Critical illness induced gastroparesis

September 14, 2020 by Josh Farkas

This chapter explores acute gastroparesis in the context of critical illness. This often occurs due to a variety of physiological stressors, with subsequent resolution over time. Gastroparesis in the ICU is related to, but not identical to, gastroparesis encountered in an outpatient context.

**Clinical presentation**

- Nausea, vomiting
- Early satiety
- Abdominal pain
- Inability to tolerate tube feeding (e.g., vomiting with high residual volumes)
causes

infection

medications

- Anticholinergic agents (including numerous medications such as diphenhydramine and tricyclic antidepressants)
- Beta-adrenergic agonists
- Calcium channel blockers
- Levodopa
- Narcotics
- Octreotide
- Hyperosmolar feeding tube formulations

metabolic abnormalities

- Adrenal insufficiency
- Hyperglycemia (often due to diabetes)
- Hypoparathyroidism or hyperparathyroidism
- Hypothyroidism or hyperthyroidism
- Electrolyte abnormalities

neurological disorders

- Multiple sclerosis
- Parkinson's disease
- Stroke
- Elevated intracranial pressure
- Diabetic neuropathy

surgical / anatomic

- Esophagectomy or gastric surgery
- Mesenteric ischemia
- Chest or abdominal surgery with injury of the vagus nerve

differential diagnosis

- Gastric outlet obstruction
- Ileus
- Small bowel obstruction

evaluation

gastric residual volumes

- Gastric residual volumes measured during tube feeding may be used to quantify the residual fluid in the stomach.
- Routine measurement of residual volumes in all patients does not appear to be beneficial (in terms of a reduction in ventilator-associated pneumonia). ([23321763](https://pubmed.ncbi.nlm.nih.gov/23321763/))
  - Isolated elevation of gastric residual volumes *without* clinical signs of feeding intolerance (e.g., distension, nausea, or vomiting) *doesn't* require intervention. ([28828195](https://pubmed.ncbi.nlm.nih.gov/28828195/))
- If there is a clinical suspicion for gastroparesis (e.g., due to distension or vomiting), then gastric residual volume may be useful.
  - Gastric residual volumes <250 ml argue strongly against gastroparesis.
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Gastric residual volume in the 250-500 ml range is **nonspecific**. Different studies vary in what the upper limit of a “normal” gastric residual volume is (with values ranging from 150 ml to 500 ml!)(28828195). Gastric residual volumes >500 ml may raise more concern for impaired gastric motility. However, this isn’t specific to gastroparesis, but may also occur with small intestinal ileus or mechanical obstruction.

**abdominal X-ray**

- May reveal gastric distension.
- Its primary role is to exclude alternative diagnoses (e.g., ileus or mechanical small bowel obstruction).

**further evaluation**

- There are other tests considered in the outpatient approach to this problem, including further imaging (CT or MRI) to rule out obstruction, upper endoscopy, and scintigraphic gastric emptying studies. These are generally not used in the ICU setting.

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**treatment**

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**post-pyloric feeding tube**

- A post-pyloric small-bore feeding tube may provide a definitive solution for weeks.
- This might be an optimal bridge until gastric function resolves (as it often does with resolution of the underlying illness).
- If feasible, this has the advantage that it avoids medication side-effects.
- Careful maintenance is essential to avoid clogging these small-bore tubes.

**removal of inciting causes**

- Avoid problematic medications (listed above[#causes]).
- Achieve reasonable glucose control.

**tube feeding formulation**

- Intuitively it might seem that concentrated, smaller-volume tube feeding would be helpful. However, this may not be the case. Concentrated tube feeds tend to be hyperosmolar and high in fat – both of which slow gastric emptying.
- The **TARGET** trial found that patients receiving more energy-dense feeds (1.5 kCal/ml) experienced greater gastric residuals and more vomiting. However, patients receiving denser feeds also received more calories, which could factor into this as well.(30346225)

**erythromycin**

- Erythromycin stimulates motilin receptors in the gut, promoting gastric emptying. ESPEN guidelines recommend erythromycin as the front-line promotility agent in the ICU. (30348463) The main drawback of erythromycin is that, over time, its use leads to tachyphylaxis (diminishing efficacy) due to down-regulation of motilin receptors. Thus, erythromycin often becomes ineffective over roughly three days.
- The dose is **100-250 mg IV three times daily**. Gradual infusion over ~20 minutes may reduce adverse outcomes. (30294835)
- **Contraindications** include QT prolongation, acute hepatic injury, or myasthenia gravis.
- Side-effects may include hypotension, abdominal pain, nausea, vomiting, and diarrhea. (30855322)

**metoclopramide**

- Metoclopramide affects a variety of receptors
  - It is a central and peripheral dopamine (D2) antagonist.
  - It has mixed serotonergic effects (partial antagonism of 5-HT3 receptors, with partial agonism of 5-HT4 receptors).
  - It is a weak cholinesterase inhibitor.
- Metoclopramide has a combination of useful effects:
Anti-emetic
Pro-kinetic, affecting the stomach and duodenum (caused by D2-antagonism and SHT4-agonism)

The dose is **10 mg IV three times daily**, with a 50% dose reduction if the GFR is <50 ml/min. Gradual infusion may reduce the incidence of extrapyramidal side-effects.

Metoclopramide may be used in combination with erythromycin to increase efficacy (potentially the most effective strategy). ([29720852](https://pubmed.ncbi.nlm.nih.gov/29720852/))

**Contraindications** include Parkinson's disease, seizure disorder, or prior adverse reaction to antipsychotics (e.g., dystonia or neuroleptic malignant syndrome).

**Side effects:**
- Antipyramidal side-effects (e.g., tardive dyskinesia, akathisia, dyskinesia, dystonia). These are rare and associated mostly with chronic use or higher dosages than are required when using metoclopramide as a pro-kinetic.
- Sedation and depression.


**gastrojejunostomy tube**
- This is essentially a durable, percutaneous post-pyloric feeding tube. It may provide more durable, long-term nutrition. In the uncommon event that total parenteral nutrition (below) might be considered, use of a gastrojejunostomy tube is often preferable.
- Interventional radiology may place a venting gastrojejunostomy tube combination:
  - One tube enters the stomach and transverses into the duodenum – this is used for feeding.
  - Another lumen remains in the stomach and may be used to "vent" the stomach.

**total parenteral nutrition (TPN)**
- This is the modality of last resort, which should be used only if all of the above treatments are impossible.
- Total parenteral nutrition is a highly undesirable treatment for isolated gastroparesis. If the remainder of the bowel is functional (i.e., small intestine and colon), then it is often preferable to obtain percutaneous or surgical access to the small bowel and provide enteral feeds (e.g., gastrojejunostomy tube above).

To keep this page small and fast, questions & discussion about this post can be found on another page [here](https://emcrit.org/pulmcrit/hypomotility/).
References


The Internet Book of Critical Care is an online textbook written by Josh Farkas (@PulmCrit), an associate professor of Pulmonary and Critical Care Medicine at the University of Vermont.