

Vomiting Not Due to Gastroparesis

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GI Core Curriculum Series

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Initial Thoughts



- All vomiting IS due to gastroparesis



Vomiting 14th Century



- The **Tacuinum Sanitatis** is a medieval handbook on wellness, based on an Arab medical treatise by Ibn Butlan
- Describes in detail the beneficial and harmful properties of foods and plants
- The Tacuinum was very popular in Western Europe in the Late Middle Ages; an indication of that popularity is the use of the word *taccuino* in modern Italian to mean any kind of pocket handbook, guide, notebook.

From Wikipedia, the free encyclopedia

Why Do We Experience N&V?

- Protection against ingesting toxic substances
- Evolutionary advantage
- Senses of sight, smell, taste usually protective
- Gastric irritation can stimulate chemoreceptors and cause vomiting
- Brain receptors test for potential toxins
- Memory



Definitions



Nausea

- Nausea is entirely subjective and is commonly described as the sensation (or sensations) that immediately precede vomiting.
- Patients state that they feel as if they are about to vomit, or use such terms as "sick to the stomach" or "queasy."

Vomiting

- Vomiting results in the rapid, forceful evacuation of gastric contents in retrograde fashion from the stomach up to and out of the mouth.
- In vomiting, nausea is followed by retching (repetitive active contraction of the abdominal musculature).
- These contractions generate the pressure gradient that leads to evacuation, the most clearly recognized component of vomiting.

Regurgitation vs. Rumination

- **Regurgitation** is passive by definition and describes the retrograde flow of esophageal contents into the mouth.
- Acid regurgitation, for example, is a cardinal symptom of GERD.
- **Rumination** is defined as the effortless regurgitation of recently ingested food into the mouth, followed by rechewing and reswallowing or spitting out



Acute vs. Chronic

- Chronic nausea and vomiting is usually defined as the persistence of these symptoms for more than one month. It often presents a greater clinical challenge and needs the assistance of Dr. Wo.



Socioeconomic Impact

- Nausea and vomiting, from all causes, involve significant social and economic costs to affected patients, their employers, and the health care industry.
- Analysis has suggested that acute enteric infectious illnesses increase medical expenses by \$1.25 billion and lead to \$21.8 billion in lost productivity in the United States each year.

Garthright, WE, Archer, DL, Kvenberg, JE. Estimates of incidence and costs of intestinal infectious diseases in the United States. Public Health Rep 1988; 103:107.

Pathophysiology

Complex Interactions

Pathophysiology

- Normal function of the upper gastrointestinal tract involves an interaction between the gut and the central nervous system.
- The motor function of the gut is controlled at three main levels: the parasympathetic and sympathetic nervous systems; enteric brain neurons; and smooth muscle cells.

CNS Control

- CNS control of vomiting has been ascribed to a vomiting center in the medulla
- Vomiting center is the final pathway that gives rise to vomiting
- Four main areas of input

Areas of Input to Vomiting Center

- GI tract
- Chemoreceptor trigger zone
- Vestibular apparatus
- Cerebral cortex

GI tract

- Stimulation of gut chemoreceptors and stretch receptors trigger N&V via vagal afferents associated with the sympathetic nervous system
- Serotonin, Ach, histamine, and Substance P are major neurotransmitters involved in stimulating these receptors

Chemoreceptor trigger zone

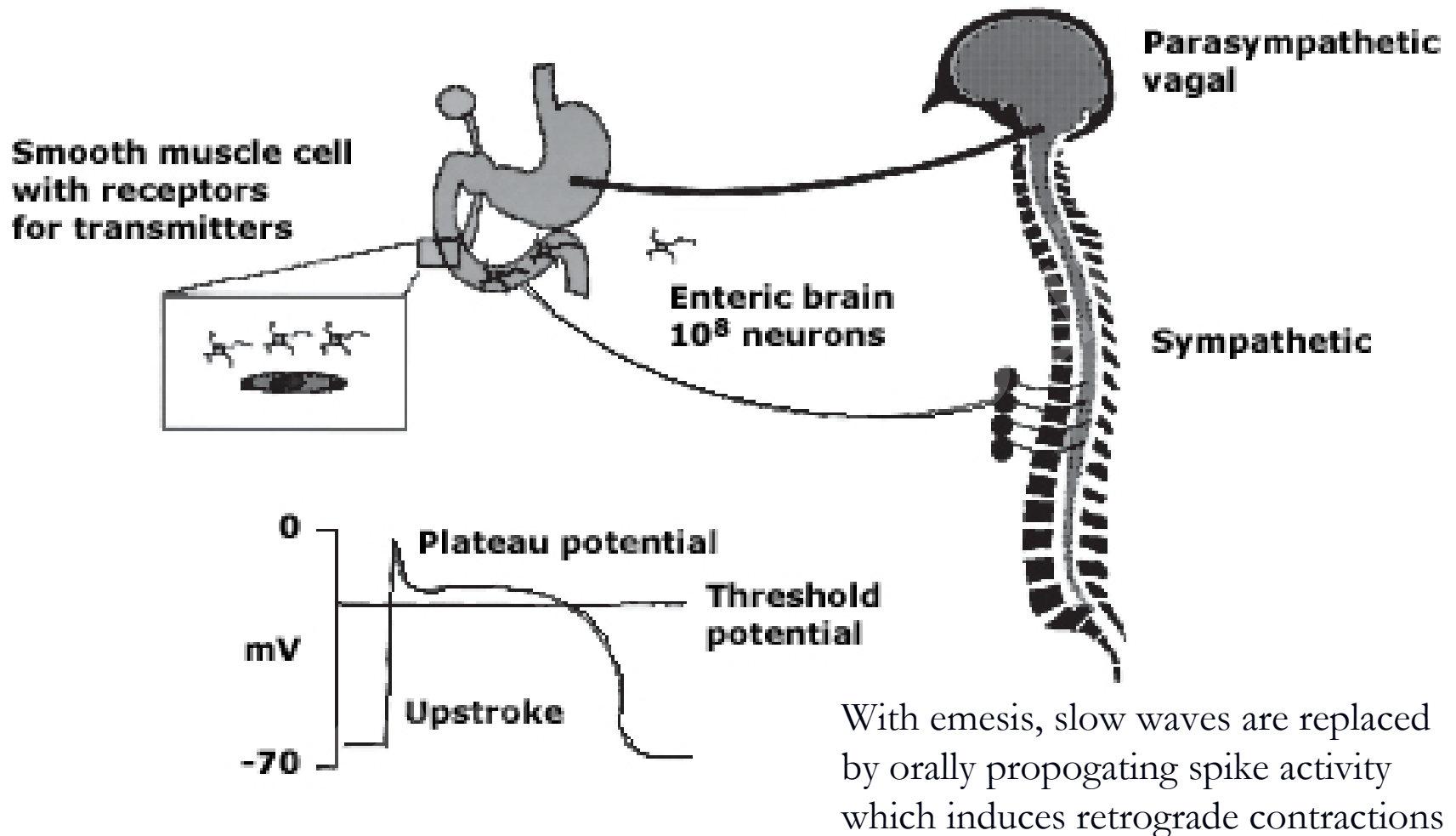
- Senses chemicals in the blood
- Sensitive to increasing levels of potentially toxic substances.
- If toxic substance detected, nausea is experienced and vomit reflex initiated
- Mainly influenced by dopamine and serotonin

Vestibular apparatus

- Sense motion and body position
- Motion sickness
- Inner ear diseases (Meniere's)
- Toxins (etoh- hard to drink yourself to death)
- Mediated through histamine and Ach

Cerebral cortex

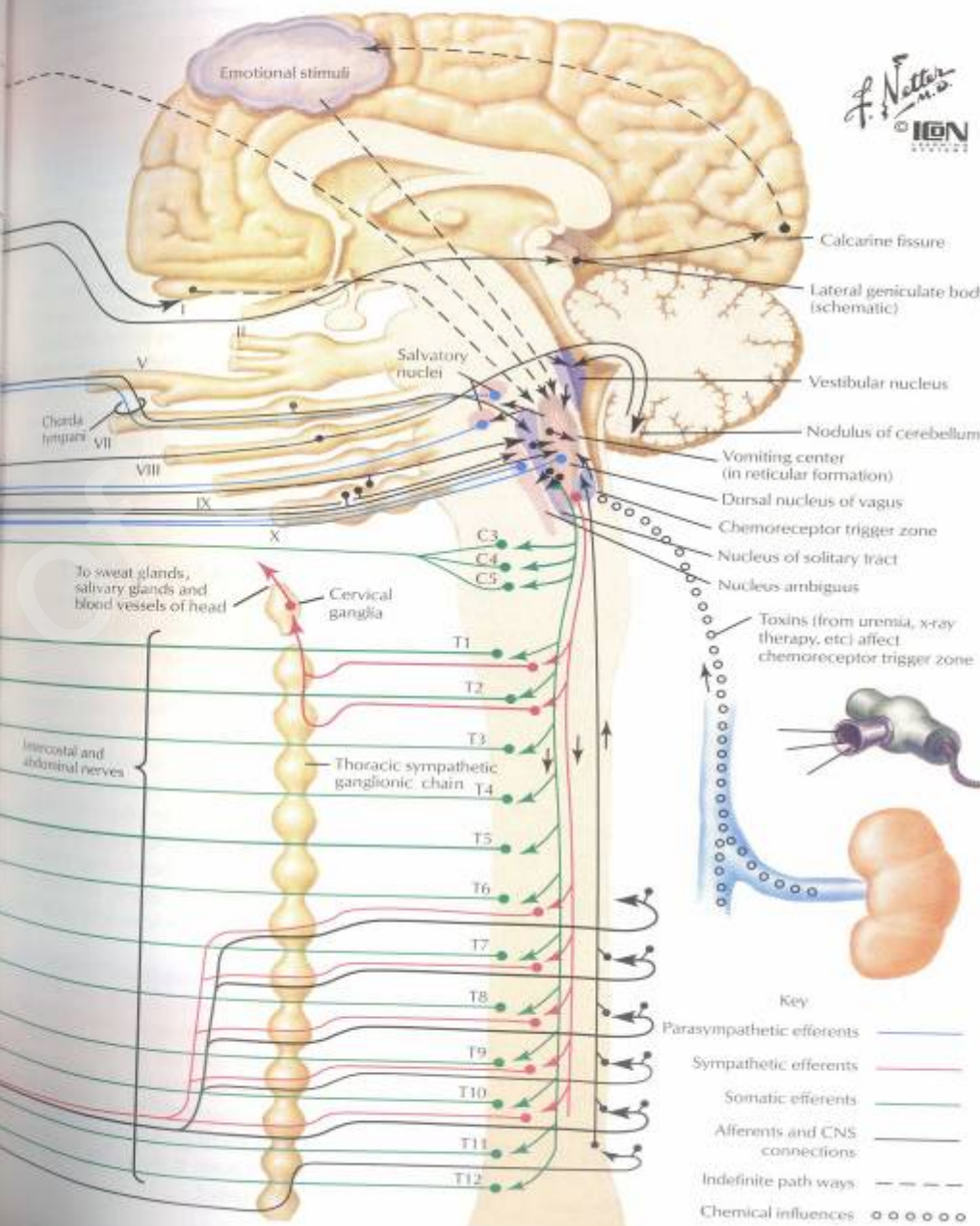
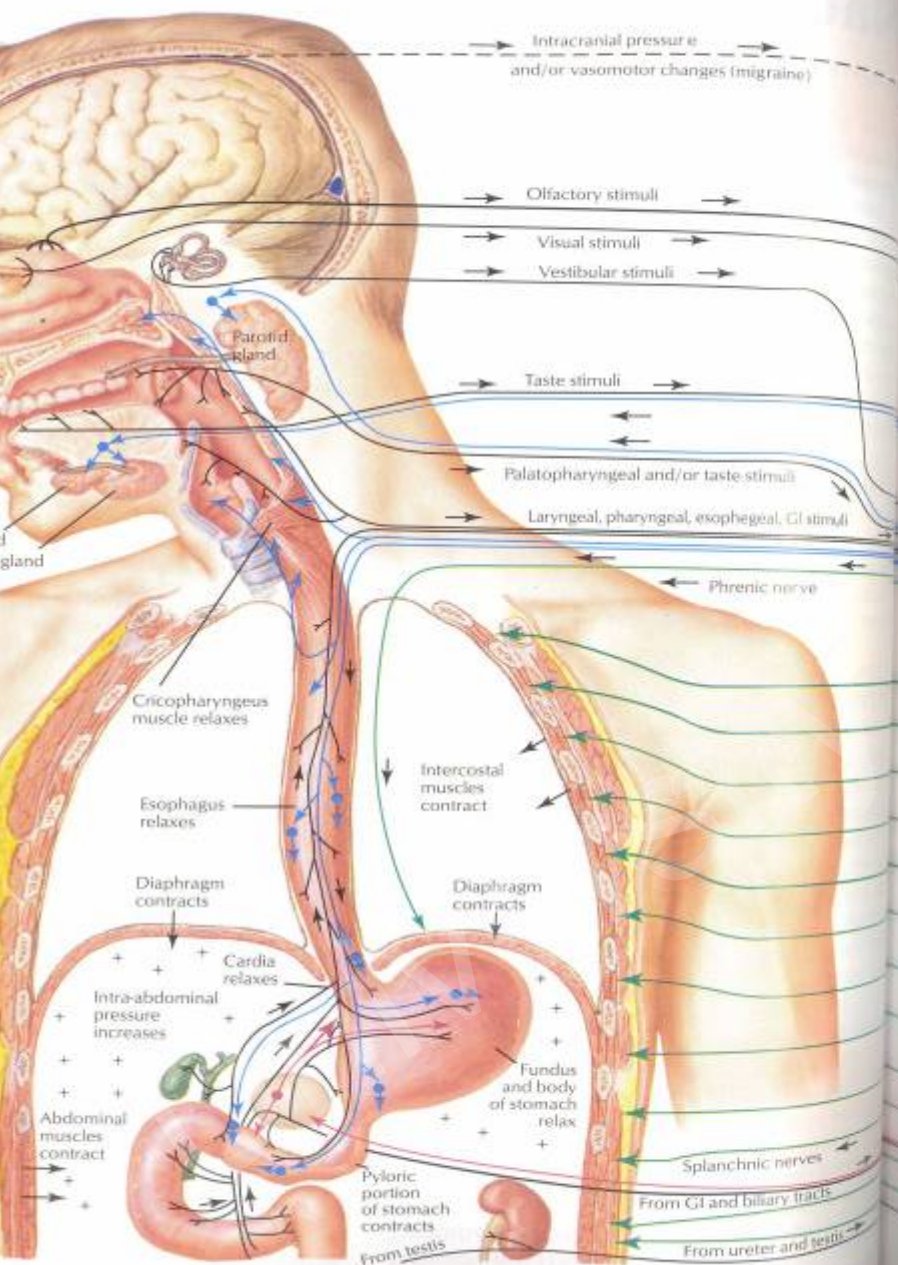
- Modulate complex experiences such as taste, sight, smell, memory, and emotion
- Discrete neuropathways less well understood
- Higher cortical effects can be powerful in stimulating or suppressing N&V



The motor function of the gut is controlled at three main levels: extrinsic neural control (vagal and sympathetic); intrinsic neural control; and excitability of smooth muscle cells controlled by transmitters.

Adapted from Camilleri, M, Prather, CM. In: Sleisenger and Fordtran's Gastrointestinal Disease, 6th ed, Feldman, M, Scharschmidt, BF, Sleisenger, MH (Eds), W.B. Saunders, Philadelphia 1998. p. 572.

Nausea and Vomiting



Differential Diagnosis

The List is Huge!

N&V Ddx by System

- Medications/Drugs
- Infectious
- Disorders of Gut and Peritoneum
- Organic GI disorders
- Endocrine
- CNS
- Psychiatric
- Labyrinth
- Miscellaneous

Quigley EM. AGA technical review: Nausea and vomiting;
Gastroenterology 2001; 120:263. Copyright 2001. AGA

Medications

Always high on the list

Cancer Chemotherapy

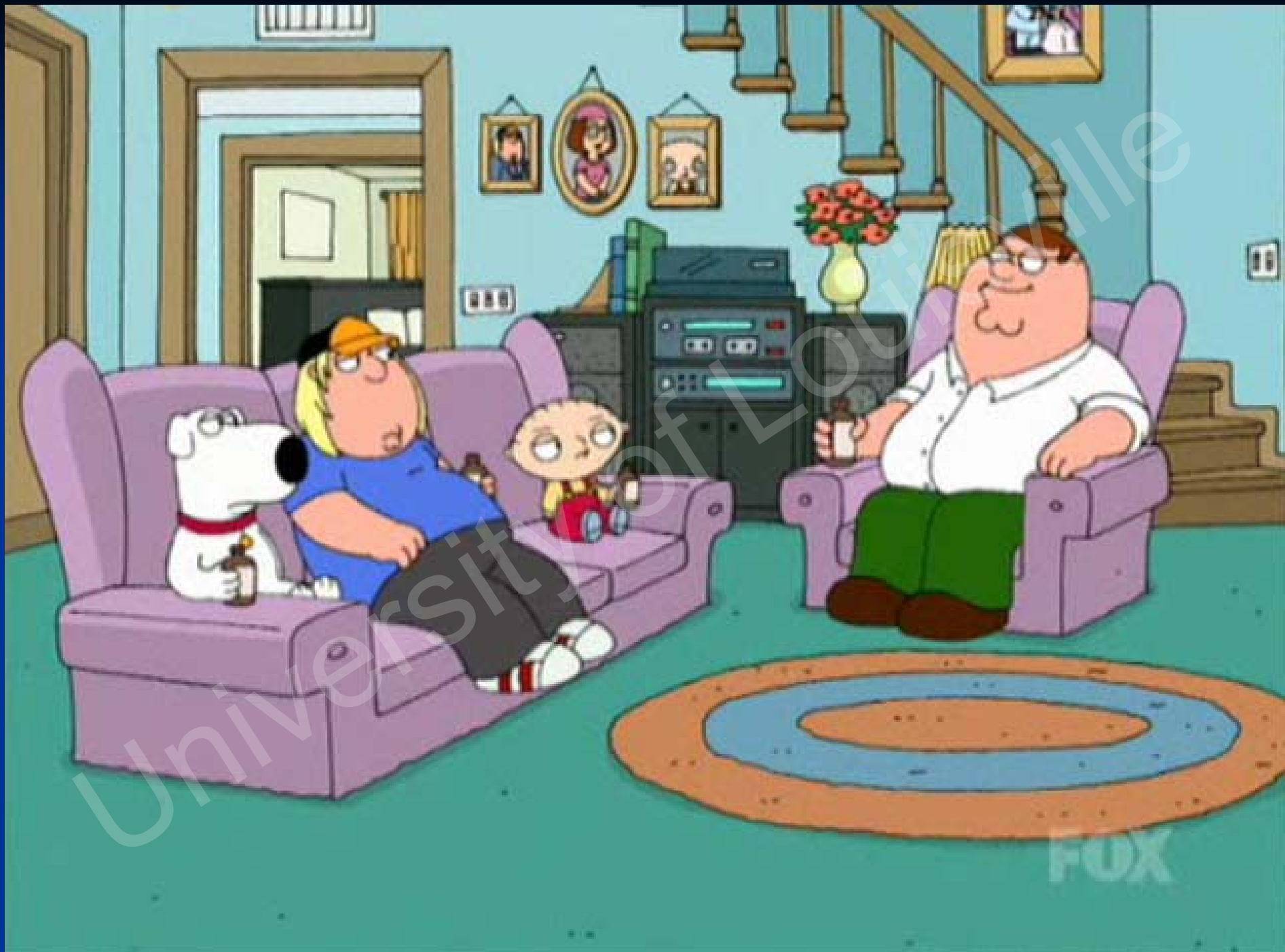
- Severe-cisplatinum, dacarbazine, nitrogen mustard
- Moderate-etoposide, methotrexate, cytarabine
- Mild-fluorouracil, vinblastine, tamoxifen
- Oncologists have a classification
- Emetogenic Class I-V
- Class I $< 10\%$
- Class II 10-30%
- Class III 30-60%
- Class IV 60-90%
- Class V $> 90\%$

Common Medications

- Analgesics: Aspirin
NSAIDS Auranofin
- Antigout drugs
- Cardiovascular meds:
Digoxin,
Antiarrhythmics,
Antihypertensives-B
blockers, Calcium
channel blockers,
Diuretics
- Hormonal
preparations/therapies
- Oral antidiabetics
- Oral contraceptives
- Antibiotics/antivirals
 - Erythromycin
 - Tetracycline
 - Sulfonamides
 - Antituberculous drugs
 - Acyclovir

Common Medications/Others

- Sulfasalazine
- Azathioprine
- Nicotine
- Narcotics
- Antiparkinsonian drugs
- Anticonvulsants
- Antiasthmatics
- Theophylline
- Radiation therapy
- Ethanol abuse
- Epicac (makes you yack)



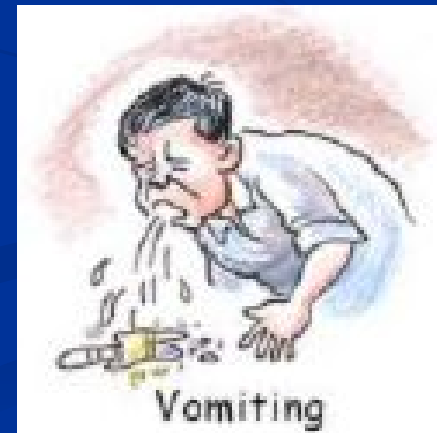
Infectious Causes of Gastroenteritis

■ Viral

- Rota, Reo, Adeno, Norwalk

■ Bacterial

- Staph aureus, salmonella, bacillus cereus, clostridium perfringes



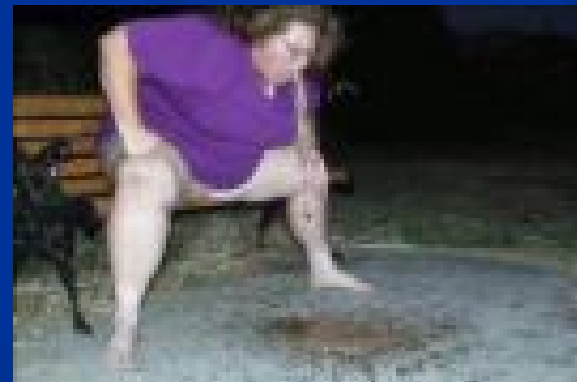
Disorders of the Gut and Peritoneum

- Mechanical obstruction
- Gastric outlet obstruction
- Small bowel obstruction
- Functional GI disorders
- Gastroparesis
- Chronic intestinal pseudo-obstruction
- Nonulcer dyspepsia
- Irritable bowel syndrome

Scope Em!!

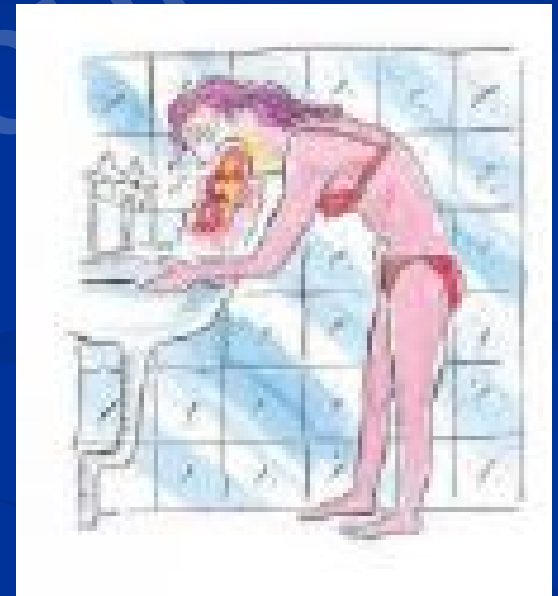
Organic GI Disorders

- Pancreatic adenocarcinoma
- Inflammatory intraperitoneal disease
- Peptic ulcer disease
- Cholecystitis
- Pancreatitis
- Crohn's disease
- Mesenteric ischemia
- Retroperitoneal fibrosis
- Mucosal metastases
- Hepatitis



Endocrinologic and Metabolic Causes

- Pregnancy (70% 1st trimester)
- Uremia
- Diabetic ketoacidosis
- Hyperparathyroidism
- Hypoparathyroidism
- Hyperthyroidism
- Addison's disease
- Acute intermittent porphyria



CNS Causes

- Migraine
- Increased intracranial pressure
- Malignancy
- Hemorrhage
- Infarction
- Abscess
- Meningitis
- Congenital malformation
- Hydrocephalus
- Pseudotumor cerebri
- Seizure disorders
- Demyelinating disorders
- Emotional responses

Psychiatric Disease

- Psychogenic vomiting
- Anxiety disorders
- Depression
- Pain
- Anorexia nervosa
- Bulimia nervosa

Labyrinthine Disorders

- Motion sickness
- Labyrinthitis
- Tumors
- Meniere's disease
- Iatrogenic



Miscellaneous Causes

- Postoperative nausea and vomiting
- Cyclic vomiting syndrome
- Starvation
- Cardiac disease
- Myocardial infarction
- Congestive heart failure
- Radiofrequency ablation

Clinical Approach to N&V

Clinical Approach to N&V

- Diverse causes- keep an open mind
- Thorough H&P
 - Timing of onset: Acute vs. chronic
 - Remember definitions (regurg, vomit, rumination)
 - Physical exam
- Directed labs, imaging, and endoscopies

Reminder of Differential

- Medications/Drugs
- Infectious
- Disorders of Gut and Peritoneum
- Organic GI disorders
- Endocrine
- CNS
- Psychiatric
- Labyrinth
- Miscellaneous

Clinical Pearls

- Abdominal **pain** with vomiting usually indicates an organic etiology (eg, cholelithiasis).
- Abdominal **distension** and tenderness suggest bowel obstruction.
- Vomiting of food eaten several hours earlier and a succussion **splash detected on abdominal examination** suggest gastric obstruction or gastroparesis.
- Early morning vomiting is characteristic of **pregnancy**.
- **Feculent vomiting** suggests intestinal obstruction or a gastrocolic fistula.
- **Vertigo and nystagmus** are typical of vestibular neuritis.
- **Bulimia** is associated with dental enamel erosion, parotid gland enlargement, lanugo-like hair, and calluses on the dorsal surface of the hand.
- Neurogenic vomiting may be **positional, projectile**, and is usually associated with other neurologic signs or symptoms.

Treatment

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Phenergan!

One size fits all!



Dr. McClave Sized

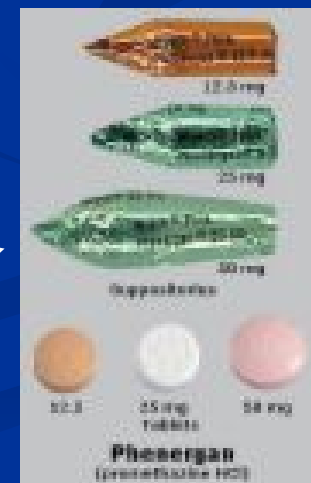


Table 41-2 Treatment of Nausea and Vomiting

Treatment	Mechanism	Examples	Clinical Indications
Antiemetic agents	Antihistaminergic	Dimenhydrinate, meclizine	Motion sickness, inner ear disease
	Anticholinergic	Scopolamine	Motion sickness, inner ear disease
	Antidopaminergic	Prochlorperazine, droperidol	Medication-, toxin-, or metabolic-induced emesis
	5-HT ₃ antagonist	Ondansetron, granisetron	Chemotherapy- and radiation-induced emesis, post-operative emesis
Prokinetic agents	Tricyclic antidepressant	Amitriptyline, nortriptyline	Functional nausea
	5-HT ₄ agonist	Cisapride	Gastroparesis functional dyspepsia, gastroesophageal reflux disease, intestinal pseudoobstruction
	5-HT ₄ agonist and antidopaminergic	Metoclopramide	Gastroparesis, functional dyspepsia
	Motilin agonist	Erythromycin	Gastroparesis, ? Intestinal pseudoobstruction
Special settings	Peripheral antidopaminergic	Domperidone	Gastroparesis, functional dyspepsia
	Somatostatin analogue	Octreotide	Intestinal pseudoobstruction
	Benzodiazepines	Lorazepam	Anticipatory nausea and vomiting with chemotherapy
	Glucocorticoids	Methylprednisolone, dexamethasone	Chemotherapy-induced emesis
	Cannabinoids	Tetrahydrocannabinol	?Chemotherapy-induced emesis

Key Points

- Know Definitions
- Know Onset
- Always consider differential diagnosis
- Perform good H&P
- Remember chemoreceptor trigger zone
- Know pathophysiology when considering tx

Board Questions

Which restaurant did Steve develop food poisoning last year?

- A. Ruth Chris
- B. Café Metro
- C. Napa Valley
- D. White Castle
- E. Mortons

Assuming sour cream (not wine) was the culprit, which was most likely?

- A. C. Diff
- B. Rota virus
- C. Staph Aureus
- D. Salmonella
- E. Work overload

Which is a main area of input for the vomiting center?

- A. GI tract
- B. Chemoreceptor trigger zone
- C. Vestibular apparatus
- D. Cerebral cortex
- E. All of the above

What Country is this?

- A. Mexico
- B. Bolivia
- C. Peru
- D. El Salvador
- E. Argentina



Which of these cannot vomit?

■ A



■ C



■ B



■ D



Questions?

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Pregnancy

- Pregnancy-induced nausea- cause is unknown
- For nausea: ginger, vitamin B6
- For hyperemesis gravidarum: promethazine (phenergan, first-line agent); serotonin antagonists and corticosteroids (second-line agents)

Vestibular Nausea

- Histamine, acetylcholine
- Antihistamines and anticholinergics (equally effective)

Gastroenteritis

- Cause- dopamine, serotonin
- First-line agents: dopamine antagonists
- Second-line agents: serotonin antagonists
- Use in children is controversial

Postoperative Nausea and Vomiting

- Dopamine, serotonin
- Prevention: serotonin antagonists, droperidol (inapsine), dexamethasone
- Treatment: dopamine antagonists, serotonin antagonists, dexamethasone

Migraine Headache

- Dopamine (probably a primary mediator)
- For headache and nausea: metoclopramide (reglan) or prochlorperazine (compazine)
- For nausea: oral antiemetics, metoclopramide, prochlorperazine, serotonin antagonists