

Clinical Presentation of Dehydration

Clinical Signs	Mild (3%–5%)	Moderate (6%–9%)	Severe (≥10%)
Systemic Signs	Increased thirst	Irritable	Lethargic
Urine Output	Decreased	Decreased (<1 mL/kg/hr)	Decreased (oliguria/anuria)
Mucous Membranes	Tacky	Dry	Parched
Skin Turgor [†]	Normal	Reduced	Tenting
Capillary Refill [†]	Normal	Mildly delayed	Markedly delayed
Skin Temperature	Normal	Cool	Cool, mottled
Anterior Fontanelle	Normal	Sunken	Markedly sunken
Heart Rate	Normal	Increased	Markedly increased or ominously low
Blood Pressure	Normal	Normal to low	Low
Respirations [†]	Normal	Deep, may be increased	Deep and increased or decreased to absent

Skin turgor



Two Caveats:

- severe malnutrition - skin may go back slowly even if no dehydration
- overweight/edema —> skin may spring back even if dehydrated

Differential Diagnosis

Life Threatening

Sepsis

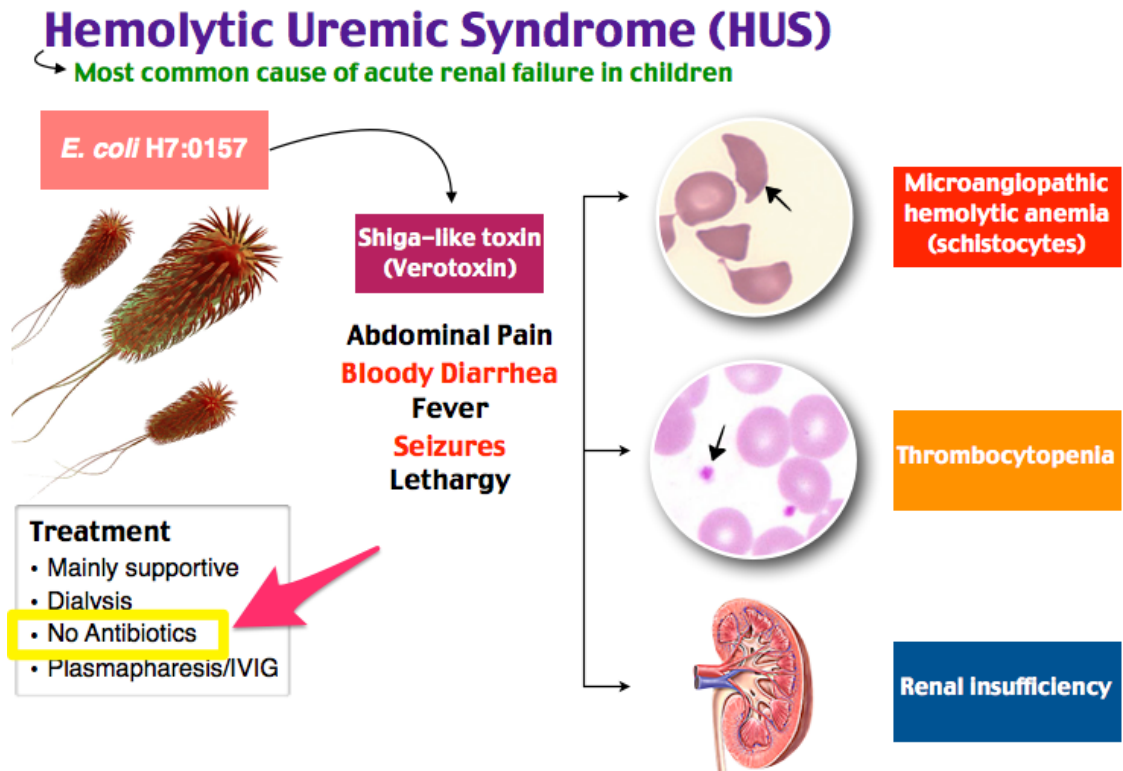
- Salmonella - bacteremia and sepsis occurs in 1% of all patients with nontyphoidal salmonella gastro!
- Toxigenic strains of Staph aureus
 - Presentation: Profuse non-bloody and watery diarrhea - often the first presentation, unresponsive to aggressive fluids
 - Diagnosis note: S. Aureus is often not recovered from blood cultures (only in 5% of cases!) usually wound or mucosa (80-90%)

Intussusception

- Age Range: 6-12 months (almost always <2 years)
- Usually 2 inches long
- Within 2 feet of the ileocecal valve
- Sudden, intermittent severe cramps abdominal pain - *some* with currant jelly stools (only 15%! and usually late finding)
- Occurs usually in 15-20 minute intervals

Hemolytic Uremic Syndrome

- **Etiology:** Shiga toxin producing enterohemorrhagic E. Coli (EHEC)
- **Vector:** Undercooked meat, unpasteurized milk, but also water, fruits, veggies, petting zoos
- **Pathogenesis:** HUS complicates 6-9% of EHEC infections with 0157:H7 strains
 - Begins 5-10 days after onset of diarrhea



Fulminant C. difficile colitis (pseudomembranous colitis)

- **Presentation:** watery diarrhea, low grade fever, abdominal pain after antibiotic course
- Can progress from diarrhea to toxic megacolon and shock!

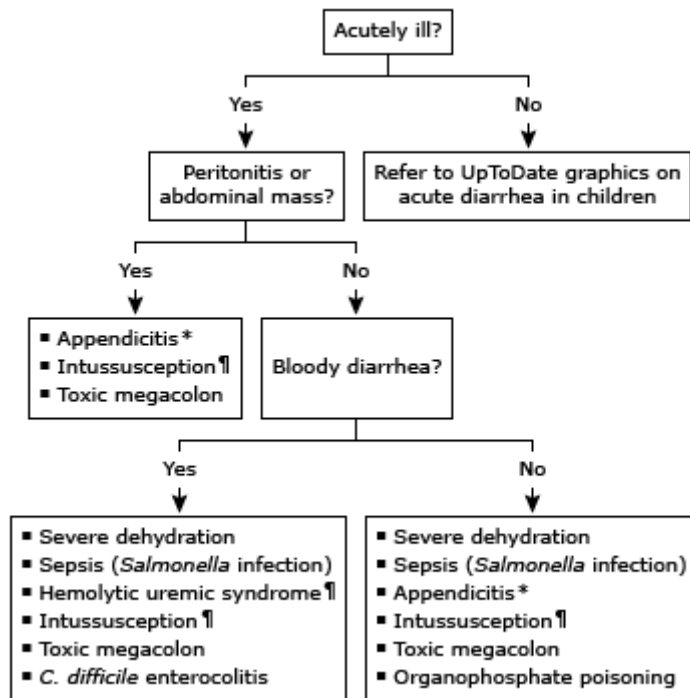
Appendicitis! - don't forget

- NB: Studies show that children <5 more likely to present with diarrhea for appendicitis (irritation of colon!)

Toxic megacolon

- **Etiology:** Complication of pre-existing bowel disease or infectious colitis = total or segmental non obstructive colonic dilatation plus systemic toxicity
- Presentation: Severe bloody diarrhea, abdominal distension, sepsis

Congenital Secretory Diarrheas - profuse watery diarrhea beginning at birth



Common Things Being Common

Viral gastroenteritis - most common!

- Norovirus
- Rotavirus
- Adenovirus

Bacterial Gastroenteritis

- E. Coli strains
 - ETEC = Potato salad and cruise ships!
- Salmonella strains
- Campylobacter
- Shigella
 - seizures associated with this
- C. Difficile
- Yersinia enterocolitica
- Vibrio Cholera

PARASITES

- Giardia
- E. Histolytica
- Cryptosporidium
- Cyclospora
- Amebiasis
- Worms
 - Ascariasis
 - Whipworm
 - Hookworm

Cause of Diarrhea Outside the Gut

- Sepsis
- UTI
- Otitis Media
- Pneumonia

Other Causes of Diarrhea

- **Functional** - too much juice! increase in osmotic load ==> diarrhea (often seen in toddlers)
- **Antibiotic associated**
 - Most commonly associated with amoxicillin, augmenting, cephalosporins, and clindamycin
- **Lactase deficiency**
- **Toxic Exposures!**
 - Food borne
 - Plant poisoning
 - Mushroom poisoning
 - Organophosphates **SLUDGE**
 - Laxative induced (Munchausen by proxy)

Considering Chronic Diarrhea

- HIV
- Food allergies
- Celiac Disease
- Inflammatory Bowel Disease
- Cystic Fibrosis
- Acrodermatitis enteropathica- zinc deficiency!
- Neuroendocrine secretory tumors
 - Gastrinoma
 - VIPoma
 - Mastocytosis
- Endocrine Disorders
 - Hyperthyroidism
 - Hypoparathyroidism
 - Congenital Adrenal hyperplasia
- Neonatal drug withdrawal
- Irritable bowel syndrome

Work-Up

If well appearing don't need anything!

If **Ill- appearing**:

- CBC with differential

- Reticulocyte count
- BMP
 - Looking for electrolytes, blood glucose, BUN/Creatinine
- Blood culture
- Stool Culture
- Stool for C. Diff
- Imaging
 - Concern for toxic megacolon or perforation - AXR (Upright or Left lateral decubitus and AP views)
 - Concern for intussusception or appendicitis - Abdominal US

If fever and blood/mucus in the stool but look OK- should still do

- Stool culture - checks for salmonella, shigella, campylobacter, yersinia, shiva toxin producing E. Coli
- C. Difficile
 - only for patients older than 1 year!
- O&P for recent travelers or poultry/farm animals or meat

If fever and no source for diarrhea, consider UA and UCx

Management

Fluids:

- In the first 4-6 hours give 100mL/kg of IV or NG ORS
 - Start with 20mL/kg fast
 - Best fluids for **shock** are LR or 0.9% NS
- Start oral fluids as soon as child can drink

Continue feeding

Oral Rehydration Solution

Solution	-CHO	glu	Na	mOsm
ORS	dextrose	D2 (20g/L)	75	245
Pedialyte	dextrose	D2.5 (25g/L)	45	250
Gatorade	sucrose, fructose	255g/L	20	+
PepsiCola	fructose	700g/L	1	++

Zinc

- *International role:* decreased admission by 1 day in malnourished patients

- Decreased stool output but more emesis
- Protective against pneumonia
- Dose: 10-20mg/day for 10 days

Antiemetics

Anti-diarrehal agents *never necessary, can hurt*

Antibiotics: *rarely help, only good for Dysentery*

- Shigella
- Cholera
- Severe abdominal distension (gut sepsis)