

## VOMITING

### 1. General Presentation

#### Background

##### Definition

Vomiting is an organized, autonomic response that ultimately results in the forceful expulsion of gastric contents through the mouth.

##### Why is it important?

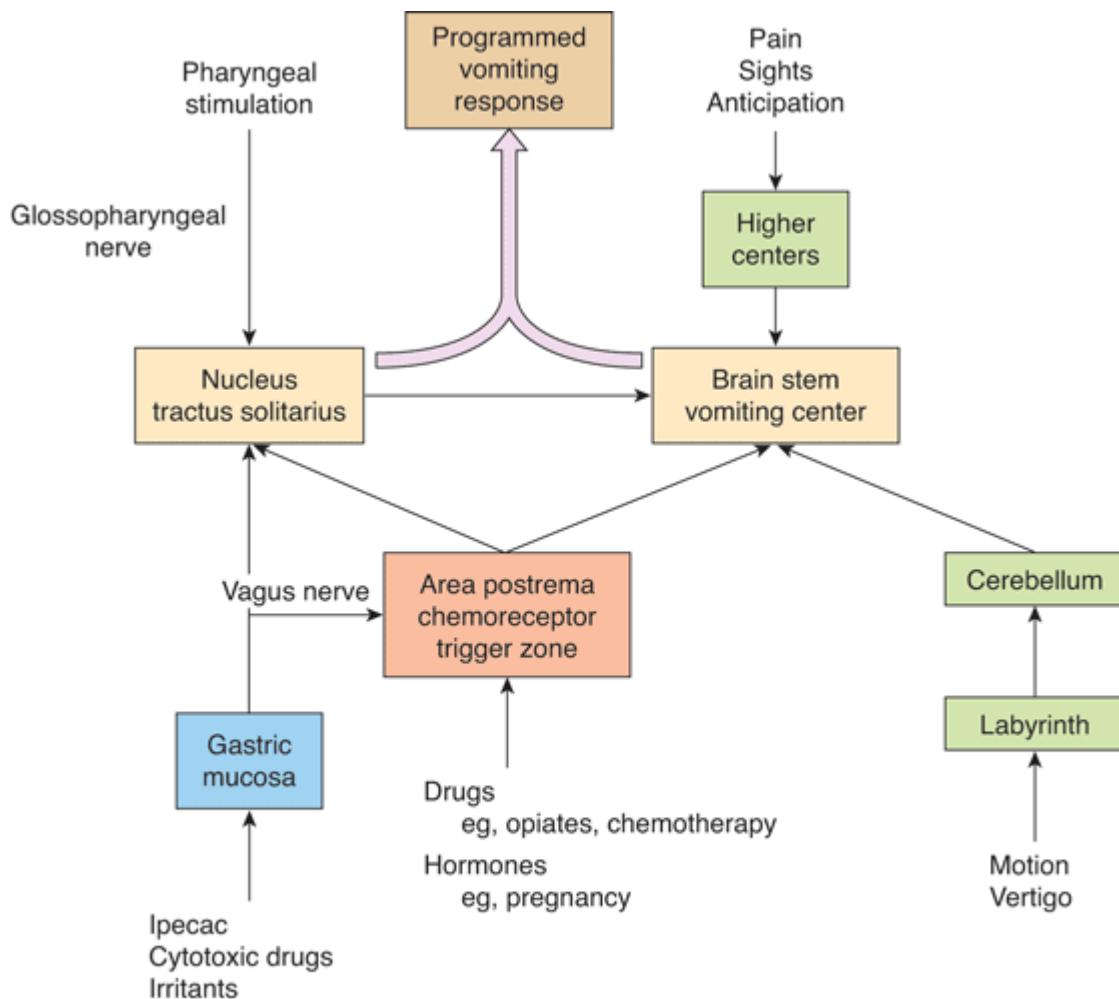
Vomiting in children is most commonly acute infectious gastroenteritis; however, vomiting is a nonspecific symptom and may be initial presentation of serious medical conditions including infections (meningitis, septicemia, urinary tract infection); anatomical abnormalities (malrotation, obstruction, volvulus) and metabolic disease. Persistent and severe vomiting, if untreated, may result in clinically significant volume depletion and electrolyte disturbances.

#### Basic Anatomy and Physiology

##### Why / How does this occur in children?

Vomiting is a coordinated autonomic response involving neural, hormonal, and muscular responses generated by the reticular formation of the medulla that consists of several scattered groups of neurons. The vomiting response may be triggered by peripheral and central stimuli (see figure 1). In particular, the *area postrema* in the medulla (unprotected by the blood brain barrier) samples peripheral blood and cerebrospinal fluid and likely causes vomiting associated with metabolic disorders and hormones.

Once the vomiting response is triggered, a pattern of somatic muscle action occurs with abdominal, thoracic, and diaphragm muscles contracting against a closed glottis. The resulting increased intra-abdominal pressure reverses the negative pressure of the esophagus and forces gastric contents upwards. The vomiting response also alters intestinal motility by generating a retroperistaltic contractile complex that moves intestinal contents towards the esophagus.



Source: Barrett KE, Barman SM, Boitano S, Brooks H: *Ganong's Review of Medical Physiology*, 23rd Edition: <http://www.accessmedicine.com>

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### Classification

- Spitting up: small volumes (usually < 5-10 mL) of vomit during or shortly after feeding, often when being burped; typically caused by rapid/overfeeding and air swallowing
- Infant regurgitation: vomiting occurring ≥ 2 times per day for at least 3 weeks in the first 1-12 months of life in an otherwise healthy infant; often transient in nature and due to immature gastrointestinal tract

### Central

- Vestibular - motion-sickness and vertigo
- Infectious - gastroenteritis, septicemia, non-GI infections
- Cortical - pain, strong emotions, smell, taste
- Drugs - chemotherapy, opiates
- Hormonal - pregnancy

- Metabolic - acidosis, uremia, hyperthyroidism, hypercalcemia, adrenal disorders

Peripheral

- Pharyngeal stimulation
- Gastric mucosal irritation
- Gastric and intestinal distension

## 2. History

- History of presenting illness
  - Characteristics of vomitus
    - Smell
    - Quantity
    - Colour
    - Blood - bright red/dark red/coffee-ground
    - Biliious
  - Timing
    - Onset
    - Duration
    - Frequency
    - Time of day
    - Triggers
  - Associated symptoms
    - Diarrhea
    - Fever
    - Abdominal pain/distension
    - Anorexia
    - Stool frequency
    - Urinary output
    - Headache
    - Vertigo
    - Lethargy
    - Stiff neck
    - Cough
    - Sore throat
- Past medical history
  - Chronic illnesses (diabetes)
  - Travel history (infectious gastroenteritis)
  - Sexual history (pregnancy)
    - Ineffective use of birth control
    - Last menstrual period
  - Recent head trauma
  - Toxin exposure

- Medications
- Allergies

### 3. Differential Diagnosis: Common causes of vomiting by age group

Age	Acute	Chronic
Infant 1 month to 1 year	Gastroenteritis Pyloric stenosis Hirschsprung's disease Acutely evolving surgical abdomen <ul style="list-style-type: none"> <li>• Congenital atresias and stenosis</li> <li>• Malrotation</li> <li>• Intussusception</li> </ul> Sepsis and non-GI infection Metabolic disorders	Gastroesophageal reflux disease Food intolerance Congenital atresias and stenosis Malrotation Intussusception
Children and adolescents	Gastroenteritis Appendicitis Sepsis and non-GI infection Metabolic disorders Pregnancy Toxic ingestion	Gastroesophageal reflux disease Gastritis Food intolerance Cyclic vomiting Intracranial hypertension Inborn errors of metabolism Eating disorders

### 4. Physical exam findings

- Vitals
  - Fever – sign of infection
  - Hypotension, tachycardia – volume loss
- Inspection
  - Consciousness - intracranial hypertension, meningitis, metabolic disorders, toxic ingestion
  - Weight loss – eating disorders, obstruction
- Head and Neck
  - Red, bulging tympanic membrane – ear infection
  - Bulging anterior fontanelle and nuchal rigidity – meningitis

- Erythematous tonsils – upper respiratory tract infection
- Cardiovascular system
  - Tachycardia – infection, dehydration
- Abdominal exam
  - Abdominal distention – obstruction, mass, congenital abnormality, organomegaly
  - Bowel sounds – high pitched tinkle (obstruction), absent (ileus)
  - Guarding, rigidity, rebound tenderness – appendicitis, peritoneal inflammation
- Skin and extremities
  - Petechiae or purpura – serious infection
  - Skin turgor, capillary refill – dehydration
  - Jaundice – metabolic disorder
  - Rashes – food intolerance, viral infection

**Red flags:** The following findings are of particular concern:

- Lethargy and listlessness
- Inconsolability and bulging fontanelle in an infant
- Nuchal rigidity, photophobia, and fever in an older child
- Peritoneal signs or abdominal distention ("surgical" abdomen)
- Persistent vomiting with poor growth or development

## 5. Procedure for Investigation (this will be based on the differential diagnosis)

Condition	History and Physical	Diagnostic approach
Gastroenteritis	Diarrhea (usually), history of infectious contact, fever (sometimes)	Clinical evaluation
GERD	Fussiness after feeding, poor weight gain	Empiric trial of acid suppression
Pyloric stenosis	Recurrent projectile vomiting in neonates aged 3-6 weeks, emaciated and dehydrated	Ultrasound
Congenital atresia or stenosis	Abdominal distension, bilious emesis in first 24-48 hours of life	Abdominal X ray Contrast enema
Malrotation	Bilious emesis, abdominal distention, abdominal pain,	Abdominal X ray Upper GI series with contrast under

	bloody stool	fluoroscopy
Sepsis	Fever, lethargy, tachycardia, tachypnea, widening pulse pressure, hypotension	CBC, Cultures (blood, urine, CSF)
Food intolerance	Abdominal pain, urticarial, eczematous rash	Elimination diet
Metabolic disorders	Poor feeding, failure to thrive, hepatosplenomegaly, jaundice, dysmorphic features, developmental delays, unusual odors	Electrolytes, ammonia, liver function tests, BUN, creatinine, serum glucose, total and direct bilirubin, CBC, PT/PTT  Further specific tests based on findings
Non-GI infection	Fever, localized findings (sore throat, dysuria, flank pain) depending on source	Clinical evaluation  Further tests if needed
Serious infection	Meningitis <ul style="list-style-type: none"> <li>• photophobia, nuchal rigidity, headaches</li> </ul> Pyelonephritis <ul style="list-style-type: none"> <li>• fever, back pain, dysuria</li> </ul>	CBC, Cultures (CSF, blood, urine) gram stains  CBC, Cultures (urine, blood)
Cyclic vomiting	At least 3 self-limited episodes of vomiting lasting 12 h, 7 days between episodes, no organic cause of vomiting	Diagnosis of exclusion
Intracranial hypertension	Nocturnal wakening, progressive recurrent headache made worse by coughing or Valsalva maneuver, nuchal rigidity, visual changes, weight loss, photophobia	Brain CT (without contrast)
Eating disorders	Body dysmorphism, teeth erosions, skin lesions on hand (Russell's sign), binge eating behavior	Clinical evaluation
Pregnancy	Amenorrhea, morning sickness, breast tenderness, bloating, history of sexual activity and improper contraception use	Urine pregnancy test
Toxic ingestion	History of ingestion, findings vary	Varies depending on substance

	depending on substance and pattern of ingestion	
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## 6. Conclusion

Vomiting is a symptom that can be caused by a variety of conditions that affect different organ systems. When evaluating a child with vomiting it is important to identify conditions in which immediate medical intervention is needed.

The most common causes of vomiting are age dependent and can cross over age ranges (see the above table for differential diagnosis based on age). If a child has prolonged vomiting (>12 hours in a neonate, >24 hours in children younger than two years of age, or >48 hours in older children) they should have appropriate investigations.

If a patient displays any of the following red flags, it is important to watch them carefully and have a low threshold for intervention:

- Lethargy and listlessness
- Inconsolability and bulging fontanelle in an infant
- Nuchal rigidity, photophobia, and fever in an older child
- Peritoneal signs or abdominal distention ("surgical" abdomen)
- Persistent vomiting with poor growth or development

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