Acute Gastroenteritis Pathway v4.0: **Table of Contents**

Stop and **Review**

Inclusion Criteria

- Vomiting and/or diarrhea of recent onset not due to chronic disease, with or without fever, nausea, or abdominal pain

Exclusion Criteria

- Patient < 3 months of age
- 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 mEq/L) or Hypernatremia (>155 mEq/L)
- Acute surgical abdomen

Acute Gastroenteritis Care

ED/Urgent Care
Oral Rehydration Therapy (ORT)

ED/Urgent Care
IV or NG Rehydration

Inpatient Management

Appendix

Version Changes | **Approval & Citation** | **Evidence Ratings** | **Bibliography**

Last Updated: March 2024
Next Expected Review: June 2026

For questions concerning this pathway, contact:
AcuteGastroenteritis@seattlechildrens.org

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Acute Gastroenteritis Pathway v4.0: **Emergency Department/ Urgent Care Oral Rehydration Therapy (ORT)**

Stop and **Review**

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- Acute surgical abdomen

! **Routine testing for bacterial pathogens not recommended**

! **Anti-diarrheals and antimicrobials are not recommended**

Assessing Dehydration

- In children 1-36 months of age, the Clinical Dehydration Score (CDS) may be used to diagnose moderate to severe dehydration (≥6%); however, given the wide confidence interval surrounding the (+) LR, the decision to treat should not solely rest on the CDS
- The decision to treat should incorporate clinical judgment and assessment of the patient's vital signs (HR, RR) and ability to take oral intake
- The CDS is not useful in assessing dehydration of <6%

Overt shock → **Off Pathway**

Moderate to Severe (CDS 5-8)

Minimal to no dehydration

Give a single dose of Ondansetron

- Consider holding if diarrhea is chief complaint

Failed oral challenge (if attempted)

Consider oral challenge

Begin ORT

Initial ORT Challenge (suggested regimen)

- 5 mL q 5 mins if <10 kg
- 10 mL q 5 mins if ≥10 kg
- Higher initial volumes can be used for adult-sized patients

Reassess after 20 minutes

Emesis after initial ORT?

Yes

Hold ORT for 20 minutes

- Then restart ORT at initial rate

No

Increase ORT

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

Continued emesis?

Yes

Continue to IV or NG Rehydration

No

Discharge Criteria

- Clinical status improved
- Tolerating ORT or regular diet
- Adequate family teaching
- Follow-up established

Discharge Instructions

- Continue ORT at home for 4-6 additional hours then resume regular diet
- Breastfeeding infants and children should neither interrupt breast-feeding nor introduce diluted or modified formula.
- Dispense 1-3 day supply of Pedialyte if needed
- Lactobacillus for 5 days

Passed oral challenge (if attempted)

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Acute Gastroenteritis Pathway v4.0: **Emergency Department/ Urgent Care IV or NG Rehydration**

Stop and **Review**

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- Hyponatremia (<130 mEq/L) or Hypernatremia (>155 mEq/L)
- Acute surgical abdomen

!

Consider checking blood glucose if altered mental status

!

Consider myocarditis if patient deteriorates after fluid boluses

Check vital signs

- Check BP, HR, RR
- Evaluate heart and lung sounds

Involve caregiver and patient in decision to hydrate with IV or NG

IV / NG

1st IV Fluid Bolus

- NS 20 mL/kg over 30-60 mins (max dose: 1,000 mL)
- Upon initiation of IV, check electrolytes
- Consider ondansetron if not already given or tolerated

1st NG Fluid Bolus

- Pedialyte 20 mL/kg over 60 mins (max dose: 600 mL) requires feeding pump
- Consider ondansetron if not already given or tolerated

Recheck Vital Signs; Re-examine

- If improved, consider returning to ORT

Urgent Care Transfer Criteria

- Unable to treat in urgent care
- If not improving after 1st IV/NG bolus, consider transfer (send by BLS); patient could be at risk for shock
- If not tolerating ORT after 2nd IV/NG bolus, definitely transfer (send by BLS)
- Overt shock (IV access, bolus started, ALS transport)
- Worsening clinical status

Recheck Vital Signs; Re-examine

- If improved, consider returning to ORT

2nd IV Fluid Bolus

- NS 20 mL/kg over 30-60 mins

2nd NG Fluid Bolus

- Pedialyte 20 mL/kg over 60 mins

Recheck Vital Signs; Re-examine

Discharge Criteria

- Clinical status improved
- IV or NG fluids not required
- Tolerating ORT or regular diet
- Adequate family teaching
- Follow-up established

Discharge Instructions

- Continue ORT at home for 4-6 additional hours then resume regular diet
- Breastfeeding infants and children should neither interrupt breast-feeding nor introduce diluted or modified formula.
- Dispense 1-3 day supply of Pedialyte if needed
- Lactobacillus for 5 days

Does not meet discharge criteria

Re-examine Exclusion Criteria

Off Pathway

Continue to Inpatient Management

- Admit on AGE pathway

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Acute Gastroenteritis Pathway v4.0: **Inpatient Management**

Stop and **Review**

Inclusion Criteria

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!

Consider secretory diarrhea if there is output (>30 cc/kg/day) in the absence of oral intake

!

Anti-diarrheals and antimicrobials are not recommended

Use AGE SmartSet

- Start IV D5 NS + 20 mEQ KCL/liter OR NG Pedialyte at maintenance rate
- Assess need for additional NS or Pedialyte bolus
- Administer zinc if < 6 months of age and risk factors are present

Assess at 0800 (or after 4 hours of IV/NG fluids if admitted between 0800-1600)

- Vomiting: ≤1 episodes in the past 4 hours?

No, not ready for regular diet challenge

Yes, ready for regular diet challenge

Continue maintenance IV/NG fluids

- IV: Replace ongoing stool and emesis losses with NS 1:1 every 4 hours
- NG: Replace ongoing stool and emesis losses with Pedialyte 1:1 every 4 hours

Not ready for regular diet

Reassess for switch to regular diet every 4-6 hours

Ready for regular diet

Regular Diet Challenge

- Discontinue IV or NG fluids
- Resume regular diet (lactose-free formula is not required)
- Reassess after 20 minutes
- Send prescription for Lactobacillus GG

Emesis after initial diet challenge?

Yes

No

Hold diet for 4-6 hours then attempt again

No emesis

Emesis

Advance Diet

Continued emesis > 48 hrs

No emesis

Consider other diagnoses

Discharge Criteria

- Sufficient rehydration as indicated by weight gain OR normal respiratory rate, capillary refill, and skin turgor
- IV or NG fluids not required
- Tolerating ORT or regular diet
- Adequate family teaching
- Follow-up established

Discharge Instructions

- Continue ORT at home for 4-6 additional hours then resume regular diet
- Breastfeeding infants and children should neither interrupt breast-feeding nor introduce diluted or modified formula.
- Dispense 1-3 day supply of Pedialyte if needed
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Acute Gastroenteritis: Diagnosis (page 1)

What is the preferred scale for assessing dehydration?
In general, (+) LRs >10 and (-) LRs < 0.1 are more useful clinically. That is, harms the FPs and FNs are acceptable at these values.

Clinical Dehydration Scale (CDS):
< 3% Dehydration
CDS was evaluated against a gold standard of percentage loss of body weight to detect <3% dehydration in 3 studies (n = 442 participants) performed in high and low income countries. (+) LR 1.55 (95% CI: 0.87 to 3.18); (-) LR 0.9 (95% CI: 0.79 to 1.03). [*Level of Evidence (LOE): +2 Low certainty (Falszewska 2018)*]

3-6% Dehydration
CDS was evaluated against a gold standard of percentage loss of body weight to detect 3-6% dehydration in 3 studies (n = 441 participants) performed in high and low income countries (+) LR 1.3 (95% CI: 1.01 to 1.65) (-) LR 0.7 (95% CI: 0.415 to 0.985). [*Level of Evidence (LOE): +4 High certainty (Falszewska 2018)*]

>6% Dehydration
CDS was evaluated against a gold standard of percentage loss of body weight to detect >6% dehydration in 4 studies (n = 565 participants) performed in high and low income countries (+) LR 1.96 (95% CI: 1.26 to 2.92) (-) LR 0.69 (95% CI: 0.5 to 0.9). [*Level of Evidence (LOE): +3 Moderate certainty (Falszewska 2018)*]

In 2 studies in high income countries (n = 317 participants), CDS provided a moderate-to-large increase in the post-test probability of predicting moderate to severe (≥6%) dehydration (positive LR (3.9–11.79), but it was of limited value for ruling it out (negative LR 0.55–0.71). For a low disease prevalence of 15% which is typically seen in patients with <1 day of symptoms, the (+) post-test probability is 58% (95% CI: 41% to 68%). This means that after learning the test results the probability that the person testing positive has the condition is between 41% and 68%. The (-) post-test probability is 10% (95% CI: 9% to 11%). This means that after learning the test results the probability that the person testing negative has the condition is between 9% and 11%. For a high disease prevalence of 75% which is typically seen in patients with depressed mental status, tachycardia and tachypnea, the (+) post-test probability is 96% (95% CI: 92% to 97%). [*Level of Evidence (LOE): +3 Moderate certainty (Falszewska 2018); Guideline (FISPGHAN 2018)*]

Clinical Dehydration Scale (CDS) for children aged 1-36 months.

Characteristic	0	1	2
General Appearance	Normal	Thirsty, restless, or lethargic, but irritable when touched	Drowsy, limp, cold, sweaty, and/or comatose
Eyes	Normal	Slightly sunken	Very sunken
Mucous Membranes	Moist	“Sticky”	Dry
Tears	Tears	Decreased Tear	Absent tears

A score of 0 represents no dehydration (<3%); a score of 1 to 4, some dehydration (3-6%); and a score of 5-8, moderate/severe dehydration (≥6%)

Acute Gastroenteritis: Diagnosis (page 2)

Gorelick Scale (10-point scale)

5-10% Dehydration: The Gorelick Scale was evaluated against a gold standard of percentage loss of body weight to detect 5-10% dehydration in 1 study (n = 117 participants) in a high-income country. (+) LR 0.4 (95% CI: 0.1 to 1.8) (-) LR 1.2 (95% CI: 0.8 to 1.4). [*Level of Evidence (LOE): +4 High certainty (Falszewska 2018)*]

>10% Dehydration:The Gorelick Scale was evaluated against a gold standard of percentage loss of body weight to detect >10% dehydration in 1 study (n = 117 participants) in a high income country. (+) LR 4 (95% CI: 0.5 to 4.7) (-) LR ? (95% CI: 0 to 1.1). [*Level of Evidence (LOE): +4 High certainty (Falszewska 2018)*]

WHO Scale

<5% Dehydration: WHO scale was evaluated against a gold standard of percentage loss of body weight to detect <5% dehydration in 1 study (n = 116 participants) in a high income country. (+) LR 2 (95% CI: 0.95 to 5.7) (-) LR 0.6 (95% CI: 0.4 to 1.1). [*Level of Evidence (LOE): +4 high certainty (Falszewska 2018)*]

5-10% Dehydration: WHO Scale was evaluated against a gold standard of percentage loss of body weight to detect 5-10% dehydration in 1 study in a high-income country (n = 116 participants). (+) LR 1.2 (95% CI: 0.5 to 2.3) (-) LR 0.9 (95% CI: 0.5 to 1.3). [*Level of Evidence (LOE): +4 High certainty (Falszewska 2018)*]

Acute Gastroenteritis: Diagnosis (page 3)

When should stool samples be sent for bacterial culture?

In most cases, children with AGE do not require a diagnostic workup. In severe conditions and/or in the hospital setting, investigations may be appropriate in individual cases.

Microbiological investigations should be considered in the following circumstances:
1. Children with underlying chronic conditions (e.g., oncologic diseases, inflammatory bowel disease, immunodeficiency)
2. Extremely severe clinical conditions (e.g., sepsis)
3. Prolonged symptoms (>14 days): Persistent diarrhea of infectious etiology is more often caused by bacterial and protozoal pathogens compared to acute diarrhea. In certain hosts, viruses and helminths are identified. When infectious agents are not identified, noninfectious causes should be considered (e.g., irritable bowel syndrome, inflammatory bowel disease, celiac disease, lactase deficiency, ingested substances, or cancer).
4. Children with severe bloody diarrhea and high fever
5. Recent history of travel to at-risk area
[*LOE Guideline(FISPGHAN 2018, World Health Organization 2021)*]

Perform stool testing for Salmonella, Shigella, Campylobacter, Yersinia, C. difficile, and S Shiga toxin–producing Escherichia coli (STEC) in people with diarrhea accompanied by fever, bloody or mucoid stools, severe abdominal cramping or tenderness, or signs of sepsis. [*LOE Guideline (Shane 2017)*]

Finding	Likely Pathogens
Persistent or chronic diarrhea	*Cryptosporidium* spp, *Giardia lamblia* , *Cyclospora cayetanensis* , *Cystoisospora belli* , and *Entamoeba histolytica*
Visible blood in stool	Shiga toxin–producing *Escherichia coli.* (STEC), *Shigella* , *Salmonella* , *Campylobacter* , *Entamoeba histolytica* , non-cholera *Vibrio* species, *Yersinia* , *Balantidium coli* , *Plesiomonas*
Fever Not highly discriminatory	Viral, bacterial, and parasitic infections can cause fever. Higher temperatures suggest bacterial etiology or *E. histolytica* . STEC infection presents afebrile.
Abdominal pain	STEC, *Salmonella* , *Shigella* , *Campylobacter* , *Yersinia* , non-cholera *Vibrio* species, *Clostridium difficile*
Severe abdominal pain, often grossly bloody stools (occasionally non-bloody), and minimal or no fever	STEC, *Salmonella* , *Shigella* , *Campylobacter* , and *Yersinia enterocolitica*
Persistent abdominal pain and fever	*Y. enterocolitica* and *Y. pseudotuberculosis* ; may mimic appendicitis
Nausea and vomiting lasting ≤24 hours	Ingestion of *Staphylococcus aureus* enterotoxin or *Bacillus cereus* (short-incubation emetic syndrome)
Diarrhea and abdominal cramping lasting 1–2 days	Ingestion of *Clostridium perfringens* or *B. cereus* (long-incubation emetic syndrome)
Vomiting and non-bloody diarrhea lasting 2–3 days or less	Norovirus (low-grade fever usually presents during the first 24 hours in 40% if infections)
Chronic watery diarrhea, often lasting a year or more	Brainerd diarrhea (etiologic agent has not been identified); post-infectious irritable bowel syndrome

Acute Gastroenteritis: Treatment (page 1)

Which therapies are most effective in reducing vomiting?
Give a single dose of Ondansetron to children presenting to the ED with AGE to decrease vomiting, the chance of hospitalization and the need for intravenous rehydration. It is unclear if Ondansetron reduces revisits to the ED.

Outcome: Cessation of Vomiting
Cessation of vomiting was higher with Ondansetron, OR 3.57 (2.17 to 6.25). [*Level of Evidence (LOE): +3 to +4 Moderate to High certainty (Nino-Serna 2020)*]

Outcome: Hospitalization
Hospitalization was lower with Ondansetron, OR 0.34 (0.16 to 0.59). [*Level of Evidence (LOE): +3 to +4 Moderate to High certainty (Nino-Serna 2020)*]

Outcome: Intravenous Rehydration
The need for intravenous rehydration was lower with Ondansetron OR 0.33 (0.19 to 0.52). [*Level of Evidence (LOE): +3 to +4 Moderate to High certainty (Nino-Serna 2020)*]

Outcome: Revisit to the ED
There was no difference between Ondansetron and control for revisits to the ED, OR 1.21 (0.68 to 2.63). [Level of Evidence (LOE): +1 to +2 Low to Very low certainty (Nino-Serna 2020)]

The abovementioned findings are supported by a guideline where the authors recommend a single dose of Ondansetron in young children presenting to an emergency department with vomiting to ensure oral rehydration and reduce hospital admission. Add harms [*Level of Evidence (LOE): Guideline (FISPGHAN 2018)*].

Acute Gastroenteritis: Treatment (page 2)

What is the optimal rate, mode of delivery and/or composition of IVFs to adequately treat the patient and prevent side effects? When should children be re-fed orally?

Mode of Delivery: Intravenous fluid therapy and oral rehydration therapy
Outcome: Hospitalization
There was no difference between intravenous fluid therapy and oral rehydration therapy for hospitalization RR 0.8 (95% CI: 0.2 to 2.7). [*Level of Evidence (LOE): +2 Low certainty (Freedman 2015)*]

Outcome: Return to the ED
There was no difference between intravenous fluid therapy and oral rehydration therapy for returns to the ED. RR 0.9 (95% CI: 0.4 to 1.9). [*Level of Evidence (LOE): +2 Low certainty (Freedman 2015)*]

ORS and Refeeding Guideline Recommendation
A guideline recommended stated that ORS is the first-line treatment of AGE as it has fewer side effects than IV rehydration. Additionally, children should be re-fed early during the course of AGE. Regular oral feeding should be reintroduced no later than 4 to 6 hours after the onset of rehydration. [*Level of Evidence (LOE): Guideline (FISPHGHAN 2018)*]

IVF Bolus Rate
Outcome: Treatment failure requiring hospital admission at index visit, or a prolonged emergency department visit > 6 hours.
There was no difference between an IV Bolus Rate: 20 to 60 ml/kg over 1-2 hours vs 2-4 hours for hospital admission or prolonged ED visit (>6 hours). [*Level of Evidence (LOE): +2 Low certainty (Iro 2018)*]

Outcome: Hospital readmission following discharge
There was no difference between an IV Bolus Rate: 20 to 60 ml/kg over 1-2 hours vs 2-4 hours for hospital readmission following discharge. [*Level of Evidence (LOE): +2 Low certainty (Iro 2018)*]

IVF Composition
The authors of a systematic review of 3 RCTs and 3 observational studies stated that short term use of isotonic intravenous replacement (IVR) fluids are safe and effective in most children with AGE. They also recommend avoiding hypotonic IVR solutions for older children and over long periods due to the risk of hyponatremia. Finally they recommend that hypotonic IVR solutions can be used for infants < 6 months age with moderate to severe hypernatremia dehydration, Na > 146 mEq/L. [*Level of Evidence (LOE): +1 to +2 Very low to Low certainty (Grisaru (2018)*]

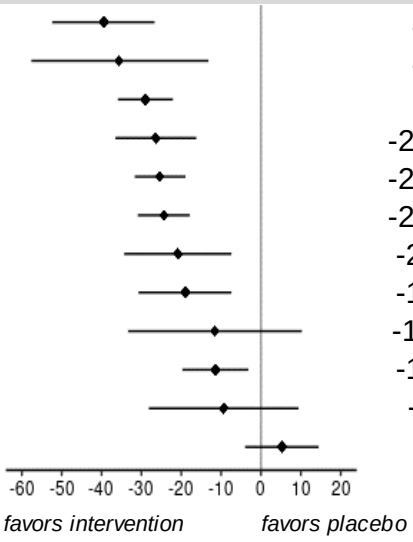
Acute Gastroenteritis: Treatment (page 3)

Are probiotics, kaolin-pectin, diluted milk, lactose-free formula, loperamide, prebiotics, micronutrients, racecadotril, symbtiotics, gelatin tannate, zinc, Vitamin A, smectite, or yogurt singly or in combination effective in treating AGE?

Outcome: Duration of diarrhea

Forest plot summary of interventions for duration of diarrhea (hours)

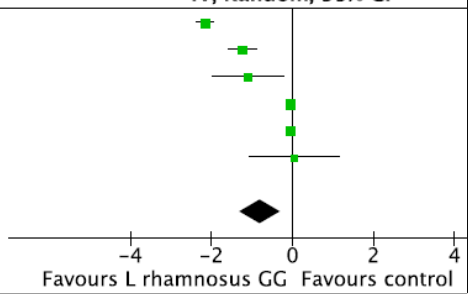
Duration of diarrhea (hours)	Mean Difference (95% CI)	GRADE
S. boulardii + zinc	-39.4 (-52.4 to -26.7)	+3
Smectite + zinc	-35.6 (-57.6 to -13.2)	+3
Zinc inpatients	-29 (-35.9 to -22.1)	+3
Zinc (20-40 mg/day)	-26.39 (-36.54 to -16.23)	+4
Saccharomyces boulardii	-25.44 (-31.68 to -18.96)	+2
Smectite	-24.38 (-30.91 to -17.85)	+3
Lactobacillus reuteri	-20.88 (-34.32 to -7.44)	+1
Lactobacillus rhamnosus GG	-18.96 (-30.72 to -7.44)	+3
Gelatin Tannate	-11.56 (-33.36 to 10.25)	+2
Zinc (> 6 months of age)	-11.46 (-19.72 to -3.19)	+2
Yogurt	-9.36 (-28.14 to 9.41)	+1
Zinc (< 6 months of age)	5.23 (-4 to 14.45)	+2



Subgroup analysis of high and moderate quality studies, data from Szajewska 2019 Figure 1, pg.1381 L rhamnosus GG; Dose: > or = 10^{10} CFU/day (high dose)

	Experimental			Control				Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Basu 2009	5.069	1.24	374	7.23	1.27	185	19.4%	-2.16 [-2.38, -1.94]
Berni Canani	3.46	1.48	100	4.7	0.98	92	18.3%	-1.24 [-1.59, -0.89]
Shomikova	2.7	2.2	59	3.8	2.8	64	12.1%	-1.10 [-1.99, -0.21]
Schnadower	2.07	0.47	472	2.12	0.44	480	20.2%	-0.05 [-0.11, 0.01]
Costa-Ribeiro	1.59	0.16	61	1.63	0.19	63	20.2%	-0.04 [-0.10, 0.02]
Ritchie	2.18	2.44	33	2.13	2.11	31	9.8%	0.05 [-1.07, 1.17]
Total (95% CI)			**1099**			**915**	**100.0%**	**-0.79 [-1.28, -0.31]**

Heterogeneity: $Tau^2 = 0.30$; $Chi^2 = 379.73$, df = 5 (P < 0.00001); $I^2 = 99\%$
Test for overall effect: Z = 3.21 (P = 0.001)



Go to: How to Read a Forest Plot

Acute Gastroenteritis: Treatment (page 4)

Gelatin Tannate
There was no difference between gelatin tannate versus placebo for duration of diarrhea for duration of diarrhea. MD -11.56 hours (95% CI: -33.36 to 10.25). [*Level of Evidence (LOE): +2 Low certainty (Florez 2020)*]

Probiotics
Guideline Recommendation:
Probiotics are effective in reducing the duration and intensity of symptoms of AGE. Consider probiotic strains (including Lactobacillus rhamnosus GG, Saccharomyces boulardii, and L Reuteri DSM 17938) in children with AGE, as an adjunct to ORS. [*Level of Evidence (LOE): Guideline (FISPGHAN 2018)*]

Lactobacillus reuteri
DSM 17938, variable dose, for 5-7 days was compared to placebo or no treatment in 4 RCTs (n = 347 participants) to evaluate duration of diarrhea. L. reuteri daily for 5-7 days may reduce the duration of diarrhea compared to placebo or no treatment but the evidence is very uncertain [mean difference MD -0.87 days (95% CI: -1.43 to 0.31)]. [*Level of Evidence (LOE): 1+ Very low certainty (Patro-Golab 2019)*]

Lactobacillus rhamnosus GG
Lactobacillus rhamnosus GG, daily doses ranged from 1.2 x 10^8 CFU to 2 x 10^12 CFU, 2-10 days in duration (majority used ~5 day duration) was compared to placebo or no treatment in 15 RCTs (n = 3820 participants) to evaluate the duration of diarrhea. L. rhamnosus GG daily may reduce the duration of diarrhea compared to placebo or no treatment [mean difference MD -0.85 days (95% CI: -1.15 to -0.56)].

S. boulardii + zinc
In this network meta-analysis, S. boulardii + zinc was compared to control across 174 RCTs (n = 32832 participants) to evaluate duration of diarrhea. S. boulardii + zinc reduces the duration of diarrhea compared to control. [mean difference MD -39.4 hours (95% CI: -52.4 to -26.7)]. Quality of evidence was assessed for direct and indirect comparisons. [*Level of Evidence (LOE): +3 to +4 Moderate to high certainty (Florez 2018)*]

Saccharomyces boulardii
Saccharomyces boulardii, <300 mg to 4000 mg daily (though most commonly used dose 500 mg), for 3-10 days (typically 5 days) was compared to placebo or no treatment in 23 RCTs (n = 3450 participants) to evaluate the duration of diarrhea. S. Boulardii may reduce the duration of diarrhea compared to placebo or no treatment but the evidence is very uncertain [mean difference MD -1.06 days (95% CI: -1.32 to -0.79)].

Acute Gastroenteritis: Treatment (page 5)

Smectite
Smectite (1.5-6 gms qd -qid X 3 days) (2 studies added lactobacillus to treatment and control groups; 1 study added zinc to the treatment and control groups) was compared to control in 14 RCTs and quasi-RCTs (n = 2209 participants) to evaluate the duration of diarrhea over a 1-week follow-up period. Smectite may reduce the duration of diarrhea compared to control. [mean difference MD -24.38 hours (95% CI: -30.91 to -17.85)]. [*Level of Evidence (LOE): +2 Low certainty (Perez-Gaxiola)*]

Smectite + zinc
In this network meta-analysis, smectite + zinc was compared to control in 174 RCTs (n = 32832 participants) to evaluate duration of diarrhea. Smectite + zinc reduces the duration of diarrhea compared to control. [mean difference MD -35.6 hours (95% CI: -57.6 to -13.2)]. Quality of evidence was assessed for direct and indirect comparisons. [*Level of Evidence (LOE): +3 to +4 Moderate to high certainty (Florez 2018)*]

Yogurt
Yogurt defined by the Codex Alimentarius standard for fermented milks, of any dose and of unspecified duration was compared to placebo (milk formula) or no intervention in 2 RCTs (n = 208 participants) to evaluate the duration of diarrhea over an unspecified follow-up period. The evidence is very uncertain about the effect of yogurt (of any dose) on the duration of diarrhea compared to placebo or no intervention [mean difference MD -9.36 hours (95% CI: -28.14 to 9.41)]. [*Level of Evidence (LOE): +1 Very low certainty (Patro-Bolab 2015)*]

Zinc (patients > 6 months of age)
Children > 6 months of age: Zinc was compared to placebo in 9 RCTs (n = 2581 participants) to evaluate the duration of diarrhea. Zinc may reduce duration of diarrhea compared to placebo. [mean difference MD -11.46 hours (95% CI: -19.72 to -3.19)]. [*Level of Evidence (LOE): +2 Low certainty (Lazzerini 2017)*]

Zinc (patients < 6 months of age)
Children < 6 months of age: Zinc was compared to placebo in 2 RCTs (n = 1334 participants) to evaluate duration of diarrhea. The evidence suggests that zinc results in little to no difference in the duration of diarrhea compared to placebo [mean difference MD 5.23 hours (95% CI: -4 to 14.45)]. [*Level of Evidence (LOE): +2 Low certainty (Lazzerini 2017)*]

Zinc (20-40 mg/day)
Zinc (20-40 mg/day) was compared to placebo in 5 RCTs (n = 419 participants) to evaluate the duration of diarrhea. Zinc reduces the duration of diarrhea compared to placebo [mean difference MD -26.39 hours (95% CI: -36.54 to -16.23)]. [*Level of Evidence (LOE): +4 High certainty (Lazzerini 2017)*]

Acute Gastroenteritis: Treatment (page 6)

Zinc in Inpatients
Zinc (inpatients) was compared to control in 174 RCTs (n = 32832 participants) to evaluate duration of diarrhea. Zinc (when used in inpatients) reduces the duration of diarrhea compared to control. [mean difference MD -29 hours (95% CI: -35.9 to -22.1)]. This quality of evidence was assessed for direct and indirect comparisons. [*Level of Evidence (LOE): +3 to +4 Moderate to high certainty (Florez 2017)*]

Zinc (Guideline Evidence)
Zinc is recommended as an adjunct to oral rehydration solution therapy (ORS) in children older than 6 months living in low-income countries or in settings with medium or high risk of zinc deficiency. [*Level of Evidence (LOE): Guideline (FISPGHAN 2018)*]

Outcome: Need for Hospitalization
Smectite
Smectite (3 g once daily + Lactobacillus GG until diarrhea ceased (Guarino); 1.5 g bid for infants < 12 months, 3 g/dose for older children (Pelscik-Lech) was compared to control in 2 RCTs (n = 885 participants) to evaluate need for hospitalization over a follow-up period. The evidence suggests that smectite results in little to no difference in need for hospitalization compared to control. [event rates 8.51% versus 9.11%, RR 0.9 (95% CI: 0.8 to 1.2)]. [*Level of Evidence (LOE): +2 Low certainty (Perez-Gaxiola 2018)*]

Lactose Free Forumula
Lactose-free formula is not necessary in AGE episodes. Lactose-restricted diets may be considered in hospitalized children and in children with prolonged diarrhea (>7 days). +Lactose-free formula should be recommended in children with chronic diarrhea (>14 days). [*Level of Evidence (LOE): Guideline (FISPGHAN 2018)*]

Acute Gastroenteritis: Treatment (page 7)

Antidiarrheal Agents
Loperamide and other anti-motility drugs are not recommended in the treatment of AGE. [*Level of Evidence (LOE): Guideline (FISPGHAN 2018)*]

Antimicrobial Agents
Do not use routine antibiotics for the treatment of AGE.

For specific situations, the use of antibiotics should be started immediately and may be considered in:
1. Infants younger than 3 months
2. Children with underlying chronic conditions, including those with sickle cell anemia or immunodeficiency and those at risk for developing severe or extra-intestinal dissemination
3. Isolation of specific pathogens such as Shigella, enterotoxigenic (but not Shiga-like toxin-producing) Escherichia coli, V cholerae, Yersinia enterocolitica, and Entamoeba histolytica.
4. Campylobacter colitis can be treated with antibiotics, but treatment is effective only if administered within the first 2 days from the onset of symptoms.
[*Level of Evidence (LOE): Guideline (FISPGHAN 2018)*]

Breastfeeding
Infants younger than 6 months should neither interrupt breast-feeding nor introduce diluted or modified formula. [*Level of Evidence (LOE): Guideline (FISPGHAN 2018)*]

Myocarditis

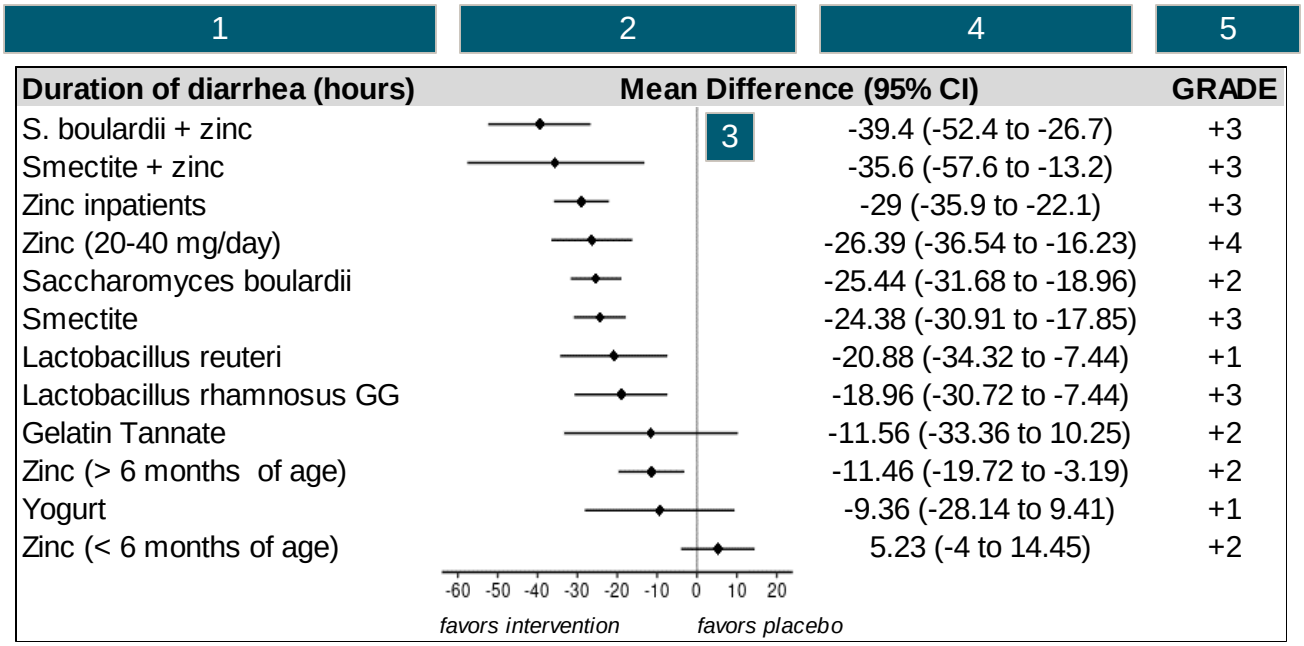
Patients with AGE who deteriorate after an IV fluid bolus should be assessed for evidence of myocarditis or heart failure

Signs and symptoms my include

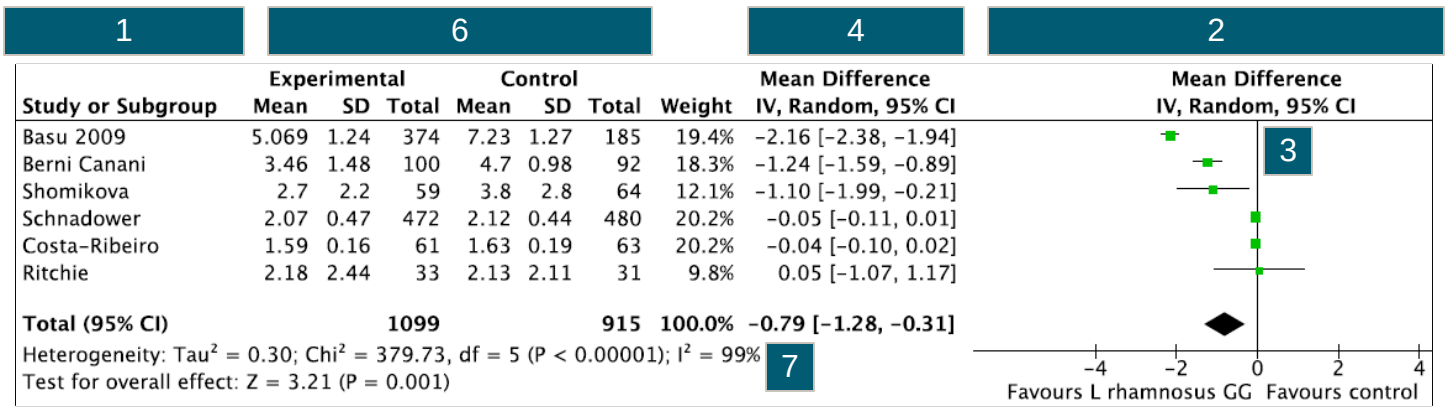
- Worsening tachypnea or increase in heart rate over baseline
- Hypotension or a decrease in blood pressure below baseline
- Muffled or harder-to-hear heart sounds
- Coarser (wetter) lung sounds
- Enlarging liver span

Patients with signs/symptoms of myocarditis or heart failure should be removed from the AGE pathway

How to Read a Forest Plot



1. Intervention or study
2. Forest plot: graphical display of the estimates for each study
3. Vertical line representing no effect: if the CI crosses this line there is no statistically significant difference between intervention and control
4. Reported effect size with confidence intervals (CI)
5. GRADE (1-4): Indicates the certainty of the position of the CI
6. Number of events and sample size in intervention and control groups
7. Heterogeneity (I^2): a measure of the difference between studies; > 40% may be important



Return to: Treatment Forest Plots

Summary of Version Changes

- **Version 1.1 (11/8/2011):** Go live.
- **Version 1.2 (7/28/2014):** Administrative update.
- **Version 2.0 (6/17/2015):** Periodic review; updated literature search, recommendations, and pathway tools.
- **Version 3.0 (6/29/2021):** Periodic review go live with new formatting style and minor content changes: updated links to evidence, removed recommendation for lactose free formula, and removed option for ORT trial for inpatients after initial IV hydration.
- **Version 3.1 (5/19/2022):** No content changes. Medication dosages reviewed and approved by Pharmacy and Therapeutics Committee on 12/8/2021.
- **Version 4.0 (3/11/2024):** Updated list of circumstances in which microbiological investigation should be considered on Diagnosis information page. Added WHO reference to Bibliography.

Approval & Citation

Approved by the CSW Acute Gastroenteritis Pathway team for June 29, 2021, go-live

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Retrieval Website: https://www.seattlechildrens.org/pdf/acute-gastroenteritis-pathway.pdf

Please cite as:
Seattle Children's Hospital, Migita, D., Charpentier, M., Delos Reyes, C., Fenstermacher, S., O'Connor, M., 2024 March. Acute Gastroenteritis Pathway. Available from: https://www.seattlechildrens.org/pdf/acute-gastroenteritis-pathway.pdf

Evidence Ratings

This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children's. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94, Hultcrantz M et al. J Clin Epidemiol. 2017;87:4-13.):

Quality ratings are *downgraded* if studies:

- Have serious limitations
- Have inconsistent results
- If evidence does not directly address clinical questions
- If estimates are imprecise OR
- If it is felt that there is substantial publication bias

Quality ratings are *upgraded* if it is felt that:

- The effect size is large
- If studies are designed in a way that confounding would likely underreport the magnitude of the effect OR
- If a dose-response gradient is evident

Certainty of Evidence

✪✪✪✪ High: The authors have a lot of confidence that the true effect is similar to the estimated effect
✪✪✪○ Moderate: The authors believe that the true effect is probably close to the estimated effect
✪✪○○ Low: The true effect might be markedly different from the estimated effect
✪○○○ Very low: The true effect is probably markedly different from the estimated effect
Guideline: Recommendation is from a published guideline that used methodology deemed acceptable by the team
Expert Opinion: Based on available evidence that does not meet GRADE criteria (for example, case-control studies)

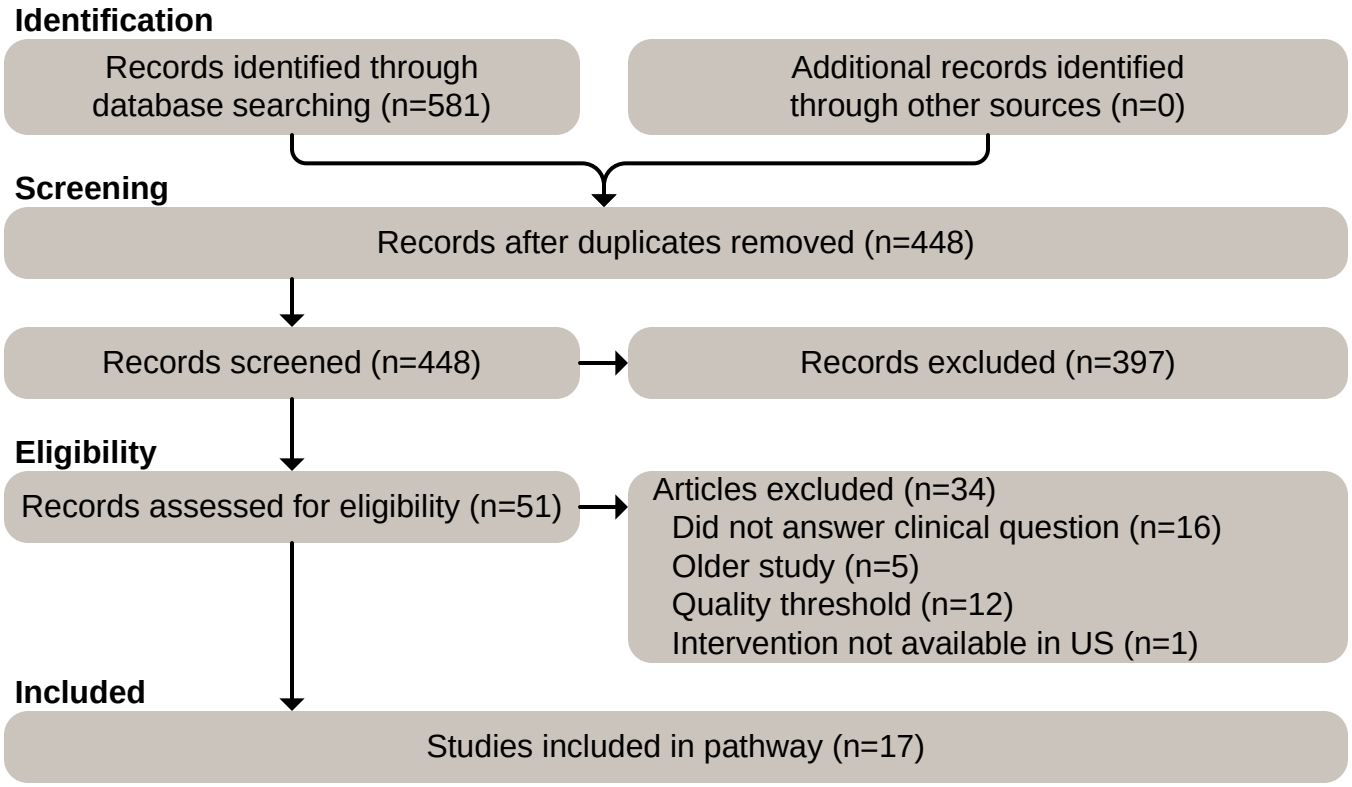
Bibliography

Literature Search Methods
For this update, we revised the search strategies in line with current Library practices. The search was executed in March 2020 in Ovid Medline, Embase, Cochrane Database of Systematic Review (CDSR), and Turning Research into Practice database (TRIP). The search strategy targeted synthesized literature on acute gastroenteritis. The following concepts were included: gastroenteritis, dysentery, enteritis, adenoviridae infections, rotavirus infections or rotavirus. Results were limited to English language, 2015 to current.

Literature Search Results
The searches of the 4 databases (electronic searches) retrieved 581 records. Our searches of other resources (hand searches) identified 0 additional records that appeared to meet the inclusion criteria.

Once duplicates had been removed, we had a total of 448 records. We excluded 397 records based on titles and abstracts. We obtained the full text of the remaining 51 records and excluded 34.

We combined these studies with those previously identified for prior versions of this pathway, and for this update we have included a total of 17 studies. The flow diagram summarizes the study selection process.



Flow diagram adapted from Moher D et al. BMJ 2009;339:bmj.b2535

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