Improving Surgical Care and Recovery Pathway Worksheet

Use this worksheet to develop an enhanced recovery pathway for use at your hospital. The information in this tool is based on a recent evidence review conducted by the national project team at the American College of Surgeons and Johns Hopkins Armstrong Institute for Patient Safety and Quality.[1,2] The evidence review included literature search, followed by review of relevant articles including meta-analyses and systematic reviews when available as well as review of relevant published guidelines. This worksheet should be used by your team, in conjunction with the evidence review and local experts, to develop a clinical pathway that incorporates the principles of enhanced recovery (narcotic sparing multimodal analgesia, early restoration of functional status, avoidance of prolonged fasting periods) and best practices for preventable harms (surgical site infection, venous thromboembolism and urinary tract infection). This worksheet includes some common approaches for incorporating these principles in your pathway but there may be other approaches that are also appropriate. We anticipate that pathways will vary from hospital to hospital because certain skills or medications may not be available but it is important to try to adhere to as many of the principles as possible.

Disclaimer:

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Any practice described in this document must be applied by health care practitioners in accordance with professional judgement and standards of care in regard to the unique circumstances that may apply in each situation they encounter.

Use of brand, manufacturer, or vendor names is for identification only and does not imply endorsement by the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

[1] Ban KA, Gibbons MM, Ko CY, Wick E. Technical Evidence Review for Colorectal Surgery – Surgery. Developed for the AHRQ Safety Program for Improving Surgical Care and Recovery. 2017.

[2] Ban KA, Gibbons MM, Ko CY, Wick E, Canneson M, Scott MJ, Wu CL. Technical Evidence Review for Colorectal Surgery – Anesthesia. Developed for the AHRQ Safety Program for Improving Surgical Care and Recovery. 2017.

ISCR Pathway

Drugs and dosages are given as examples.
Please consult with a pharmacist as you develop your pathway.
All medications have side effects that should be taken into consideration on an individual patient basis prior to administration.

PREOPERATIVE

Patient Education

Patients should receive preoperative education, including detailed information on the surgical procedure and components of the enhanced recovery pathway in which patients are expected to participate (bowel preparation, preoperative bathing, reduced fasting, carbohydrate loading, early ambulation, early oral (PO) intake, venous thromboembolism (VTE) prophylaxis, possible use of regional anesthesia, avoiding or minimizing opioid pain medication, and discharge criteria).

IMMEDIATE PREOPERATIVE

Bowel Preparation

Patients undergoing elective colorectal surgery should undergo combined mechanical bowel preparation with oral antibiotics and be allowed to drink nonalcoholic, noncaffeinated liquids freely up to 2 hours before surgery to avoid dehydration.

Preoperative Bathing

Patients should undergo at-home bathing the night before surgery and morning of surgery with either soap or antiseptic agent.

Reduced Fasting

Reduced fasting is recommended in all patients without documented contraindications such as delayed gastric emptying. In patients receiving mechanical bowel preparation, intake of clear liquids until 2 hours prior to induction is recommended. In patients not receiving mechanical bowel preparation, intake of solids until 6 hours prior to induction and intake of clear liquids until 2 hours prior to induction is recommended.

Carbohydrate Loading

Routine carbohydrate loading in the immediate preoperative period is recommended, though there is not consensus regarding the optimal regimen and formulation.

Multimodal Pre-anesthesia Medication

a. Analgesics: Routine administration of multiple analgesics in the immediate preoperative period is recommended.
b. Anti-emetics and adjunct agents: Routine administration of anti-emetic agents and other adjuncts should be considered in patients without contraindications.

Glucose Control: Glucose control should be considered in all patients regardless of diabetic status, beginning in the immediate preoperative period and continuing until discharge to prevent hyperglycemia. Hyperglycemia is prevalent in both diabetic and non-diabetic hospitalized patients and has been associated with surgical site infections and complications. A 2017 Centers for Disease Control and Prevention guideline recommends target blood glucose levels less

than 200 mg/dL.[3] The guideline notes that lower targets had not been evaluated in randomized controlled trials, but some other organizations had made recommendations that included consideration of observational evidence. A 2016 guideline from the American College of Surgeons and Surgical Infection Society recommends target glucose levels between 110 and 150 mg/dL.[4]

Normothermia
Normothermia should be maintained throughout the procedure and into the immediate postoperative period. Preoperative warming may be helpful in maintaining intraoperative normothermia and should be especially considered for patients who are elderly, patients with cardiopulmonary disease, and long procedures.

INTRAOPERATIVE

Surgical Technique
A laparoscopic surgical approach is preferred if no contraindications exist and the surgeon is comfortable with this technique.

Prophylactic Antibiotics
Prophylactic antibiotics should be administered within 1 hour prior to incision or 2 hours for vancomycin and fluoroquinolones. Local patterns of antibiotic resistance should be considered when choosing an agent. Intra-operative redosing and weight-based dosing should follow guideline recommendations.

Preoperative VTE Prophylaxis
Preoperative administration of a single dose of VTE chemoprophylaxis (in patients without a contraindication) and the use of sequential compression devices beginning prior to anesthesia induction are recommended. Timing of VTE chemoprophylaxis administration should take into account the need for performing regional analgesia.

Skin Preparation
Skin preparation should be done with an alcohol-containing agent unless contraindicated.

Standard Intraoperative Anesthesia Pathway
Intraoperative anesthesia should be tailored to optimize anesthetic depth while facilitating rapid awakening after completion of surgical procedure. Adjuncts to avoid strong long-acting opiates should be considered, such as—

a. Intravenous (IV) infusions of anesthetics (lidocaine, propofol, ketamine)
b. Regional anesthesia (epidural, spinal, or transversus abdominus plane block)

Ventilation
A lung-protective ventilation strategy is recommended. Tidal volumes of 6-8 mL/kg predicted body weight may decrease pulmonary complications. Supplemental oxygen 80% fraction of inspired oxygen (FiO_2) continued into the postoperative phase for 2-6 hours should be considered.

Normothermia
Normothermia should be maintained throughout the procedure and into the immediate postoperative period. Preoperative warming maybe helpful in maintaining intraoperative normothermia and should be especially considered for patients who are elderly, patients with cardiopulmonary disease, and long procedures.

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[3] Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, Reinke CE, Morgan S, Solomkin JS, Mazuski JE, Dellinger EP, Itani KMF, Berbari EF, Segreti J, Parvizi J, Blanchard J, Allen G, Kluytmans JAJW, Donlan R, Schecter WP; Healthcare Infection Control Practices Advisory Committee. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surg. 2017 May 3. doi: 10.1001/jamasurg.2017.0904. [Epub ahead of print] PubMed PMID: 28467526.

[4] Ban KA, Minei JP, Laronga C, Harbrecht BG, Jensen EH, Fry DE, Itani KM, Dellinger EP, Ko CY, Duane TM. American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update. J Am Coll Surg. 2017 Jan;224(1):59-74. doi: 10.1016/j.jamcollsurg.2016.10.029. Epub 2016 Nov 30. Review. PubMed PMID: 27915053.

Euvolemia
Intraoperative fluid management should be individualized to maintain euvolemia and a near-zero fluid balance. Goal-directed fluid therapy may be beneficial in high-risk patients or surgical procedures where there are large fluid shifts, blood loss, or a systemic inflammatory response. Balanced crystalloid solutions are preferred and albumin supplementation can be considered as needed.

Avoid Nasogastric Tubes and Drains
Routine use of nasogastric tubes is not recommended. Routine intraperitoneal drains following colectomy is not recommended. The role of pelvic drainage after rectal anastomoses remains uncertain and should be patient specific.

POSTOPERATIVE

VTE Prophylaxis
Combined mechanical and chemoprophylaxis for VTE is recommended for the duration of hospitalization in all patients. Postoperative chemoprophylaxis should begin within 24 hours of surgery. Extended chemoprophylaxis for 28 days total is recommended for patients undergoing surgery for colorectal cancer.

Multimodal Analgesia and Medication for Postoperative Nausea and Vomiting
A standard, multimodal anti-emetic and opioid sparing analgesic regimen is recommended for all patients. Medications should be administered orally with cessation of IV medication as early as tolerated by the patient.

a. Core nonopioid analgesic regimen
b. Optional analgesic agents and adjuncts
c. Anti-emetic prophylaxis

Early Alimentation
Early postoperative feeding is recommended for patients unless they experience nausea or vomiting.

Early Ambulation
Early postoperative mobilization is recommended with the aim of patients walking 3 to 4 times a day from postoperative day 1.

Early Urinary Bladder Catheter Removal
Routine urinary bladder catheter removal by postoperative day 1 is recommended for patients undergoing colon or upper rectal surgery. For patients undergoing low rectal surgery, routine bladder drainage is at the discretion of the surgeon, and can be considered through postop days 3-5 based on the higher risk of urinary retention associated with these procedures.

Minimize IV Fluids
Routine discontinuation of IV maintenance fluid is recommended as soon as the patient is drinking liquids unless the patient has difficulty with oral (PO) intake and/or evidence of kidney injury. This is usually on postoperative day 1.

Discharge Planning
Discharge planning should begin well before surgery and involve a multidisciplinary approach including wound, ostomy and continence nurses (WOCNs), physical therapists, case managers, and social workers.

The table below lists some options and examples that hospitals can consider in developing their pathway. The information is intended to be adapted by a hospital based on collective review of the pathway by all local stakeholders. Important stakeholders include surgeons, anesthesia providers, nurses, pharmacists, physical therapists, technicians among other health care providers. As a team, review each component of the pathway and discuss what approach best fits your hospital. Any practice described in this tool must be applied by health care practitioners in accordance with professional judgment and standards of care in regard to the unique circumstances that may apply in each situation they encounter.

Most hospitals find it easiest to agree on a single pathway that best fits the majority of their colorectal surgery patients, recognizing that there will be patients that require exceptions.

Component	Example Processes to Consider As a team, go through each component and discuss what approach best fits your hospital. It may be an option other than what is listed below.	Team Decisions/Notes As a team, note exceptions and contraindications to the treatment or medications.	Tools/Tips	Corresponding Variable
PREOPERATIVE				
Patient Education	Recommended approach: • Review existing patient education materials for colorectal surgery patients • Adapt the provided patient education booklet template as needed to your hospital and use it to counsel and educate patients on enhanced recovery • Identify staff (surgeons, nurses and/or office staff) who will ensure patients receive and understand education		Sample Patient Education Booklet (available mid-August)	**Preadmission Counseling**
IMMEDIATE PREOPERATIVE				
Bowel Preparation	Recommended approaches: 1. (Preferred) Bowel prep with neomycin 1,000 mg + metronidazole 1,000 mg three times the day before operation + polyethylene glycol 2. Bowel prep with neomycin 1,000 mg + erythromycin 1,000 mg three times the day before operation + polyethylene glycol 3. Other: _____		Patient Handout Sample Bowel Prep Protocol - Metronidazole Patient Handout Sample Bowel Prep Protocol - Erythromycin	**Preoperative Mechanical Bowel Prep** **Preoperative Oral Antibiotics**
Preoperative Bathing	Choose your approach: 1. Antiseptic agent (either washcloths with chlorhexidine gluconate or soap with chlorhexidine gluconate, such as Hibiclens) 2. Antibacterial Soap 3. Other: _____		Patient Handout Sample Skin Prep Before Surgery Protocol -Cloths Patient Handout Sample Skin Prep Before Surgery Protocol -Soap	

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Reduced Fasting	Choose your approach: 1. NPO 2 hours before surgery 2. Other duration: NPO ____ hours before surgery		American Society of Anesthesiologists Practice Guidelines for Preoperative Fasting[5]	**Allow Clear Liquids Up to 2 Hours Before Induction**
Carbohydrate Loading	Choose your approach: 1. Volume: choose one: 8 oz., 12 oz.,16 oz., or 20 oz 2. Drink: choose one: sports, nutritional or fruit drink 3. Other: _____		**TIP**: Some institutions carbohydrate load in diabetic patients, though care should be taken to ensure glucose management in these patients	
Multimodal Pre-Anesthesia Medication	Example approach: If no contraindications, **give all the following analgesics,** but choose the dosing: 1. Gabapentin [300, 600, or 900 mg] PO or Pregabalin [75 or 150 mg] PO once 2. Acetaminophen [500 mg, 650 mg or 1g] PO once 3. Nonsteroidal anti-inflammatory drug [e.g., Celecoxib 200mg or 400mg] PO once **Anti-emetics and adjunct agents** For nausea (choose one or both) 1. Scopolamine patch 1.5 mg once, remove 24 to 72 hours after surgery [postoperative nausea and vomiting] 2. Intraoperative antiemetic [e.g. ondansetron 4 mg or dexamethasone 8mg IV] **Optional:** • Mu opioid antagonist [e.g. Alvimopan 12 mg PO 30 minutes to 5 hours prior to surgery]		**TIP**: Get anesthesiology colleagues and preoperative area nurses involved to improve your compliance of preoperative medication bundle	**Use of Anti-Emetic Prophylaxis**

[5] American Society of Anesthesiologists Committee. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. Anesthesiology. 2011 Mar;114(3):495-511. doi: 10.1097/ALN.0b013e3181fcbfd9. PubMed PMID: 21307770.

Component	Example Processes to Consider As a team, go through each component and discuss what approach best fits your hospital. It may be an option other than what is listed below.	Team Decisions/Notes As a team, note exceptions and contraindications to the treatment or medications.	Tools/Tips	Corresponding Variable
Glucose Control	Recommended approach: • Check glucose in preoperative area		If your hospital chooses to do this, see Glucose Control Protocol (multiple documents) **TIP**: Include sliding scale insulin in order set to help maintain glucose levels	
Normothermia	Recommended approach: • Forced air warmer in preoperative area		**TIP**: Place blanket warmers in prep area and include in order set/policy. Let all know that blanket warmers also increase patient satisfaction	
INTRAOPERATIVE				

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Prophylactic Antibiotics	Example approaches (see guideline for details) Choose your prophylactic antibiotics approach*: 1. Cefazolin 2g (patient <120 kg) or 3 g (patient ≥ 120 kg) q4h during procedure + metronidazole 500 mg once 2. Ampicillin–sulbactam 3 g q2hr during procedure 3. Ceftriaxone 2 g + metronidazole 500 mg 4. Ertapenem 1 g 5. Cefoxitin 2g q2h during procedure**[6][7][8] 6. Cefotetan 2g q6h during procedure** Alternative agents for patients with beta-lactam allergy: 1. Clindamycin 600 mg q6hr during procedure + aminoglycoside (e.g., gentamicin 5 mg/kg actual body weight (use adjusted body weight if actual body weight is > 20% above ideal), consider 2 mg/kg for patients with creatinine clearance (CrCl) < 20 mL/min) or aztreonam 2 g q4h during procedure or fluoroquinolone (ciprofloxacin 400 mg or levofloxacin 500 mg) 2. Metronidazole 500 mg + aminoglycoside (e.g., gentamicin 5 mg/kg actual body weight (use adjusted body weight if actual body weight is > 20% above ideal), consider 2 mg/kg for patients with CrCl < 20 mL/min) or fluoroquinolone (ciprofloxacin 400 mg or levofloxacin 500 mg) *First dose should be administered within 60 minutes before incision (120 minutes for fluoroquinolones and vancomycin). Intraoperative redosing for longer cases and those with significant blood loss should be done as described in the Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery		Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery[9] **TIP**: Include in operating room briefing	

[6] Hendren S, Fritze D, Banerjee M, et al. Antibiotic Choice Is Independently Associated With Risk of Surgical Site Infection After Colectomy: A Population-Based Cohort Study. Ann Surg 2013;257:469-75.

[7] Eagye KJ, Nicolau DP. Selection of prophylactic antimicrobial agent may affect incidence of infection in small bowel and colorectal surgery. Surg Infect (Larchmt) 2011;12:451-7.

[8] Deierhoi RJ, Dawes LG, Vick C, Itani KM, Hawn MT. Choice of Intravenous Antibiotic Prophylaxis for Colorectal Surgery Does Matter. J Am Coll Surg 2013

[9] Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA; American Society of Health-System Pharmacists (ASHP); Infectious Diseases Society of America (IDSA); Surgical Infection Society (SIS); Society for Healthcare Epidemiology of America (SHEA). Clinical practice guidelines for antimicrobial prophylaxis in surgery. Surg Infect (Larchmt). 2013 Feb;14(1):73-156. doi: 10.1089/sur.2013.9999. Epub 2013 Mar 5. PubMed PMID: 23461695.

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	**Multiple recent publications demonstrate that cefoxitin and cefotetan (the old standards) are currently inferior to every other choice.			
Preoperative VTE Prophylaxis	Recommended option: • Heparin 5,000 units subcutaneously prior to incision		**TIP**: Include in preoperative order set. Involve pain team to facilitate timing of administration to allow safe use of neuraxial blocks.	**Preoperative VTE Chemoprophylaxis**
Skin Preparation	Choose your approach: 1. Chloraprep 2. Duraprep 3. Other: _____		**TIP**: Train nurses in operating room to do preparation to standardize. Clarify skin preparation for patients with ostomies.	

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Standard Intraoperative Anesthesia Pathway	Example approach: Below are <u>three elements</u> which you should consider when building your protocol: A. Type of anesthesia to allow rapid awakening, return of function and minimize opioids: 1. General anesthesia [e.g. Desflurane, Sevoflurane, Propofol /total intravenous anesthesia] 2. Regional anesthesia [e.g. epidural, spinal] B. Non-narcotic analgesia adjuncts (one or more of the following)*: 1. IV Lidocaine 2. Ketamine 3. Magnesium 4. Other: _____ **Consensus dosing recommendations not available. Confer with local anesthesia providers and pharmacists to develop standardized approach* C. Postoperative nausea and vomiting prophylaxis: 1. Ondansetron 4–8 mg IV 2. Dexamethasone 8 mg IV 3. Other: _____		See recommended doses in Evidence Review (available mid-August)	**Use of Regional Anesthesia**

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Ventilation	Recommended option: • Intraoperative tidal volume 6-8 ml/kg			
Normothermia	Choose your approach: 1. Forced air warmer in operating room 2. Warmed intravenous fluids in the operating room 3. Other: _____			
Euvolemia	Agreement between surgery and anesthesia providers for intraoperative fluid volumes for specific surgical procedures and surgical approach. For example, fluid approach to laparoscopic techniques differ from open surgery.			
Avoid Drains/nasogastric tubes	Recommended option: • Remove nasogastric or orogastric tube at end of procedure			
POSTOPERATIVE (INPATIENT)				
VTE Prophylaxis	Choose your approach: 1. Heparin 5,000 units subcutaneously three times a day* 2. Heparin 5,000 units subcutaneously twice a day* 3. Enoxaparin 40 mg subcutaneously daily* 4. Other: _____ *Consider increasing dose in obese patients		**TIP**: Include VTE prophylaxis in admission order sets and have policy in place to prescribe VTE prophylaxis for a total of 28 days after surgery if that is indicated by the patient's diagnoses and operation.	**First Postoperative VTE Chemoprophylaxis Dose**

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Multimodal Analgesia and Medication for Postoperative Nausea and Vomiting	Example approaches: **If local expertise or resources are available, use:** 1. Regional analgesia (e.g. epidural or transversus abdominis plane block) using a local anesthetic regimen [minimize opioids] Nonnarcotic analgesics **Scheduled (pick at least 2 if no contraindications):** 1. Acetaminophen [3-4g PO per day divided q6 hr or q8 hr] 2. Nonsteroidal anti-inflammatory drug (e.g. Ibuprofen [400–600mg PO q6 hr], ketorolac [15–30 IV q6 hr]) 3. Gabapentin or Pregabalin (no consensus regarding optimal dose, but if given, should be scheduled, consider gabapentin 100 mg q8h or pregabalin 75 mg q12 hr) **If available, adjuncts to consider:** 1. Mu opioid antagonists (Alvimopan 12 mg q12 hr for a maximum of 7 days) 2. Lidocaine topical patch (4% or 5%) placed for up to 12 hours in a 24-hour period 3. IV Ketamine low dose continuous infusion (consider 4-10 mg/hr) 4. NMDA antagonists (e.g., dextromethorphan 20-30 mg q6 hr or q8 hr) 5. IV Lidocaine low dose continuous infusion 0.5-2 mg/kg/hr (consider maximum of 170 mg/hr) **PRN (or as needed dosing):** 1. Tramadol [can be given 25–50 mg PO q 4-6 hrs as needed]. Try before giving opioids. 2. Opioids (IV for breakthrough pain, PO for when tolerating liquids). May give as a last option for analgesia if other analgesics are insufficient		Example Electronic Health Record Order Sets **TIP**: Standardize multi-modals in order sets and have timing of meds conducive to patient sleep patterns	**Multimodal Pain Management**

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Early Alimentation	Choose your approach: 1. Clears POD 0 2. Regular diet POD 0 3. Other: _____		**TIP**: Offer patient glass of water prior to leaving recovery room	**First Postoperative Intake of Liquids** **First Postoperative Intake of Solids**
Early Ambulation	Choose your approach: 1. OOB to chair on POD 0 2. Ambulate on POD 0 3. Ambulate on POD 1 4. Other: _____		**TIP**: Engage patients with checklist and teach nurses that patients use call bell less when they start to ambulate	**First Postoperative Mobilization** **First BID Mobilization**
Early Urinary Bladder Catheter Removal	Choose your approach: 1. DC foley on POD 0 2. DC foley on POD 1 3. Other: _____		**TIP**: Have instructions placed in standardized order sets	**Foley Catheter Removal** **Prolonged Foley Catheterization**
Minimize IV Fluids	Choose your approach: 1. Heplock IV POD 0 2. Intravenous fluids at 40 mL per hour x 24 hours 3. Intravenous fluids at 75 mL per hour x 24 hours 4. Other: _____		**TIP**: Place in order sets	**IV Fluid Discontinuation**

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Discharge Planning	Multi-disciplinary approach to discharge planning to begin before admission including: • Wound, ostomy and continence nurses (WOCNs) • Physical therapists • Case managers • Social workers			

Abbreviations: DC = discontinue; IV = intravenous; OOB = out of bed; POD = postoperative day; PO=by mouth; hrs=hours; NMDA = N-methyl-D-aspartate