1.0 Introduction
This Clinical Practice Guideline (CPG) has been adapted from the Cincinnati Children’s Hospital Medical Center CPG, Prevention and Management of Acute Gastroenteritis (AGE): In children aged 2 months to 18 years (2011).

Acute gastroenteritis (AGE) is a diarrheal disease of rapid onset, with or without accompanying symptoms and signs, such as nausea, vomiting, fever, or abdominal pain (King 2003, Guerrant 2001). It is a common cause of presentation to the emergency department (ED) in children under 5 years old.

Because most patients included in this guideline will have self-limited viral or bacterial diarrhea, dehydration caused by the disease is the focus of treatment in this guideline. The purpose of this clinical practice guideline is to provide a framework for assessment and management of children with AGE, based on the most current and best scientific information, which will assist the interdisciplinary team in the Division of Paediatric Emergency Medicine.

1.1 Target Population

Inclusions: These guidelines are intended primarily for use in children aged 2 months through 5 years of age with signs and symptoms of acute gastroenteritis (diarrhea of recent onset not caused by chronic disease with or without accompanying nausea, vomiting, fever, or abdominal pain) presenting to the emergency department.

Exclusions: These guidelines do NOT address all considerations needed to manage those with the following:
- toxic appearance or requiring intensive care
- acute abdomen, bowel obstruction or ileus
- previously diagnosed disorders including immunodeficiency or those affecting major organ systems
- diarrhea and/or vomiting accompanied by chronic metabolic disorders (e.g. diabetes, PKU)
- AGE accompanying failure to thrive
- episodes of diarrhea lasting longer than 7 days
- diagnosis of hyponatremic or hypernatremic dehydration

1.2 Target Users
Include but are not limited to:
- Emergency Medicine physicians and nurses
- Emergency Medicine trainees
- Patients and families

1.3 Challenges & Objectives
Challenges in the management of AGE include:
- prevention of dehydration
- diagnosing degree of dehydration

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In the target population, the objectives of this guideline are to:

- improve the use of appropriate clinical and laboratory assessment
- increase the use of oral rehydration and early progression to usual diet
- reduce the number of hospitalizations
- reduce the length of stay
- improve parental involvement in decision making around the management of AGE
- decrease use of ED services for management of mild cases
- improve prevention of transmission of AGE

### 2.0 Etiology

Infectious agents are the most common causes of AGE. Viruses, primarily rotavirus species, are responsible for 70 to 80% of infectious diarrhea cases in the developed world. Various bacterial pathogens account for another 10 to 20% of cases; as many as 10% may be attributable to diarrheagenic Escherichia coli (Cohen 2005).

Parasitic organisms such as Giardia species cause fewer than 10% of cases. See Table 1 for etiologic agents. Incidence is affected by climate and season. Other factors that increase the risk of AGE in children include attendance at day care centers and impoverished living conditions with poor sanitation (Burkhart 1999).

<table>
<thead>
<tr>
<th>Table 1: Etiologic Agents for Pediatric Infectious Gastroenteritis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viruses (about 70%)</strong></td>
</tr>
<tr>
<td>• Rotaviruses</td>
</tr>
<tr>
<td>• Noroviruses (Norwalk-like viruses)</td>
</tr>
<tr>
<td>• Enteric adenoviruses</td>
</tr>
<tr>
<td>• Caliciviruses</td>
</tr>
<tr>
<td>• Astroviruses</td>
</tr>
<tr>
<td>• Enteroviruses</td>
</tr>
<tr>
<td><strong>Bacteria (10-20%)</strong></td>
</tr>
<tr>
<td>• Campylobacter jejuni</td>
</tr>
<tr>
<td>• Non-typhoid Salmonella spp</td>
</tr>
<tr>
<td>• Enteropathogenic Escherichia coli</td>
</tr>
<tr>
<td>• Shigella spp</td>
</tr>
<tr>
<td>• Yersinia enterocolitica</td>
</tr>
<tr>
<td>• Shiga toxin producing E coli</td>
</tr>
<tr>
<td>• Salmonella typhi and S paratyphi</td>
</tr>
<tr>
<td>• Vibrio cholerae</td>
</tr>
<tr>
<td><strong>Protozoa (&lt;10%)</strong></td>
</tr>
<tr>
<td>• Cryptosporidium</td>
</tr>
<tr>
<td>• Giardia lamblia</td>
</tr>
<tr>
<td>• Entamoeba histolytica</td>
</tr>
<tr>
<td><strong>Helminths</strong></td>
</tr>
<tr>
<td>• Strongyloides stercoralis</td>
</tr>
</tbody>
</table>

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3.0 Guideline Recommendations

3.1 Assessment and Diagnosis

Clinical Assessment
1. The history and physical examination should be the primary basis for the diagnosis of AGE. (Elliott 2007; Grade C). Specific information should be sought about the following topics (SickKids Consensus).

- Stool Output: frequency, consistency, presence of blood/mucous
- Emesis: frequency, bilious vs. non-bilious, hematemesis, last episode
- Fluid Intake: volume, type
- Urine output: frequency, last episode
- Fever, appetite, weight loss
- Use of antibiotics or other drugs that may cause diarrhea
- Sick contacts, travel
- Underlying illness: cardiac disease, diabetes, renal disease, cystic fibrosis

2. Clinical assessment is initially performed for the presence and degree of dehydration (Steiner 2004; Grade A). See Appendix 1 for physical parameters associated with degree of dehydration. Different scales are used to diagnose the degree of dehydration. See Table 2 for a clinical dehydration scale developed in Canada. (Goldman 2008; Grade B).

Note 1: Prolonged capillary refill time, abnormal skin turgor, and abnormal respiratory pattern are the best individual examination measures for predicting 5% dehydration in children (Steiner 2004; Grade A).

Note 2: Clinical diagnosis of dehydration has been shown to be imprecise and thus a general classification of a child’s dehydration status such as none, some (mild/moderate), or severe is suggested by the literature as a useful starting point in the management of the child at risk for dehydration (Steiner 2004; Grade A, King 2003).

Note 3: Acute body weight change is considered the gold standard measure of dehydration in a child but is often impractical for the initial assessment due to lack of an accurate pre-illness weight measurement (Gorelick 1997, Duggan 1996; Grade B).
Table 2: Clinical Dehydration Scale

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Appearance</td>
<td>Normal</td>
<td>Thirsty, restless, or lethargic but irritable when touched</td>
<td>Drowsy, limp, cold, sweaty</td>
</tr>
<tr>
<td>Eyes</td>
<td>Normal</td>
<td>Slightly sunken</td>
<td>Very sunken</td>
</tr>
<tr>
<td>Mucous Membranes</td>
<td>Moist</td>
<td>Sticky</td>
<td>Dry</td>
</tr>
<tr>
<td>Tears</td>
<td>Present</td>
<td>Decreased</td>
<td>Absent</td>
</tr>
</tbody>
</table>

No / minimal dehydration = score of 0-1  
Some dehydration (mild to moderate) = score ≥ 2  
Severe dehydration / shock  
(Bailey, 2010, Goldman 2008; Grade B)

**Laboratory Studies**

1. Laboratory tests are not routinely required in the ED and may be misinterpreted, leading to inappropriate treatment (WHO report 2003; Grade C).

**Note 1:** Urinalysis is not valid in the assessment of dehydration. Specific gravity, urinary ketones and urine output do not correlate with the degree of dehydration (Steiner 2007; Grade B).

**Note 2:** Serum electrolytes (including glucose, sodium, potassium, BUN, creatinine and serum bicarbonate) should be measured before starting intravenous fluids. A normal bicarbonate concentration may be useful in ruling out dehydration (Steiner 2004; Grade A).

**Note 3:** Most children present with isonatremic dehydration. Suspect hypernatremic dehydration in case of hypertonic oral intake (e.g., salt solutions), hypotonic fluid loss (e.g., profuse watery diarrhea), and decreased level of consciousness or lethargy beyond expected from apparent mild signs of dehydration or associated seizure. Younger infants are at a higher risk (Local Expert Opinion 2009; Grade C).

**Note 4:** Tests for specific pathogens, such as those for rotavirus, ova and parasites, bacteria, fecal antigen tests for parasites and C difficile toxin are not indicated in the ED (Northrup 1994; Grade C). These tests should be considered if unusual causes of gastroenteritis are suspected (e.g., recent travel, bloody diarrhea) or with prolonged symptoms.

**Note 5:** Children with evidence of lethargy should have a bedside glucose test performed as soon as possible to determine if hypoglycemia is a contributing factor (Reid 2003; Grade B).
3.2 Management Recommendations

Prevention of Dehydration

1. Continued use of the child’s preferred, usual, and age appropriate diet should be encouraged to prevent or limit dehydration (Brown 1994, Fayad 1993, Alarcon 1992). Regular diets are generally more effective than restricted and progressive diets, and in numerous trials have consistently produced a reduction in the duration of diarrhea (Alarcon 1991, Margolis 1990, Placzek 1984, Khin 1985). (Grade A)

Note 1: There is no evidence to support the use of the historical BRAT diet (consisting of bananas, rice, applesauce and toast); however it may be offered as part of the child’s usual diet. Encourage complex carbohydrates (e.g., rice, wheat, bread and cereals), meats, yogurt, fruits and vegetables in the diet. (King 2003; Grade C).

Note 2: Clear liquids are not recommended as a substitute for oral rehydration solutions (ORS) or regular diets in the prevention or therapy of dehydration (King 2003; Grade C) (See Appendix 2). Encourage continuation of breast feeds during rehydration with ORS (Khin 1985; Grade A).

Note 3: The vast majority of patients with AGE do not develop clinically important lactose intolerance. In selected patients with persistent symptoms (suspect if >7 days of diarrhea or buttock excoriation in an infant <6mo), lactose-free formulas are recommended (Brown 1994; Grade A).

2. It is recommended that the vomiting child be offered frequent small feedings of any tolerated foods or oral rehydration solutions (ORS) (Wan 1999, Santosham 1985; Grade A).

Rehydration

1. No dehydration

Instructions should be provided regarding adequate fluid intake and continued age-appropriate diet. In case of vomiting, small frequent feedings should be offered (Local Expert Opinion 2009; Grade C).

Note: ORS may be used to compensate for ongoing losses: 10ml/kg for each episode of diarrhea, 2ml/kg for each episode of vomiting (Local Expert Opinion 2009; Grade C).

2. Some dehydration (Mild to Moderate dehydration)


Note 1: Administer small volume of ORS frequently (i.e.; 5 ml every 2-3 minutes and increase as tolerated up to 30 ml every 5 minutes. Aim for 25-50 ml/kg ORS over 1-2 hours (Local Expert Opinion 2009; Grade C).

Note 2: There is no need to demonstrate the successful completion of an oral rehydration period before discharge. Factors such as frequency of vomiting and heart rate are stronger predictors of ED revisits (Freedman 2009, Grade B).
Note 3: For every 25 children (95% CI 14 to 100) treated with ORS one would fail and require IVT. The ORS group has a higher risk of paralytic ileus, while the IVT group is exposed to risks of intravenous therapy (Cochrane 2009; Grade A).

Note 4: Once ORS has failed intravenous therapy (20 ml/kg of normal saline IV bolus in 60 minutes) or ORS via nasogastric (NG) tube is indicated. Reassess frequently. Treatment should be repeated as indicated by clinical signs or symptoms (Neville 2006; Grade A & Local Expert Opinion 2009).

3. Severe dehydration
Prompt IVT is indicated for shock/near-shock (20 ml/kg normal saline or ringer’s lactate as fast as possible). Therapy must be repeated until adequate degree of rehydration is achieved. Reassessment after each therapeutic manoeuvre is vital (Fleisher 2006; Grade C).

Maintenance Rehydration
1. On-going IV fluids or NG ORS following the initial period of fluid resuscitation is indicated:
   - when unable to replace the estimated fluid deficit and keep up with the on-going losses using oral feedings alone after discussion with family regarding choice of IV or NG
   - in severely dehydrated children with obtunded mental status

Note 1: Use Normal saline with 5% glucose as the maintenance infusion fluid. The isotonic solution protects from dilutional hyponatremia (Neville 2006; Grade A). Administration of larger amounts of IV dextrose is associated with reduced return visits requiring admission in children with gastroenteritis and dehydration (Levy 2007; Grade B).

Note 2: Calculation of maintenance IV fluid rate:
4 ml/kg/hr for first 10 kg of body weight
+ 2 ml/kg/hr for next 10 kg of body weight
+ 1 ml/kg/hr for the remainder
(Behrman 2004; Grade C)

Oral Feeding Following Rehydration

Note 1: A meta-analysis of 16 studies found no significant clinical advantage to diluting milk or formula in the management of AGE (Brown 1994; Grade A).

Note 2: Following rehydration therapy in the child with mild to moderate dehydration, regular diets may be supplemented with ORS containing at least 45mEq Na+/L, and targeted to deliver 10ml/kg for each stool or emesis (Cohen 1995; Grade A).
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Pharmacological Therapies

1. Anti-diarrheals
The routine management of children with AGE should **not** include anti-diarrheal agents (King 2003; Grade C).

**Note 1:** Racecadotril, an enkephalinase inhibitor (antisecretory agent) significantly reduced stool output in two controlled clinical trials among children (Salazar-Lindo 2000, Cezard 2001; Grade A), therefore more studies are needed. Caution is advocated in disorders of carbohydrate intolerance due to the presence of saccharose as an excipient and in children younger than 2 years due to potential for CNS depression.

**Note 2:** Loperamide (antimotility agent) reduces mean amount and duration of diarrheal episodes in clinical trial among children (Li 2007; Grade A). However its use is not recommended due to the reported serious adverse events (ileus, lethargy or death).

2. Anti-emetics
In children with frequent and persistent vomiting, the administration of an anti-emetic may increase the success rate of oral rehydration therapy (ORT). The safety profile of the medication and cost-effective outcomes should be considered (King 2003; Grade C).

**Note 1:** There is a lack of high quality evidence for the effectiveness of intravenous metoclopramide and intravenous dexamethasone in the treatment of children with gastroenteritis, therefore they are not recommended (Cubeddu 1997, Stork 2006; Grade A). There is a high incidence of side effects with Metoclopramide (somnolence, nervousness, irritability, dystonic reactions).

**Note 2:** Ondansetron reduces vomiting during ORT, need for IV fluids and hospital admission rates in children with vomiting (Brussese 2013, Churgay 2012, Carter 2012, Reeves 2002, Ramsook 2002, Freedman 2006, Roslund 2008; Grade A). There is evidence suggesting that following administration of Ondansetron there is increase in diarrheal episodes, however this adverse event seems clinically insignificant.

Ondansetron is administered as a single oral dissolving tablet, by weight:

- 8-15kg: 2mg PO
- >15-30kg: 4mg PO
- >30kg: 8mg PO

ORS should be resumed 15 minutes after administration of Ondansetron.

**Note 3:** Dimenhydrinate, a histamine receptor blocker, has been proven safe and effective in controlling post-operative nausea and vomiting in children. No clinical trials have been conducted to study its efficacy in children with acute gastroenteritis and therefore should not be utilized.

3. Antimicrobial Agents

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Antimicrobial therapies should be used only for selected children with AGE who present with special risks or evidence of a serious bacterial infection (Barbara 2000; Grade B).

Note 1: Antibiotics increase likelihood of hemolytic uremic syndrome if the pathogen is enterohemorrhagic E. coli (O157:H7) and are therefore contraindicated, if identified (Wong 2000; Grade B).

Note 2: Giardia lamblia and Cryptosporidium are common causes of persistent diarrhea and, if found, treatment is available with metronidazole (AAP 2003, Grade C).

Adjunct Therapies
1. There is some evidence of possible clinical benefit of probiotics in children with gastroenteritis (shortening the duration of diarrhea and reducing the stool frequency). The available studies varied in quality, in the specific probiotics studied, in the treatment regimens used and in the outcomes examined and therefore more research is needed before recommending its routine use (Allen 2004, Salvatore 2007; Grade A). Probiotics have also been associated with decrease in infection transmission. Family preference may be central to the decision to use probiotics.

Note 1: The following organisms have consistently showed benefit in one or more study:
- Lactobacillus rhamnosus GG
- Saccharomyces boulardii

More recent clinical trials did not show a positive effect of Lactobacillus rhamnosus GG on the clinical course of children with gastroenteritis (Salazar-Lindo 2004, Basu 2007; Grade A). Ongoing studies are trying to determine what dose is needed to achieve a significant effect.

Note 2: Probiotics may be more effective for rotavirus diarrhea, compared to all-cause diarrhea (Allen 2004; Grade A).

Note 3: The microorganisms used to culture yogurt, Streptococcus thermophilus and Lactobacillus bulgaricus, are not considered probiotics because they do not survive the acidity of the stomach to colonize the intestines. One study of malnourished infants found that yogurt, compared to milk was not effective in reducing the duration of diarrhea (Allen 2004, Bhatnagar 1998; Grade A).

2. Zinc supplementation could be effective in the treatment of diarrhea and vomiting in children with gastroenteritis in developing countries, by reducing stool frequency (Lazzerini 2008; Grade A). There is insufficient evidence to justify recommending zinc supplementation for well-nourished children with gastroenteritis.

Disposition Considerations
1. Prompt discharge should be considered when the following levels of recovery are reached:
- sufficient rehydration achieved as indicated by clinical status;
- IV or NG fluids not required;
- adequate family teaching has occurred; and
- medical follow up is available via telephone or office visit

(Local Expert Opinion 2009; Grade C)
Note 1: There is no need to demonstrate the successful completion of an oral rehydration period before discharge. Factors such as frequency of vomiting and heart rate are stronger predictors of ED revisits (Freedman 2009; Grade B).

2. Inpatient care is indicated for children in case of:
   - severe dehydration (>9% of body weight) exists;
   - significant electrolyte abnormality such as hyponatremia or hypernatremia;
   - substantial difficulties exist in administering ORT, including intractable vomiting, ORS refusal, or inadequate ORS intake;
   - ORS treatment fails, including worsening diarrhea or dehydration despite adequate volumes;
   - factors such as young age, unusual irritability or drowsiness, progressive course of symptoms, or uncertainty of diagnosis exist that might indicate a need for close observation;
   - caregivers cannot provide adequate care at home; or
   - social or logistical concerns exist that might prevent return evaluation, if necessary

(King 2003, Local Expert Opinion 2009; Grade C)

3.3 Education
The following information should be offered to all parents and caregivers on the management of gastroenteritis. These recommendations are based on evidence that is presented elsewhere in the guideline or local expert opinion (Grade C).

1. Recommendations and advice for parents
In children without clinical dehydration and who are not at increased risk of dehydration:
   - continue usual feeds including breast or other milk
   - encourage the child to drink plenty of fluids

In children without clinical dehydration but who are at increased risk of dehydration:
   - continue usual feeds including breast or other milk
   - encourage the child to drink plenty of fluids
   - offer ORS as additional supplemental fluid

In children with clinical dehydration:
   - rehydration is usually possible with ORS
   - give the specified amount of ORS (50 ml/kg for rehydration plus maintenance volume) over a 4 hour period
   - give this amount of ORS in small but frequent feeds
   - continue breast feeding in addition to giving the ORS
   - be concerned if:
     1. the child refuses to take the ORS or persistently vomits
     2. the child does not appear to be recovering or is worsening
   - seek advice from a specified healthcare professional if concerned
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Following rehydration in the ED:

- the child should be encouraged to drink plenty of their usual fluids including milk feeds if these were stopped
- reintroduce the child’s usual diet. Restrictive diets, such as BRAT are unnecessary
- give a specified volume of ORS (5-10 ml/kg) following the passage of large watery stools in children at increased risk of dehydration

Other instructions:

- the usual duration of diarrhea is 5-7 days and in most children it resolves within 2 weeks.
- the usual duration of vomiting is 1-2 days and in most children it resolves within 3 days.
- seek advice from a specified healthcare professional if children’s symptoms are not resolving as expected or if there’s blood in the diarrhea or vomit

2. Recommendations to prevent spread of gastroenteritis

- hand washing with soap (liquid where possible) in warm running water, for minimum 15 seconds and careful drying is the most important factor in the prevention of spread of diarrhea and vomiting
- hand washing should occur after going to the toilet (children) or changing diapers (parents) and before handling of food
- towels, toys and utensils used by infected children should not be shared
- children should not attend any childcare facility or school when fever, diarrhea or vomiting is present and may return to school or other childcare facility once the stool is formed

4.0 Development Process

4.1 Implementation of CPG:

Facilitators to implementation

- Tools/Appendices
- Nursing Medical Directive for Ondansetron

Organizational barriers to implementation

- Physician behaviour

Potential health benefits for patients

- Uniform assessment
- Quicker evidence based care
- Involvement / education of family

Key review criteria / indicators for monitoring and audit purposes

- Audit percentage of patients managed according to the CPG
- Evaluate change in admission rate and re-visit rate following treatment with Ondansetron

4.2 Development Process & Statement of Evidence

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A search was performed to determine existing published guidelines on acute gastroenteritis. Identified guidelines were screened to ensure that the clinical questions developed by the working group were covered within the retrieved guidelines. Cincinnati Children’s Acute Gastroenteritis CPG (2006) was assessed using the AGREE tool. Group consensus was to adapt this CPG.

A literature search was completed (January 2006 - March 2009) using OVID, Embase, Cochrane, CCTR, ACPJournal Club and DARE, using key words: gastroenteritis, dysentery, enteritis, enterocolitis, esophagitis, gastritis, antiemetic, odansetron and oral rehydration therapy. 2006-2009 literature was reviewed by an interdisciplinary CPG development team. Modifications to the Cincinnati CPG were discussed & agreed upon by consensus. The above described literature search was repeated in 2013. No evidence was obtained to change the focus of the recommendations made in the original guideline.

Once the guideline has been in place for three years, the development team will reconvene to explore the continued validity of the guideline. This phase can be initiated at any point that evidence indicates a change is needed.

<table>
<thead>
<tr>
<th>Table 1. Grades of Recommendation</th>
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<tbody>
<tr>
<td><strong>A</strong></td>
</tr>
<tr>
<td><strong>B</strong></td>
</tr>
<tr>
<td><strong>C</strong></td>
</tr>
</tbody>
</table>

Note: Table 1 serves as a guideline to the hierarchy of evidence available; with meta-analysis considered to be the highest level of evidence and expert opinion considered to be the lowest level of evidence that can be used to support each recommendation in this CPG.

4.3 Guideline Group and Reviewers

Original Guideline Group Membership:
Ayelet Rimon Babad; Clinical Fellow, Emergency Medicine
Richard Raptopoulos; Research Registered Nurse, Emergency Medicine
Shagan Kaur; Research Registered Nurse, Emergency Medicine
Bill Mounstephen; Director, Emergency Medicine
Cindy Capstick; Manager, Emergency Medicine
Jennifer Pepper; Quality Analyst & CPG Coordinator, Quality & Risk Management

Additional members, Guideline Group Review 2013:
Stephen Porter, MD; Medical Director, Emergency Medicine
Internal Reviewers:
Jill Adolphe, parent & Family Advisory Council Co-chair
Margot Follett Rowe, Quality Analyst, Emergency Medicine
Stephen Freedman, Staff Physician, Emergency Medicine
Katherine Nash, Registered Nurse, Emergency Medicine
Bruce Minnes, Staff Physician, Associate Director (Clinical), Emergency Medicine
Jonathon Pirie, Staff Physician, Emergency Medicine
Lisa Robinson, Advanced Nursing Practice Educator, Emergency Medicine
Suzan Schneeweiss, Staff Physician, Emergency Medicine

4.5 External Reviewers:
Dr. Ran Goldman - BC Childrens'
Dr. Ken Farion - CHEO

NOTE: These recommendations result from review of literature and practices current at the time of their formulations. This protocol does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the guidelines to meet the specific and unique requirements of individual patients. Adherence to this pathway is voluntary. The physician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

5.0 References


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Acute Gastroenteritis: In Children Aged 2 Months Through 5 Years


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Acute Enteritis: In Children Aged 2 Months Through 5 Years


Acute Gastroenteritis: In Children Aged 2 Months Through 5 Years


Acute Gastroenteritis: In Children Aged 2 Months Through 5 Years


### Appendix 1: Symptoms and Signs of Dehydration

<table>
<thead>
<tr>
<th>Symptom/Sign</th>
<th>Minimal or no dehydration (&lt;3% loss body wt)</th>
<th>Mild to moderate dehydration (3-9% loss body wt)</th>
<th>Severe dehydration (&gt;9% loss body wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Status</td>
<td>Well, alert</td>
<td>Normal, fatigued or restless, irritable</td>
<td>Apathetic, lethargic, obtunded</td>
</tr>
<tr>
<td>Fontanel</td>
<td>Normal</td>
<td>Depressed</td>
<td>Sunken</td>
</tr>
<tr>
<td>Thirst</td>
<td>Drinks normally, may refuse</td>
<td>Thirsty, eager to drink</td>
<td>Drinks poorly, unable to drink</td>
</tr>
<tr>
<td>Mucous Membranes</td>
<td>Moist</td>
<td>Dry</td>
<td>Parched</td>
</tr>
<tr>
<td>Tears</td>
<td>Present</td>
<td>Decreased</td>
<td>Absent</td>
</tr>
<tr>
<td>Eyes</td>
<td>Normal</td>
<td>Slightly sunken</td>
<td>Deeply Sunken</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>Normal</td>
<td>Normal to increased</td>
<td>Tachycardia in severe cases</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Normal</td>
<td>Normal or orthostatic changes</td>
<td>Decreased</td>
</tr>
<tr>
<td>Breathing</td>
<td>Normal</td>
<td>Normal or tachypnea</td>
<td>Tachypnea, hyperpnea</td>
</tr>
<tr>
<td>Quality of Pulses</td>
<td>Normal</td>
<td>Normal to decreased</td>
<td>Weak, thready or impalpable</td>
</tr>
<tr>
<td>Capillary Refill</td>
<td>Normal</td>
<td>Prolonged &gt;2 sec</td>
<td>Prolonged &gt;4 sec</td>
</tr>
<tr>
<td>Skin Turgor</td>
<td>Instant recoil</td>
<td>Recoil &lt;2 sec</td>
<td>Recoil &gt;2 sec</td>
</tr>
<tr>
<td>Extremities</td>
<td>Warm</td>
<td>Cool</td>
<td>Cold, mottled, cyanotic</td>
</tr>
<tr>
<td>Urine Output</td>
<td>Normal to decreased</td>
<td>Decreased</td>
<td>Minimal</td>
</tr>
</tbody>
</table>

Adapted from King CK, Glass R, Bresee JS, Duggan C. MMWR 2003;52(RR16):1-16.
### Appendix 2: Oral Rehydration Solutions

<table>
<thead>
<tr>
<th>Manufacturer / Brand Name</th>
<th>Product Description</th>
<th>CHO gm</th>
<th>NA+ mEq/liter</th>
<th>K+ mEq/liter</th>
<th>Osmolarity mOsm/liter</th>
<th>CHO:Na ratio mmol/liter: mol/liter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generic</strong></td>
<td>Liquid in litre or 8 oz sizes (single or 4-pk)</td>
<td>25</td>
<td>45</td>
<td>20</td>
<td>Flavoured 270 Unflavoured 250</td>
<td>3.1 : 1</td>
</tr>
<tr>
<td></td>
<td>Freezer pops, 2.1 oz, 16 per box*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 assorted flavours, varies by product</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ross Pedialyte®</strong></td>
<td>Liquid in litre or 8 oz sizes (4-pk)</td>
<td>30</td>
<td>50</td>
<td>25</td>
<td>167</td>
<td>3.3 : 1</td>
</tr>
<tr>
<td></td>
<td>Freezer pops, 2.1 oz, 16 per box*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 assorted flavours, varies by product</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mead Johnson Enfamil®</strong></td>
<td>Ready-to-use; no mixing or dilution required</td>
<td>20</td>
<td>90</td>
<td>20</td>
<td>330</td>
<td>1.2 : 1</td>
</tr>
<tr>
<td><strong>Enfalyte®</strong></td>
<td>Made with natural fruit flavour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 oz per bottle, 24 bottles per case</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low osmolality (170 mOsm/kg water)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WHO-ORS</strong></td>
<td>Standard ORS packet</td>
<td>15</td>
<td>60</td>
<td>30</td>
<td>224</td>
<td>1.4 : 1</td>
</tr>
<tr>
<td><strong>WHO-ORS</strong></td>
<td>Hypo-osmolar ORS packet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Solutions not appropriate for rehydration***

<table>
<thead>
<tr>
<th>Solution</th>
<th>CHO gm</th>
<th>NA+ mEq/liter</th>
<th>K+ mEq/liter</th>
<th>Osmolarity mOsm/liter</th>
<th>CHO:Na ratio mmol/liter: mol/liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cola</td>
<td>126</td>
<td>2</td>
<td>0.1</td>
<td>750</td>
<td>1944 : 1</td>
</tr>
<tr>
<td>Apple juice</td>
<td>125</td>
<td>3</td>
<td>32</td>
<td>730</td>
<td>1278 : 1</td>
</tr>
<tr>
<td>Chicken broth</td>
<td>0</td>
<td>250</td>
<td>8</td>
<td>500</td>
<td>0 : 1</td>
</tr>
<tr>
<td>Gatorade®, sports drink</td>
<td>59</td>
<td>20</td>
<td>3</td>
<td>330</td>
<td>62.5 : 1</td>
</tr>
</tbody>
</table>

* Labelled for children 1 year of age or older.
** WHO = World Health Organization
*** Inappropriate and non-physiologic fluids are given for comparison only.

1. An effective rehydration solution:
   - is hypotonic (osmolarity <~310 mOsm/litre),
   - has enough sodium to replace loss,
   - adequately replaces potassium and HCO₃ (as bicarbonate or citrate), and
   - takes advantage of equimolar Na:glucose co-transport which is 1:1 and linear until about a concentration of 100 mmol/litre.

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2. For non-cholera diarrhea, glucose:sodium ratios about 3 mmol/litre : 1 mmol/litre are effective in maintaining hydration.

3. In 2004, the World Health Organization (WHO) introduced a hypo-osmolar formulation ORS packet for non-cholera diarrhea. This formulation reduces stool volume, vomiting and need for IV therapy, and has also been shown to be safe and effective for children with cholera (CHOICE Study Group 2001 [A]). The WHO standard formula was originally developed to treat any acute gastroenteritis, including cholera in all age groups. WHO-ORS packets are not ready available in North America.
Acute Gastroenteritis: In Children Aged 2 Months Through 5 Years

Appendix 3: Algorithm - Evaluation & Management of Acute Gastroenteritis (2 mos to 5 yrs)

Algorithm: Evaluation & Management of Acute Gastroenteritis in Children Aged 2 months to 5 years => (See attachment section at end of document)

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Acute Gastroenteritis: In Children Aged 2 Months Through 5 Years

Attachments:

Acute Gastro algorithm Feb 2010.doc