.
- Administer weight-based antibiotics within 1 hour prior to surgical incision. Ideally, antibiotic is given 15 minutes before incision to maximize level in the tissues.
- Consider noting on an OR white board or implementing pre-programmed anesthesia EMR reminders and triggers to signal intraoperative re-dose time to anesthesia team.
- Re-dose cefazolin for operations lasting 3 hours or more. (**Note:** Metronidazole, Quinolones and Ertapenem have a long ½ life of 9-10 hours, therefore, typically will not need to re-dosed.)
- Prophylactic antibiotics should be discontinued when the patient leaves the OR.

Recommended Doses—Parenteral Antimicrobial Prophylaxis Intra-Operatively			
Ertapenem	1 gm	First dose given within 60 minutes of incision	No re-dosing for Ertapenem unless the operation lasts 24 hours
Cefazolin	1 gm up to 80 kg weight	First dose given within 60 minutes of incision	Follow up re-dose same as original
	2 gm for 120 kg weight or above	First dose given within 60 minutes of incision	Follow up re-dose same as original
	3 gm for 160 kg weight or above	First dose given within 60 minutes of incision	Follow up re-dose same as original
Metronidazole	1 gm x 1	Single dose	Single dose
Levofloxacin	500 mg	First dose given within 60 minutes of incision	Single dose
Ciprofloxacin	400 mg	First dose given within 60 minutes of incision	Single dose

Resource: Bratzler, D. W., Dellinger, E. P., Olsen, K. M., Perl, T. M., Auwaerter, P. G., Bolon, M. K., Weinstein, R. A. (2013). Clinical practice guidelines for antimicrobial prophylaxis in surgery. *American Journal of Health-System Pharmacy*, 70(3), 195-283. doi:10.2146/ajhp120568.

10. Normothermia

Maintaining patient normothermia perioperatively is a critical element of preventing surgical site infections. Patients undergoing colorectal surgery have a decreased risk of SSI if they are not allowed to become hypothermic during the perioperative period. Maintain core temperature > **36°C (96.8 °F)** during the perioperative period.

Interventions

- Standardize warming interventions and protocols in both the pre-operative holding area, OR, and PACU.
- Surgical team members coordinate efforts to keep patient covered and warm during the preoperative and postoperative phases with the use of warm blankets or warming devices.
- Ensure active warming of patients (e.g. forced air, hot air blanket) in the holding area to reduce risk of early temperature drop at the onset of anesthesia.
- Check patient's temperature prior to entering the operating room. Check every 15 minutes intra-operatively. Check immediately upon arrival in PACU and every 30 minutes until discharge from PACU.
- Use warmed IV fluids in the OR.

11. Wound Edge Protectors

Endogenous pathogens from the skin or gastrointestinal tract are the most frequent pathogens contributing to SSIs. Protecting the wound edges from bacterial invasion during surgery may reduce SSIs. The physical barrier formed by the impervious sheet covering the cut edges of the wound prevents endogenous and exogenous pathogens from coming into contact with the cut skin, fat, and fascia, thereby reducing likelihood of infection. One study revealed that the use of impervious plastic wound protectors was associated with a 45% decrease in SSIs.

Interventions

- Consider use of a fascial wound protector in these surgical procedures as part of a comprehensive bundled approach to SSI prevention.

12. Dedicated Wound Closure Tray or Anastomosis Pan

Use of dedicated non-contaminated closing set instruments after all the contaminated instruments have been removed and the working areas re-draped with fresh, sterile towels are considered logical and common sense interventions in the pursuit of SSI prevention. (**Note:** The Mayo Clinic, Johns Hopkins Hospital and Duke University Medical Center have incorporated this intervention into their Colorectal surgery bundles which, along with implementation of the other bundle elements, collectively have had an impact on reducing SSI Colon.)

Interventions

- Utilize either a separate wound closure tray with clean instruments to be introduced after the anastomosis is done or an anastomosis tray that is used only for the anastomosis and then discarded when the anastomosis is done. (**Note:** An example is 2 debakey forceps, 1 needle driver, 2 linen shod clamps and a pair of metzenbaum scissors)
- The closure tray or anastomosis tray is not opened until the team has changed their gloves and gowns, if soiled.

13. Gown and Glove Change after Anastomosis

At the time of fascia closure, it is recommended that all staff change gloves and gowns, if soiled. (**Note:** The Mayo Clinic and Duke University Medical Center have incorporated this intervention into their Colorectal surgery bundles which, along with implementation of the other bundle elements, collectively have had an impact on reducing SSI Colon.)

Interventions

- Once anastomosis is completed, have the surgical team and scrub nurse change their contaminated gloves.

14. Administration of Supplemental Oxygen

Oxygen is required for appropriate wound healing and white blood cell functioning. Tissue hypoxia is a known risk factor for wound infection and dehiscence. Increasing tissue oxygenation during the surgical procedure may help prevent SSI.

Interventions

- In patients with normal pulmonary function, administer increased FiO₂ (up to 0.80 FiO₂) intra-operatively and post-operatively while in PACU or for 2 hours in the receiving unit, in combination with strategies to optimize tissue oxygenation through maintenance of perioperative normothermia and adequate volume replacement.

Post-Operative Period

15. Discontinue Prophylactic Antibiotics

Existing evidence does not support longer duration of prophylactic antimicrobial use. Continuing prophylaxis beyond 24 hours does not increase effectiveness but does expose the patient to an increased risk of developing resistant bacterial flora and can lead to Clostridium difficile infections (CDI).

Interventions

- Ensure prophylactic antibiotics are discontinued by the time the patient leaves the OR.
- Ideally, there should be no additional antibiotics administered after completion of the surgical case, unless an identified concern and need exist for additional prophylaxis or therapeutic administration in the case of a suspected or actual infection.

16. Maintain Glycemic Control

Maintain blood glucose level < 160 mg/dL on the day of surgery and throughout the postoperative period.

Interventions

- Frequent monitoring of blood glucose (all patients, both known diabetics and non-diabetics) beginning in the PACU, and on all patient care units.
- Institute glucose management protocol (e.g. Basal bolus or standard protocol insulin delivery for blood glucose > 160 mg/dL.)
- When evaluating resources, nurses, and investments required on the patient care units to safely administer insulin infusions to postsurgical patients, carefully consider and evaluate substantial costs to be saved by the prevention of SSIs and other complications.

17. Promote Hand Hygiene

Hand hygiene is widely recognized as a primary method to prevent health care-associated infections and the transmission of pathogens in the perioperative setting. This intervention is an effective and cost-efficient way to prevent infections and is essential for the health care team, patients and families.

Interventions

- The Association of periOperative Registered Nurses' (AORN) "Recommended practices for hand hygiene" advocates that hands should be washed on arrival to the facility; before and after every patient contact (e.g. transferring or positioning the patient); before performing a clean or sterile task (e.g. changing dressing); after risk for blood or body fluid exposure (e.g. after gloves and gown); after contact with patient surroundings (e.g. patient bed and linens); when hands are visibly soiled; before and after eating; after using the restroom; and before leaving the facility.
- Encourage good hand hygiene practices with the patient and family and provide hand sanitizing products at the bedside.
- Patients should be empowered to question clinician practices that are not in compliance with recommended guidelines.

Post-Hospitalization Period

18. Patient and Family Education on Wound Care

To optimize management of postoperative wounds, it is critical that the patient and family understand what is necessary to enhance recovery, properly care for the wound and reduce the risk of postoperative complications.

Interventions

- Ensure the patient and family understand the importance of taking all prescribed medications, observing for potential signs and symptoms of infection, resting and increasing activity as appropriate, and keeping follow-up appointments.
- If a wound infection is suspected, patients and families must inform the provider immediately and active management be initiated.
- Reinforce the importance of good hand hygiene post-discharge.

19. Follow-Up Phone Call

Nurses providing reassuring and informative follow-up phone calls to patients in the early post-operative phase may assist in preventing or minimizing the effects of postoperative complications by reinforcing discharge instructions, answering patients' questions, and assessing their concerns. Potential serious complications such as an SSI may therefore be addressed early.

Interventions

- Arrange for an interpreter if needed to ensure patient and/or family is able to communicate effectively by telephone.
- Assess patient's health and postoperative recovery status, adherence to prescribed medications and discharge instructions and knowledge of signs and symptoms of infection.
- Confirm the patient and family know when, where and with whom the follow-up appointment is and the purpose of the appointment. Verify the patient has transportation arrangements to the office location.
- Document your call and communicate concerns and actions taken with the appropriate provider(s).

Variation and Performance Improvement

1. Data and Feedback

Accurate and timely data on SSI Colon prevention performance is invaluable to educate the health care team and motivate change where needed. It is essential for leadership, surgeons, anesthesiologists, perioperative nurses, pharmacists and the team to understand SSI data and to strategically address any outliers. The goal is to reduce variation through continuous monitoring and actions and perform all interventions for every patient.

Reliable compliance with the bundle elements can ideally be tracked through the EMR, such as appropriate antibiotic prophylaxis, use of CHG, normothermia, euglycemia and whether a wound closure tray was used.

Benchmarking improves the meaningfulness of data feedback and is essential to sustain improved performance in a non-punitive environment.

2. Conduct analysis of SSI Case and determine if “Potentially Preventable SSI”

By viewing each SSI as a sentinel event and conducting a thorough and timely investigation, the myriad contributing factors leading to an infection can be promptly identified and result in specific interventions

and action plans to prevent future infections. Root Cause Analysis (RCA) is a process by which a team formally investigates to understand what, how and why it happened. An RCA will determine if the SSI case was potentially preventable by asking if all the recommended bundle elements were implemented.

A potentially preventable SSI is one that occurs, and on investigation you find that not all the recommended actions to reduce SSI risk were completed. Although the SSI rate for colon surgeries will never get to zero, the potentially preventable SSI rate should be zero.

By reviewing the bundle, toolkit, and process measures identified above and investigating whether there were failures along the continuum, the perioperative team is able to evaluate how successful it is in implementing evidence-based practices designed to prevent infections and thereby, identify specific opportunities to improve.

Summary of SSI Colon Prevention Strategies

Preadmission	Preoperative	Intraoperative	Postoperative
CHG bathing/wipes night before and morning of surgery.	Clip hair outside of OR.	Use chlorhexidine and alcohol-based prep for skin cleansing in the OR.	
Mechanical bowel prep.	Forced air warming to maintain T ≥ 36°.	Maintain normothermia-- T ≥ 36° throughout surgery.	Hand hygiene on floors.
Maintenance of normothermia.			
Oral antibiotic prep.	Administer appropriate IV antibiotic within 60 minutes prior to incision.	Re-dose antibiotic based on length of surgery and antimicrobial agent.	Discontinue prophylactic antibiotics.
Screen diabetic and nondiabetic's blood glucose in office-- notify provider for BS > 160.	Check blood glucose in holding area—notify provider for BS > 160. Establish euglycemic target.	Check blood glucose every 1 hour if patient is hyperglycemic prior to surgery. If BS > 160, initiate insulin infusion.	For all patients (diabetic and/or hyperglycemic postoperatively), monitor and maintain serum glucose <160 mg/dL through an insulin infusion.
Maintenance of euglycemia.			
		Maintain FiO2 up to 0.80.	
		Gown and glove change before fascial closure.	
		Dedicated wound closure tray.	
		Use wound protectors if appropriate.	
Patient education and reinforcement of SSI preventive measures.			

Safety Action Bundle: Surgical Site Infections (SSI)—Colorectal Surgeries

Background

- Surgical site infections (SSI) are the most common and costly reported health care-associated infection (HAI). Colorectal surgery SSI rates range from 5% to 45%.
- SSIs contribute to significant patient morbidity, mortality, prolonged hospital stays, readmissions and the need for subsequent procedures.
- SSIs are believed to account for \$3.5 billion to \$10 billion annually in healthcare expenditures.
- Up to 60% of SSIs have been estimated to be preventable by using evidence-based guidelines.

Aim

To reduce the incidence of Colorectal Surgical Site Infections by **20%** by September 28, 2017.
 * *Hospitals in top quartile (zero) should focus on maintenance and hardwiring.*

Measures

Outcome: Colorectal Surgical Site Infections Rate per Centers for Medicare and Medicaid (CMS) and State Law **D**
Process: SSI Colon Bundle **D**
Submit: National Healthcare Safety Network (NHSN) **D**



Core Strategies

Definition **D** Reference **i** Tool **X**

Patient and Family Engagement	<ul style="list-style-type: none"> <input type="checkbox"/> Educate patient and family on what to expect throughout the surgical experience and identify discharge needs. <input type="checkbox"/> Encourage and support patient and family participation in care planning and decision making by providing tools like the Centers for Disease Control (CDC) “Frequently Asked Questions about <i>Surgical Site infections</i>”. X <input type="checkbox"/> Educate patient and family on the significance of hand hygiene and impact on SSI prevention.
Leadership	<ul style="list-style-type: none"> <input type="checkbox"/> Identify a multidisciplinary team that includes senior and unit-level leadership, perioperative clinical providers, infectious disease and prevention, pharmacy and quality personnel. <input type="checkbox"/> Set aims, goals and timelines for practice changes and performance. <input type="checkbox"/> Educate care providers on risk factors for SSI and prevention with an emphasis on bundle elements and evidence-based best practices.
Pre-Operative Period	<ul style="list-style-type: none"> <input type="checkbox"/> Provide education to patient in the office/clinic when the decision is made for operation on “Preventing SSIs” and ensure understanding. Include information about the importance of pre-operative bowel prep and oral antibiotics and consider providing the antibiotics.

	<ul style="list-style-type: none"> ❑ Ensure patient had a Hibiclens shower night before and day of surgery. ❑ Use 2% chlorhexidine gluconate (CHG) cloths on the morning of surgery, if no CHG shower or BMI >30. ❑ Screen and identify patients at risk for hyperglycemia and implement a glucose control protocol. Every patient should have a fasting glucose checked during the 30 days before the operation. Anyone with a glucose >100 should have intra-operative glucose screening. ❑ Ensure weight-based antimicrobial prophylaxis administered within 1 hour prior to incision. (Ideally, antibiotics are given by anesthesia in the OR.) ❑ If hair removal is needed, use clippers and not razors, outside of the operating room. ❑ Actively warm all patients for at least 30 minutes BEFORE going into the OR.
<p>Intra-Operative Period</p>	<ul style="list-style-type: none"> ❑ Pause and have surgical team review surgical checklist. Establish teamwork, culture of safety and open communication. ❑ Skin Prep: Wash and clean skin around incision site using a 2% CHG product with alcohol. ❑ Maintain normothermia. Standardize procedures for active warming in the operating room (Maintain body temp $\geq 96.8^{\circ}$ F/36.0°C) (warming blankets/warm fluids). ❑ Ensure weight-based re-dose of antimicrobial agents within 3-4 hours after incision (use timer/electronic reminder in anesthesia record). ❑ Optimize tissue oxygenation by administering supplemental oxygen (FiO₂ = or > 80%). ❑ Measure glucose in OR 30-60 minutes after incision and use insulin to control if level above 160. ❑ Consider wound-edge protectors. ❑ Use dedicated wound closure tray for closure of fascia and skin. ❑ Glove and gown change by entire team after anastomosis completed and before fascial closure.
<p>Post-Operative Period</p>	<ul style="list-style-type: none"> ❑ Discontinue antibiotics when patient leaves the OR. ❑ Maintain blood glucose during the postoperative period at 160mg/dL or lower. ❑ Optimize tissue oxygenation by administering supplemental oxygen. ❑ Promote a patient shower with Hibiclens after dressing removal. ❑ Promote good hand hygiene practices with patient/family and provide hand sanitizing products at bedside. ❑ Reinforce patient education about SSI prevention measures and objectives.
<p>Post-Hospitalization Period</p>	<ul style="list-style-type: none"> ❑ Educate patient on wound care and signs and symptoms of infection. ❑ Follow-up phone call to patient within one week.
<p>Performance and Variation</p>	<ul style="list-style-type: none"> ❑ Measure and provide on-going feedback of Colorectal SSI rates with perioperative personnel and leadership. ❑ Investigate any SSI Colon that occurs and document if all elements of the bundle were completed.

Moving Towards Zero

Daily Monitoring of SSI Colon	<ul style="list-style-type: none"><input type="checkbox"/> Create and implement an SSI Colon bundle checklist based on the evidence-based guidelines and best practices.<input type="checkbox"/> Monitor adherence to SSI Colon prevention bundle elements to identify gaps and opportunities for improvement.<input type="checkbox"/> Collect SSI Colon rates by clinical provider to identify potential opportunities.
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Hardwiring

Culture	<ul style="list-style-type: none"><input type="checkbox"/> Promote a blame-free environment where individuals are able to report errors or near misses without fear of reprimand or punishment.<input type="checkbox"/> Encourage collaboration across ranks and disciplines to seek solutions for patient safety problems.<input type="checkbox"/> Promote transparency of results from display on units to the board and public.
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Key Resources

1. Anderson, D. J., Podgorny, K., Berríos-Torres, S. I., Bratzler, D. W., Dellinger, E. P., Greene, L., . . . Kaye, K. S. (2014). Strategies to prevent surgical site infections in acute care hospitals. *Infection Control and Hospital Epidemiology*, 35(6), 605-627. doi:10.1086/676022
2. Cima, R., & Quast, L. (2013). Review of processes to reduce colorectal surgery surgical site infections. *OR Nurse*, 7(6), 18-26. doi:10.1097/01.orn.0000436912.57000.2c
3. Cima, R., Dankbar, E., Lovely, J., Pendlimari, R., Aronhalt, K., Nehring, S., Quast, L. (2013). Colorectal surgery surgical site infection reduction program: A national surgical quality improvement program–driven multidisciplinary single-institution experience. *Journal of the American College of Surgeons*, 216(1), 23-33. doi:10.1016/j.jamcollsurg.2012.09.009
4. Reducing Colorectal Surgical Site Infections. (2014). December 22 Update. *The Joint Commission Center for Transforming Health Care*. 1-19. http://www.centerfortransforminghealthcare.org/assets/4/6/SSI_storyboard.pdf
5. Rosenthal, M. (2014). Duke protocol reduces colorectal surgical site infections by 75%. *General Surgery News*, 41:10, 1-5.
6. Cedars-Sinai News Release. “New Practices Reduce Surgical Site Infections after Colorectal Surgery.” Nov. 28, 2012. 1-2.

FAQs

(frequently asked questions)

about “Surgical Site Infections”

What is a Surgical Site Infection (SSI)?

A surgical site infection is an infection that occurs after surgery in the part of the body where the surgery took place. Most patients who have surgery do not develop an infection. However, infections develop in about 1 to 3 out of every 100 patients who have surgery.

Some of the common symptoms of a surgical site infection are:

- Redness and pain around the area where you had surgery
- Drainage of cloudy fluid from your surgical wound
- Fever

Can SSIs be treated?

Yes. Most surgical site infections can be treated with antibiotics. The antibiotic given to you depends on the bacteria (germs) causing the infection. Sometimes patients with SSIs also need another surgery to treat the infection.

What are some of the things that hospitals are doing to prevent SSIs?

To prevent SSIs, doctors, nurses, and other healthcare providers:

- Clean their hands and arms up to their elbows with an antiseptic agent just before the surgery.
- Clean their hands with soap and water or an alcohol-based hand rub before and after caring for each patient.
- May remove some of your hair immediately before your surgery using electric clippers if the hair is in the same area where the procedure will occur. They should not shave you with a razor.
- Wear special hair covers, masks, gowns, and gloves during surgery to keep the surgery area clean.
- Give you antibiotics before your surgery starts. In most cases, you should get antibiotics within 60 minutes before the surgery starts and the antibiotics should be stopped within 24 hours after surgery.
- Clean the skin at the site of your surgery with a special soap that kills germs.

What can I do to help prevent SSIs?

Before your surgery:

- Tell your doctor about other medical problems you may have. Health problems such as allergies, diabetes, and obesity could affect your surgery and your treatment.

- Quit smoking. Patients who smoke get more infections. Talk to your doctor about how you can quit before your surgery.
- Do not shave near where you will have surgery. Shaving with a razor can irritate your skin and make it easier to develop an infection.

At the time of your surgery:

- Speak up if someone tries to shave you with a razor before surgery. Ask why you need to be shaved and talk with your surgeon if you have any concerns.
- Ask if you will get antibiotics before surgery.

After your surgery:

- Make sure that your healthcare providers clean their hands before examining you, either with soap and water or an alcohol-based hand rub.

If you do not see your providers clean their hands, please ask them to do so.

- Family and friends who visit you should not touch the surgical wound or dressings.
- Family and friends should clean their hands with soap and water or an alcohol-based hand rub before and after visiting you. If you do not see them clean their hands, ask them to clean their hands.

What do I need to do when I go home from the hospital?

- Before you go home, your doctor or nurse should explain everything you need to know about taking care of your wound. Make sure you understand how to care for your wound before you leave the hospital.
- Always clean your hands before and after caring for your wound.
- Before you go home, make sure you know who to contact if you have questions or problems after you get home.
- If you have any symptoms of an infection, such as redness and pain at the surgery site, drainage, or fever, call your doctor immediately.

If you have additional questions, please ask your doctor or nurse.

Co-sponsored by:

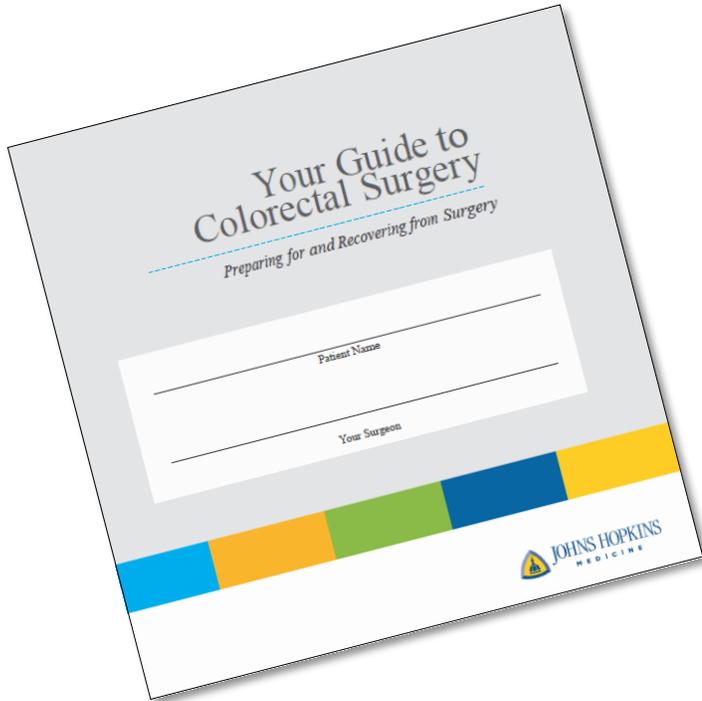


Tool 3: Strong for Surgery Nutrition Screening Checklist
 Link to http://www.becertain.org/strong_for_surgery/hospitals/nutrition

	<h2 align="center">Nutrition Screening Checklist</h2>
	<p>Screening for Malnutrition</p> <p>Is BMI less than 19? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Has the patient had unintentional weight loss of over 8 pounds in the last 3 months? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Has the patient had a poor appetite – eating less than half of meals or fewer than two meals per day? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Is the patient unable to take food orally (ex. dysphagia, vomiting)? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <hr/>
	<p>Lab Tests for Risk Stratification If YES then:</p> <p>Is the patient having inpatient surgery? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> Referral to Registered Dietitian for evaluation unless currently receiving nutrition therapy</p> <hr/>
	<p>Supplementation If YES then:</p> <p>Is the patient having complex surgery (example: GI anastomosis)? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><input type="checkbox"/> Give evidence-based immune modulating supplementation</p>
	<p>IMPORTANT NOTICE <i>These sample checklists are provided for informational purposes only and should NOT be used in the care of a patient outside of a comprehensive preoperative program such as Strong for Surgery. Patients should not rely on information on this checklist as an alternative to medical advice from a doctor or other professional healthcare provider. The logos on the checklists are registered trademarks of Strong for Surgery and SCOAP. To find out how you can start using the Strong for Surgery checklist in your clinic, please contact us at www.strongforsurgery.org</i></p> <p>Version 1.07 Revised 01/25/2013</p>

Tool 4: Patient Guide to Colorectal Surgery Example from Johns Hopkins Hospital

Link to http://www.wsha.org/wp-content/uploads/2_Johns_Hopkins_Guide.pdf



Your Checklist

Wound Care

For the first few weeks following surgery, your wound may be slightly red and uncomfortable. You may shower and let the soapy water wash over your incision. **Avoid soaking in the tub for one month following surgery or until the wound is well-healed.** It will take the wound several months to "soften." It is common to have bumpy areas in the wound near the belly button and at the ends of the incision.

If you have staples, these should be removed when you are seen by your surgeon at the follow-up appointment. You may have a gluelike material on your incision. **Do not pick at this.** It will come off over time. It is the surgical glue used in surgery to close your incision. You also have sutures inside of you that will dissolve over time

Tool 5: Patient Instructions Example for CHG Bathing Pre-operatively
Link to http://www.wsha.org/wp-content/uploads/9_CHG_Pt_Instructions.pdf

Pre-Surgery CHG body cleansing: INSTRUCTIONS

Getting your skin ready for surgery is extremely important! To do this, one must cleanse your skin with CHG. This is a special chemical found in soaps such as Hibiclens and other brands. First, purchase the 4% Hibiclens at any pharmacy (Walmart, City Market, etc). Second, preparation is to gather clean, freshly-laundered washcloths, towels and clothes for each shower. Before using, read all instructions!

Frequency for bathing must be once a day, for 3 days prior to surgery, & the morning of surgery for the best results!

Steps for showering or bathing with the CHG/4% Hibiclens : If allergy reactions occur, stop using.

1. Wash and rinse your hair, face, and body using your normal shampoo and soap.
2. Make sure you completely rinse off in a very thorough manner.
3. Turn off the shower, or step out of the bathwater.
4. Pour a quarter size amount of liquid CHG/Hibiclens soap onto a wet, clean washcloth, and apply to your entire body FROM THE NECK DOWN. Do NOT use on your face, hair, or genital areas.
5. Rub the soap filled washcloth over your entire body for 3 minutes; apply more soap as needed (1/4 of bottle should be used with each of the 4 showers/cleansing). Avoid scrubbing your skin too hard.
6. Turn on the shower/return to the bath, & rinse the soap off your body completely with warm water.
7. Do NOT use regular soap after washing with the Hibiclens.
8. Pat your skin dry with a freshly-laundered, clean towel after each shower/bath cleansing.
9. Dress with freshly-laundered clothes after each shower/bath cleansing
10. It is important the night **before** surgery, upon the 3rd day of bathing, sleep with clean bed linens!
11. Do NOT apply any lotions, deodorants, powders, or perfumes to your body.
12. Do NOT shave your legs the night **before** or the day of surgery! Nor remove any body hair below the neck. Facial shaving is the only thing permitted before surgery.
13. Throughout this process, good hand hygiene is a must throughout the entire day, each day. Wash hands with soap and water for the timeframe it takes to sing "Row, Row your boat" to ensure adequate cleansing.

PLEASE BRING THIS FORM WITH YOU TO SURGERY CENTER AT ADMISSIONS ON SURGERY DAY

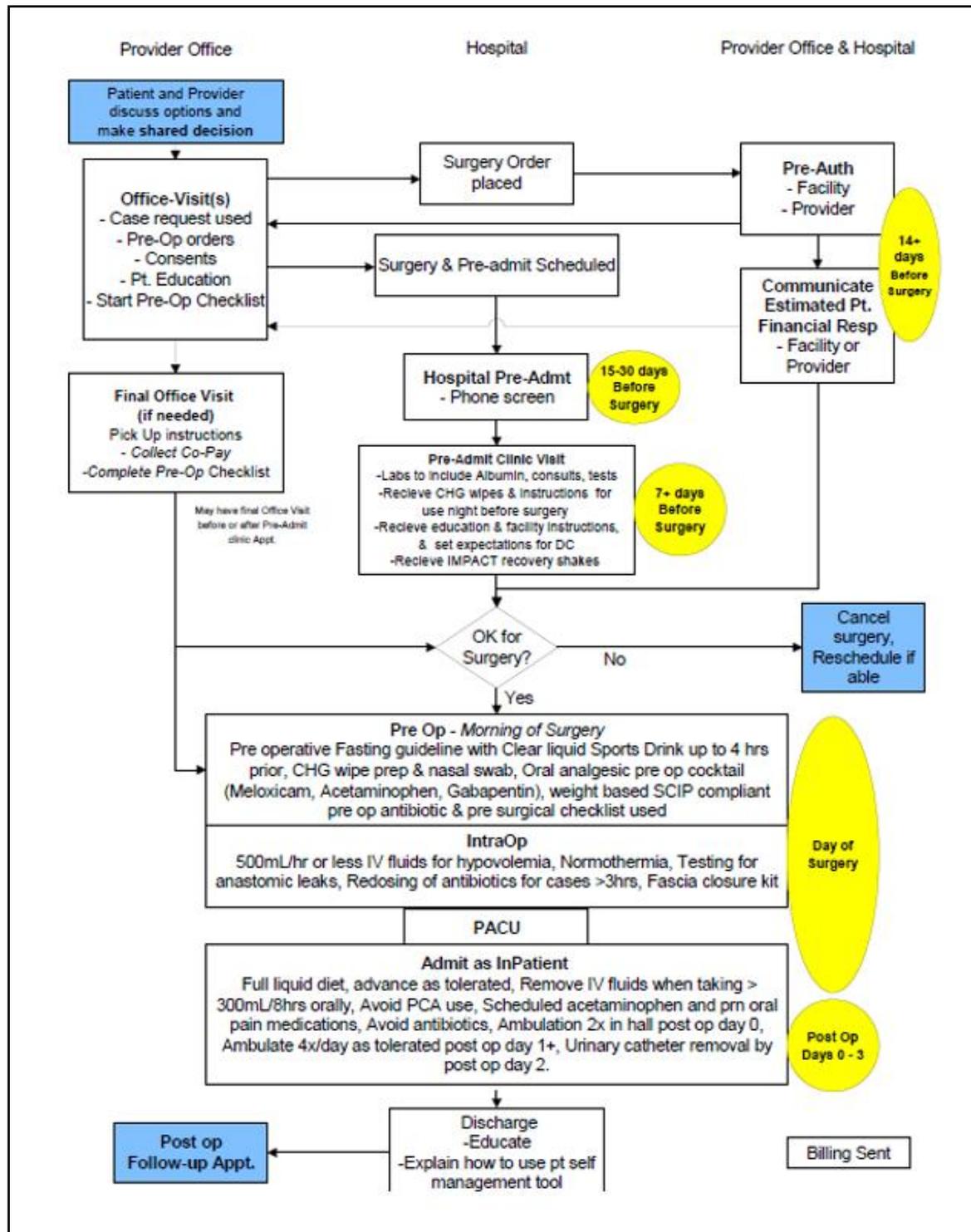
I, the patient, DID complete the following showers/baths Hibiclens Cleansing as instructed:

- _____ 3 days before surgery
- _____ 2 days before surgery
- _____ 1 day before surgery
- _____ Morning of surgery

Patient's Signature: _____ Date: _____

Tool 6: Colorectal Surgery Clinical Pathway Example from MultiCare Health System

Link to http://www.wsha.org/wp-content/uploads/16_MultiCare_Elective_Colon.pdf



Tool 7: Colorectal Surgery Care Map and Patient Education from MultiCare Health System

Link to http://www.wsha.org/wp-content/uploads/16_MultiCare_Elective_Colon.pdf



ELECTIVE COLON SURGICAL CARE MAP

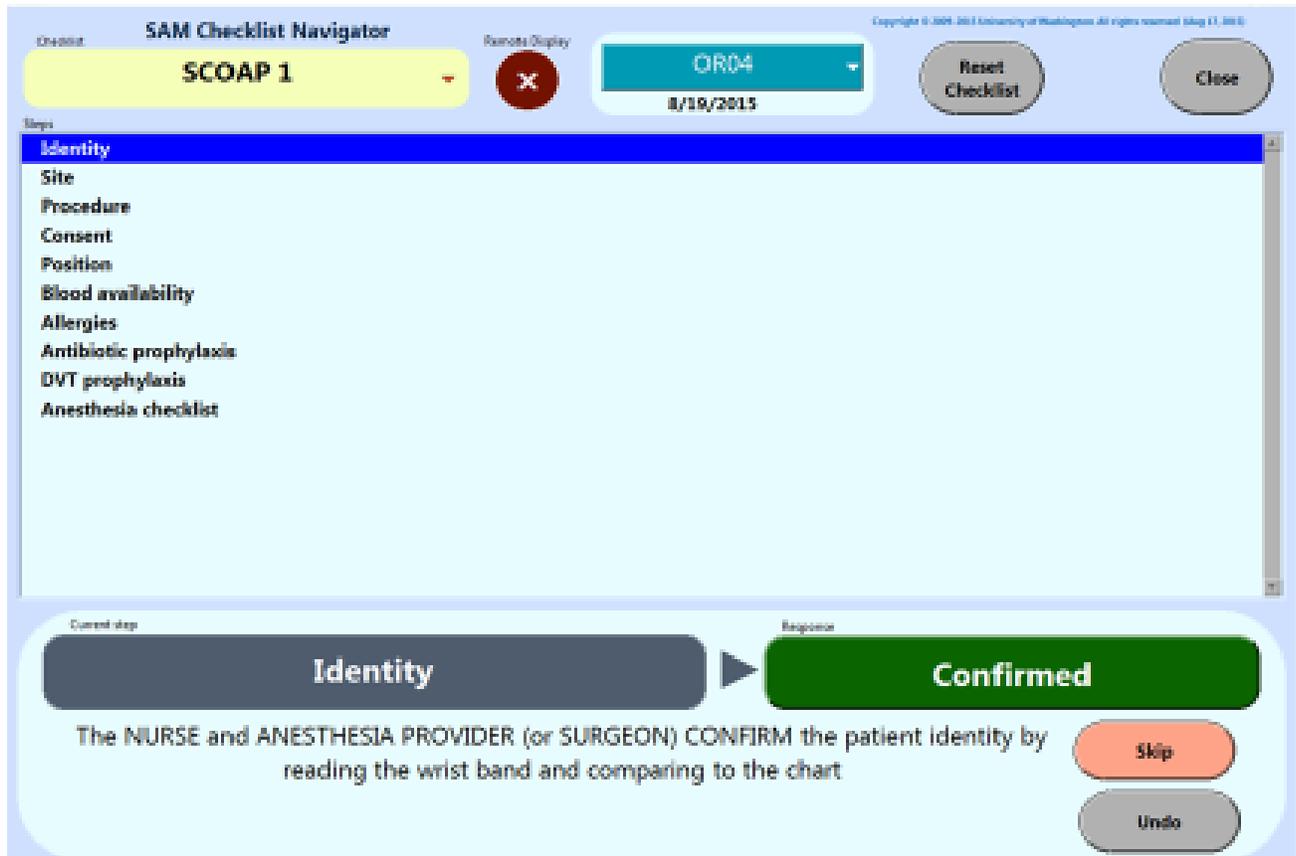
The Care Map below is what you can generally expect during your hospital stay. Your health care team may also suggest changes unique to your recovery.

Pre-Admit Visit 7+ days before Surgery	Day of Surgery	
	Day of Surgery Before you leave home:	Day of Surgery When you wake up from surgery:
<ul style="list-style-type: none"> <input type="checkbox"/> Go to pre-admit clinic visit, labs if needed <input type="checkbox"/> Pick up IMPACT Advanced Recovery shakes at Pre-Admit <input type="checkbox"/> Pick up CHG wipes and instructions to use the night before surgery <input type="checkbox"/> Receive instructions for eating, drinking & medications to take/stop prior to surgery 	<ul style="list-style-type: none"> <input type="checkbox"/> Up to 4 hours before surgery, continue to drink sports drinks like Gatorade or Powerade <input type="checkbox"/> Remember to bring an Identification card & Insurance card <input type="checkbox"/> Have a family member or friend hold onto expensive or important valuables for safe keeping 	<p>Things to know:</p> <ul style="list-style-type: none"> <input type="checkbox"/> You will wake up in the recovery room. <input type="checkbox"/> You will have an IV in your arm to give you fluids during your stay, until you can hold down around 300+mL of liquids/8 hrs <input type="checkbox"/> You may have compression devices (SCDs) on your legs to reduce your risk for blood clots <input type="checkbox"/> A Nurse will give you scheduled oral medicines to reduce pain once you can hold things down. <input type="checkbox"/> You will have a catheter (tube) in your bladder to remove urine. We will get this out as soon as appropriate. <input type="checkbox"/> You will be moved to a bed in a hospital unit where your loved ones can visit you.
<p>At Home 6 days before Surgery</p> <ul style="list-style-type: none"> <input type="checkbox"/> Drink your Impact Advanced Recovery drink 3 times a day for 5 days (5th day is the day before Surgery) 	<p>Day of Surgery When you arrive at the hospital:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Check in at Surgery Registration at your assigned arrival time <input type="checkbox"/> A nurse will call you to come to the Pre-Op area to be prepped <input type="checkbox"/> A nurse will help you to perform another CHG wipe application prior to surgery <input type="checkbox"/> An IV will be placed in your arm to give you fluids and antibiotics <input type="checkbox"/> You will be given a heating gown to keep you warm during & after surgery <input type="checkbox"/> The OR Team will take you to the operating room when you are ready 	<p>Your nurse will help you:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Get out of bed and begin to walk, this will help you to heal faster. <input type="checkbox"/> Do not get out of bed on your own. Having surgery puts you at higher risk for falling. <input type="checkbox"/> The nurse will teach you to use your incentive spirometer and remind you to use it 10 times each hour. This will reduce your risk for lung illnesses after surgery.
<p>At Home The Day before Surgery</p> <ul style="list-style-type: none"> <input type="checkbox"/> Take any Pre-surgery medications you received, as instructed <input type="checkbox"/> Take a shower with regular soap and water. <input type="checkbox"/> Apply the CHG wipes and allow the areas to dry completely. Do not wash off. Video instructions at: http://www.multicare.org/prepare-for-surgery/ <input type="checkbox"/> Follow the fasting guidelines given to you at the pre-admit clinic visit 		

00-0000-011/15

	Day of Surgery Goal	Goals during your Stay	After Discharge
Nutrition	<input type="checkbox"/> Begin with a full liquid diet.	<input type="checkbox"/> Your diet will advance based on your ability to tolerate foods. <input type="checkbox"/> Eat many small meals rather than large ones.	<input type="checkbox"/> Eat healthy, small meals multiple times per day. <input type="checkbox"/> Avoid soda pop as it will cause gas and bloating. <input type="checkbox"/> DO NOT smoke or drink alcoholic beverages as these can slow your healing.
Activity	<input type="checkbox"/> Walk in the Hall with the Nurse 2 times. <i>Movement is the key to faster healer – sooner is better.</i>	<input type="checkbox"/> Walk in the Hall with the Nurse/staff member 4 times each day as tolerated. <input type="checkbox"/> Sit up in a chair for meals and between walks. Rest as needed. <input type="checkbox"/> Keep your lungs moving as well. Use your Incentive spirometer 10 times each hour.	<input type="checkbox"/> Continue to move and walk. <input type="checkbox"/> Rest often and as needed. <input type="checkbox"/> Avoid lifting.
Pain Control	<input type="checkbox"/> IV pain medications will be used reduce your initial pain.	<input type="checkbox"/> You will switch to oral pain medications for longer relief.	<input type="checkbox"/> Your provider will continue you on oral pain medications for relief at home as needed. <input type="checkbox"/> You may need to use over the counter medications like Gas X or simethicone for mild gas pains and bloating issues.
Risk Reduction	Your provider may order medications and/or devices that reduce your risk for blood clots based on your risk/needs. <input type="checkbox"/> Injectable medication (shot) _____ <input type="checkbox"/> Device to squeeze legs (SCDs)		<input type="checkbox"/> Wash your hands often. <input type="checkbox"/> Shower daily. <input type="checkbox"/> You may be sent home needing to continue medications to reduce risks. Check your after Visit Summary as well. <input type="checkbox"/> _____ <input type="checkbox"/> _____
Planning for After Care	<input type="checkbox"/> Meet with Care Management or Social Work if you have after care needs like a skilled nursing facility or home health.	<input type="checkbox"/> You will receive education about your condition <input type="checkbox"/> You will receive education on how to use the Red, Yellow, Green patient self management tool to review your symptoms. - Green zone- Your symptoms are normal/expected - Yellow zone- Call the office for additional support - Red zone- Need help now	<input type="checkbox"/> Make sure you have transportation to your follow up visit at the surgeon's office. _____ (date) _____ (time) _____ (phone) <i>It is important to your recovery, for the team to check on your progress and look at your incision site.</i>

Tool 8: EMR embedded Perioperative Checklist Example (SAM-Smart Anesthesia Manager)



Tool 9: SCOAP Surgical Checklist

Link to http://www.wsha.org/wp-content/uploads/17_SCOAP_Checklist.pdf

SCOAP Surgical Checklist

March 8, 2012

1 Before induction: Briefing

All Team Members - (Attending Surgeon or designee leads):

- Confirm patient (at least 2 identifiers), procedure, site, Left/Right
- Describe procedure, expected duration, & anticipated difficulties
- Expected blood loss & blood availability
- Need for special instruments / supplies / IV access beyond usual
- Heparin given/not needed and/or SCDs in place and turned on

Nursing/Tech reviews:

- Equipment issues (instruments ready, staff in-serviced, implants available)

Anesthesia reviews:

- Airway or other concerns
- Allergies
- Special meds, other

All Team Members

- Questions/issues/concerns from any team member & duty to speak up at any time in the procedure

2 Before incision: Process control

Attending Surgeon reviews: (as applicable)

- Attending Surgeon not present for SCOAP 1? Repeat SCOAP 1.
- Each person introduces self by name & role
- Personnel exchanges: timing, plan for announcing changes
- Essential imaging displayed; right & left confirmed
- Has patient positioning changed since SCOAP 1? Is marking still visible?
- Antibiotic prophylaxis - drug, dose, time, redosing plan
- Active warming – needed? In place, turned on?
- Risk of hyperglycemia? Plan for insulin protocol if needed
- Sharps management plan
- Specialty-specific checklist

3 Just before closure of operative field or removal of trocars: No retained objects

Attending Surgeon:

- Perform methodical visual & physical sweep of wound & report

Nursing/Tech:

- All music, conversation, & distractions halted
- Perform preliminary count of needles/ sponges/ instruments & report

4 After skin closure complete: No retained objects, debriefing, care transition

All Team Members (Attending Surgeon or designee leads):

- Confirm final needles/ sponges/ instruments count correct
- Surgeon views all sponges & laps in holders
- Confirm name of procedure
- Any specimens? Confirm label & instructions
- Equipment issues to be addressed? If yes, response plan
- Other issues? If yes, response plan

Surgeon and Anesthesia:

- Does patient need special monitoring?
- Insulin drip needed?
- Post-op beta blockers needed?
- Post-op anticoagulation needed?
- Pain management by Surgery or Acute Pain Service?
- Other special concerns for patient recovery?

Tool 10: Strong for Surgery Blood Sugar Control Checklist

Link to http://www.becertain.org/strong_for_surgery/hospitals/glycemic_control

	<h1>Blood Sugar Control</h1>
	<p>All Patients</p> <p>Does the patient have a prior diagnosis of diabetes? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Patient's age > 45? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Patient's BMI ≥ 30? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <hr/> <p>Diabetic Patients Degree of Blood Sugar Control:</p> <p>Hemoglobin A1c level > 7.0%? OR Has any fingerstick reading in the past 2 weeks been >200? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <hr/> <p>Diabetic Patients Peroperative Management:</p> <p>Will the patient be NPO after midnight? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Is the patient having bowel prep? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>IMPORTANT NOTICE <i>These sample checklists are provided for informational purposes only and should <u>NOT</u> be used in the care of a patient outside of a comprehensive preoperative program such as Strong for Surgery. Patients should not rely on information on this checklist as an alternative to medical advice from a doctor or other professional healthcare provider. The logos on the checklists are registered trademarks of Strong for Surgery and SCOAP. To find out how you can start using the Strong for Surgery checklist in your clinic, please contact us at strongforsurgery@becertain.org.</i></p> <p>Version 1.08 Revised 12/18/12</p>

Tool 11: Peri-Operative Insulin Infusion Protocol Order Examples from University of Washington
 Links to http://www.wsha.org/wp-content/uploads/5_OR_Insulin_Algo_UW.pdf; http://www.wsha.org/wp-content/uploads/6_Standard_Insulin_Algo_UW.pdf; http://www.wsha.org/wp-content/uploads/7_Hi_Dose_Insulin_Algo_UW.pdf

SERVICE	ATTENDING	RESIDENT	SEE	FOR ALLERGIES
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OPERATING ROOM AND PRE-OP HOLDING INSULIN INFUSION PROTOCOL ORDERS
Goal BG Range = 100-140 mg/dL

- Discontinue All Previous Subcutaneous Insulin Orders
- Standard insulin infusion: 100 units/100 mL 0.9% Sodium chloride via an infusion device
- Confirm piggyback of 5% Dextrose at 100mL/hr is infusing
- Check blood glucose (BG) hourly

Treatment of Hypoglycemia (BG <70 mg/dL) or symptoms of hypoglycemia

- Turn off insulin infusion for any BG below goal AND
- Give 25 mL (1/2 amp) of 50% dextrose IV if BG 50-69 mg/dL OR
- Give 50 mL (1 amp) of 50% dextrose IV if BG < 50 mg/dL.
- Recheck BG every 20 minutes until BG \geq 100 mg/dL
 - IF BG is <70 mg/dL repeat 25 mL (1/2 amp) 50% dextrose
 - WHEN BG is \geq 100 mg/dL, restart the insulin infusion at a lower dose by using one algorithm LEFT from previous algorithm (see "Evaluating Trends & Using Algorithms" section).

Algorithm 1 Start here for Type 1 DM		Algorithm 2 Start here for Type 2 DM		Algorithm 3 Do NOT Start here		Algorithm 4 Do not start here	
BG	Units/hr	BG	Units/hr	BG	Units/hr	BG	Units/hr
<70 = Hypoglycemia (See page 1 for treatment)							
70-99: Off x 20 minutes & recheck BG							
100-120	0.5	100-120	1	100-120	2	100-120	3
121-140	0.8	121-140	1.5	121-140	2.5	121-140	4
141-160	1.2	141-160	2	141-160	3	141-160	5.5
161-180	1.5	161-180	2.5	161-180	4	161-180	7
181-210	2	181-210	3	181-210	5	181-210	9
211-240	2.5	211-240	4	211-240	6	211-240	12
241-270	3	241-270	5	241-270	8	241-270	16
271-300	3.5	271-300	6	271-300	10	271-300	20
301-330	4	301-330	7	301-330	12	301-330	24
331-360	4.5	331-360	8	331-360	14	>330	28
>360	6	>360	12	>360	16		

Evaluating Trends & Using Algorithms:

Move right or left only one algorithm per BG check. Subtract current BG reading from previous BG reading for the change in BG.

- BG in goal range:
 - o If BG has decreased \geq 100 mg/dL in one hour, move LEFT one algorithm and use appropriate rate from table
 - o If BG has decreased <100 mg/dL in one hour, maintain patient within current algorithm and adjust rate until patient is in goal range for 4 hours
 - o Once patient is within goal range for 4 hours, do NOT adjust rate unless BG exits goal range
- BG above goal range:
 - o If BG has not decreased by at least 60 mg/dL, move RIGHT one algorithm and use appropriate rate from table
 - o If BG has decreased by 60-100 mg/dL, stay within current algorithm and use appropriate rate from table
 - o If BG has decreased \geq 100 mg/dL in one hour, move LEFT one algorithm and use appropriate rate from table
- Hypoglycemic event OR BG below goal range
 - o Turn off insulin infusion. Treat hypoglycemia if BG <70mg/dL. Recheck BG in 20 minutes.

Move LEFT one algorithm and use appropriate rate from table when BG returns to goal range.

PHYSICIAN SIGNATURE	PRINT NAME	PAGER	UPIN/NPI	DATE	TIME
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DOB

OPERATING ROOM INSULIN INFUSION ORDERS

WHITE - MEDICAL RECORD
 CANARY - PHARMACY
 PINK - NURSING

REV SEP 09

PHYSICIAN ORDER - YELLOW

SERVICE	ATTENDING	RESIDENT/IARN/PA	
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Protocol (Not For DKA/HHS or Pediatrics)

► **CONSULT ENDOCRINE SERVICE FOR:**

- Acute Care patients on insulin infusion receiving oral nutrition or intermittent tube feeding

GOAL Blood Glucose (BG) RANGE :

ACUTE CARE OR ICU: 100-180 mg/dL initiate when ordered

ICU ONLY: 100-140 mg/dL initiate when BG > 140 x 2

Discontinue all previous insulin orders.

Insulin Infusion: 100 units insulin/ 100 mL NS given IV infusion, at:

Algorithm 1: Start here for most patients.

Algorithm 2: Start here if S/P CABG surgery, solid organ transplant, receiving glucocorticoids, or patient receiving >80 units/day of insulin as an outpatient.

- **NO PATIENT STARTS AT ALGORITHM 3 OR 4.**

► See back of form for the Algorithms and decision tree

► When transitioning to SubQ: Use www.uwmedres.org/resources for dosing assistance: Give specified basal SubQ insulin dose, and then stop insulin infusion in 2 hours.

Fluid/Nutrition Orders:

Recommendations for patients that are not eating:

DM Type 1 (10 grams glucose/hour) **DM Type 2** (5 grams glucose/hr)

D51/2 normal saline with _____ mEq/L Potassium chloride IV at _____ mL/hr

D5LR with _____ mEq/L Potassium chloride IV at _____ mL/hr

TPN or Enteral Feeds (see separate orders)

Other _____ at _____ mL/hr

Patient Monitoring:

Check BG every 1 hour until it is within **goal** range for 4 hours. Then decrease BG checks to every 2 hours. ALWAYS resume hourly checks if BG exits goal range.

► Hourly monitoring may be indicated for critically ill patients or patients having medical or surgical procedures even if they have stable BG.

Notify the Provider:

For any BG increase >100 mg/dL from a stable baseline

For 2 consecutive BG decreases of >100 mg/dL

For any hypoglycemia which results in loss of consciousness **OR** does not resolve within 20 min of implementing the hypoglycemia protocol below

Treatment of Hypoglycemia (BG <70 mg/dL) or symptoms of hypoglycemia

Turn off insulin infusion for any BG below goal **AND**

Give 25 mL (1/2 amp) of 50% dextrose IV if BG 50-69 mg/dL **OR**

Give 50 mL (1 amp) of 50% dextrose IV if BG < 50 mg/dL.

Recheck BG every 20 minutes until BG ≥ 100 mg/dL

→ IF BG is <70 mg/dL repeat 25 mL (1/2 amp) 50% dextrose

→ **WHEN** BG is ≥ 100 mg/dL, restart the insulin infusion at a lower dose by using one algorithm **LEFT** from previous algorithm (see "Evaluating Trends & Using Algorithms" section).

TPN/ Enteral feeding:

If TPN/ Enteral feeding is stopped or significantly reduced, decrease insulin infusion by 50% for 1 hour. Then, use algorithm table & instructions to determine subsequent rate changes **AND** check BG every 1 hour x 4 hours.

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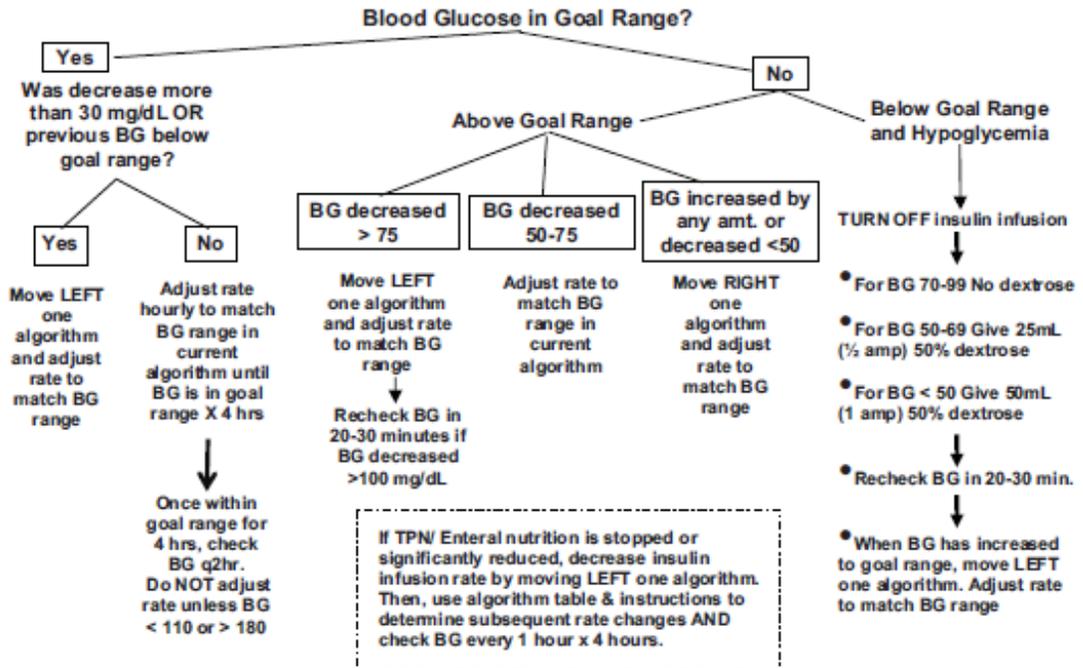
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BG monitoring: Check BG every 1 hour until it is within goal range for 4 hours. Then decrease BG checks to every 2 hours. ALWAYS resume hourly checks if BG exits goal range and when there is a change in algorithm. Check BG in 20-30 minutes as noted below. Hourly monitoring may be indicated for critically ill patients or patients having medical or surgical procedures even if they have stable BG.

Insulin Infusion Algorithm Decision Tree



Algorithm 1		Algorithm 2		Algorithm 3		Algorithm 4	
BG	Unit/hr	BG	Units/hr	BG	Units/hr	BG	Units/hr
<70 = Hypoglycemia See front of form for treatment							
70-99: Off x 20-30 minutes & recheck BG							
100-120	0.5	100-120	1	100-120	1.5	100-120	2
121-140	0.8	121-140	1.5	121-140	2.5	121-140	3.5
141-160	1.2	141-160	2	141-160	3	141-160	4.5
161-180	1.5	161-180	2.5	161-180	4	161-180	6
181-210	2	181-210	3	181-210	5	181-210	7.5
211-240	2.5	211-240	4	211-240	6.5	211-240	9.5
241-270	3	241-270	5	241-270	8	241-270	11
271-300	3.5	271-300	6	271-300	9	271-300	13
301-330	4	301-330	6.5	301-330	10.5	301-330	15
331-360	4.5	331-360	7.5	331-360	12	331-360	17
>360	5	>360	8.5	>360	14	>360	19

If NOT achieving glycemic control with Algo 4 X ≥3 consecutive hours Consider High Dose Infusion Protocol

REV APR 10 BACK

SERVICE	ATTENDING	RESIDENT/ARNPPA	SEE ORCA FOR ALLERGIES
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UWMC HIGH DOSE Insulin Infusion Protocol

Initiate HIGH DOSE Insulin Infusion Orders only after documented failure to achieve glycemic control with Algorithm 4 Standard Insulin Infusion Orders X ≥3 consecutive hrs

GOAL Blood Glucose (BG) RANGE – check one box:

ACUTE CARE OR ICU: 100-180 mg/dL ICU ONLY: 100-140 mg/dL

- Discontinue all previous insulin orders.
- Start Insulin Infusion: 100 units insulin/ 100 mL NS given IV infusion, at **Algorithm 5**
 - **ONLY after documented failure to achieve glycemic control with Algorithm 4 X 3 or more hours**
- ▶ See back of form for the Algorithms and instructions: "Evaluating Trends and Using Algorithms".
- ▶ Transition to SubQ (Endocrine Consult Strongly Encouraged): Give specified basal SubQ insulin dose, then stop insulin infusion in 2 hours.

Fluid/Nutrition Orders:

Recommendations for patients that are not eating:

- DM Type 1** (10 grams glucose/hour) **DM Type 2** (5 grams glucose/hr)
- D51/2 normal saline with _____ mEq/L Potassium chloride IV at _____ mL/hr
 - D5LR with _____ mEq/L Potassium chloride IV at _____ mL/hr
 - TPN or Enteral Feeds (see separate orders) _____ at _____ mL/hr
 - Other _____ at _____ mL/hr

Patient Monitoring:

- Check BG every 1 hour until it is within goal range for 4 hours. Then decrease BG checks to every 2 hours. ALWAYS resume hourly checks if BG exits goal range.
- ▶ Hourly monitoring may be indicated for critically ill patients or patients having medical or surgical procedures even if they have stable BG.

Notify the Provider:

- For any BG increase >100 mg/dL from a stable baseline
- For 2 consecutive BG decreases of >100 mg/dL (consider resuming standard insulin infusion protocol)
- For any hypoglycemia which results in loss of consciousness OR does not resolve within 20 min of implementing the hypoglycemia protocol below

Treatment of Hypoglycemia (BG <70 mg/dL) or symptoms of hypoglycemia

- Turn off insulin infusion for any BG below goal AND
- Give 25 mL (1/2 amp) of 50% dextrose IV if BG 50-69 mg/dL OR
- Give 50 mL (1 amp) of 50% dextrose IV if BG < 50 mg/dL.
- Recheck BG every 20 minutes until BG ≥100 mg/dL
 - IF BG is <70 mg/dL repeat 25 mL (1/2 amp) 50% dextrose
 - WHEN BG is ≥100 mg/dL, restart the insulin infusion at a lower dose by using one algorithm LEFT from previous algorithm (see "Evaluating Trends & Using Algorithms" section).

TPN/ Enteral feeding:

- If TPN/ Enteral feeding is stopped or significantly reduced, decrease insulin infusion by 50% for 1 hour. Then, use algorithm table & instructions to determine subsequent rate changes AND check BG every 1 hour x 4 hours.

PROVIDER SIGNATURE	PRINT NAME	PAGER	NPI	DATE	TIME
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UW Medicine
 Harborview Medical Center – UW Medical Center
 University of Washington Physicians
 Seattle, Washington

UWMC HIGH DOSE INSULIN INFUSION PROTOCOL ORDS



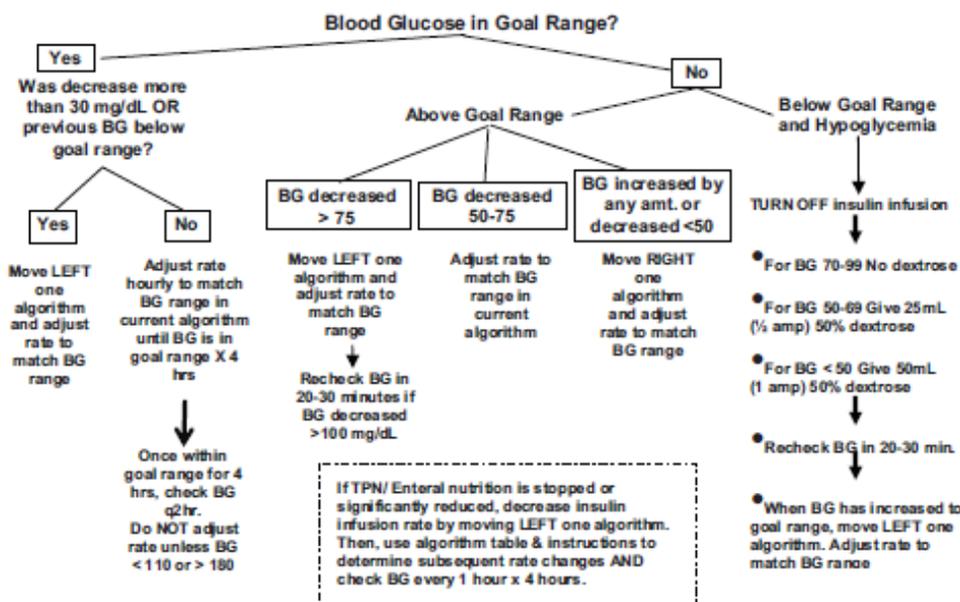
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WHITE - MEDICAL RECORD

UH2813 REV APR 10

UWMC HIGH DOSE Insulin Infusion Protocol

Insulin Infusion Algorithm Decision Tree



	Algorithm 5		Algorithm 6		Algorithm 7		Algorithm 8	
	BG	Unit/hr	BG	Units/hr	BG	Units/hr	BG	Units/hr
<70 = Hypoglycemia See front of form for treatment								
70-99: Off x 20-30 minutes & recheck BG								
100-110: Recheck BG in 20-30 min, consider moving left one Algorithm								
Algorithm 4 See Standard Insulin Infusion (UH1957)	100-120	3	100-120	4	100-120	5	100-120	6
	121-140	5	121-140	6.5	121-140	8.5	121-140	10
	141-160	7	141-160	9	141-160	12	141-160	14
	161-180	9	161-180	12	161-180	15	161-180	18
	181-210	11	181-210	15	181-210	19	181-210	23
	211-240	14	211-240	19	211-240	23	211-240	28
	241-270	17	241-270	23	241-270	28	241-270	34
	271-300	20	271-300	26	271-300	33	271-300	40
	301-330	23	301-330	30	301-330	38	301-330	46
	331-360	26	331-360	34	331-360	42	331-360	52
>360	29	>360	38	>360	47	>360	57	

General Guidelines:

- ▶ All patients start with algorithm 5
- ▶ Patients who do not achieve desired control with Algorithm 4 for >3 hours are likely to have increase insulin resistance or high caloric intake.
- ▶ Resume standard insulin infusion protocol if BG drops more than 100 mg/dL in one hour using Algorithm 5
- ▶ Patients may not receive insulin by more than one route (i.e. IV/ SubQ) except at transition off IV insulin or by order of an endocrine consult team.

UH2813 REV APR 10 BACK

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