VOMITING IN PEDIATRIC PATIENTS

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Objectives

- Understand basic pathophysiology of vomiting
- Develop a basic differential for vomiting in different age groups
- Recognize life threatening causes of vomiting
- Develop initial plan for evaluation of vomiting in different aged patients

Vomiting

- Vomiting: forceful oral expulsion of gastric contents associated with contraction of the abdominal and chest wall musculature
- Vomiting is a challenging problem to evaluate as there are many different causes and organ systems involved or causing vomiting

Physiology of vomiting

- Vagal afferents:
  - Overdistension
  - Obstruction
  - Mucosal irritation
  - Food poisoning
  - Cytotoxic Drugs
  - Radiation

Physiology of Vomiting

- Area postrema- Chemoreceptor Trigger Zone
  - Permeable area of BBB
  - Systemic chemicals induce vomiting

Ondansetron = Selective 5-HT3-receptor antagonist
Physiology of vomiting

- Vestibular system:
  - Motion sickness
  - Vestibular (semicircular canal) movement contradicting visual sensations

Vomiting

- Vomiting is a symptom of underlying problem
- No ALGORITHM for vomiting
- Important to have a solid differential for vomiting
- In pediatrics, the differential for vomiting is different between age groups.
Vomiting in Neonates

- Gastroesophageal Reflux
  - Associated with feeding
  - Non-bilious
  - Appears to “roll out of mouth”
  - Generally happy and otherwise asymptomatic
  - Some infants can be fussy

Sandifer Syndrome

- Pyloric Stenosis
  - Non-bilious vomiting
  - 3 – 6 week old infants
  - Males > Females
  - Prominent in first child
  - Family History
  - Associated with feeding
  - “Projectile”
  - Appear Hungry
  - Decreased stooling
  - Palpable olive

Electrolyte Abnormalities:
- Cl: Decreased
- K: Decreased
- CO2: Increased

Vomiting in Neonates

- Duodenal Atresia
  - Non-bilious vomiting mostly
  - Associated with Downs Syndrome
  - Abdominal distension
  - Can be associated with other congenital anomalies

Vomiting in Neonates

- Malrotation/Volvulus
  - Bilious emesis
  - Abnormal development of midgut
  - “Acute Abdomen”
  - Obstruction
  - Bowel ischemia
  - Intestinal perforation
  - Shock
  - Sepsis

Vomiting in Neonates

- Intestinal Malrotation

Vomiting in Neonates

- Adrenal Insufficiency
  - Congenital Adrenal Hyperplasia
    - 21-hydroxylase deficiency
    - Increased androgens
    - Decreased cortisol and aldosterone
  - Clinical Presentation
    - Non-bilious emesis
    - Shock
    - Hypotension
    - Septic
Vomiting in Neonates

- Adrenal Insufficiency
  - Decrease in Aldosterone:
    - Sodium down
    - Potassium up
  - Decrease in Cortisol
    - Hypotension
    - Hypoglycemia
  - Increase in Androgens
    - Ambiguous genitalia

Inborn errors of metabolism
- Organic aciduria
- Urea cycle disorders

Presentation
- Non-bilious vomiting
- Lethargy
- Dehydration
- Hypotension/Shock
- Hypoglycemia

Vomiting in Infants/Young Children

- Gastroenteritis
  - Mostly viral etiology
    - Rotavirus
    - Calicivirus
    - Adenovirus
    - Entero adenovirus
  - Highest incidence in children less than 5 years
    - Even higher in 3 month – 2 year olds

- Clinical Exam:
  - Dehydration
    - Tachycardia
    - Increased Capillary Refill time
  - Increased skin turgor
  - Hypotension
  - Lethargy
Vomiting in Infants

- Intussception
  - Bilious emesis
  - Intestinal obstruction
  - Peak age 3 months – 3 years
  - Presentation
    - Severe, intermittent abdominal pain
    - Generally act normally between episodes initially
    - As disease process worsens patient will have increased somnolence
    - Bloody Stools (Currant Jelly)

Vomiting in Infants/Young Children

- Increased Intracranial Pressure
  - Mass
  - Bleed
    - Trauma
    - Coagulopathy
  - Hydrocephalus-obstructive
  - Clinical Presentation
    - Abnormal behavior
    - Bulging fontanelle
    - Increasing head size
    - Scalp swelling
    - Focal neurologic signs
    - Seizures

- Infectious Etiologies
  - Gastroenteritis
  - Strep Pharyngitis—generally above the age of 3
  - Urinary Tract Infection
  - Meningitis
  - Sepsis

Vomiting in Infants/Young Children

- Increased ICP
  - Epidural Hematoma
  - Subdural Hematoma
  - Hydrocephalus

- Metabolic
  - Adrenal Insufficiency
  - Insulin Dependent Diabetes Mellitus
    - Clinical Presentation
      - Weight loss
      - Polyuria, polydypsia
      - Lethargy
      - Abdominal Pain
    - Evaluation
      - Dehydration
      - Hyperglycemia
      - Acidosis
Vomiting in Infants/Young Children

- Toxic Ingestions
  - Medications
  - Drugs
  - Cleaning agents
- Foreign Bodies
  - Button battery
  - Coin
  - Etc.

Vomiting in Adolescents

- Appendicitis
  - Increased incidence in 2nd decade of life
  - Clinical Presentation
    - Non-bilious vomiting
    - Abdominal pain
      - Periumbilical
      - Moves to Right Lower Quadrant
    - Fever
    - Anorexia

Vomiting in Adolescents

- Pregnancy
  - Fertile Female = pregnancy test
  - Non-bilious emesis
  - Abdominal pain
    - Ectopic
    - PID
    - TOA

Vomiting in Adolescents

- Intracranial mass
  - Non-bilious vomiting
  - Not necessarily associated with nausea
  - Early morning
  - Waking at night with headaches
  - Focal neurologic signs
  - Behavioral changes
  - Grades going down

Questions

Stand by Me
Case #1

- 3 day old male
- Discharged last night from hospital
- Parents concerned because he has vomited 6 times today, has only taken about 1 ounce of formula and is difficult to wake up.

Differential Diagnosis
- Infectious
- GI
- GU
- CNS
- Metabolic

HPI:
- Vomited in hospital, changed to alimentum formula, seemed to not vomit as much
- Today, more vomiting, now appears green
- Not wanting to eat, refuses to latch to bottle
- Sleeping a lot more and seems difficult to arouse for feeding
- Concerned that his abdomen is “pooching out”

PMHx/Birth History
- FT: 39 weeks
- G2P2 mother
- Prenatal care since 8 weeks
- Multiple US that were normal
- No infections
- GBS negative
- Apgars 8/9
- Vomited a few times in hospital, changed to alimentum
- Stool x 1 in hospital

Social History:
- Lives with parents
- No drugs, alcohol during pregnancy
- Medications: None
- Allergies: NKDA
- ROS: otherwise negative

Vital signs:
- Weight: 2890 (~50th percentile)
- HR 186 RR 66 BP 86/45 SaO2 96

Interpret Vital Signs:
- Tachycardic
- Tachypneic
- Normotensive
### Case #1

- **General:** Sleepy, wakes slowly, cries with exam
- **HEENT:** AFO, PERRLA, EOM, sutures approximated. MM tachy.
- **CV:** Tachycardia, no m/g/r. Nml S1S2. Upper/Lower pulses 2+
- **Lungs:** Tachypneic, good aeration, no rales, wheezes

### Case #1

- **Abdominal exam:**
  - Tense, cries wherever palpated.
  - High pitched bowel sounds

### Case #1

- **GU:** Normal male, testes descended bilaterally
- **Skin:** CR ~4 seconds. Normal turgor, no rash.
- **EXT:** MAE, hands/feet a little cool

### Case #1

- **Differential Diagnosis:**
  - Bowel obstruction:
    - Volvulus
    - Intestinal atresia
    - Hirschprung
    - NEC
    - Mass
  - Sepsis
  - Metabolic

### Case #1

- **Diagnostics:**
  - XRAY
  - Labs
- **Interventions**
  - PIV
  - IV Fluids
  - Gastric decompression
  - Monitor airway closely

- **Diagnosis:** Bowel obstruction
- **Management:**
  - UGI
  - Definitive surgical care
Case #2

- 4d old male
- Born at home
- Limited prenatal care
- No newborn screens obtained
- Parents bring in today because he has vomited multiple times and is sleeping a lot.
- Very difficult to wake up

Differential
- Sepsis
- Sepsis
- Sepsis
- Bowel obstruction
- Metabolic abnormality

Case #2

PMHx/Birth Hx
- 35 yr female
- G1P1
- A few visits with a clinic while pregnant
- No ultrasounds
- No infections
- GBS negative
- Born at home with midwife, no immediate concerns noted at birth.
- Weight: 2700 grams
- Apgars 9/9

Vital signs
- Weight: 2340 grams
- Temp: 96.2 F
- HR: 180
- RR: 65
- BP: 62/24
- SaO2: 92

Please interpret
- Hypothermic
- Tachycardia
- Tachypnea
- Hypotensive

Case #2

Exam:
- Sleepy, whines a little when removed from blanket and examined
- HEENT: AF sunken, PERRLA, EOMI, +icterus
- CV: Tachycardia, no m/g/r. Pulses 1+ x 4
- Lungs: CTA
- Abd: soft, NT, slightly distended, no mass, no HSM
- GU: nmI male
- EXT: cool to touch
- Skin: CR ~5 sec

What’s wrong?
- Shock

What next?
- CAB
- Airway:
  - Stable
- Breathing:
  - Tachypneic
- Circulation
  - Poor
Case #2

**Interventions**
- Oxygen
- PIV
- What do you do if no PIV available?

**Diagnosis**
- Congenital Adrenal Hyperplasia

**Treatment**
- Hydrocortisone
- Fluid resuscitation
- Dextrose
- Pressor support
- Respiratory Support

**Case #3**

**3 year old male**
- Diarrhea 2-3x per day for 3 days
- Abdominal pain, worse today.
- Started vomiting today, last emesis was light green

**Differential**
- Bowel obstruction
- Gastroenteritis
- Sepsis

**Vital signs**
- Wt: 18 kg
- Temp: 39.5 C
- HR: 160
- RR: 22
- BP: 95/65
- SaO2: 95

**Interpret:**
- Febrile
- Tachycardic
- Normotensive

**Celsius to Fahrenheit**
- 38 = 100.4
- 38.5 = 101.3
- 39 = 102.2
- 39.5 = 102.1
- 40 = 104.0
Case #3

**Exam:**
- Curled up in ball on bed, fussy
- HEENT: TMs WNL. PERRLA. MMR. Tonsils 1+, no exudate.
- Neck: no nodes. No meningismus
- CV: tachycardic
- Lungs: CTA
- Abd: Decreased Bowel Sounds, firm, diffusely TTP. + involuntary guarding. + rebound
- Gl: nml male
- Ext: Warm, well perfused

**ABCs:** Stable

**Labs:**
- CBC: WBC 18 11/33 Platelets 300
  - Segs: 70
- BMP: Na 135/ K 4.8/Cl 100/CO2 14/Gluc 89

**Interventions**
- PIV
- IVF
  - What, how much, how fast

**Differential Diagnosis**
- Bowel obstruction
- Appendicitis
- Sepsis

**Further management**
- Stabilize hemodynamics
- Surgical Consult
- Appendicitis uncommon at this age, but, most of the time it is missed early and these patients regularly get picked up after rupture
- HIGH INDEX OF SUSPICION

**XR Abdomen**

**CT Abdomen**

**References**
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- www.utdol.com
- www.medscape.com