



MGH Gastrectomy ERAS Pathway  
Updated 04.17.2022

**ANESTHESIA BUNDLE**

Element	Definition
Preoperative Testing  Surgeons, residents, fellows PPE/PATA Anesthesia	<ul style="list-style-type: none"> <li>In accordance with hospital policy, all patients should receive an anesthesia preoperative phone call, or visit, per departmental guidelines, prior to the day of surgery. Anesthesia consultant will communicate any recommendations for further testing with primary surgeon's office.</li> <li>Patients with high degree of medical or anesthetic complexity as assessed by the surgeon at the preoperative visit should be referred to anesthesia for preoperative evaluation per institutional best practice via e-mail at least 7 days prior to surgery to facilitate preoperative workup</li> <li>In accordance with departmental guidelines, patients older than 65 and patients with a history of cardiac disease should have an EKG performed within 6 months of surgery</li> <li>In accordance with preoperative CBC should be performed within 90 days for patients with a history of anemia</li> <li>Routine preoperative chest x-rays and coagulation studies are not indicated</li> <li>Diabetic patients should have a preop fingerstick on day of surgery</li> </ul>
Preoperative Medication Management  Surgeons, residents, fellows PPE/PATA Anesthesia	<ul style="list-style-type: none"> <li>Hold ACE inhibitors and ARBs on the day of surgery</li> <li>Take prescribed beta-blockers on the day of surgery</li> <li>Patients on long-acting narcotic therapy (e.g. OxyContin) should take their extended-release narcotic on the day of surgery</li> <li>Anticoagulating medications should be held prior to surgery, with exact duration depending on the medication and at the discretion of the primary surgeon; aspirin may be continued if an appropriate indication exists</li> <li>Vitamin/herbal supplements, fish oil, and NSAIDs should be held 7 days prior to surgery</li> </ul>
Preemptive Analgesia  Surgeons, residents, fellows CPC / pre-op Nursing Anesthesia	<ul style="list-style-type: none"> <li>Patients should receive 975mg to 1,000mg of acetaminophen orally prior to surgery</li> <li>Patients should receive 400mg of celecoxib orally prior to surgery except for patients with known or suspected renal disease</li> <li>Patients may receive gabapentin if epidural analgesia is not planned or is contraindicated</li> </ul>
Premedication  CPC / pre-op Nursing Anesthesia	<ul style="list-style-type: none"> <li>Routine premedication with midazolam is discouraged in older patients</li> <li>Epidural placement may be facilitated by fentanyl +/- midazolam for procedural sedation; however, patients over 65 should receive no more than 1 mg IV midazolam (fentanyl only sedation preferred)</li> </ul>
Intraoperative Antiemetic Prophylaxis  Anesthesia	<ul style="list-style-type: none"> <li>Unless contraindicated, patients should receive antiemetic prophylaxis with at least two of the following medications administered intraoperatively:               <ol style="list-style-type: none"> <li>Zofran 4mg IV</li> <li>Haloperidol 1mg IV</li> <li>Dexamethasone 0.1mg/kg (max 8mg)</li> <li>Scopolamine patch, applied pre-op (should not be used in patients over 65)</li> </ol> </li> </ul>
Postoperative Antiemetic Use  Surgeons, residents, fellows Anesthesia PACU Nursing Floor Nursing	<ul style="list-style-type: none"> <li>The following medications are acceptable for rescue antiemetic use:               <ol style="list-style-type: none"> <li>Zofran 4mg IV</li> <li>Haloperidol 1mg IV</li> <li>Metoclopramide 5-10mg IV</li> <li>Promethazine 6.25-12.5mg IV may be used as a last resort</li> </ol> </li> <li>The first line rescue antiemetic given in the PACU should be a drug not given pre- or intraoperatively</li> </ul>
Intraoperative Medication Use  Anesthesia	<ul style="list-style-type: none"> <li>Antibiotic prophylaxis should be provided with cefazolin + metronidazole (unless allergic in which case an appropriate substitute should be given) within 60 minutes of incision</li> <li>The following medications are <b><u>NOT PREFERRED</u></b> and should be avoided if possible:</li> </ul>

	<ol style="list-style-type: none"> <li>1. Isoflurane</li> <li>2. Morphine</li> </ol> <ul style="list-style-type: none"> <li>• Fentanyl is the preferred narcotic for intraoperative use</li> <li>• Total intravenous anesthesia (TIVA) is preferred for appropriate patients</li> <li>• Remifentanyl infusions should be used sparingly given concern for remifentanyl-induced hyperalgesia</li> <li>• If an epidural catheter is placed and planned for post-operative pain control, intra-operative narcotic use should be minimized with little to no usage of longer-acting agents</li> <li>• If epidural analgesia is not available or contraindicated, multimodal analgesia should be achieved with use of two or more of the following, unless contraindicated: <ol style="list-style-type: none"> <li>1. Ketamine 0.5mg/kg bolus and 5mcg/kg/min</li> <li>2. Lidocaine 1mg/kg bolus and 1.5mg/kg/hr (should not be used for patients receiving regional anesthesia)</li> <li>3. Dexmedetomidine 0.5mcg/kg/hr</li> <li>4. Other regional anesthetic techniques</li> </ol> </li> </ul>
<p>Neuromuscular Blockade</p> <p>Anesthesia</p>	<ul style="list-style-type: none"> <li>• NMB may be maintained with either rocuronium, vecuronium or cisatracurium; cisatracurium is preferred in patients with renal dysfunction</li> <li>• Adequate offset of neuromuscular blockade should be ensured with either: quantitative TOF monitor with ratio &gt;0.9 <u>or</u> documentation of adequate conditions for reversal (&gt;2 twitches) and appropriate dose of reversal agent per best practice.</li> </ul>
<p>Intraoperative Fluid and Ventilation Management</p> <p>Anesthesia</p>	<ul style="list-style-type: none"> <li>• Intraoperative fluid management should be aimed at maintaining adequate end-organ perfusion while minimizing iatrogenic volume overload</li> <li>• Hypotension alone should not necessarily be treated with fluid boluses unless other clinical signs point to hypovolemia</li> <li>• Vasopressors should be considered a first line treatment for hypotension due to induction of general anesthesia</li> <li>• Best practice: <ul style="list-style-type: none"> <li>○ No fluids should be administered in preop holding</li> <li>○ If patients are hypotensive <u>with</u> other indicators of hypovolemia, crystalloid boluses should be given at no more than 3-5mL/kg/hr with appropriate time allowed for clinical response</li> <li>○ Colloid may be substituted for crystalloid at the anesthesiologist's/surgeon's discretion</li> </ul> </li> <li>• Urine output <ul style="list-style-type: none"> <li>○ Accept urine output of 0.2mL/kg/hr</li> <li>○ Do not give fluid to treat low UO if other data imply euvolemia</li> </ul> </li> <li>• Ventilation strategy <ul style="list-style-type: none"> <li>○ Goal ventilation strategy should be TV of 5-7 mL/kg of IBW with PEEP ≥ 5 cm H2O</li> </ul> </li> </ul>
<p>Postoperative Analgesia</p> <p>Surgeons, residents, fellows Anesthesia PACU Nursing Floor Nursing</p>	<ul style="list-style-type: none"> <li>• Patients should receive <u>scheduled</u> non-narcotic therapy <ol style="list-style-type: none"> <li>1. Ketorolac IV 15mg q6h only for select patients based on surgeon discretion</li> <li>2. Acetaminophen 1g q8h. This may start as IV therapy but should be converted to oral therapy once the patient tolerates clear liquids.</li> </ol> </li> <li>• Narcotic therapy should be minimized <ol style="list-style-type: none"> <li>1. First-line rescue therapy for mild to moderate pain should be a non-narcotic such as an additional 15 mg IV ketorolac, 1g IV Tylenol, or adjustment of neuraxial analgesia catheter</li> <li>2. Patients should not receive more than 0.5mg hydromorphone (or equivalent) in the PACU without notification of the PACU resident or equivalent anesthesia provider on call</li> <li>3. For patients receiving IV narcotic therapy, PCA is preferred rather than intermittent IV bolus dosing</li> </ol> </li> <li>• Patients should consider regional anesthesia unless otherwise contraindicated. Patients who do not undergo epidural placement should be considered for other regional anesthesia to assist with postoperative analgesia.</li> </ul>

Anesthesia	<p><b>Epidural Best Practice:</b></p> <ul style="list-style-type: none"><li>● Epidural should be placed preoperatively</li><li>● Ideally epidural should be placed at T7-T8 or T8-T9 to adequately cover incision while decreasing leg weakness and urinary retention</li><li>● Use of epidural catheters intraoperatively should be determined by the anesthesia team based on individual patient characteristics</li><li>● Unless contraindicated, the post-operative epidural mixture should be started prior to emergence to minimize need for additional analgesic agents</li><li>● Epidural mixture should be chosen to minimize narcotics per institutional best practice</li><li>● To minimize hypotension, epidural infusion rates should be adjusted to the minimum amount needed to establish adequate analgesia<ul style="list-style-type: none"><li>○ If patient remains hypotensive post-operatively despite adequate resuscitation, consider conversion to more dilute epidural mixture</li></ul></li><li>● Epidural is typically removed on POD #3, or earlier if patient tolerating PO intake.<ul style="list-style-type: none"><li>○ Avoid removing at night if possible</li><li>○ Ideally epidural should be removed &gt; 3 hours prior to discharge</li></ul></li></ul>
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## SURGICAL BUNDLE

Element	Definition
Demarcation and Verification as ERAS/SSI Patient  Surgeons, residents, fellows Amb clinic nursing	<ul style="list-style-type: none"> <li>All patients undergoing gastrectomy are considered ERAS patients</li> </ul>
Preoperative screening  Surgeons, residents, fellows Amb clinic nursing PPE/PATA	Preoperative screening should include: <ol style="list-style-type: none"> <li>Anemia screening</li> <li>Nutritional screening per institutional best practice</li> <li>Tobacco and alcohol use screening and cessation counseling</li> </ol>
Patient Education  Surgeons, residents, fellows Amb clinic nursing PPE/PATA	Educational material will be provided by the surgeon's office at the time of booking covering: <ol style="list-style-type: none"> <li>Preoperative discharge preparation including dietary recommendations, home preparation, physical activity, and alcohol/tobacco abstinence</li> <li>Preoperative hydration and regimen</li> <li>Day of surgery workflow / expectations</li> <li>ERAS pain control methodology, including epidural analgesia</li> <li>Routine postoperative care and expectations</li> </ol>
Preoperative Nutritional Supplement  Surgeons, residents, fellows Amb clinic nursing	<ul style="list-style-type: none"> <li>All patients should receive a preoperative nutritional supplement drink prior to surgery.</li> </ul> <p>Patients should be given instructions to drink the accepted carbohydrate drinks starting 4 hours before check-in at the hospital. Patients are advised to drink 2 bottles of Ensure Clear Pre-Surgery® or equivalent (see below). Patient must stop drinking 2 hours before check-in at the hospital for the surgery.</p> <ol style="list-style-type: none"> <li>A carbohydrate drink containing at least 45 gm of complex carbohydrates in at least 24 oz of isotonic fluid is strongly recommended (e.g., 24 oz of Clearfast®, Ensure Clear Pre-Surgery® or a clear equivalent preparation)</li> <li>If above option is unavailable, up to 20 oz of Gatorade “Thirst Quencher” or other complex carbohydrate containing solution is an acceptable alternative. Of note, G2 or artificially sweetened sports drinks should not be consumed.</li> </ol>
Preoperative antibacterial shower  Surgeons, Amb clinic nursing	<ul style="list-style-type: none"> <li>Shower/bathe with liquid chlorhexidine soap for 2 days prior to and on the morning of surgery per institutional best practice.</li> </ul>
Maintenance of Normothermia  Surgeons, residents, fellows Anesthesia OR Nursing	<ul style="list-style-type: none"> <li>Actively warm before and throughout surgery to achieve target temperature of 36° C using one or more of the following:               <ol style="list-style-type: none"> <li>Room temperature at &gt;68° F until patient prepped and draped</li> <li>Fluid warming device</li> <li>OR table warming pad</li> <li>Forced warm air under-body or over-body device</li> </ol> </li> </ul>
Intraoperative Skin Prep  Surgeons, residents, fellows OR Nursing	<ul style="list-style-type: none"> <li>Acceptable skin preps:               <ol style="list-style-type: none"> <li>Chloroprep is the preferred skin prep</li> <li>Duraprep is an acceptable substitute</li> <li>Prep must be allowed to air-dry (minimum 3 minutes) before draping and incision</li> <li>Exclusive iodine-only solutions are <u>not</u> acceptable except in emergent cases</li> </ol> </li> </ul>
Instrument Segregation	<ul style="list-style-type: none"> <li>When bowel is to be opened, a pan, tray or additional mayo stand is brought to the field.</li> </ul>

<p>Best practice (Dirty Tray Best practice)</p> <p>Surgeons, residents, fellows OR Nursing</p>	<ul style="list-style-type: none"> <li>• All instruments used until the bowel is closed are taken from and placed back on this surface.</li> <li>• The ST cannot go with his/her hands to retrieve a clean instrument, but must use another clean instrument to retrieve the needed item off the sterile instrument table</li> <li>• If drapes are contaminated a sterile towel is placed over the contaminated area</li> <li>• When bowel is closed, suction tip and electrocautery pencil are added to the instruments on this surface and the pan/tray/mayo is passed off or moved away.</li> <li>• Light handle covers removed if they were touched during the dirty portion of the case.</li> <li>• Gown and gloves should be changed routinely at the end of the dirty portion of the case.</li> </ul>
<p>Use of Wound Protectors During Bowel Resection</p> <p>Surgeons, residents, fellows OR Nursing</p>	<ul style="list-style-type: none"> <li>• Acceptable types of wound protectors: <ol style="list-style-type: none"> <li>1. Single ring wound protectors</li> <li>2. Double ring wound protectors</li> </ol> </li> <li>• Standard steps for removing contaminated wound protector: <ol style="list-style-type: none"> <li>1. A plastic wound protector is placed at the beginning of the surgery (in open cases) and at the time of bowel division (in laparoscopic cases) Single ring and double ring wound protectors are acceptable. The protector is also covered by towels during the time that the bowel is open (see dirty tray best practice above).</li> <li>2. Once the dirty portion of the procedure is concluded and the dirty pan/tray/mayo has been passed off or moved away, one of the surgeons will remove the wound protector (unless the anastomosis needs to be completed under laparoscopic vision) taking care not to contaminate the subcutaneous tissues. The Tech and the other surgeon(s) will change gloves before touching the field or instruments. The surgeon who discarded the wound protector will change his/her gloves after.</li> <li>3. Gowns should be changed routinely after completion of the dirty portion of the case</li> <li>4. If the wound protector is grossly contaminated during the procedure it should be removed and replaced using the above procedure</li> <li>5. If gloves are grossly contaminated during the procedure they should be changed and then changed again when the manipulation steps are finished and the towels/wound protectors are removed.</li> </ol> </li> </ul>
<p>Intraoperative Drain Placement</p> <p>Surgeons, residents, fellows OR Nursing</p>	<ul style="list-style-type: none"> <li>• Routine use of peritoneal drains are not indicated.</li> </ul>
<p>Optimized Postoperative Fluid Management</p> <p>Surgeons, residents, fellows Anesthesia PACU Nursing Floor Nursing</p>	<ul style="list-style-type: none"> <li>• Initial postoperative fluid orders: Lactated Ringer's 75mL/hr or 1 mL/kg/hr, discontinue once nasogastric tube is removed (see diet section below)</li> </ul> <p><u>Postoperative Hypotension and Fluid Responsiveness:</u></p> <ul style="list-style-type: none"> <li>• Do not intervene unless: <ol style="list-style-type: none"> <li>1. MAP &lt; 65 <b>or</b></li> <li>2. UOP &lt; 0.2 mL/kg/hr <b>and</b> patient has other signs of hypovolemia</li> </ol> </li> <li>• If any of the above occur, the patient should be examined and causes of hypotension other than inadequate fluid administration excluded (e.g. bleeding, myocardial ischemia etc.)</li> <li>• If the patient meets above criteria, initial response may be: <ol style="list-style-type: none"> <li>1. Crystalloid or colloid 250mL bolus up to 3 times <u>and/or</u></li> <li>2. Pressors if patient is in a step-down or ICU setting (consider placing patients in such a setting if you anticipate fluid management challenges)</li> </ol> </li> <li>• Failure to respond appropriately should result in: <ol style="list-style-type: none"> <li>1. A call to the senior resident or attending before administering additional fluid</li> <li>2. A more objective measure of fluid status. Inferring fluid status is difficult and frequently inaccurate. Ideally, non-invasive monitoring should be made available (e.g. ultrasound machines that allow simple echocardiography).</li> <li>3. The on-call Acute Pain Service (APS) resident or equivalent anesthesia provider on call should be notified for patients with fluid-refractory hypotension with an epidural. If the patient has adequate pain control, early consideration of reducing epidural infusion rate or mixture concentration is encouraged.</li> </ol> </li> </ul>

<p>Peri-Operative Glucose Monitoring and Management</p> <p>Surgeons, residents, fellows PPE/PATA</p>	<p><b>Pre-operative Testing of Diabetes</b></p> <ul style="list-style-type: none"> <li>• A HbA1c should have been drawn within 3 months and, if not, one should be ordered</li> <li>• In the event of an abnormal elevated result the primary care MD or endocrinologist should be contacted to request their assistance in optimizing glucose control before surgery</li> </ul> <p><b>Pre-operative management of diabetes medications</b></p> <p>Instructions given for Insulin and Oral hypoglycemics given to patients with DM</p> <ol style="list-style-type: none"> <li>1. Surgeons or their staff will reach out to endocrinologists (or PCPs when there is no endocrinologist involved) and ask them to provide the patient with guidance on medication management on the prep day prior to surgery and the morning of the operation</li> </ol> <p>Monitoring:</p> <ol style="list-style-type: none"> <li>1. All diabetic patients should have a FS or other blood glucose determination in pre-op holding</li> <li>2. All diabetics and patients treated with insulin should have hourly intra-op glucose monitoring</li> <li>3. Glucose levels &gt; 180mg/dl should be treated with insulin per hospital best practice</li> </ol> <p>Timing of glucose monitoring:</p> <ol style="list-style-type: none"> <li>1. In Pre-Op holding</li> <li>2. Q1hr Intra-Op</li> <li>3. Post-Op in PACU (unless patient has 2 normal values in row): <ol style="list-style-type: none"> <li>i. Q6hr for diabetics</li> <li>ii. In the morning on Post-Op day #1 for non-diabetics. Discontinue after this unless hyperglycemic</li> </ol> </li> </ol>
<p>Early Postoperative Diet Advancement</p> <p>Surgeons, residents, fellows PACU Nursing Floor Nursing</p>	<p>For Total Gastrectomy:</p> <ul style="list-style-type: none"> <li>• PACU-POD #2: NPO with nasogastric tube</li> <li>• POD #3: goal date to remove nasogastric tube and tolerate clear liquids</li> <li>• For those patients who have jejunostomy tubes placed intraoperatively, tube feeds should start at 10cc/hr on POD #1, and advance to goal starting POD #2</li> </ul> <p>For Subtotal Gastrectomy:</p> <ul style="list-style-type: none"> <li>• PACU-POD #1: NPO with nasogastric tube</li> <li>• POD #2: goal date to remove nasogastric tube and tolerate clear liquids</li> <li>• Advance to full liquids and then soft diet afterward as tolerated; if nausea or vomiting, delay advance until symptoms have improved</li> </ul>
<p>Early Postoperative Mobilization</p> <p>Surgeons, residents, fellows PACU Nursing Floor Nursing</p>	<ul style="list-style-type: none"> <li>• The following activity orders should be placed for all ERAS patients: <ol style="list-style-type: none"> <li>1. Patients should be OOB to chair <u>at the latest 8 hours postoperatively</u> (goal would be OOB to chair in the PACU, if tolerated). Patients may ambulate as tolerated starting immediately postoperatively.</li> <li>2. Patients should be out of bed as soon as tolerated with goal by POD#1 to be OOB for all meals and at least 8h per day.</li> <li>3. On Post-Op day #1 and thereafter: Ambulate in hallway at least 3 times daily</li> </ol> </li> <li>• Expectations regarding early postoperative mobilization will be clearly conveyed to patients with patient education bundle.</li> <li>• The Acute Pain Service (APS) on-call resident or equivalent anesthesia provider on call should be notified for any patients who are unable to ambulate due to leg weakness from an epidural.</li> </ul>
<p>Early Urinary Catheter Removal</p> <p>Surgeons, residents, fellows PACU &amp; Floor Nursing</p>	<ul style="list-style-type: none"> <li>• If an epidural catheter is in place, urinary catheters should be removed as soon as possible after the epidural is removed</li> <li>• If no epidural catheter is used, urinary catheters should be removed by POD #2</li> </ul>
<p>DVT prophylaxis</p> <p>Surgeons, residents, fellows</p>	<ul style="list-style-type: none"> <li>• Per <b>departmental guidelines</b>, while epidural catheters are in place, DVT prophylaxis should consist of subcutaneous heparin.</li> </ul>

- After epidural catheter removal or for patients without epidurals, patients should receive DVT prophylaxis with enoxaparin or heparin per institutional best practice.