Overview

- Definitions
- Physiology of vomiting
- Etiology of chronic vomiting
- Clinical history and examination
- Diagnostic testing
- Approach to Chronic vomiting
- Treatment options
- Case studies

Definition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>Feeling sick or unpleasant sensation which may or may not lead onto vomiting.</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Forceful expulsion of gastric contents associated with abdominal muscle contraction.</td>
</tr>
<tr>
<td>Retching</td>
<td>Spasmodic muscular contraction of abdomen without any expulsion of gastric contents.</td>
</tr>
<tr>
<td>Regurgitation</td>
<td>Food brought back in the mouth without abdominal and diaphragmatic muscle contraction.</td>
</tr>
<tr>
<td>Ruminating</td>
<td>Chewing and swallowing of regurgitated food with high abdominal pressure.</td>
</tr>
</tbody>
</table>
Physiology of Vomiting

Most Common Cases for Chronic Vomiting

- Mechanical gastrointestinal obstruction (small bowel, colon, pylorus, bile duct)
- Mucosal inflammation (esophagus, stomach, duodenum)
- Peritoneal inflammation (Collis, cancer)
- Carcinomas (gastric, ovarian, renal, etc)
- Medications (anticholinergics, narcotics, L-dopa, progesterone, Cabc, NSAIDs, GLP analogues)
- Metabolic (Diabetes, adrenal insufficiency, thyroid disorders, uremia)
- Gastroparesis (Diabetes, hypothyroidism, postsurgical, idiopathic)
- Neurogenic (autonomic, tumor, migraine, seizure, stroke, lactulose intolerance)
- Psychogenic (eating disorders)
- Cannabis/cyclical hyperemesis syndrome

Clinical Features:
- Vomiting (forceful expulsion and associated with nausea) vs regurgitation (passive and not associated with nausea).
- Insidious onset of nausea in middle aged female- r/o pregnancy.
- Medication use: OPIOIDS, NSAIDs, levodopa, anticholinergics.
- Bowel pattern and reflux symptoms.
- Type of vomitus:
  - Regurgitation of undigested food: Achalasia or Zenker’s diverticulum or Rumination.
  - Partially digested food: Gastroparesis or gastric outlet obstruction.
  - Bilious: Small bowel obstruction.
  - Feculent-Distal bowel obstruction.
- Timing of vomiting:
  - Early morning: Pregnancy or uremia.
  - Projectile: Increased intracranial pressure.
  - Periodic: Cyclical vomiting or cannabis induced hyperemesis.
  - Postprandial: Gastric outlet obstruction or gastroparesis.
  - During meals: Rumination or eating disorder.
- Associated symptoms: colicky abdominal pain, early satiety, associated neurological symptoms.

Diagnostic testing:
- Abdominal X-ray: Stool burden, gas pattern in obstructive and non-obstructive cause.
- CT scan: Bowel obstruction.
- UGI series and SBFT: Gastric and small bowel obstruction.
- Upper endoscopy: Mucosal condition of the stomach and gastric outlet obstruction.
- Gastric emptying study:
  - Gastric scintigraphy.
  - Wireless transit study.
  - C13 breath testing.
- CNS imaging: in cases of projectile vomiting or associated CNS symptoms.
- Specialized gastric motility testing: electrogastrography, antroduodenal manometry or endoflip.
Differential diagnosis:

<table>
<thead>
<tr>
<th>DDx</th>
<th>Distinguishing feature</th>
<th>Testing</th>
<th>Treatment options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroparesis</td>
<td>Postprandial symptoms or non-periodic vomiting in the absence of obstruction</td>
<td>Delayed solid emptying</td>
<td>Dietary modifications, Medications, Nutritional support, Surgical options</td>
</tr>
<tr>
<td>Cyclic vomiting syndrome</td>
<td>Periodic vomiting episodes in the absence of cannabis use</td>
<td>Diagnosis of exclusion</td>
<td>Avoidance of triggers, Antiemetics, neuromodulators, Amitriptyline</td>
</tr>
<tr>
<td>Cannabis hyperemesis syndrome</td>
<td>Episodic vomiting with cannabis use</td>
<td>Diagnosis of exclusion</td>
<td>Cessation of cannabis</td>
</tr>
<tr>
<td>Rumination syndrome</td>
<td>Effortless regurgitation</td>
<td>Polysomnial ESM or antroduodenal manometry</td>
<td>Behavioral therapy (DBT)</td>
</tr>
<tr>
<td>Eating disorder</td>
<td>Disturbed body image, Purging episodes</td>
<td>Clinical history</td>
<td>Psychiatric care</td>
</tr>
</tbody>
</table>

Principles of Treatment

- Treatment is directed towards the cause.
- It would be important to identify triggering factors:
  - Medications.
  - Drug use anxiety/stress.
  - Menses.
  - Bowel pattern.
- Dietary modification and avoidance of triggers are the cornerstone in the management of chronic vomiting.
- Medications such as prokinetics, anti-emetics and neuromodulators are often used.
- In case of profound vomiting with weight loss, consider alternative nutrition route.
- Watch for micronutrient deficiency.

Pro-kinetics:

<table>
<thead>
<tr>
<th>Medications</th>
<th>Mechanism</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metaclopramide</td>
<td>D2 Antagonist</td>
<td>Improves gastric emptying</td>
<td>Lowest possible dose (5 mg TID before meals), No long-term study available.</td>
</tr>
<tr>
<td>Domperidone</td>
<td>D2 Antagonist</td>
<td>Improvement in symptoms</td>
<td>Efficacy 29-53%, Comparable to Metoclopramide, Drug interaction</td>
</tr>
<tr>
<td>Hyoscine</td>
<td>Anticholinergics</td>
<td>Useful during acute exacerbation</td>
<td>IV better than PO, Associated with QTC interval, Anti-cholinergic side effects (dry mouth, glaucoma, etc.)</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>5HT3 Antagonist</td>
<td>Effective in severe nausea and vomiting</td>
<td>Requires IND for approval.</td>
</tr>
<tr>
<td>Cisapride</td>
<td>5-HT4 agonist</td>
<td>Significant improvement in symptoms.</td>
<td>Cardiac arrhythmias and death Requires IND</td>
</tr>
<tr>
<td>Prucalopride</td>
<td>5-HT4 agonist</td>
<td>Improves gastric emptying and colon transit times. FDA approved for chronic constipation.</td>
<td>No cardiac toxicity document.</td>
</tr>
</tbody>
</table>

Anti-emetics:

<table>
<thead>
<tr>
<th>Medications</th>
<th>MOA</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoclopramide</td>
<td>Antihistamines</td>
<td>Useful in mild nausea/vomiting.</td>
<td>Sedative effect, Anticholinergic side effects (dry mouth, glaucoma, etc.)</td>
</tr>
<tr>
<td>Hyoscine</td>
<td>Anti-cholinergics</td>
<td>Cheap and widely available.</td>
<td>Useful in mild cases.</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>5HT3 Antagonist</td>
<td>Useful in severe nausea and vomiting.</td>
<td>QT prolongation, Psychomotor issues in elderly, Olanzepine/Parkinsonism</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>SH2 antagonists</td>
<td>Widely available.</td>
<td>Useful in mild vomiting.</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>5HT3 antagonists</td>
<td>Not widely available/cost.</td>
<td>Effective in those who cannot tolerate oral meds.</td>
</tr>
<tr>
<td>Aprepitant</td>
<td>NK1 receptor antagonists</td>
<td>Not widely available/cost.</td>
<td>Fatigue, Neutropenia, Melanoma.</td>
</tr>
<tr>
<td>Dronabinol</td>
<td>CB1 agonist</td>
<td>Helpful for N/V when other therapies have failed.</td>
<td>Delays gastric emptying.</td>
</tr>
</tbody>
</table>
### Neuromodulators:

<table>
<thead>
<tr>
<th>Medications</th>
<th>MOA</th>
<th>Pros</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nortriptyline/Amitriptyline</td>
<td>TCA</td>
<td>Modest improvement in N/V and abdominal pain</td>
<td>Worsens gastric emptying. Anti-cholinergic side effects. Constipation.</td>
</tr>
<tr>
<td>Mirtazapine/Bupiprone</td>
<td>SNRI/SSRI</td>
<td>Improves appetite.</td>
<td>Suicidal thoughts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improves fundic accommodation.</td>
<td>EKG changes. Serotonin syndrome.</td>
</tr>
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### Case studies

#### Case study 1

- 42-year-old gentleman with type 2 diabetes (HgbA1c: 9.5) on exenatide presenting with recurrent vomiting and nausea for the last 6 months?

What would be the next step?

- Normal upper endoscopy with moderate food retention in the stomach.
- Bx: negative for H. pylori.
- 4-hour GES: 43%. What do we do next?

Switch exenatide to insulin+CGM. Nutrition consult for gastroparesis.

#### Definition:

*Gastroparesis is defined as a delay in the emptying of ingested food in the absence of mechanical obstruction of the stomach or duodenum.*

Etiology of Gastroparesis

- Idiopathic gastroparesis
- Diabetic gastroparesis (30-35%)
- Post-surgical gastroparesis
  - Cholecystectomy
  - Vagotomy
  - Nissen fundoplication
  - Partial gastrectomy
  - Obesity related surgeries
  - Pancreatectomy (5-10%)

Pathophysiology

Clinical Presentation:

- Nausea
- Vomiting
- Early satiety
- Bloating
- Postprandial fullness
- Abdominal pain
- Weight loss/weight gain
- Constipation and/or diarrhea
- Wide glycemic fluctuations

Diagnostic Testing for Gastroparesis:

<table>
<thead>
<tr>
<th>Modality</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric scintigraphy</td>
<td>Widely available. Considered the &quot;gold standard&quot; for diagnosis</td>
<td>Radiation exposure. False positives with liquid phase only studies</td>
</tr>
<tr>
<td>Wireless motility capsule</td>
<td>Avoids radiation exposure. FDA approved for diagnosis</td>
<td>Less validated than scintigraphy. Cannot be used in those with pacemaker or defibrillator</td>
</tr>
<tr>
<td>Radioisotopic carbon breath test</td>
<td>Low cost</td>
<td>Lack of standardization. Has primarily been used as a research tool</td>
</tr>
</tbody>
</table>

13C-labeled octanoic acid or Spirulina platensis
Treatment Algorithm for Suspected Gastroparesis

**Suspected gastroparesis**

1. **Diagnosis**: 4 h Gastric emptying by scintigraphy
2. **Exclude**
   - Medical: Insulin, anticholinergics
   - Surgical: Gastro-jejunostomy

3. **Pharmacological Rx**
   - **Prokinetics**: metoclopramide, erythromycin, domperidone
   - **Antimetics**: anti-histamine, 5-HT3 antagonists

4. **Nutritional support**: Enteral formula

5. **Non-pharmacological Rx**
   - Pyloric injection of botulinum toxin
   - Venting gastrostomy, feeding jejunostomy
   - Parenteral nutrition
   - Gastric electrical stimulation
   - Pyloroplasty
   - Partial gastrectomy

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**Case Study 2:**

- 26-year-old female with prior hx of chronic insomnia and anxiety presented with chronic vomiting.
- She complained of:
  - Postprandial regurgitation of food associated with upset stomach and associated swallowing the food back again.
  - Feeling of Charlie-horse in her chest followed by regurgitation of food.
- Upper endoscopy and 4-hour GES were unremarkable.
  - She was tried on Nortriptyline, pantoprazole and reglan without much benefit.

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**Postprandial esophageal manometry**

1. Rise in gastric pressure
2. Reflux of gastric contents
3. Rise in esophageal pressure during reflux
4. Relaxation of upper esophageal sphincter
**ROME IV Criteria for Rumination Syndrome**

**Table 1 Clinical diagnosis of rumination in adults**

<table>
<thead>
<tr>
<th>ROME IV criterion</th>
<th>Must include all of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Persistent or recurrent regurgitation of recently ingested food into the mouth with subsequent spitting or remastication and swallowing</td>
<td></td>
</tr>
<tr>
<td>2. Regurgitation is not preceded by retching</td>
<td></td>
</tr>
</tbody>
</table>

Criteria fulfilled for the last 3 months with symptom onset at least 6 months before diagnosis.

Supportive remarks:
- Effortless regurgitation events are usually not preceded by nausea
- Regurgitant contains recognizable food that might have a pleasant taste
- The process tends to cease when the regurgitated material becomes acidic

**Effect of DBT on Rumination syndrome**

16 patients with rumination were studied with manometry before and after a meal. The postprandial assessment comprised three periods: before, during, and after DB augmented with biofeedback therapy.

Diaphragmatic breathing increased EGJ pressure and restored a negative gastroesophageal pressure gradient.

**Further Care..**

- On Physical therapy.
- Started on buspirone.
- Daily pantoprazole was stopped and only can take if she has symptoms.
- 4 weeks following therapy: She has noticed an improvement in symptoms - decreased frequency to 1-2 times every other day.

**Case Study 3:**

- 21-year-old female with prior hx of migraines presenting with episodic vomiting with normalcy in between these episodes.
- Often periodic, happens in the early morning, several episodes of vomiting requiring hospitalization.
- Underwent EGD and 4-hour GES which were unremarkable.
- She was tried on PPI, reglan without much benefit.
**Rome Criteria for Cyclical Vomiting Syndrome**

- Stereotypic episodes of vomiting regarding onset (acute) and duration (≤5 weeks)
  1. At least three discrete episodes in the prior year and two episodes in the past 6 months, occurring at least 1 week apart
  2. Absence of vomiting between episodes, but other similar symptoms can be present between cycles
- Supportive remarks:
  - Personal or family history of migraine headaches
  - Criteria must be fulfilled for the last 6 months with symptom onset at least 3 months before diagnosis

**Management of cyclic vomiting syndrome**

**Medical Nutrition Therapy for Nausea and Vomiting: a case based approach**

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Assistant Professor-Clinical, Medical Dietetics
Gastroenterology, Hepatology, and Nutrition
The Ohio State University Wexner Medical Center

**Disclosures**

- Nothing to disclose
Objectives

- Discuss evidence-based medical nutrition therapy for symptom management in those with nausea and vomiting
- Differentiate when oral diet is sufficient to meet nutritional needs

Nutritional Problems Associated with N/V

- Starvation
  - Chronic: significant deterioration in body mass (adiposity and lean body mass).
  - Intermediate: Metabolic derangements, decreased EER, episodic illness leads to obesity.
- Dehydration and electrolyte abnormalities
- Micronutrient deficiencies
- Poor nutritional quality of life

General Nutrition Recommendations for N/V
- Keep patient away from strong food odors; remove lid to food served in hospital prior to entering room
- Provide assistance in food preparation so as to avoid cooking odors
- Eat foods at room temperature
- Keep patient's mouth clean and perform oral hygiene tasks after each episode of vomiting
- Offer fluids between meals
- Patient should sip liquids throughout the day
- Cold beverages may be more easily tolerated
- Keep low-fat crackers or dry cereal by the bed to eat before getting out of bed
- Relax after meals instead of moving around
- Sit up for 1 hour after eating
- Wear loose-fitting clothes

Case Study #1: Gastroparesis
54 F with T2DM on metformin. Ha1c 6.7% down from 7.1% 6 months prior.
C/o worsening nausea, abdominal pain and intermittent vomiting. Worsening symptoms in the morning. GES confirms gastroparesis.
RDN consult for dietary management of T2DM and GP.

GES – 4/21/2018
Findings:
- At 60 minutes after meal consumption, 87% of initial gastric contents were retained within the stomach (normal range, 30-90%).
- At 120 minutes after meal consumption, 68% of initial gastric contents were retained within the stomach (normal range, 20-90%).
- At 240 minutes after meal consumption, 45% of initial gastric contents were retained within the stomach (normal range, <10%).

Particle Size and Food Consistency
- Emptying is faster for smaller particles and liquid consistencies.
- Liquid foods empty at 200 kcals/hr\(^1\)
- Translation for patient care:
  - Chew your food well
  - Trial a liquid meal at the 'worst point' in your day

\(^1\) Camilleri M. Gastroenterology 2006.
Low-Fiber Diet

- Avoid foods with ≥ 3 grams of fiber per serving
- Avoid meals with >5 grams of fiber

<table>
<thead>
<tr>
<th>FOOD GROUPS</th>
<th>FOOD TO AVOID</th>
<th>FOODS TO CHOOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains, cereal, pasta</td>
<td>Whole grains, brown rice, popcorn, potatoes with the skin, high fiber cereals, rye bread, whole wheat breads, corn bread</td>
<td>White bread, white rice, crackers, refined grains, pretzels, refined cereals</td>
</tr>
<tr>
<td>Fruits, vegetables and legumes</td>
<td>Skins, nuts and seeds of the plant. Avoid uncooked fruits and vegetables. Avoid corn, onion, lentils, peas and beans.</td>
<td>Cooked or canned fruits and vegetables with the skin removed. Casseroles. Sweet or white potatoes without the skin</td>
</tr>
<tr>
<td>Milk and dairy products</td>
<td>Dairy products that are fortified with fiber.</td>
<td>Dairy should be consumed as tolerated as this is a naturally fiber-free food</td>
</tr>
<tr>
<td>Meats, fish, eggs and poultry</td>
<td>Tough cuts of meat, processed meats (hot dogs, sausage, cold-cuts). Baked, broiled, tender meats/fish/poultry; tofu, ground meats, smooth peanut butter and any style eggs.</td>
<td>High-fat beef/pork/lamb. Avoid meats with visible fat (white-marbling).</td>
</tr>
</tbody>
</table>

Modified-Fat Diet

- Fats are essential for life—Moderation is key for tolerance.
- 10-15 grams of fat per meal is a good starting point.

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<thead>
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<th>FOOD GROUPS</th>
<th>FOOD TO AVOID</th>
<th>FOODS TO CHOOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains, cereal, pasta</td>
<td>Crackers, chips, fried bread</td>
<td>White bread, white rice, crackers, refined grains, pretzels, refined cereals</td>
</tr>
<tr>
<td>Fruits, vegetables and legumes</td>
<td>Fruits, vegetables or legumes that are fried or cooked with excessive oil/butter</td>
<td>Cooked or canned fruits and vegetables with the skin removed. Casseroles. Sweet or white potatoes without the skin</td>
</tr>
<tr>
<td>Milk and dairy products</td>
<td>2% or whole dairy products (milk, yogurt, cheese). If tolerated, skim or 1% dairy products (milk, yogurt, cheese).</td>
<td></td>
</tr>
<tr>
<td>Meats, fish, eggs and poultry</td>
<td>High-fat beef/pork/lamb.</td>
<td>Egg whites, skinless chicken or turkey breast, lean pork/beef/lamb/beef, liver, fish, shrimp and crab.</td>
</tr>
</tbody>
</table>

Case Study #2: SIBO

67 M hx bladder cancer s/p RTx. Presents with excessive flatulence, intermittent nausea and abdominal pain. HBT supports SIBO and patient selecting dietary management. RDN consult placed.

Low FODMAP Diet

- Efficacy: 50-75% experience symptom improvement*
- Nutritional Adequacy: concern for inadequate intake due to restriction; inconsistent data
- Adherence: High rates of adherence (75%) generally reported, but inconsistently assessed

<table>
<thead>
<tr>
<th>Nutrient of Concern</th>
<th>Restricted Source</th>
<th>Supporting Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>Dairy</td>
<td>Staudacher et al. 2012</td>
</tr>
<tr>
<td>Overall CHO</td>
<td>Fruits, veg., grains, dairy</td>
<td>Both et al. 2015</td>
</tr>
<tr>
<td>Fiber</td>
<td>Fruits, veg., whole grains</td>
<td>Both et al. 2015</td>
</tr>
</tbody>
</table>
Case Study #3: Cyclic Vomiting Syndrome

- 24 F newly dx with cyclic vomiting syndrome failed pharmacotherapy and dietary management.
- Consult to RDN who documents:
  - 92% of UBW
  - Severe loss of subcutaneous fat and muscle.
  - Skin rash
  - Micronutrient deficiencies

<table>
<thead>
<tr>
<th>Laboratory Assessment</th>
<th>Baseline values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum retinol (20-120 mcg/dL)</td>
<td>8</td>
</tr>
<tr>
<td>Zinc (65-150 ug/dL)</td>
<td>30</td>
</tr>
<tr>
<td>CRP (0-3 mg/L)</td>
<td>2</td>
</tr>
</tbody>
</table>

Dehydration related to vomiting:
- Trial sips of oral rehydration solutions:
  - 1 liter of G2 with ½ teaspoon salt OR pedialyte in 1-2 ounce portions per sitting.
  - Do NOT recommend full calorie sports drinks.
  - Most patients require 1-2 liters of fluids per day.

- Micronutrient deficiencies
  - Prevent with starting a USP, chewable multivitamin daily until healthy body weight restored
  - Monitor common micronutrient deficiencies by assessing biochemical and physical presentation.
  - Data suggest that particularly common micronutrient deficiencies include iron, folate, thiamine, calcium, magnesium, phosphorus, zinc, and vitamins B12, C, D, E, and K

- Start the discussion of enteral nutrition (EN) early

When are Supplements and EN Necessary?

- Unintentional weight loss of >10% within 3 months
- Unable to achieve a healthy body weight
- Repeat hospitalizations for symptoms interfering with oral intake
- Nausea and vomiting impacting the quality of life

- Consider severity of symptoms and start liquid supplementation or consider small bowel feeding tube trial

Koch et al. Gastroenterol Clin N Amer. 2015;39-57

Nausea and Vomiting Severity and EN

- Mild disease: rarely needed
- Moderate disease: Liquid supplements and rarely EN
- Severe disease: Liquid supplements and PEJ may be required

PEJ is associated with lower complication rates and re-intervention rates compared to PEGJ


Steps to Initiation of Enteral Nutrition

- Trial nasojejunal (NJ) feeding tube
  - Consider home EN start
  - Avoid if risk for refeeding syndrome
  - Encourage NPO status.
- Place PEJ to restore nutritional balance
  - Use reverse progression of nutritional management to regain full nutritional autonomy

Sarosiek et al. Gastroenterol Clin N Amer; 2015

Referral to RDN → It's simple!

1. Have you lost weight recently without trying?
   - No
   - Unsure
   - Yes, how much weight (lb) have you lost?
     - 1 - 5
     - 6 - 10
     - 11 - 15
     - > 15

2. Have you been eating poorly because of a decreased appetite?
   - No
   - Yes

Total MIST Score (weight loss + appetite scores)