Oh no, he's vomiting... again!

Nicole Baltrushes MD
Pediatrics Cycle 7
Meet RZ

RZ is a 6 yo M who presents with vomiting and abdominal pain x 3 days.

HPI:
Patient was feeling well otherwise but started to have decreased appetite, low energy, and nausea 3 days prior. Patient began vomiting, mother gave him benadryl without any relief. He was not tolerating any solids and progressively was not tolerating water and began having worsening abdominal pain when mom brought him to ED. No Headache, no fever, no projectile vomiting, NO diarrhea, unknown last BM, h/o constipation, no SOB, no CP, no gait problems
Why do Children vomit?

DDX
**DDX**

**Medications**
- Analgesics
- Cardiovascular Meds
- Diuretics
- Antibiotics/antivirals
- Tox
  - marijuana
  - alcohol
  - other

**GI**
- Obstruction: gastric outlet obstruction, SBO
- Functional GI disorders
- Gastroparesis
- Non-ulcer dyspepsia
- IBS
- GI malignancies
- Pancreatic CA
- PUD
- Cholecystitis/lithiasis/dyskinesia
- Pancreatitis
- Crohn's Disease
- Mesenteric ischemia
- Peritoneal fibrosis
- Recurrent subacute appendicitis
- Duodenal atresia
- Choledochal cysts
- GI infection
- Cyclic vomiting syndrome

**Neuro**
- Increased ICP: CA, hemorrhage, infarction, abscess, meningitis, malformation, hydrocephalus, pseudotumor cerebri
- Seizure disorder
- Demyelinating disorder
- Migraine/abdominal migraine
- Psychiatric: psychogenic, anxiety, depression, pain, Anorexia nervosa, Bulimia nervosa
- Labrynthine disorders: BPPV, motion sickness, labrynthitis, tumors, Meniere disease, chronic sinusitis

**Endocrine/Metabolic**
- Uremia
- DKA
- Hyper/Hypoparathyroidism
- Addison's disease
- Acute intermittent porphyria
- Post-op n/v

**Uro/gyn**
- Urolithiasis
- UPJ obstruction
- Pyelonephritis
- Ovarian Cyst
- Pregnancy
- PMS

**Miscellaneous**
- MI
- CHF
- Starvation

**Tox**
- Marijuana
- Alcohol
- Other
PMH
-Since October 2012: 3 prior admissions for vomiting/abdominal pain.

1. fever, abdominal pain, vomiting, dehydration- admit 3 days, IVF, zofran --> resolved
NORMAL HAPPY

2. fever, cough, abdominal pain, vomiting, -admit 10 days, TPN, zofran, pain meds, phenergan-->resolved
NORMAL HAPPY

3. no fever, lethargy, poor PO, abdominal pain, vomiting- admit 12 days, TPN, zofran, lorazepan --> resolved
Normal Happy
PSH - none, Allergies NKDA,
Meds - amitriptyline, benadryl PRN
FH - mom/grandma with migraines
SH - lives with mom sister, several other adults, no known drug use, does well in school, well liked by peers, h/o sexual abuse by mom's BF 4/2013-unknown details
Physical Exam on Current Admit

BP 103/51 | Pulse 105 | Temp 98.5 °F (36.9 °C) | Resp 22 | Wt 20.865 kg (46 lb) | SpO2 100%

General: Sleeping restfully but arouses easily.
Head: normocephalic
Eyes: normal eye exam
Ears: TMs clear bilaterally
Nose: normal external appearance
Neck: supple, full range of motion
Chest/Breast: no chest wall deformities
Lungs: respiratory effort normal - no retractions, normal air exchange, lungs clear bilaterally
Cardiovascular: regular rate and rhythm, normal S1/S2, no murmurs
Abdomen: soft, non-tender, no masses, no hepatosplenomegaly
Lymphatic: no adenopathy noted
Neuro: alert and oriented, grossly normal, moves all extremities symmetrically

Skin: normal skin exam. Well hydrated
work up....what do you want??
results

Imaging:
KUB- normal, but increased stool in colon
Abdominal US- The liver demonstrates a homogeneous echogenicity without evidence of focal lesions. No evidence of intra or extrahepatic biliary duct dilatation. The gallbladder is unremarkable. There is no hydrenephrosis. Visualization of the pancreas is limited, however no abnormalities are detected. The spleen is unremarkable. The bladder is unremarkable. Small amount of free fluid is seen posterior to the bladder.
Head CT-Head CT: No acute intracranial pathology
UGI-SBFT-Normal upper GI and small bowel follow-through. No evidence for malrotation or small bowel obstruction
Exam:
dilated ophthalmic exam
Labs:
CMP, CBC, ESR, CRP, lipase, stool studies (O&p, giardia, Cx, fat, helminth, ph reducing substance), GGT, amylase, lead, asa, drug screen, ASO titer, C3 complement, hep panel, LFTs, UA, UCx
DDX...after w/u

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- GI infection
- constipation
- cyclic vomiting syndrome

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**Miscellaneous**
- MI
- CI IF
- Starvation
What more work up would you do?

What's left:
Cyclic Vomiting Syndrome

First described in France 1861 with criterion:

- Three or more recurrent discrete episodes of vomiting
- Varying intervals of completely normal health between episodes
- Episodes are stereotypical with regard to timing of onset, symptoms, and duration
+ Absence of an organic cause of vomiting

Supportive criteria: family hx migraine, symptoms: nausea, abdominal pain, HA, motion sickness, photophobia, and lethargy, and associated signs of fever, pallor, diarrhea, dehydration, excess salivation, and social withdrawal. In children, nausea and possibly lethargy are considered to be key diagnostic features
Cyclic vomiting Syndrome: DX

**Rome III criteria** — Rome III criteria include the presence of all of the following [41]:
- Stereotypical episodes of vomiting regarding onset (acute) and duration (less than one week)
- Three or more discrete episodes in the prior year
- Absence of nausea and vomiting between episodes

The criteria should be fulfilled for the last three months with symptom onset at least six months before diagnosis.

Supportive criteria include:
- History or family history of migraine headaches.

**North American Society for Pediatric Gastroenterology Hepatology and Nutrition** — A consensus statement issued by the North American Society for Pediatric Gastroenterology Hepatology and Nutrition (NASPGHAN) suggests the following diagnostic criteria (all of which must be met) [4].

These recommendations apply to children and adolescents:
- At least five attacks in any interval, or a minimum of three attacks during a six-month period
- Episodic attacks of intense nausea and vomiting lasting 1 hour to 10 days and occurring at least one week apart
- Stereotypical pattern and symptoms in the individual patient
- Vomiting during attacks occurs at least four times per hour for at least one hour
- Return to baseline health between episodes
- Not attributed to another disorder
Cyclic Vomiting Syndrome

Epidemiology:
1.6 % of 2165 school age children in Scotland met criteria for CVS
-age at diagnosis= 9y, symptoms onset @5y
Children have 12 cycles/year

Natural History
75 percent of children with CVS will go on to develop migraine headaches by age 18
One retrospective study of 51 children followed for up to 13 years found that vomiting resolved in 60 percent. However, 42 percent continued to have regular headaches and 37 percent had abdominal pain; these features were present even in patients whose vomiting had resolved.
# Clinical/epidemiological features of cyclic vomiting syndrome

<table>
<thead>
<tr>
<th>Feature</th>
<th>Characterization</th>
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<tbody>
<tr>
<td>Female: male ratio</td>
<td>55:45</td>
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<tr>
<td>Age of onset</td>
<td>5.3 years</td>
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<tr>
<td>Morbidity</td>
<td>20 days of missed school per year, 50 percent of patients require intravenous hydration</td>
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<tr>
<td>Symptoms:</td>
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<tr>
<td>Vomiting</td>
<td>6 times/hr at peak, with bile (76 percent) and blood (32 percent)</td>
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<tr>
<td>Autonomic</td>
<td>Lethargy (91 percent), pallor (87 percent), fever (29 percent), salivation (13 percent)</td>
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<tr>
<td>Gastrointestinal</td>
<td>Abdominal pain (80 percent), retching (78 percent), anorexia (74 percent), nausea (72 percent), diarrhea (36 percent)</td>
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<tr>
<td>Neurologic</td>
<td>Headache (40 percent), photophobia (32 percent), phonophobia (28 percent), vertigo (22 percent)</td>
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<td>Temporal pattern</td>
<td>24 to 48 hours duration; 47 percent of patients have episodes at regular intervals, usually two to four weeks; episodes occur at night or early morning in 34 to 60 percent of patients; 98 percent of patients show a stereotypical pattern</td>
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<tr>
<td>Precipitating events</td>
<td>Infection (41 percent), psychological stress (34 percent), dietary (26 percent), menstrual (13 percent), some trigger identified in 68 percent of patients</td>
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<tr>
<td>Natural history</td>
<td>3.4 year duration; 28 percent of patients progress to migraine headaches; predicted 75 percent progress to migraines by age 18 years</td>
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<tr>
<td>Family history of migraine</td>
<td>Present in 82 percent of patients</td>
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Cyclic Vomiting Syndrome

Pathogenesis: unknown
- migraines, mitochondrial disorders/defects, metabolic disorders, dysautonomia, Hypothalamic-pituitary-adrenal axis defects, Food allergy, Catamenial CVS, Chronic cannabis use
Work Up...Where do I start? How far do I go?

Warning signs: presence of severe headaches, altered mental status, gait disturbances or other new "neurological signs", gastrointestinal bleeding, unilateral abdominal pain, weight loss, failure to respond to treatment, progressive worsening, prolonged episodes requiring hospitalization, and a change in pattern or symptoms.

Approach: avoid "shotgun" testing--> look for red flags

4 red flags: abdominal signs (eg, bilious vomiting, tenderness), triggering events (eg, fasting, high protein meal), abnormal neurological examination (eg, altered mental status, papilledema), and progressive worsening or a changing pattern of vomiting episodes.

Shotgun approach:

1/8 had some other cause that could be treated
cost per patient=$17,000

Cost-effective: UGI/SBFT r/o malrotation/volvulus, trial of anti-migraine meds x 3 months, more studies if ongoing symptoms
Treatment

Abortive
anecdotal evidence for:
- high dose zofran (0.3 to 0.4 mg/kg/dose, maximum about 20 mg/dose)
- IV 10% dextrose
- sedation with benadryl or lorazepam
- triptans

Supportive
- IV hydration PRN
- pain management
- quiet dark room
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<th>In Emergency Department and in-hospital settings, an example of a regimen would include:</th>
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<tr>
<td>Darkened, quiet room, take vital signs every 4-6 hours</td>
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<tr>
<td>If child is dehydrated, rehydrate with initial intravenous fluid bolus of 10 mL/kg normal 0.9% saline and repeat as clinically necessary</td>
</tr>
<tr>
<td>Infuse 10% dextrose 0.45% (half normal) saline solution with potassium chloride as appropriate at 1.5 times maintenance rates</td>
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<tr>
<td>Intravenous ondansetron 0.3 mg/kg/dose every 6 hours x 24 hours (maximum 20 mg per dose)</td>
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<tr>
<td>Intravenous lorazepam 0.05 mg/kg/dose every 6 hours x 24 hours (maximum 2 mg per dose)</td>
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<tr>
<td>If child has moderate to severe abdominal pain, intravenous ketorolac 0.5 to 1 mg/kg/dose (maximum 30 mg per dose) every 6 hours x 24 hours (avoid in renal insufficiency or prior to hydration if dehydrated)</td>
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<tr>
<td>Admit child if &gt;5 percent dehydrated, no urine output &gt;12 hours, Na+ &lt;130 mEq/L, anion gap &gt;18 mEq/L, or inability to stop emesis</td>
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<tr>
<td>Allow oral fluid intake</td>
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Treatment

**Prophylactic:** if attacks >1 q 1-2 months or severe

- sumatriptan, erythromycin, L-carnitine, coenzyme Q10, propranolol, cyproheptadine, and tricyclic antidepressants
- amytriptyline in children >5 years old, 1-3 months for effect
- under 5 children can have tachyarrythmia, personality changes, anticholinergic effects
- cyproheptadine 1st line for children < 5 y
- coq10 and l-carnitine may be equally effective as meds
- frequent low fat feedings
- avoid triggers (motion sickness, psychological stress (birthday, holiday, school), physical stress (infection, lack of sleep menses))

** great tables on UpToDate**
**Lifestyle changes (for one to two months or one to two cycles)**

**Reassurance** (eg, episodes are not self-induced) and anticipatory guidance (eg, natural history)

**Avoidance of triggers**
- Keep a "vomiting diary" of potential precipitating factors
- Avoid fasting
- Recognize the potential role of excitement as a trigger (eg, downplay big events)
- Maintain good sleep hygiene (eg, avoid sleep deprivation)
- Avoid triggering foods: chocolate, cheese, monosodium glutamate, antigenic foods
- Avoid excessive energy output

**Supplemental carbohydrate: for fasting-induced episodes**
- Provide fruit juices, other sugar-containing drinks
- Provide extra snacks between meals, before exertion, or at bedtime

**Migraine headache lifestyle interventions**
- Regular aerobic exercise (avoid overexercising)
- Regular meal schedules (ie, avoid skipping meals)
- Moderation in consuming or avoidance of caffeine
References

North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition Consensus Statement on the Diagnosis and Management of Cyclic Vomiting Syndrome

Up To Date