



## Chapter 26 - Nausea and Vomiting

### EPISODE CONTENT BASED ON ROSEN'S EMERGENCY MEDICINE (9TH ED.)

*Italicized text is quoted directly from Rosen's.*

#### Key Concepts:

1. Nausea and vomiting can result from a primary problem in the GI tract but can also be secondary to problems in the neurological, vestibular, urogenital, and cardiac systems.
2. Associated symptoms and a medication/drug history are the most helpful in narrowing the differential diagnosis in the acutely vomiting patient.
3. Laboratory studies are not required in all patients who vomit. Patients with severe or protracted vomiting, sufficient to require IV rehydration, should have their electrolytes and renal function determined and corrected.
4. In a patient with undifferentiated nausea and vomiting or vomiting due to non-obstructive GI disease, ondansetron is the first line antiemetic.
5. Although evidence is limited, metoclopramide is the antiemetic of choice in hyperemesis gravidarum and vomiting associated with headache; ondansetron is the drug of choice in chemotherapy induced vomiting.
6. Antiemetics should not be prescribed routinely in patients receiving opioid analgesia.

#### Core Questions

1. Define the following terms:
  - a. Nausea
  - b. Retching
  - c. Vomiting
2. Outline the neural pathway regulating nausea and vomiting.
3. List 6 potential sequelae of vomiting.
4. Outline an approach to the history in the patient complaining of nausea and vomiting.
5. Outline an approach to the physical exam in the nauseated and/or vomiting patient.
6. List 10 differential diagnoses for the vomiting patient.
7. What ancillary tests are indicated in the patient with nausea and/or vomiting?
8. List five antiemetics that can be used to treat the nauseous and vomiting patient.

#### Wisecracks

1. What are the three phases of vomiting?
2. What is Hamman's Sign and what pathology does it point to?



3. What medication is indicated in the patient with intractable chemotherapy-induced nausea and vomiting.

## Rosen's in Perspective

In the US, 4% of ED visits are for a chief complaint of nausea and vomiting. In this episode, we cover key aspects of this chief complaint, including the terminology, pathophysiology, associated sequelae, approach to history and physical exam, differential diagnosis, diagnostic workup, and treatment, and classic Rosen's trivia.

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## Core Questions:

### [1] Define the following terms:

- a. Nausea
- b. Retching
- c. Vomiting

- **Nausea**→ sensation that often precedes vomiting; nausea is associated with increased tone of the duodenum/jejunum with decreased gastric tone. Often, patients are noted to have hypersalivation, repetitive swallowing, and tachycardia.
- **Retching**→ recurrent rhythmic and synchronized contractions of the diaphragm, intercostal muscles, and abdominal muscles against a closed glottis WITHOUT emptying of gastric contents
- **Vomiting**→ forceful expulsion of the stomach contents secondary to contraction of the external obliques and abdominal rectus muscles, and the pylorus portion of the stomach. During this process, there is relaxation of the hiatus portion of the diaphragm, gastric fundus/cardia, and the upper esophageal sphincter.

### [2] Outline the neural pathway regulating nausea and vomiting.

The neurologic pathways that mediate nausea are not well described, but are postulated to mirror those that regulate vomiting. The neurologic pathways that mediate vomiting are well studied and are outlined below:

#### Afferents:

- Visceral afferents from the GI tract
- Visceral afferents outside of the GI tract (i.e., biliary system, peritoneum, pharynx, genitalia, and heart)
- Extramedullary CNS afferents (e.g., vestibular system)



- The chemoreceptor trigger zone (CTZ), located in the area postrema on the floor of the fourth ventricle

**Vomiting Centre:**

- Located in the lateral reticular formation of the medulla

**Efferents:**

- Vagus nerve
- Phrenic nerve
- Spinal Nerve

**Effectors:**

- Diaphragm
- Intercostal muscles
- Abdominal muscles
- Stomach
- Esophagus

**[3] List 6 potential sequelae of vomiting.**

*Please see Rosen's 9th Edition Table 26.1 - Potential Sequelae of Vomiting for further detail*

<b>Consequence</b>	<b>Aetiology</b>
Hypovolemia	Loss of sodium and water ions in vomitus
Metabolic Alkalosis	Loss of hydrogen ions in vomitus
Hypokalemia	Loss of K <sup>+</sup> in the urine
MW Tear	Forceful retching or vomiting causes a 1-4 cm tear in the mucosa and submucosa; the cause of 3% of deaths from UGI bleeds
Boerhaave's Syndrome	<ul style="list-style-type: none"> <li>● Perforation of the esophagus due to increased intraesophageal pressure during forceful retching and vomiting</li> <li>● There is free passage of esophageal contents into the mediastinum, causing chemical mediastinitis, leading to superinfection, sepsis, multi-organ failure, and death</li> <li>● Surgical emergency</li> <li>● Mortality rate 50% if no repair in 24 hours</li> </ul>
Aspiration Pneumonitis and Pneumonia	Think about this in patients with poor baseline neurological status and pulmonary findings after an episode of vomiting



**[4] Outline an approach to the history in the patient complaining of nausea and vomiting.**

A thorough history is required to elucidate the cause of a patient’s nausea and vomiting. Important points to dig into are:

1. Timing and duration of symptoms
2. Associated CVS/RESP/GI/GU/INFECTIOUS/NEURO complaints
3. Previous history of similar events
4. Characteristics of vomitus
5. Exposure to undercooked meats, street foods, well or untreated water
6. Medications history
7. Social history elucidating use of intoxicants or herbal supplements/natural remedies

*Please see Rosen’s 9th Edition Table 26.5 - Differential Diagnosis Based on Contents of Vomitus for further detail*

<b>Color/Content of Vomitus</b>	<b>Diagnoses</b>	
Bright Red Blood	<ol style="list-style-type: none"> <li>1. PUD</li> <li>2. Gastritis</li> <li>3. Esophageal Varices</li> <li>4. Aortoenteric Fistula</li> <li>5. Esophageal Rupture</li> </ol>	<ol style="list-style-type: none"> <li>6. Duodenal or Gastric Tumors</li> <li>7. MW Syndrome</li> <li>8. Dieulafoy’s Lesion</li> <li>9. Foreign Body</li> </ol>
Coffee Grounds	<ol style="list-style-type: none"> <li>1. PUD</li> <li>2. Gastritis</li> <li>3. Esophageal Varices</li> </ol>	<ol style="list-style-type: none"> <li>4. Duodenal or Gastric Tumors</li> <li>5. MW Syndrome</li> </ol>
Undigested Food	<ol style="list-style-type: none"> <li>1. Gastric Outlet Obstruction</li> <li>2. Achalasia</li> </ol>	<ol style="list-style-type: none"> <li>3. Esophageal Stricture</li> <li>4. Foreign Body</li> </ol>
Feces	<ol style="list-style-type: none"> <li>1. SBO</li> </ol>	<ol style="list-style-type: none"> <li>2. LBO</li> </ol>
Bilious (adults)		



**[5] Outline an approach to the physical exam in the nauseated and/or vomiting patient.**

Medicine is a clinical science. Remember that a thorough physical examination is essential to determine what is causing this patient’s nausea and vomiting. Consider interrogating the following systems in these patients:

1. CNS
2. CVS
3. RESP
4. GI
5. GU

*Please see Rosen’s 9th Edition Table 26.6 - Physical Examination of the Patient With Nausea and Vomiting for further detail*

<b>Organ System</b>	<b>Finding: Suggested Diagnoses</b>
General	<b>Poor Skin Turgor, Dry Mucous Membranes:</b> Dehydration
Vital Signs	<b>Fever:</b> Gastroenteritis, cholecystitis, appendicitis, hepatitis, bowel perforation <b>Tachycardia, Orthostatic Changes:</b> Dehydration
HEENT	<b>Nystagmus:</b> Labrynthitis, vertebrobasilar insufficiency, cerebellar infarct or bleed, CPA tumor <b>Papilledema:</b> Increased ICP from CNS tumor or bleeding
Neck	<b>Goiter:</b> Thyroid Disease
Lungs	<b>Rales:</b> Pneumonia
Heart	<b>Arrhythmia, Murmur:</b> Acute MI or other cardiac pathology
Abdomen	<b>Abdominal Distention:</b> Bowel obstruction, gastroparesis <b>Peristaltic Waves:</b> Gastric outlet obstruction <b>High-pitched Bowel Sounds:</b> Bowel obstruction <b>Decreased Bowel Sounds:</b> Ileus <b>Hernias or Surgical Scars:</b> Possible bowel obstruction <b>Peritoneal Signs:</b> Appendicitis, cholecystitis, perforated viscus
Neurologic	<b>AMS, Cerebellar Findings, Cranial Nerve Findings:</b> CNS pathology



**[6] List 10 differential diagnoses for the vomiting patient.**

*Please see Rosen's 9th Edition Table 26.4 - Differential Diagnosis of Nausea and Vomiting for further detail*

<b>Aetiologic Category</b>	<b>Critical Diagnoses</b>	<b>Emergent Diagnoses</b>	<b>Non Emergent Diagnoses</b>
GI	Boerhaave's Syndrome Ischemic Bowel GI Bleeding Ruptured Viscus Cholangitis	Gastric Outlet Obstruction Pancreatitis Cholecystitis Bowel Obstruction/Ileus Appendicitis Peritonitis SBP	Gastritis Gastroparesis PUD IBD Biliary Colic Hepatitis Gastroenteritis Food Poisoning IBS
Neurologic	Intracerebral Bleed Meningitis	Meningitis CNS Tumor	Migraine
Vestibular	Cerebellar infarct	Raised ICP Suppurative Labyrinthitis	BPPV
Endocrine	DKA	Adrenal Insufficiency Uremia	Thyroid Disorder
Pregnancy	N/A	Hyperemesis Gravidarum	Nausea and Vomiting of Pregnancy
Drug Toxicity	Acetaminophen ASA	Digoxin Theophylline	N/A
Therapeutic Drug Use	N/A	N/A	ASA Antibiotics Erythromycin Ibuprofen Chemotherapy
Drugs of Abuse	N/A	Alcohol Withdrawal	Narcotics Narcotic Withdrawal Alcohol
Genitourinary	Gonadal Torsion	N/A	UTI Nephrolithiasis
Miscellaneous	MI Sepsis Organophosphate Poisoning	CO Poisoning Electrolyte Disorders	Motion Sickness Labyrinthitis



## [7] What ancillary tests are indicated in the patient with nausea and/or vomiting?

The ancillary tests you order for the nauseated and vomiting patient are dictated by the history and physical examination. Many patients do not require any ancillary tests. However, consider the following tests in specific clinical scenarios:

- **Electrolytes and renal function:** protracted or severe vomiting; anticipate hypokalemic hypochloremic metabolic alkalosis or prerenal AKI
- **Lipase:** nausea, vomiting, and severe epigastric pain
- **Urine pregnancy test:** all women of childbearing age
- **Urinalysis + C/S:** sxS consistent with UTI, urolithiasis, or DKA.
- **Liver function test +/- ammonia:** sxS c/w hepatitis or biliary disease (ammonia may be useful if liver failure is suspected)
- **Serum drug levels:** if suspected digoxin, ASA, or acetaminophen use/overdose.
- **Abdominal US:** sxS of cholelithiasis, cholecystitis, renal colic, appendicitis, SBO, or hypovolemia (looking directly at the IVC)
- **Abdominal CT:** sxS of SBO, appendicitis, or other surgical cause of their nausea and vomiting.
- **Head CT or MRI:** sxS c/w intracranial etiology
- **Chest imaging (CXR or CT):** suspicion of perforated viscus or Boerhaave's Syndrome.



**[8] List five antiemetics that can be used to treat the nauseous and vomiting patient.**

*Please see Rosen's 9th Edition Table 26.7 - Commonly Used Medications for the Treatment of Nausea and Vomiting for further detail*

Medication	Class	Site of Antiemetic Action	Dosage	Adverse Effects
Ondansetron	Serotonin Antagonist	5-HT <sub>3</sub> in CTZ and vagus nerve terminal in the GI tract	4-8 mg IV single dose; may go up to 16 mg	Headache, dizziness, and MSK pain
Metoclopramide	Dopamine and Serotonin Antagonist	D <sub>2</sub> and 5-HT <sub>3</sub> in the CTZ; D <sub>2</sub> in stomach and LES	10-20 mg IM or IV, may repeat every 6 hours	Dystonic reaction, tardive dyskinesia, NMS, drowsiness, diarrhea
Prochlorperazine	Dopamine Antagonist	D <sub>1</sub> and D <sub>2</sub> in the CTZ	5-10 mg IM or PO; 2.5-10 mg IV q4 hrs PRN; 25 mg by rectum q12 hrs as needed	Lethargy, hypotension, EPS, dystonic reactions, sedation, and feelings of restlessness  Rarely NMS, blood dyscrasias, and cholestasis
Promethazine	Antihistamine	H <sub>1</sub> in the CTZ, minimal D <sub>2</sub>	12.5-25 mg IV/PO/IM/PR q4 hrs PRN	Extravasation may cause severe tissue injury  Sedation, dry mouth, dizziness, blurred vision
Dimenhydrinate	Antihistamine	H <sub>1</sub> in GIT and CTZ	25-50 mg IV/PO/IM q6hrs PRN	Drowsiness, lightheadedness



## Wisecracks:

### [1] What are the three phases of vomiting?

Answer:

1. Nausea
2. Retching
3. Vomiting

### [2] What is Hamman's Sign and what pathology does it point to?

Answer:

- **Hamman's Sign**→crunching sound that is synchronized with each heartbeat indicative of air in the mediastinum. May be found in the setting of pathologies, but should trigger concern for Boerhaave's Syndrome in a patient with nauseated and vomiting.

### [3] What medication is indicated in the patient with intractable chemotherapy-induced nausea and vomiting.

Answer:

Dexamethasone 10 mg IV x 1, if refractory to multiple doses of antiemetics (typically ondansetron if chemo-induced emesis)