What is the next best step?

Mr. R is POD 1 s/p a Roux-en-Y gastric bypass surgery. He has type 2 diabetes with a hemoglobin A1c of 7.2. Pre-op meds: lantus once a day and lispro with meals.

1) Discontinue all insulin
2) Discontinue lispro, continue current dose of lantus
3) Discontinue lispro, decrease lantus dose by half,
4) Decrease lantus dose by half, decrease lispro dose by half

Roux-en-Y

- Most commonly performed operation
- Safest and most efficacious
- Combined restrictive and malabsorptive
- Commonly laparoscopic
- 2-4 hours

Laparoscopic Adjustable Gastric Banding

- Fastest rate of growth
- Restrictive
- Band placed around proximal aspect of stomach below GE junction
- Operative time: 1-2 hours


Roux-en-Y Gastric Bypass and DM2

<table>
<thead>
<tr>
<th>Author</th>
<th>N</th>
<th>Pre-op Weight</th>
<th>Post-op Weight (y)</th>
<th>Weight loss</th>
<th>Pre-vs Post-op Fasting Glucose</th>
<th>Pre-vs Post-op HA1c</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pories</td>
<td>886</td>
<td>134 kg</td>
<td>104 kg</td>
<td>54% EWL</td>
<td>213 vs 117</td>
<td>7.3 vs 6.0</td>
<td>R = 89%</td>
</tr>
<tr>
<td>Schauer</td>
<td>1160</td>
<td>50.4 BMI</td>
<td>4</td>
<td>60% EWL</td>
<td>193 vs 98</td>
<td>8.2 vs 5.8</td>
<td>R = 89%</td>
</tr>
<tr>
<td>Torquati</td>
<td>177</td>
<td>49.0 BMI</td>
<td>1</td>
<td>60% EWL</td>
<td>NaA</td>
<td>7.7 vs 6.0</td>
<td>R = 79%</td>
</tr>
<tr>
<td>Morinigo</td>
<td>34</td>
<td>49.0 BMI</td>
<td>1</td>
<td>52% EWL</td>
<td>N/A</td>
<td>7.9 vs 6.6</td>
<td>R = 82%</td>
</tr>
</tbody>
</table>

BMI, body mass index; EWL, excess weight loss; I, improved; IBW, ideal body weight; N/A, no applicable; R, remission; U, unchanged.


Hypotheses on why bariatric surgery improves type 2 DM

- Weight loss increases insulin sensitivity
- Less lipotoxicity/inflammation
- Effect on gut hormones

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KASHYAP S R et al. Cleveland Clinic Journal of Medicine 2010;77:468-476
Post Operative Diabetes Management

- Diabetes managed with oral therapy
  - Discontinue all insulin secretagogues
    - Sulfonylureas
    - Meglitinides
  - Discontinue metformin several days before surgery
  - Often patients on oral therapy alone will not need it at discharge

Post Operative Diabetes Management

- Diabetes managed with insulin
  - Highly variable for each patient
    - Degree of insulin resistance
    - Preoperative insulin doses
  - General rule: Basal insulin is decreased by 50% (or more)
    - Often further decreases are needed before discharge
    - Once patient eating, insulin with meals may be required

Hyperinsulinemic Hypoglycemia

- Increasingly recognized as a complication post gastric bypass
- Presents >1 year post surgery
- Typically occurs 2-3 hours after meals
- Inappropriately high C-peptide and insulin levels
- Usually amenable to dietary modification
- May need partial pancreatectomy

Patii, M.E and Goldfine, A.B. Hyperinsulinemic Hypoglycemia following gastric bypass surgery: lessons learned is too common? Diabetes Care 2010;33:276-279
Summary

Mr. R is POD 1 s/p a Roux-en-Y gastric bypass surgery. He has type 2 diabetes with a hemoglobin A1c of 7.2. Pre-op meds: lanoxin once a day and lispro with meals. What is the next best step?

1) Patients with dramatic reduction in po intake immediately postoperatively
2) Multiple factors that account for improved glycemic control
3) Once patient eating, may need to add back short acting insulin with meals
4) Patients will need close monitoring of their diabetes

What is the next best step?

Mrs. S is a 54 yo female with history of remote gun shot wound. She undergoes a Roux-en-Y gastric bypass with lysis of adhesions. On POD 4, she has increased abdominal pain, chest pain and SOB. HR 120, 89% on 6L, RR 22, AF. On exam patient visibly tachypneic, soft abdomen with positive bowel sounds, wound clean, dry, and intact. Labs: HCO3 of 18, AG 15, lactate 5.3, Cr 1.7, wbc ct 2.4, hct 36, pts 350,000.

1) CT PE study
2) Antibiotics for post op wound infection
3) Take patient to OR emergently
4) Upper endoscopy to eval for gastric leak

Gastric leaks

- High morbidity and mortality - most common surgery related cause of mortality
- Occurs 1.5-5% of the time
- Most likely place = gastrojejunal anastamosis (can also occur in gastric remnant, gastric pouch)
- Frequency depends on type of surgery
- Usually occur within a week but can occur as late as one month post op
**Gastric Leaks**

- **Signs**
  - Tachycardia (>120)
  - Tachypnea
  - Hypoxia
  - Hypotension
  - Oliguria
  - Fever
  - Elevated wbc ct

- **Evaluation**
  - Upper GI series
  - May not visualize all leaks (only detects 22% of leaks)
  - Repeat laparoscopy

**Early Post Op Medical Complications**

- **PE**
  - Second most common cause of death after bariatric surgery
  - Incidence of 2%
  - Mortality of 20-30%
  - Post op leaks or peritonitis may masquerade as a pulmonary complication

- **Infection**
  - <5% with laparoscopic procedure

- **Rhabdomyolysis**
  - Risk factors
  - BMI >60
  - Long duration of operation

**Adverse Outcomes within 30 Days after Surgery**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>13 (3.3%)</td>
<td>3 (1.5%)</td>
<td>10 (5.0%)</td>
<td>3 (1.5%)</td>
<td>10 (5.0%)</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>3 (0.7%)</td>
<td>2 (1.0%)</td>
<td>1 (0.5%)</td>
<td>1 (0.5%)</td>
<td>1 (0.5%)</td>
</tr>
<tr>
<td>Infection</td>
<td>12 (3.0%)</td>
<td>6 (3.0%)</td>
<td>6 (3.0%)</td>
<td>3 (1.5%)</td>
<td>3 (1.5%)</td>
</tr>
<tr>
<td>Operative</td>
<td>11 (2.8%)</td>
<td>6 (3.0%)</td>
<td>5 (2.5%)</td>
<td>3 (1.5%)</td>
<td>2 (1.0%)</td>
</tr>
<tr>
<td>Wound infection</td>
<td>1 (0.2%)</td>
<td>1 (0.5%)</td>
<td>0 (0.0%)</td>
<td>1 (0.5%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>

* The study involved 400 patients, including GI series gastroscopy. GI perforation was not included in this analysis. Reports with a short duration of operation were excluded.
Post Op Bleeding

- Incidence: 3.1%
  - 22% stop spontaneously
  - 55% need transfusion
  - 22% require operative intervention
- Active bleeding usually presents within 6 hours
  - Any bright red blood orally, rectally, or abdominally requires prompt surgical or endoscopic intervention
- Early UGIB - most often from the gastrojejunal anastomosis, gastric remnant, or jejunojejunal anastomosis
- Endoscopy helpful in only diagnosing gastric pouch bleeding

Stomal stenosis

- Common complication of RYGBP
  - 1.6-20% of open surgeries
  - Usually presents in the first 6 mo after surgery
- Symptoms
  - Postprandial epigastric pain
  - Vomiting of undigested solids
  - May progress to vomiting of liquids
- Diagnosis
  - UGI series
  - Endoscopy (can also be therapeutic)
  - May need operative revision

Acute Gastrointestinal Obstruction

- 1-5%
- Bloating, hiccups, nausea, vomiting, abdominal pain
- X-rays: reveal massive distention with air fluid level in gastric pouch
- Other etiologies
  - Internal hernias (3%)
  - Adhesions
  - Intussusception of Y limb - rare
### Stomal Ulcers

- Also called marginal ulcers (.5-4%)
- Less common than stenosis
- Usually present within 2-4 months of surgery
- Etiology:
  - Local ischemia
  - Staple line dehiscence
  - Increased gastric acid production
  - NSAIDS
  - Tension on the pouch
- Symptoms:
  - Epigastric pain or retrosternal pain
  - Dyspepsia
  - Nausea/vomiting
  - Upper GI bleed
- Diagnosis:
  - Upper endoscopy
- Treatment:
  - PPI or sucralfate

---

### Complications specific to LAGB

- **Gastric slippage**
  - Most common complication
  - Portion of the stomach becomes prolapsed relative to band
  - Enlarged gastric pouch is reservoir for food and gastric secretions
  - Present with epigastric pain, dysphagia, food intolerance, vomiting and reflux
  - X-ray with large gastric air bubble with air fluid level above the band

---

### Complications specific to LAGB

- **Gastric stoma obstruction**
  - Occurs if band too tight
- **Esophageal and gastric pouch dilatation**
  - Occurs if band too tight
  - Diet non-compliance
  - If not fixed can result in permanent damage (esophageal dysmotility)
- **Band erosion**
  - Usually chronic process
  - Often fibrous capsule will form
  - May present in a more benign way
  - Infection at access port site
- **Gastric injury and necrosis**
  - Acute complication within 24-48 hours
  - Necrosis can be late

---

Summary
Mrs. S is a 54 yo female with history of remote gun shot wound. She undergoes a Roux-en-Y gastric bypass with lysis of adhesions. On POD 4, she has increased abdominal pain, chest pain and SOB. HR 120, 89% on 6l, RR 22, AF. On exam patient visibly tachypneic, soft abdomen with positive bowel sounds, wound clean, dry, and intact. Labs: HCO3 of 18, AG 15, lactate 5.3, Cr 1.7, wbc cl 2.4, hct stable, pts stable.

- Gastric leaks most common surgical cause of mortality
- PE most common medical cause of mortality
- Prompt diagnosis of serious medical/surgical issues can be difficult in this population

What is the next best step?
Ms. R is a 32 year old female status post Roux-en-Y gastric bypass surgery 3 months ago. She has had persistent nausea and vomiting since her surgery.

1) Get a stat abdominal x-ray
2) Nutrition consult
3) Needs EGD
4) CT of abdomen and pelvis
5) Patient needs to return to OR for further evaluation

Nausea and Vomiting
- Usually improves with dietary education
- Other items to consider
  - Strictures
  - Obstructions
  - Over inflated LAGB
  - Pregnancy
  - Small bowel obstruction
  - Screen for thiamine deficiency

Dumping Syndrome

- Occurs when food enters the small intestine bypassing the stomach
- Immediately post op and for up to 2-18 mo after surgery
- Symptoms
  - Occur within 30 minutes of eating
  - Nausea, vomiting, stomach pain or cramping, diarrhea, fullness or bloating, increased heart rate
  - Late symptoms: 1-3 hours after eating
  - Changes in the amount of insulin and sugar in the blood
  - “Reactive hypoglycemia”
  - Flushing, sweating, need to lie down, feel weak or dizzy, feel nervous or shaky, drop in BP


Nutritional Complications

- Laparoscopic adjustable gastric banding < vertical sleeve gastrectomy < biliopancreatic diversion
- Iron deficiency
- Megaloblastic anemia secondary to folate deficiency
- B12 deficiency
  - Felt to be secondary to failure of food-bound vitamin B12 to be cleaved in upper gastric pouch
  - Secondary hyperparathyroidism


What is the next best step?

Ms. R is a 32 year old female status post Roux-en-Y gastric bypass surgery 3 months ago. She has had persistent nausea and vomiting since her surgery.

- Frequently nausea/vomiting can be due to dietary indiscretion
- Other etiologies of nausea and vomiting must be considered as well
- Fertility also increases after surgery – remember to check a pregnancy test if indicated
Outcomes Data

Effects of Bariatric Surgery on Obesity-related Co-morbidities

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>Preoperative Incidence (%)</th>
<th>Remission &gt; 2yrs postoperatively</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2DM, IFG, IGT</td>
<td>34</td>
<td>85</td>
</tr>
<tr>
<td>HTN</td>
<td>26</td>
<td>66</td>
</tr>
<tr>
<td>Hypertrag, low HDL</td>
<td>40</td>
<td>85</td>
</tr>
<tr>
<td>Sleep apnea</td>
<td>22 (men)</td>
<td>40</td>
</tr>
<tr>
<td>OHS</td>
<td>12</td>
<td>76</td>
</tr>
</tbody>
</table>

Adapted from AACE/TOS/ASMBS Guidelines, 2009

Effects of Bariatric Surgery on Mortality

- SOS study
  - 2010 - bariatric surgery, 2007 conventional treatment
  - Average follow-up of 10.9 years
    - 6.3% in matched control group died, 5% in surgery group died
    - Representing 29% adjusted (all-cause) mortality reduction associated with surgery