Gastroenteritis

Introduction

- Acute GE is a common clinical problem in children.
- Estimates of the overall incidence of acute GE range from 1.3 to 2.3 episodes of diarrhea per year in children under five years of age.
- Each year, more than 300 U.S. children die from this illness.
- In the US alone, GE accounts for approximately 10 percent of hospitalizations in children less than five years of age.

Definition

- The AAP defines acute GE as "diarrheal disease of rapid onset, with or without accompanying symptoms or signs such as nausea, vomiting, fever or abdominal pain."

- The hallmark of the disease is increased stool frequency with alteration of stool consistency.

Causes

- Infectious agents (viruses, bacteria and parasites) are the most common causes of acute gastroenteritis.
- Viruses, primarily rotavirus species, are responsible for 70 to 80 percent of infectious diarrhea.
- Bacterial pathogens account for another 10 to 20 percent of cases.
- Parasitic organisms such as Giardia species cause fewer than 10 percent of cases.

Viruses

- Rotavirus (most common)
- Enteric adenovirus
- Norwalk virus
- Calicivirus
- Astrovirus
- Parvovirus

Bacteria

- Salmonella (most common)
- Shigella (second most common)
- Campylobacter jejuni
- Yersinia enterocolitica
- Hemorrhagic E. coli
- Toxigenic Escherichia coli
- Clostridium difficile

Parasites

- Giardia lamblia (most common)
- Cryptosporidium

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Risk factors:

- Winter season
- attendance at day care centers and
- impoverished living conditions with poor sanitation.

History

To elicit information that might point to other illnesses with similar presentations.

- Respiratory symptoms such as cough, dyspnea or tachypnea may indicate the presence of an underlying pneumonia.
- Urinary frequency, urgency or pain may be symptoms of UTI.
- An earache may be a symptom of acute otitis media.
- High fever and altered mental status may be signs of meningitis or sepsis.

History

- To assess the severity of the symptoms and the risk of complications such as dehydration.

- The presence or absence of fever, the amount and type of oral intake, and the frequency and estimated volume of emesis or stool are important factors to consider.

History

- Stool characteristics such as the presence of blood should prompt consideration of inflammatory bacterial disease and a much more aggressive work-up and intervention.
- Travel to underdeveloped countries
- Exposure to untreated drinking or washing water sources
- Day care center attendance
- Recent antibiotic treatment or even
- Recent change in diet

Physical Examination

- The PE helps searching for signs of comorbid conditions and estimating of the level of dehydration.

- Dehydration assessment:

  -It may be most helpful to compare the patient's present weight with the last recorded weight in the chart, to assess the degree of dehydration.

  -Clinical signs may also be used to classify the patient's dehydration as mild, moderate or severe

  -In assigning patients to a category, physicians should use all of the available clinical and historical information, not just the physical findings.

Mild Dehydration

- Child: 3% deficit (30 ml/kg)
- Infant: 5% deficit (50 ml/kg)

- λ NL or increased pulse.
- λ Decreased urine output
- λ Thirsty
- λ Normal PE

Moderate Dehydration

- Child: 6% deficit (60 ml/kg)
- Infant: 9% deficit (90 ml/kg)

- λ Tachycardia
- λ Little or no urine output
- λ Irritable or lethargic
- λ Decreased tears
- λ Dry mucus membranes
- λ Mild tenting of the skin
- λ Delayed capillary filling
- λ Cool and pale

Severe Dehydration

- Child: 10% deficit (100 ml/kg)
- Infant: 15% deficit (150 ml/kg)

- Rapid and weak pulse
- Decreased BP
- Anuria
- Very sunken eyes
- Parched mucus membranes
- Tenting of the skin
- Very delayed refill
- Cold and mottled

Laboratory Assessment

- Routine laboratory testing is not longer necessary.
- High urinary specific gravity may indicate significant dehydration when combined with a history of decreased urine output.
- Serum chemistry measurements such as electrolyte, blood urea nitrogen and creatinine levels do not change the initial management approach in most patients.
- Hemodynamically stable children can be safely treated with oral rehydration therapy with only minimal risk of developing significant electrolyte abnormalities.

Laboratory Assessment

- Laboratory studies should be performed in children who are severely dehydrated and children who are receiving intravenous rehydration therapy.
- Serum electrolyte levels should also be obtained in children who show signs of hypernatremia or hypokalemia.
- The presence of gross or occult blood in the stool should raise suspicion of such pathogens as Shigella species, Campylobacter species and hemorrhagic E coli strains.
- Large numbers of leukocytes on a fecal smear may also indicate an inflammatory bacterial process.

Hypernatremia

1. Cutaneous signs
- Warm
- Doughy texture

2. Neurologic signs
- Hypertonia
- Hyperreflexia
- Lethargy common, but marked irritability when touched

Hypokalemia

- Weakness
- Ileus with abdominal distention
- Cardiac arrhythmias

Laboratory Assessment

- In the absence of gross blood or leukocytes, costly stool cultures usually have a very low yield and rarely change clinical management because most noninflammatory diarrheas are self-limited.
- Viral studies, such as rotavirus antigen tests, may confirm the causative agent but do not usually change management.
- Giardia antigen studies and smears for ova and parasites are generally not indicated unless the diarrheal illness lasts more than 10 days or a likely exposure history exists.

Dehydration Management

I. Replace Phase 1 Acute Resuscitation (sever dehydration)

A. Give LR OR NS at 10-20 ml/kg IV over 30-60 minutes

B. May repeat bolus until circulation stable

II. Calculate 24 hour maintenance requirements

1. First 10 kg: 4 cc/kg/hour (100 cc/kg/24 hours)
2. Second 10 kg: 2 cc/kg/hour (50 cc/kg/24 hours)
3. Remainder: 1 cc/kg/hour (20 cc/kg/24 hours)

Example: 35 Kilogram Child

1. Hourly: 40 cc/h + 20 cc/h + 15 cc/h = 75 cc/hour
2. Daily: 1000 cc + 500 cc + 300 cc = 1800 cc/day

Dehydration Management

III. Calculate Deficit

A. Mild Dehydration — Child: 3% deficit (30 ml/kg/day), Infant: 5% deficit (50 ml/kg/day)

B. Moderate Dehydration — Child: 6% deficit (60 ml/kg/day) Infant: 9% deficit (90 ml/kg/day)

C. Severe Dehydration — Child: 10% deficit (100 ml/kg/day) Infant: 15% deficit (150 ml/kg/day)

Example: 8 y child weigh 35 kg has moderate dehydration
Deficit = 60*35= 2100 ml/day

Dehydration Management

IV. Calculate remaining deficit

Subtract fluid resucitation given in Phase 1

Fluid to be given/day = Maintenance + Deficit - Resuscitation fluid

Example: 1800 cc + 2100 – 0 = 3900 /day

V. Calculate Replacement over 24 hours

A. First 8 hours: 50% Deficit + Maintenance

B. Next 16 hours: 50% Deficit + Maintenance

Example: 3900/2=1950 cc

2L Over first 8 hrs (2000 cc/ 8 = 250 cc/hr)

2L over next 16 hrs (2000 cc/ 8 = 125 cc/hr)

Dehydration Management

VI. Determine Serum Sodium Concentration

A. Hypertonic Dehydration (Serum Sodium > 150)

B. Isotonic Dehydration (Serum Sodium 130-150)

C. Hypotonic Dehydration (Serum Sodium < 130)

D5 ½ NS or D5 ¼ NS in isotonic dehydration

VII. Add Potassium to Intravenous Fluids after patient voids

1. Weight <10 kilograms: 10 meq/liter KCl
2. Weight >10 Kilograms: 20 meq/liter KCl