

Acute Gastroenteritis v.1.1: Oral Rehydration Therapy (ORT)

[Executive Summary](#)

[Test your knowledge](#)

PHASE I (ED): ORT

[Explanation of Evidence Ratings](#)

[Summary of Version Changes](#)

!
[Routine testing](#)
for stool pathogens
not recommended

- Inclusion Criteria**
- Vomiting and/or diarrhea of recent onset not due to chronic disease, with or without fever, nausea, or abdominal pain
- Exclusion Criteria**
- Toxic appearance (consider sepsis)
 - Diarrhea >7 days (consider chronic disease, bacterial enteritis)
 - Bloody diarrhea (consider HUS)
 - Comorbid conditions (Medically Complex Children (MCC), renal failure, cardiac disease)
 - Bilious emesis (consider bowel obstruction)
 - On diuretic therapy
 - Hyponatremia (<130) or Hypernatremia (>155)
 - Hypoglycemia <50 (consider metabolic disease)
 - Acute surgical abdomen

!
Anti-diarrheal
or antiemetic agents
are not recommended

Overt Shock (>10%)

Moderate Dehydration (5-10%)

- Prolonged capillary refill (>2 seconds)
- Abnormal skin turgor ('tenting' or inelastic skin)
- Tachypnea

Minimal (<5%)

- Educate on prevention of dehydration

Ondansetron if:

- Recent and/or frequent emesis
- Hematemesis presumed to be secondary to vomiting
- May give 2nd dose if patient received 1st dose >4 hours prior to arrival to the ED

Begin ORT

Initial ORT Challenge

- 5mL q 5 mins if <10 kg
- 10mL q 5 mins if ≥10 kg

Emesis after initial ORT

No emesis after initial ORT

Hold ORT for 20 minutes

- Consider ondansetron
- Restart ORT in 20 mins

Increase ORT after 20 mins

- 10mL q 5 mins if <10kg
- 20mL q 5 mins if ≥10kg
- Assess in 30-60 mins

If emesis, consider add'l dose of ondansetron

Continued emesis

Not improved

No emesis and improved

Phase Change

!
Antimicrobials
not recommended

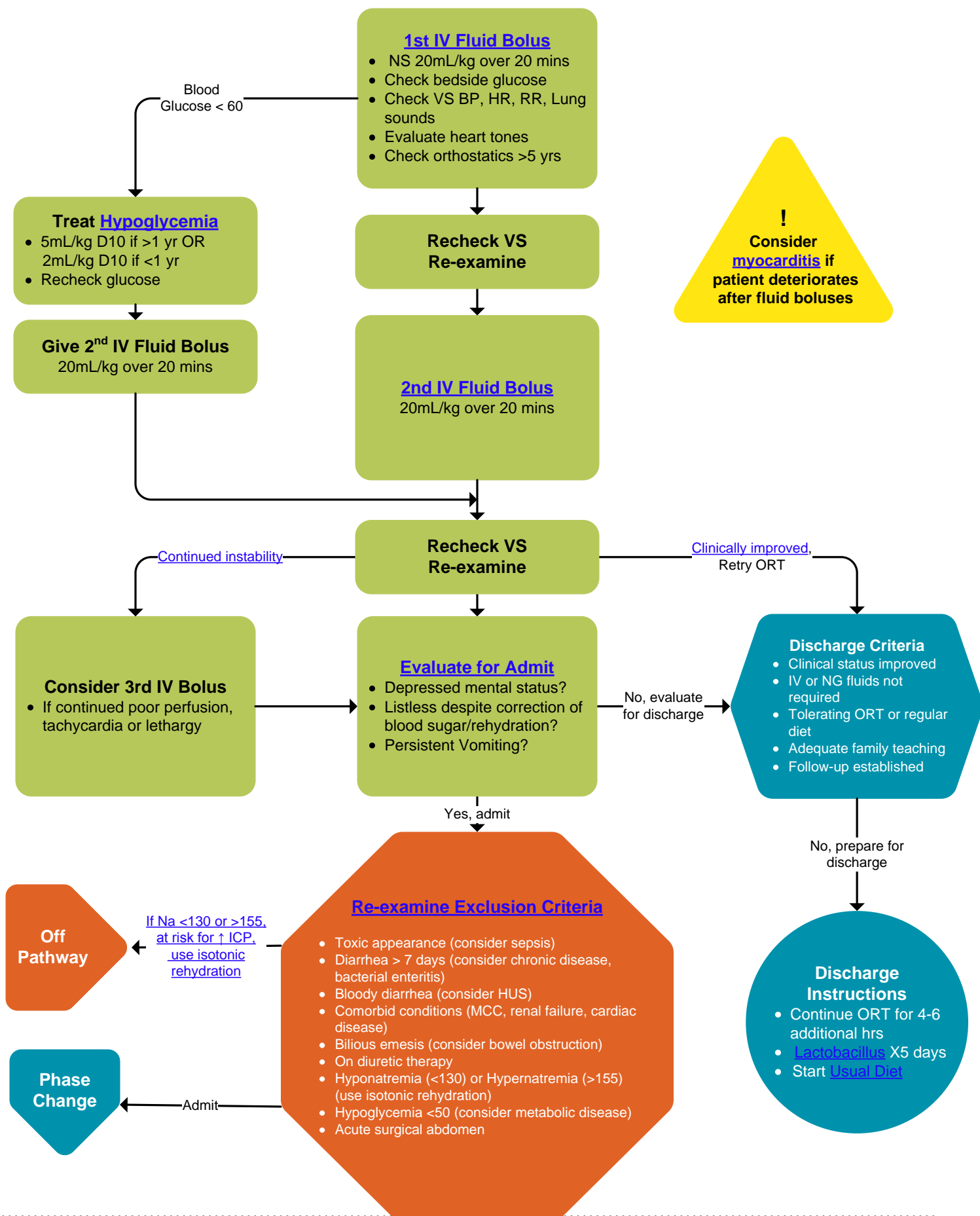
Discharge Instructions

- Continue ORT for 4-6 additional hrs
- [Lactobacillus](#) X5 days
- Start [Usual Diet](#)

[Educate and prepare for discharge](#)

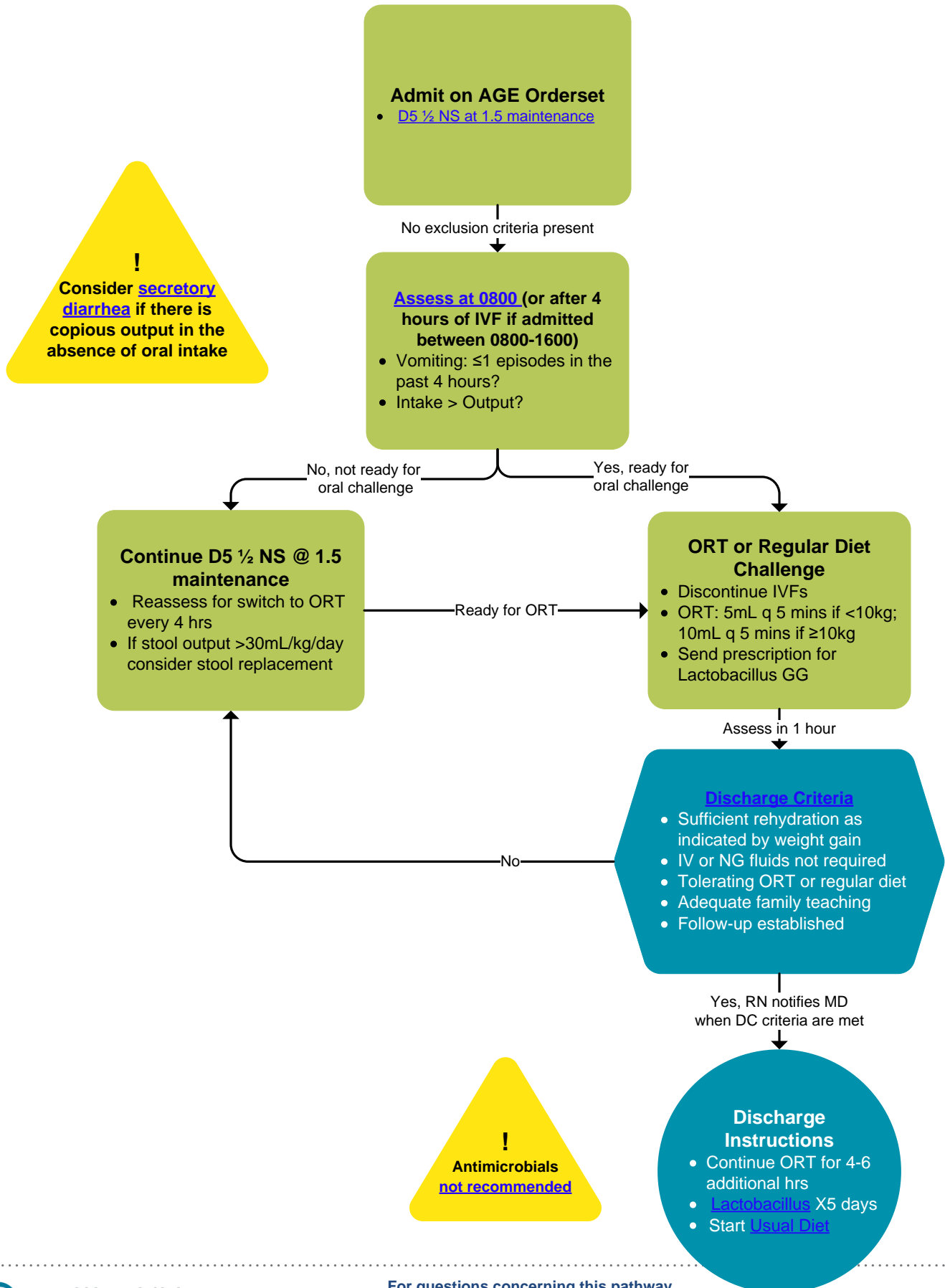
Acute Gastroenteritis v.1.1: IV Rehydration

PHASE II (ED): IV Hydration



Acute Gastroenteritis v.1.1: Inpatient Management

PHASE III: INPATIENT MANAGEMENT



Etiology

Infectious agents are the most common cause of AGE

- *Viruses, primarily rotavirus species, are responsible for 70 to 80% of infectious diarrhea cases in the developed world [LOE: C (Cohen 2005)].*
- *Various bacterial pathogens account for another 10 to 20% of cases; as many as 10% may be attributable to diarrheagenic Escherichia coli [LOE: C (Cohen 2005)].*

Laboratory Studies

-
- *It is recommended that laboratory tests not be routinely performed in children with signs and symptoms of AGE, including tests for specific pathogens, such as those for rotavirus, ova and parasites, bacteria, and fecal antigen tests for parasites [LOE: S (Northrup 1994); LC].*

Laboratory Studies / Stools Studies

-
- Stool studies should be considered in patients with symptoms greater than 7 days, presence of bloody stools, or a contact history with someone with bacterial or parasitic enteritis [LOE: LC].
 - Routine rotavirus testing is not recommended but should be considered if the infection is thought to be hospital acquired [LOE: LC].

Assessment

- It is recommended that the history and physical examination be the primary basis for the diagnosis of AGE [LOE: LC].
- *It is recommended that clinical assessment be initially performed for the presence and degree of dehydration [LOE: M (Steiner 2004)].*

Assessment

- *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 [LOE: C (Duggan 1996), (Gorelick 1997)]. When a reliable pre-illness weight is available, it is recommended to compare the pre-illness to the current weight as the best assessment for degree of dehydration.*
- *Prolonged capillary refill time, abnormal skin turgor, and respiratory rate are the best individual examination measures [LOE: M (Steiner 2004)].*

PHASE 1 (ED): Oral Rehydration Therapy (ORT)

Return to Phase I

- After using the Inclusion and Exclusion criteria to determine if a patient is appropriate for the Acute Gastroenteritis: Clinical Standard Pathway, the next step is to determine the level of dehydration of the patient
- Determining the level of dehydration of the patient will guide the amount of intervention required of the patient
- The level of dehydration can broadly be categorized into 3 levels:
 - (1) minimal dehydration (loss of < 5% body weight)
 - (2) mild to moderate dehydration (loss of 5 – 10% body weight)
 - (3) severe dehydration (loss >10% body weight)

PHASE 1 (ED): Minimal Dehydration

- Minimal dehydration is estimated to be a loss of <5% of total pre-illness body weight
- Patients with this level of dehydration should not require treatment with IVF or ORT
- Patients with minimal dehydration should be encouraged to continue on their usual or regular diet and should be educated on the prevention of dehydration



Prevention of Dehydration

- *It is recommended that continued use of the child's preferred, usual, and age appropriate diet be encouraged to prevent or limit dehydration [LOE: M (Brown 1994); A (Alarcon 1992), (Fayad 1993)].*
- *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 [LOE: A (Alarcon 1991); B (Margolis 1990), (Placzek 1984); C (Khin 1985)].*
- *It is recommended that the vomiting child be offered frequent small feedings (every 10 minutes) of ORS or any tolerated foods [LOE: A (Santosham 1985), (Wan 1999)].*



[Return to Phase I](#)

Prevention of Dehydration

- *It is recommended that continued use of the child's preferred, usual, and age appropriate diet be encouraged to prevent or limit dehydration [LOE: M (Brown 1994); A (Alarcon 1992), (Fayad 1993)].*
- *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 [LOE: A (Alarcon 1991); B (Margolis 1990), (Placzek 1984); C (Khin 1985)].*
- *It is recommended that the vomiting child be offered frequent small feedings (every 10 minutes) of ORS or any tolerated foods [LOE: A (Santosham 1985), (Wan 1999)].*

Prevention of Dehydration / BRAT and liquid diets

- The historical BRAT diet (consisting of bananas, rice, applesauce, and toast) is unnecessarily restrictive, but may be offered as part of the child's usual diet [LOE: S (King 2003); LC].
- Clear liquids are not recommended as a routine substitute for oral rehydration solutions (ORS) or regular diets in the prevention or therapy of dehydration [LOE: S (King 2003); LC].

Prevention of Dehydration / Diets Containing Milk

- *The vast majority of patients with AGE do not develop clinically important lactose intolerance. In selected patients with documented, persistent lactose intolerance, lactose-free formulas are recommended [LOE: M (Brown 1994)].*
- *A meta-analysis of 16 studies found no significant clinical advantage to diluting milk or formula in the management of AGE [LOE: M (Brown 1994)].*

[Return to Phase I](#)

[Return to Phase II](#)

[Return to Phase III](#)

Medication Use: Probiotics

- *Probiotics may be considered as adjunctive therapy, as they have been shown to reduce the duration of diarrhea [LOE: M (Allen 2004)].*
- Family preference may be central to the decision to use probiotics. Parameters influencing the family's decision may include cost, degree of potential benefit, availability, unverified effectiveness of commercial products, and case reports of lactobacillus bacteremia with probiotic use.

Medication Use: Probiotics

- *A Cochrane meta-analysis of 23 randomized controlled trials found mild therapeutic benefit from probiotics that was generally reproducible regardless of organism, quality of study design, or outcome measure [LOE: M (Allen 2004)]. The following organisms/combinations showed benefit in one or more study (in alphabetical order): Enterococcus LAB strain SF68, Lactobacillus acidophilus and Lactobacillus bifidus, Lactobacillus acidophilus LB strain (killed), Lactobacillus casei strain GG, Lactobacillus reuteri*
- *Probiotics may be more effective for rotavirus diarrhea, compared to all-cause diarrhea [LOE: M (Allen 2004)].*
- *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 [LOE: M (Allen 2004); B (Bhatnagar 1998)].*



Medication Use: Probiotics

- The recommended strain of probiotic is *Lactobacillus rhamnosus* at a dose of 10^{10} colony forming units per day for a duration of 5 days.
- This recommendation comes from a Best Evidence Statement (BEST) from Cincinnati Children's Hospital Medical Center (CCHMR) and can be found at:

<http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/guidelines.htm>

Return to Phase I

Return to Phase II

Return to Phase III

Medication Use: Anti-diarrheal Agents and Antiemetics

-
- *Anti-diarrheal agents are NOT recommended in the routine management of children with AGE [LOE: S, E (King 2003)].*
 - *Antiemetics are NOT recommended, although ondansetron has been shown to be safe and effective therapy in the pediatric emergency department (ED), in addition to oral or IV rehydration therapy. [LOE: S, E (King 2003)]*

Medication Use: Anti-microbial Agents

-
- *It is recommended that antimicrobial therapies be used ONLY for selected children with AGE who present with special risks, evidence of a serious bacterial infection (SBI), or have a stool study that indicates a bacterial or parasitic etiology [LOE: C (Barbara 2000)].*



Medication Use: Anti-microbial Agents

-
- *Giardia lamblia and Cryptosporidium are common causes of persistent diarrhea and, if found, treatment is available with metronidazole or nitazoxanide [LOE: O (American Academy of Pediatrics 2003)].*
 - Special consideration should be given to patients found to have a bacterial intestinal infection. Some, but not all, bacterial intestinal infections require treatment. [LOE: LC]



[Return to Phase I](#)

[Return to Phase III](#)

Phase I (ED): Moderate Dehydration

-
- Patients with moderate dehydration are estimated to have a degree of dehydration greater than 5% of body weight but less than 10% of body weight.
 - On assessment, patients with moderate dehydration are likely to have:
 - prolonged capillary refill > 2 seconds
 - abnormal skin turgor ('tenting' or inelastic skin)
 - tachypnea

[Return to Phase I](#)

Phase I (ED): Moderate Dehydration

-
- Patients with moderate dehydration may be given a trial of ondansetron, prior to challenge with ORT, if:
 - they have had recent and/or frequent emesis
 - they have hematemesis presumed to be secondary to emesis [LOE: LC]
 - they had previously received ondansetron more than 4 hours prior to arrival in the emergency room [LOE: LC]



Medication Use: Ondansetron

-
- *Oral ondansetron may decrease vomiting, ED length of stay, need for IV fluid, and hospitalization rates in those patients receiving oral hydration in the ED [LOE: A (Reeves 2002); B (Ramsook 2002)].*
 - *IV ondansetron may decrease the likelihood and frequency of vomiting in ED patients who require IV fluids [LOE: A (Reeves 2002); B (Cubeddu 1997)].*
 - The efficacy of ondansetron for hospitalized children has not adequately been studied [LOE: X].



[Return to Phase I](#)

Phase I (ED): Moderate Dehydration

-
- Patients with moderate dehydration by assessment will be given an ORT challenge.
 - The amount of ORT to be given during the challenge is based on the patient's admitted weight:
 - 5 mL every 5 minutes if < 10 kg
 - 10 mL every 5 minutes if \geq 10 kg
 - *The amount of ORT started is limited at first, and gradually increased as tolerated [LOE: S (King 2003)]*

Rehydration

-
- *It is recommended that dehydration be treated with oral rehydration solutions (ORS), if tolerated and if intake exceeds losses, for a period of 4 to 6 hours or until an adequate degree of rehydration is achieved [LOE: M (Gavin 1996), (Gore 1992); A (Cohen 1995), (Fayad 1993), (Molina 1995), (Santosham 1982), (Santosham 1985); B (Atherly 2002), (Listernick 1986), (Nager 2002); C (Tamer 1985); S (Holliday 1996), (King 2003)].*
 - Given the concern of palatability of ORS solutions in older children, we have opted to use [LOE: LC]:
 - 100% Pedialyte if the patient is < 1 year old
 - 100% flavored Pedialyte if the patient is \geq 1 year old

Phase I (ED): Moderate Dehydration

-
- If, after 20 minutes, the patient tolerates the initial ORT challenge (there is no emesis), then the amount of ORT is increased:
 - 10 mL every 5 minutes if < 10 kg
 - 20 mL every 5 minutes if ≥ 10 kg

 - If, during the initial 20 minute challenge, the patient does have emesis, then:
 - the ORT challenge is held for 20 minutes
 - ondansetron can be considered at this time



Phase I (ED): Moderate Dehydration

-
- If the patient tolerates the increase in ORT without emesis, then the patient can be prepared for discharge.
 - Patients should be encouraged to continue on their usual or regular diet and should be educated on the prevention of dehydration

 - If the patient does not tolerate the increase in ORT, and continues to have emesis, then the patient will change phases on the AGE: Clinical Standard Pathway and move to:

Phase II (ED): IV Rehydration



[Return to Phase I](#)

Phase I (ED): Severe Dehydration

-
- Patients who on assessment are determined to have severe dehydration of >10% loss of body weight, or are in overt shock, are not candidates for ORT challenge.
 - Patients with severe dehydration or overt shock will change phases on the AGE: Clinical Standard Pathway and move to:

Phase II (ED): IV Rehydration

[Return to Phase I](#)

Laboratory Studies / Electrolyte Studies

- *Supplementary laboratory studies, including serum electrolytes, are usually unnecessary. Serum electrolytes are sometimes useful in assessing children suspected severe dehydration prior to intravenous (IV) or nasogastric (NG) fluids. They have not been shown to be a reliable surrogate for determining the degree of dehydration or rehydration [LOE: C (Wathen 2004)].*
- Repeat serum electrolytes are not recommended after IV hydration in an otherwise clinically well appearing child as an assessment for adequate hydration, evaluation for persistent metabolic acidosis, nor as predictor for outcome. They may be useful to follow for correction of severe hyponatremia, hyponatremia, hyperkalemia, or hypokalemia [LOE: LC].



Laboratory Studies / Bicarbonate Level

- *A normal bicarbonate concentration may be useful in ruling out dehydration [LOE: M (Steiner 2004)].*
- An abnormal bicarbonate concentration has not been studied as a predictor for hospitalization after correction of dehydration [LOE: LC].



[Return to Phase I](#)

Rehydration

-
- It is recommended that IV fluids or NG ORS be given for a period of 4 to 6 hours or until an adequate degree of rehydration is achieved when unable to replace the estimated fluid deficit and keep up with the on-going losses using oral feedings alone, and/or for severely dehydrated children with obtunded mental status. IVF should be discontinued promptly once rehydration as been achieved and patient tolerating ORT.
 - *It is appropriate to involve the family in the decision regarding the method of fluid replacement [LOE: A (Cohen 2005), (Mackenzie 1991), (Santosham 1982); B (Listernick 1986), (Nager 2002), (Vesikari 1987); C (Tamer 1985); S (King 2003)].*

[Return to Phase II](#)

Phase II (ED): IV Rehydration

-
- Patients who advance to Phase II (ED): IV Rehydration on the AGE: Clinical Standard Pathway will:
 - Be given a first bolus of IV fluid, consisting of normal saline (NS) at a dose of 20 mL/kg body weight over 20 minutes [LOE: LC].
 - Have a bedside glucose check performed, usually during the placement of the peripheral IV [LOE: LC].
 - Have a full assessment before and after the fluid bolus, that includes vital signs (HR, RR, BP) and evaluation of heart tones and lung sounds, for consideration of the potential for heart failure and/or myocarditis

[Return to Phase II](#)

Heart Failure / Myocarditis

-
- Patients with AGE who deteriorate after an IV fluid bolus should be assessed for evidence of heart failure or myocarditis [LOE: LC]. Signs and symptoms might include:
 - Worsening tachypnea or increase in heart rate over baseline
 - Hypotension or a decrease in blood pressure over baseline
 - Muffled or harder-to-hear heart sounds
 - Coarser (wetter) lung sounds
 - An enlargement of liver span
 - Patients with signs and/or symptoms of heart failure or myocarditis should be removed from the AGE pathway and an attending physician should be consulted.

Phase II (ED): Hypoglycemia

-
- If a patient is found to have hypoglycemia, defined as a bedside glucose check < 60, then the hypoglycemia must first be treated with:
 - an IV bolus of D10W equal to 5 mL/kg body weight, or
 - an IV bolus of D10W equal to 2 mL/kg body weight can be used if the patient is < 1 year old [LOE: LC]
 - The patient will then, after correcting the hypoglycemia, receive a second bolus of NS at a dose of 20 mL/kg over 20 minutes.
 - The patient will then be assessed and will be placed into 1 of 3 categories:
 - Clearly clinically improved
 - Continued instability or signs/symptoms of severe dehydration
 - Clinically not improved, or 'somewhere in-between'

[Return to Phase II](#)

Phase II (ED): IV Rehydration

-
- If a patient receives the first bolus NS, and does not show any signs and/or symptoms of heart failure or myocarditis, then the patient will receive a second bolus of NS, identical in dose to the first one—20 mL/kg body weight over 20 minutes.
 - After receiving two NS boluses, and showing no signs and/or symptoms of heart failure or myocarditis, the patient will then be assessed and will be placed into 1 of 3 categories:
 - Clearly clinically improved
 - Continued instability or signs/symptoms of severe dehydration
 - Clinically not improved, or ‘somewhere in-between’

[Return to Phase II](#)

Phase II (ED): Clear Improvement

-
- Patients with clear clinical improvement after two IV boluses of NS will be rechallenged with ORT.
 - They will be restarted at the initial ORT doses, or:
 - 5 mL every 5 minutes if < 10 kg
 - 10 mL every 5 minutes if ≥ 10 kg
 - If the patient tolerates the ORT challenge without emesis, then the patient can be prepared for discharge.
 - Patients should be encouraged to continue on their usual or regular diet and should be educated on the prevention of dehydration



Oral Feeding Following Rehydration

-
- *It is recommended that re-feeding of the usual diet be started at the earliest opportunity after an adequate degree of rehydration is achieved [LOE: A (Cohen 2005), (Fayad 1993), (Santosham 1982); B (Fox 1990), (Gazala 1988), (Hjelt 1989); S (Walker-Smith 1997)].*



[Return to Phase II](#)

[Return to Phase II](#)

Phase II (ED): Continued Instability

-
- Patients with continued instability or signs / symptoms of severe dehydration will receive a 3rd IV bolus of NS at a dose of 20 mL/kg over 20 minutes.
 - These patients will then change phases on the AGE: Clinical Standard Pathway and move to:

Phase III: Inpatient Management

[Return to Phase II](#)

Phase II (ED): IV Rehydration

-
- Patients who are not clearly clinically improved, but are also not showing signs or symptoms of continued instability, are in the 'in-between' category.
 - These patients may not have continued hypotension, tachycardia or poor perfusion necessitating a 3rd IV bolus of NS. However, they may have continued emesis or persistent listlessness, making an ORT challenge difficult.
 - These patients will then change phases on the AGE: Clinical Standard Pathway and move to:

Phase III: Inpatient Management



[Return to Phase II](#)

Phase II (ED): Re-examination of Exclusion Criteria

-
- A re-examination of the exclusion criteria for patients on the AGE pathway should take place for any patient changing Phases from Phase II (ED): IV Rehydration to Phase III: Inpatient Management (i.e. any patient that is being admitted from the ED to the Inpatient Ward)
 - This re-examination of the exclusion criteria serves as a double-check to exclude inappropriate patients that might be harmed by placement on the AGE pathway.
 - If no exclusion criteria are present, then admit the patient to Phase III: Inpatient Management on the Acute Gastroenteritis pathway

[Return to Phase II](#)

Phase II (ED): Re-examination of Exclusion Criteria

-
- For example, if during the work up in the ED, a patient is found to be either hypernatremic (serum Na > 155) or hyponatremic (serum Na < 130), then:
 - this patient might be harmed by placement on the AGE pathway, where the standard IV fluid order is D5 ½NS
 - hypotonic IV fluids might lead to seizures or other CNS derangements
 - this patient will likely require isotonic IV fluids
 - Patients with either hypernatremia or hyponatremia should therefore be removed from the AGE pathway and an attending physician should be consulted for further management.

[Return to Phase II](#)

PHASE III: Inpatient Management

- By Local Expert Consensus, the initial starting intravenous fluid (IVF) in the inpatient setting is dextrose 5% with 0.45% normal saline (D5 1/2NS)
- Hyponatremic fluids, such as dextrose 5% with 0.225% normal saline (D5 1/4NS) should be avoided, as use of these fluids increases the risk of iatrogenic seizures due to inadvertent iatrogenically induced hyponatremia
- By Local Expert Consensus, the initial starting IVF rate is 1.5 times the maintenance intravenous fluid rate (MIVF). This rate should account for both the fluid deficit and the ongoing losses, as well as the maintenance fluid requirements

[Return to Phase III](#)

Secretory Diarrhea

-
- Special consideration should be made for children with high stool output exceeding 30 mL/kg/day, especially if coupled with low or no oral intake.
 - These children may have secretory diarrhea, and might require a period of hyperalimentation, as well as nothing-by-mouth for a period of time [LOE: LC].

[Return to Phase III](#)

Oral Feeding Following Rehydration

- As part of Clinical Standard Work (CSW), there will be a new change in the AGE order-set, beginning in October 2011, for any patients requiring IV fluids or NG ORS, concerning the clinical decision point of when to transition from IV fluids back to ORT
- In the past, this decision was a clinical decision left to each individual provider. This led to a large amount of variation in how patients with AGE were treated. A goal of this clinical standard pathway is to standardize this clinical decision point.

PHASE III: Inpatient Management

- *There will now be a nursing assessment at 8:00am for any patient admitted after 16:00 the previous day.*
- *This nursing assessment will determine if a patient is ready for an ORT challenge*
- *Patients admitted between 8:00am and 16:00pm will be assessed after 4 hours of IV fluid rehydration*

Oral Feeding Following Rehydration

- The patient will be assessed for:
 - (1) total input and output, and
 - (2) number of episodes of emesis/vomiting
- These 2 clinical criteria will be used to assess a patient's readiness for a challenge of ORT [LOE: LC].

[Go to Oral Feeding Page 2](#)

[Return to Phase III](#)

Oral Feeding Following Rehydration

- If input > output, and the patient has ≤ 1 episode of emesis in the previous 4 hours, then there will be an automatic restart of ORS, or regular diet, by nursing at the same time, 8:00am
- The ORT challenge will begin at the initial doses, or:
 - 5 mL every 5 minutes if < 10 kg
 - 10 mL every 5 minutes if ≥ 10 kg
- if input < output and/or the patient has 2 or more episodes of emesis in the previous 4 hours, then the patient will not be considered ready for ORT challenge or regular diet. The patient will then continue on IV fluid rehydration and will then be reassessed serially every 4 hours until the above criteria are achieved [LOE: LC].



Oral Feeding Following Rehydration

The goals of this change are to:

- reduce the reliance on a physician assessment in order to advance a patient along a care continuum,
- reduce the time on IV fluids or NG ORS and expedite the resumption of oral feeds
- reduce the length of stay of patients hospitalized with AGE
- increase nursing and parental involvement in the management of patients with AGE



[Back](#)

[Return to Phase III](#)

Discharge Criteria

-
- *It is recommended that those patients who are treated in the hospital setting and who are eligible for the AGE guideline have a discharge goal of 23 hours or less [LOE: C (Browne 1996); D (McConnochie 1999)].*
 - It is recommended that prompt discharge be considered when the following levels of recovery are reached [LOE: LC]:
 - sufficient rehydration achieved as indicated by weight gain and/or clinical status
 - IV or NG fluids not required
 - tolerating ORT or regular, usual diet
 - adequate family teaching has occurred
 - medical follow up is available via telephone or office visit



[Return to Phase III](#)

Executive Summary

Executive Summary Acute Gastroenteritis



Objective

To increase the use of oral rehydration therapy and increase early progression to usual, regular diet on patients with acute gastroenteritis.

Recommendations

1. Assessment of patients, to determine their readiness to transition from IVF to ORT, will now be done by nursing, similar to nursing/RT assessment of patients' readiness to transition in the management of patients with asthma
2. Standardized process for ORT challenge (timing, amounts, escalation schedule)
3. Decrease use of inappropriate medications and laboratory studies

Rationale

- Will increase nursing and parental involvement in the management of AGE, currently thought to be a hindrance to early discharge
- Standardized process for ORT challenge should improve nursing and parental satisfaction
- Decrease use of medications and laboratory studies is clinically appropriate and will drive down the cost per episode

Evidence

We are indebted to Cincinnati Children's Hospital Medical Center and their Health Policy and Clinical Effectiveness Program. Major portions of this Best Practice Pathway were adopted and adapted from their Evidence Based Care Guideline (EBCG) for Acute Gastroenteritis: Acute Gastroenteritis Guideline Team, Cincinnati Children's Hospital Medical Center: Evidence-based clinical care guideline for medical management of acute gastroenteritis in children aged 2 months through 5 years, <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/evidence-based/gastro.htm>, Guideline 5, pages 1-15, October 31, 2005

Implementation Highlights

- New web-based training module for physicians, modeled after recent DKA training module
- New patient handouts and discharge teaching/planning
- New nursing teaching protocol

Metrics Plan

- Length of stay (LOS): goal is <24 hours for patients admitted with AGE. Review every 3-6 months.
- Medication usage/ordering rates, laboratory testing ordering rates. Review every 3-6 months.
- Pathway/order set usage rate. Review every month by AGE owner O'Callaghan.

PDCA Plan

AGE committee to meet ever 2-3 months and review metrics above.

Approval

Date Approved: October 2011

Review Due: October 2014

Self-Assessment

• If you are taking this self-assessment as a part of required departmental training, you will need to logon to the [Learning Center](#) to receive credit. Completion also qualifies you for 1 hour of Category II CME credit.

- 1) Which one of the following is NOT an exclusion criteria?
 - a) toxic appearance
 - b) bloody diarrhea
 - c) rotavirus infection
 - d) diarrhea for more than 7 days
 - e) bilious emesis

- 2) Which of the following statements concerning probiotics is/are TRUE?
 - a) Probiotics are considered adjunctive therapy.
 - b) Probiotics may be more effective for rotavirus diarrhea, compared to all-cause diarrhea
 - c) Yogurt is considered a good source of probiotics
 - d) a and b
 - e) a and c
 - f) b and c
 - g) all of the above

- 3) The historical BRAT diet (consisting of bananas, rice, applesauce, and toast) is unnecessarily restrictive.
 - a) true
 - b) false

- 4) Which of the following statements is/are FALSE concerning the clinical assessment of dehydration in AGE?
 - a) Prolonged capillary refill time, abnormal skin turgor, and respiratory rate are the best individual examination measures
 - b) A normal bicarbonate concentration may be useful in ruling out dehydration
 - c) Acute body weight change is considered the gold standard measure of dehydration
 - d) It is recommended that the history and physical examination be the primary basis for the diagnosis of AGE
 - e) none of the above (all of the above statements are true)

- 5) Which of the following discharge criteria are TRUE?
 - a) tolerating ORT and/or regular diet
 - b) tolerating BRAT diet
 - c) medical follow up is available via telephone or office visit
 - d) a and b
 - e) a and c
 - f) b and c
 - g) all of the above

- 6) Ondansetron has been shown to be a safe and effective therapy in hospitalized children.
 - a) true
 - b) false

- 7) As of October 2011, changes to the AGE order-set will include which of the following?
 - a) automatic second bolus of normal saline upon arrival to floor, if not given previously in the Emergency Department
 - b) assessment of input and output, as well as number of episodes of emesis, by nursing at 8:00am for patients admitted after 16:00 the previous day
 - c) routine testing of stool for rotavirus for infection control purposes and possible bed assignment
 - d) stopping of IVF and restarting of ORT by nursing at 8:00am based on their assessment
 - e) a and c
 - f) b and d
 - g) all of the above

- 8) Which of the following is the recommended diet to prevent or limit dehydration?
 - a) ORT
 - b) BRAT diet
 - c) clear liquid diet
 - d) lactose-free diet
 - e) regular diet

[Return to Home](#)

[View Answers](#)

Answer Key

- 1) The correct answer is (c); all other choices except rotavirus infection are exclusion criteria
- 2) The correct answer is (d); probiotics are considered adjunctive therapy and may be more effective for rotavirus diarrhea, compared to all-cause diarrhea.
- 3) The correct answer is (a).
- 4) The correct answer is (e); all of the above statements are true about the clinical assessment of dehydration in AGE.
- 5) The correct answer is (e); tolerating ORT and/or a regular diet and ensuring that adequate medical follow up is available by telephone or office visit are discharge criteria for patients with a diagnosis of AGE.
- 6) The correct answer is (b); while studies suggest a benefit of ondansetron in the outpatient or emergency room setting, ondansetron has not been shown to be an effective therapy in hospitalized children.
- 7) The correct answer is (f); nursing will make an assessment at 8:00am for all patients with AGE admitted since 16:00 the prior day. If the input is greater than the output, and the number of episodes of emesis ≤ 1 in the previous 4 hours, then nursing will stop IVF and restart ORT.
- 8) The correct answer is (e); only a patient's usual or regular diet is the recommended diet to prevent or limit dehydration.

[Return to Home](#)

Evidence Ratings

KEY TO LEVELS OF EVIDENCE

M =Meta-analysis or Systematic Review

A =Randomized controlled trial: large sample

B =Randomized controlled trial: small sample

C=Prospective trial or large case series

D= Retrospective analysis

O= Other evidence

S=Review article

LC =Expert opinion or consensus

NC = National consensus

F =Basic Laboratory Research

X= No evidence

This will appear in the text as [LOE: M]

[Return to Home](#)

[To Bibliography](#)

Summary of Version Changes

- **Version 1.1 (11/08/2011):** Go Live

[Return to Home](#)

Medical Disclaimer

- The enclosed policies, procedures, standards, guidelines, or other materials (including forms) are specifically for use at Seattle Children's Hospital. We are providing these materials to you for information-sharing only.
- Children's is not responsible for subsequent application of the procedures or guidelines to patient care at your facility. It is your responsibility to revise, adapt and adopt any policies, etc., for use at your facility. It is further your responsibility to become updated and to remain current in the constantly evolving area of pediatric health care. Policies and forms may not be reproduced without permission."

[Return to Home](#)

Bibliography

We are indebted to Cincinnati Children's Hospital Medical Center and their Health Policy and Clinical Effectiveness Program. Major portions of this Best Practice Pathway were adopted and adapted from their Evidence Based Care Guideline (EBCG) for Acute Gastroenteritis:

Acute Gastroenteritis Guideline Team, Cincinnati Children's Hospital Medical Center: Evidence-based clinical care guideline for medical management of acute gastroenteritis in children aged 2 months through 5 years, <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/gastro.htm>, Guideline 5, pages 1-15, October 31, 2005.

1. Alarcon P, Montoya R, Perez F, Dongo JW, Peerson JM, Brown KH. Clinical trial of home available, mixed diets versus a lactose-free, soy-protein formula for the dietary management of acute childhood diarrhea. *J Pediatr Gastroenterol Nutr* 1991 Feb;12(2):224-32.
2. Alarcon P, Montoya R, Rivera J, Perez F, Peerson JM, Brown KH. Effect of inclusion of beans in a mixed diet for the treatment of Peruvian children with acute watery diarrhea. *Pediatrics* 1992 Jul;90(1 Pt 1):58-65.
3. Allen SJ, Okoko B, Martinez E, Gregorio G, Dans LF. Probiotics for treating infectious diarrhoea. *Cochrane Database Syst Rev* 2004;(2):CD003048. [92 references]
4. American Academy of Pediatrics (AAP). American Academy of Pediatrics Red Book. 26th ed. Elk Grove (IL): American Academy of Pediatrics (AAP); 2003.
5. Atherly-John YC, Cunningham SJ, Crain EF. A randomized trial of oral vs intravenous rehydration in a pediatric emergency department. *Arch Pediatr Adolesc Med* 2002 Dec;156(12):1240-3.
6. Barbara G, Stanghellini V, Berti-Ceroni C, De Giorgio R, Salvioli B, Corradi F, Cremon C, Corinaldesi R. Role of antibiotic therapy on long-term germ excretion in faeces and digestive symptoms after Salmonella infection. *Aliment Pharmacol Ther* 2000 Sep;14(9):1127-31.
7. Bhatnagar S, Singh KD, Sazawal S, Saxena SK, Bhan MK. Efficacy of milk versus yogurt offered as part of a mixed diet in acute noncholera diarrhea among malnourished children. *J Pediatr* 1998 Jun;132(6):999-1003.
8. Brown KH, Peerson JM, Fontaine O. Use of nonhuman milks in the dietary management of young children with acute diarrhea: a meta-analysis of clinical trials. *Pediatrics* 1994 Jan;93(1):17-27.
9. Browne GJ, Penna A. Short stay facilities: the future of efficient paediatric emergency services. *Arch Dis Child* 1996 Apr;74(4):309-13.
10. Cincinnati Children's Hospital Medical Center. Evidence based clinical care guideline for acute gastroenteritis (AGE) in children aged 2 months through 5 years. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2005 Oct 31.
11. Cohen M, Mezoff A, Laney D, Bezerra J, Beane B, Drazner D, Baker R, and Moran J. Use of a single solution for oral rehydration and maintenance therapy of infants with diarrhea and mild to moderate dehydration. *Pediatrics*, 95(5): 639-45, 1995.
12. Cohen M, Nataro J, Bernstein D, Hawkins J, Roberts N, and Staat M. Prevalence of diarrheagenic Escherichia coli in acute childhood enteritis: a prospective controlled study. *J Pediatr*, 146(1): 54-61, 2005.
13. Cubeddu IX, Trujillo LM, Talmaciu L, Gonzalez V, Guariguata J, Seijas J, Miller IA, Paska W. Antiemetic activity of ondansetron in acute gastroenteritis. *Aliment Pharmacol Ther*; 11:185-191, 1997.
14. Duggan C, Refat M, Hashem M, Wolff M, Fayad I, Santosham M. How valid are clinical signs of dehydration in infants. *J Pediatr Gastroenterol Nutr* 1996 Jan;22(1):56-61.
15. Fayad IM, Hashem M, Duggan C, Refat M, Bakir M, Fontaine O, Santosham M. Comparative efficacy of rice-based and glucose-based oral rehydration salts plus early reintroduction of food. *Lancet* 1993 Sep 25;342(8874):772-5.
16. Fox R, Leen CL, Dunbar EM, Ellis ME, Mandal BK. Acute gastroenteritis in infants under 6 months old. *Arch Dis Child* 1990 Sep;65(9):936-8.
17. Gavin N, Merrick N, Davidson B. Efficacy of glucose-based oral rehydration therapy. *Pediatrics* 1996 Jul;98(1):45-51.
18. Gazala E, Weitzman S, Weizman Z, Gross J, Bearman JE, Gorodischer R. Early vs. late refeeding in acute infantile diarrhea. *Isr J Med Sci* 1988 Mar;24(3):175-9.
19. Gore SM, Fontaine O, Pierce NF. Impact of rice based oral rehydration solution on stool output and duration of diarrhoea: meta-analysis of 13 clinical trials. *BMJ* 1992 Feb 1;304(6822):287-91.
20. Gorelick MH, Shaw KN, Murphy KO. Validity and reliability of clinical signs in the diagnosis of dehydration in children. *Pediatrics* 1997 May;99(5):E6.
21. Guerrant RL, Van Gilder T, Steiner TS, et al. Practice guidelines for the management of infectious diarrhea. *Clin Infect Dis* 2001;32:331--51
22. Hjelt K, Paerregaard A, Petersen W, Christiansen L, Krasilnikoff PA. Rapid versus gradual refeeding in acute gastroenteritis in childhood: energy intake and weight gain. *J Pediatr Gastroenterol Nutr* 1989 Jan;8(1):75-80.
23. Holliday M. The evolution of therapy for dehydration: should deficit therapy still be taught. *Pediatrics* 1996 Aug;98(2 Pt 1):171-7.
24. Khin MU, Nyunt-Nyunt-Wai, Myo-Khin, Mu-Mu-Khin, Tin U, Thane-Toe. Effect on clinical outcome of breast feeding during acute diarrhoea. *Br Med J (Clin Res Ed)* 1985 Feb 23;290(6468):587-9.
25. King CK, Glass R, Bresee JS, Duggan C. Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy. *MMWR Recomm Rep* 2003 Nov 21;52(RR-16):1-16. [114 references]
26. Listerick R, Zieserl E, Davis AT. Outpatient oral rehydration in the United States. *Am J Dis Child* 1986 Mar;140(3):211-5.
27. Mackenzie A, Barnes G. Randomized controlled trial comparing oral and intravenous rehydration therapy in children with diarrhoea. *BMJ* 1991 Aug 17;303(6799):393-6.
28. Margolis PA, Litterer T, Hare N, Pichichero M. Effects of an unrestricted diet on mild infantile diarrhea. A practice-based study. *Am J Dis Child* 1990 Feb;144(2):162-4.
29. McConnochie KM, Connors GP, Lu E, Wilson C. How commonly are children hospitalized for dehydration eligible for care in alternative settings. *Arch Pediatr Adolesc Med* 1999 Dec;153(12):1233-41.
30. Molina S, Vettorazzi C, Peerson JM, Solomons NW, Brown KH. Clinical trial of glucose-oral rehydration solution (ORS), rice dextrin-ORS, and rice flour-ORS for the management of children with acute diarrhea and mild or moderate dehydration. *Pediatrics* 1995 Feb;95(2):191-7.
31. Nager AL, Wang VJ. Comparison of nasogastric and intravenous methods of rehydration in pediatric patients with acute dehydration. *Pediatrics* 2002 Apr;109(4):566-72.
32. Northrup, R. S., and Flanigan, T. P.: Gastroenteritis. *Pediatr Rev*, 15(12): 461-72, 1994,
33. Placzek M, Walker-Smith JA. Comparison of two feeding regimens following acute gastroenteritis in infancy. *J Pediatr Gastroenterol Nutr* 1984 Mar;3(2):245-8.
34. Ramscook C, Sahagun-Carreón I, Kozinetz CA, Moro-Sutherland D. A randomized clinical trial comparing oral ondansetron with placebo in children with vomiting from acute gastroenteritis. *Ann Emerg Med* 2002 Apr;39(4):397-403.
35. Reeves JJ, Shannon MW, Fleisher GR. Ondansetron decreases vomiting associated with acute gastroenteritis: a randomized, controlled trial. *Pediatrics* 2002 Apr;109(4):e62.
36. Santosham M, Burns B, Nadkarni V, Foster S, Garrett S, Croll L, O'Donovan JC, Pathak R, Sack RB. Oral rehydration therapy for acute diarrhea in ambulatory children in the United States: a double-blind comparison of four different solutions. *Pediatrics* 1985 Aug;76(2):159-66.
37. Santosham M, Daum RS, Dillman L, Rodriguez JL, Luque S, Russell R, Kourany M, Ryder RW, Bartlett AV, Rosenberg A, Benenson AS, Sack RB. Oral rehydration therapy of infantile diarrhea: a controlled study of well-nourished children hospitalized in the United States and Panama. *N Engl J Med* 1982 May 6;306(18):1070-6.
38. Steiner MJ, DeWalt DA, Byerley JS. Is this child dehydrated. *JAMA* 2004 Jun 9;291(22):2746-54. [45 references]
39. Tamer AM, Friedman LB, Maxwell SR, Cynamon HA, Perez HN, Cleveland WW. Oral rehydration of infants in a large urban U.S. medical center. *J Pediatr* 1985 Jul;107(1):14-9.
40. Vesikari T, Isolauri E, Baer M. A comparative trial of rapid oral and intravenous rehydration in acute diarrhoea. *Acta Paediatr Scand* 1987 Mar;76(2):300-5.
41. Wathen JE, MacKenzie T, Bothner JP. Usefulness of the Serum Electrolyte Panel in the Management of Pediatric Dehydration Treated with Intravenously Administered Fluids. *Pediatrics*. 114:5:2004.
42. Walker-Smith JA, Sandhu BK, Isolauri E, Banchini G, van Caillie-Bertrand M, Dias JA, Fasano A, Guandalini S, Hoekstra JH, Juntunen M, Kolacek S, Marx D, Micetic-Turk D, Razenberg MC, Szajewska H, Taminiou J, Weizman Z, Zanacca C, Zetterstrom R. Guidelines prepared by the ESPGAN Working Group on Acute Diarrhoea. Recommendations for feeding in childhood gastroenteritis. *European Society of Pediatric Gastroenterology and Nutrition. J Pediatr Gastroenterol Nutr* 1997 May;24(5):619-20.
43. Wan C, Phillips MR, Dibley MJ, Liu Z. Randomized trial of different rates of feeding in acute diarrhoea. *Arch Dis Child* 1999 Dec;81(6):487-91.