

Acute Gastroenteritis: Pediatric

Gastrointestinal

Clinical Decision Tools for RNs with Additional Authorized Practice [RN(AAP)s]

Effective Date: June 9, 2022

Background

Gastroenteritis is an inflammatory process (usually infectious) involving the stomach and small intestines (Thomas, 2019). The condition is characterized by diarrhea and vomiting, with or without fever (Freedman & Translating Emergency Knowledge for Kids [TREKK] Network, 2019). Gastroenteritis can be acute or chronic and can be caused by a viral, bacterial, and systemic infection; malabsorption syndrome; autoimmune disorder; congenital malformation; and genetic disorder (Fidanza & Sables-Baus, 2019). Viral pathogens are the most common cause of acute gastroenteritis in children (Freedman & TREKK Network, 2019). Diarrhea caused by acute gastroenteritis remains a major cause of pediatric morbidity and mortality around the world, accounting for about two million deaths annually in children under five years of age (Boyce, 2019).

Immediate Consultation Requirements

The RN(AAP) should seek immediate consultation from a physician/NP when any of the following circumstances exist:

- moderate to severe dehydration as evidenced by:
 - altered mental status (e.g., lethargy),
 - cyanosis,
 - weak rapid pulse,
 - tachypnea,
 - marked decreased urine output,
 - sunken fontanelle,
 - hypotension, and/or
 - delayed capillary refill greater than two seconds;
- mild dehydration that fails to respond to oral rehydration after four hours;
- inability to tolerate fluids by mouth;
- infant less than six months of age;
- hypotonia;

- malnutrition or child on fortified feeds;
- hematemesis;
- bilious emesis;
- absent bowel sounds;
- focal abdominal pain;
- bloody stool;
- seizure activity;
- immunocompromised client;
- inability of the child's care to be managed at home;
- short-gut syndrome;
- ileostomy;
- Clostridium difficile (C. difficile) diagnosis;
- congenital heart disease; and/or
- repeated presentations for same/similar symptoms (Interprofessional Advisory Group [IPAG], personal communication, October 20, 2019; The Royal Children's Hospital Melbourne [RCHM], n.d.).

The RN(AAP) should initiate an intravenous fluid replacement as ordered by the physician/NP or as contained in an applicable RN Clinical Protocol within RN Specialty Practices if any of the *Immediate Consultation* circumstances exist.

Classification of Infectious Gastroenteritis

Viral Pathogens
<p>Rotavirus:</p> <ul style="list-style-type: none">• most common cause in young children,• releases an enterotoxin that damages intestinal mucosa cells, resulting in damage that decreases the absorptive surface area in the intestine,• recovery from mucosal damage may take several weeks,• transmitted via the fecal-oral route, and/or• most common in winter months (Fidanza & Sables-Baus, 2019; Richardson, 2020).• availability of rotavirus vaccines has made rotavirus less of a factor in immunized children.
<p>Norovirus:</p> <ul style="list-style-type: none">• affects mainly older children and adults,• is the main cause of gastroenteritis epidemics, and• is transmitted via the fecal-oral route (Richardson, 2020).

Adenovirus:

- is the second most common cause of gastroenteritis in children younger than 2 years of age (Richardson, 2020).

Bacterial Pathogens

- *Shigella*,
- *Escherichia coli*,
- *Campylobacter*, and
- *C. difficile* (Fidanza & Sables-Baus, 2019).
- bloody stools are often present (Fidanza & Sables-Baus, 2019).

Parasitic Pathogens

- *Giardia*, and
- *Cryptosporidium* (Fidanza & Sables-Baus, 2019).
- bloody stools may be present (Fidanza & Sables-Baus, 2019).

Predisposing and Risk Factors

Predisposing and risk factors for acute gastroenteritis in pediatric clients include:

- recent travel to developing countries,
- immunocompromised clients,
- anal intercourse,
- day care attendance,
- frequent hospitalizations,
- consumption of raw shellfish and seafood,
- consumption of contaminated food or water,
- crowded living conditions, and/or
- antibiotic and/or antacid use (Thomas, 2019).

Health History and Physical Exam

Subjective Findings

The circumstances of the presenting complaint should be determined. These include:

- onset (abrupt or gradual) and duration of symptoms;
- alleviating or provoking factors;
- contact with someone with similar symptoms;
- degree of nausea, vomiting, and diarrhea;
- fever;
- abdominal pain or cramping;

- fatigue, malaise, anorexia, tenesmus, borborygmus (presence of symptoms depends on underlying condition);
- symptoms of dehydration;
- characteristics of feces (frequency, amount, fluidity, and colour);
- diet history, including food intolerances, feeding pattern, and fluid intake;
- weight loss;
- recent travel;
- exposure to animals (e.g., reptiles which may harbour Salmonella, pets with diarrhea, or a recent visit to a farm or petting zoo);
- source of drinking water;
- intake of untreated water (e.g., swimming in a stream or lake);
- medications (e.g., antibiotics, antacids);
- medical/surgical history including recent hospitalizations;
- immunization history (e.g., rotavirus in infants);
- sexual practices, including anal intercourse;
- social history, including living conditions, illicit drug use, alcohol use; and/or
- family history (e.g., colon cancer, inflammatory bowel disease) (Thomas, 2019).

Objective Findings

The physical examination for acute gastroenteritis should include careful assessment of the abdomen (tenderness, guarding, and masses) and rectal area (perineal irritation, diaper rash) as well as assessment of hydration status and activity level (Richardson, 2020). The calculation of a percentage weight loss using an accurate and recent pre-illness weight is the most effective way to determine the degree of hydration (Cellucci, 2019; Richardson, 2020). If a calculation of recent loss of weight is not possible, the degree of dehydration can be estimated by the clinical signs below (Cellucci, 2019; Richardson, 2020).

Dehydration Classification

Mild	Moderate Requires Immediate Consultation	Severe Requires Immediate Consultation
<ul style="list-style-type: none"> • dehydration may have no clinical signs or increased thirst as the only finding, and • 3-5% weight loss. 	<ul style="list-style-type: none"> • delayed central capillary refill time of more than 2 seconds, • increased respiratory rate, • increased heart rate, • weak peripheral pulses, • mild decreased skin turgor, • decreased urine output, and/or • fontanelle may be normal to slightly depressed, and • 6-9% weight loss. 	<ul style="list-style-type: none"> • very delayed central capillary refill time (more than 3 seconds), • mottled skin, • tachycardia with thready pulse, • irritable or altered level of consciousness, • hypotension, • deep breathing, • decreased skin turgor, • cyanosis, • oliguria or anuria, • absence of tears, and/or

		<ul style="list-style-type: none"> • sunken fontanel, and • $\geq 10\%$ weight loss.
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(Cellucci, 2019; Richardson, 2020; Vega & Avva, 2022)

Differential Diagnosis

The following should be considered as part of the differential diagnosis:

- viral infection,
- bacterial infection,
- parasitic infection,
- diet induced (e.g., excess consumption of alcohol or fruit),
- medication induced (e.g., current or recent antibiotic use, laxatives, supplements),
- irritable bowel syndrome (IBS),
- inflammatory bowel disease (Crohn's colitis, ulcerative colitis, ischemic colitis),
- ischemic bowel disease,
- partial bowel obstruction,
- pelvic abscess,
- malabsorption syndrome (e.g., lactase deficiency),
- acute psychosocial stress/anxiety, or
- any surgical alteration of the GI tract (Thomas, 2019).

Making the Diagnosis

Systematically ruling out all differential diagnoses through history, physical, and diagnostic testing where appropriate can help lead to a definitive diagnosis. Caution should be exercised in making the diagnosis and attributing gastrointestinal symptoms only to acute gastroenteritis. The diagnosis of dehydration is based on clinical evaluation of clients as a combination of signs and symptoms are used to assess the degree of dehydration (Cellucci, 2019). The following table may assist in determining the diagnosis.

Clues to Underlying Etiology

Sign or Symptom	Potential Cause
Bloody stool	Bacterial pathogens such as: <ul style="list-style-type: none"> • Shigella • Salmonella • Campylobacter
Watery diarrhea	Viral pathogen C. difficile

Watery diarrhea in infants and young children lasting 5 to 7 days; 90% experience vomiting	Rotavirus
Acute onset of vomiting with or without diarrhea, lasting 1 to 2 days	Norovirus
Diarrhea lasting 1 to 2 weeks; may also have respiratory symptoms and mild vomiting that occurs 1 to 2 days after the onset of diarrhea	Adenovirus
Symptoms present after eating hamburger meat	<i>E. coli</i>
Persistent diarrhea (> 2 weeks)	Ova and parasites
Recent travel to Russia, Nepal, Rocky Mountains or other mountainous regions	Ova and parasites
Exposure to infants in a daycare centre	Ova and parasites
Men who have sex with men	Ova and parasites
Symptoms after initiation or completion of antibiotic therapy	<i>C. difficile</i>
Vomiting as main symptom	Viral pathogen
Suspected food or waterborne contamination	Viral pathogen
Frothy stools and flatus	malabsorption

(Boyce, 2019; Thomas, 2019)

Investigations and Diagnostic Tests

Laboratory tests are not usually necessary in clients with non-bloody diarrhea and no evidence of systemic toxicity (Richardson, 2020; Thomas, 2019). Selection is based on the history and physical exam (Thomas, 2019) as well as through consultation with a physician/NP, as in most cases clients requiring testing are acutely ill. Stool testing for culture and sensitivity, ova and parasites, and *C. difficile* toxin, may be considered in clients with severe bloody diarrhea and fever of $\geq 38.5^{\circ}\text{C}$ (Thomas, 2019).

Management and Interventions

Goals of Treatment

The primary goals of immediate treatment are to identify the cause, relieve symptoms, prevent complications (e.g., dehydration), and prevent transmission if the cause is determined to be infectious (Richardson, 2020).

Non-Pharmacological Interventions

All clients who present with diarrhea and/or vomiting require fluid and electrolyte management, particularly infants and those who are immunocompromised. The RN(AAP) should recommend oral rehydration as it is effective, safe, and inexpensive compared to intravenous therapy (Cellucci, 2019). Oral fluids should be used for children with mild to moderate dehydration who are accepting fluids by mouth (Cellucci, 2019). Oral fluid therapy is not appropriate in children with protracted vomiting; severe dehydration with shock; impaired consciousness; paralytic ileus; and monosaccharide malabsorption (Cellucci, 2019).

Oral Rehydration Solution (ORS)

Oral rehydration solutions containing sodium and glucose (e.g., Pedialyte™, Gastrolyte™) are required to prevent additional fluid loss and are effective for the treatment of dehydration regardless of age, cause, or type of electrolyte imbalance (Cellucci, 2019). The 1:1 ratio of sodium to glucose is ideal to optimize sodium/glucose cotransport (Cellucci, 2019). Apple juice diluted 1:1 with water followed by preferred liquids is effective for mild gastroenteritis (Dynamed, 2020). The use of sports drinks, sodas, or water do not meet the requirements for glucose and sodium content and must be avoided as death due to hyponatremia from water intoxication can occur (Cellucci, 2019; Richardson, 2020). Breastfeeding should continue if the infant has adequate suck, and this can alternate with ORS (Richardson, 2020).

Administration for Initial Oral Rehydration

Degree of dehydration	Amount of ORS	Duration	Reassess	Comments
Mild	50 mL/kg	over 4 hours	after 4 hours	<ul style="list-style-type: none"> encourage small frequent amounts(e.g., 5 mL every five minutes and increase as tolerated); alternatively, calculate the volume required over a 4-hour period and divide into 4 smaller amounts. Further divide each amount into 12 smaller amounts to be given orally every five minutes via syringe over the course of an hour.
Moderate and Severe	Consult physician/NP or implement an applicable RN Clinical Protocol within RN Specialty Practices.			

(Cellucci, 2019; Richardson, 2020)

If signs of dehydration remain after the four-hour period, the RN(AAP) should consult the physician/NP. If signs of dehydration have resolved after the four-hour period, ORS should be continued as the child desires to manage ongoing fluid losses (e.g., diarrhea, vomiting). Give extra oral replacement solution after each emesis (e.g., 2 mL/kg) or diarrheal stool (e.g., 5-10 mL/kg) (Richardson, 2020). Breastfeeding should continue uninterrupted. Formula feeds should resume within six to 12 hours for bottle-fed infants (Richardson, 2020). A full, age-appropriate diet should be reinstated as soon as they have been rehydrated and are not vomiting (Richardson, 2020).

Pharmacological Interventions

Antispasmodic and antidiarrheal agents should not be used (Richardson, 2020). Explain to the parents/caregivers that it is best to consider diarrhea as a purging process, to rid the intestinal tract of organisms (Richardson, 2020). The most important part of managing gastroenteritis is the replacement of lost fluids. There is also a very limited role for antiemetic agents.

The pharmacological interventions recommended for the treatment of dehydration in the pediatric population are in accordance with the *Emergency Department use of Oral Ondansetron for Acute Gastroenteritis-related Vomiting in Infants and Children* (Canadian Paediatric Society, 2018).

The Canadian Paediatric Society (2018) recommends a single dose of oral ondansetron therapy for infants and children age six months and older with mild to moderate dehydration and suspected acute gastroenteritis. Ondansetron is not recommended in children with gastroenteritis whose predominant symptom is diarrhea because diarrhea is a common adverse effect of ondansetron. A single dose of ondansetron should be given 15 to 30 minutes before initiating oral rehydration therapy.

	Drug	Dose	Route	Frequency	Duration
Pediatric (≥ 8 kg to ≤ 15 kg)					
	Ondansetron	2 mg	p.o.	once	n/a
Pediatric (>15 kg to ≤ 30 kg)					
	Ondansetron	4 mg	p.o.	once	n/a
Pediatric (> 30 kg)					
	Ondansetron	6-8 mg	p.o.	once	n/a

Client and Caregiver Education

The RN(AAP) provides client and caregiver education as follows:

- Educate about handwashing with soap after toileting, before meals and especially after diaper changing.
- Advise that diaper changing areas should be separate from eating areas.
- Advise to disinfect diaper changing area with 70% alcohol solution or bleach, which will kill rotavirus.
- Advise about water purification, which is to boil water for 20 minutes or use chlorine tablets or solution.
- Avoid foods with excessive sugar, high-fat, and fried foods until condition resolved.
- Advise to monitor intake and output including vomiting, diarrhea, and wet diapers.
- Recommend vaccination to prevent viral illnesses (e.g., rotavirus vaccination for infants).
- Discuss safe food preparation (e.g., hygienic food practices; ensure meat is fully cooked).
- Recommend soft wipes or cloths to clean skin and zinc oxide ointment, which may provide relief to the raw perianal area (Brennan, Milne, Agrell-Kann, & Ekholm, 2017; Dynamed, 2020).

Monitoring and Follow-Up

The RN(AAP) should:

- re-evaluate the child with mild symptoms (treated at home) every 24 hours for two days and reassess the child's weight at follow-up.
- ensure that the parent/caregiver is aware of the signs and symptoms of dehydration.
- advise to monitor intake and output and to return immediately if dehydration worsens or if the child cannot ingest an adequate quantity of fluid.
- monitor output by assessing the number of wet diapers. The frequency should return to pre-diagnosis levels. The child should be reassessed if they have not voided in six hours (Richardson, 2020).

Complications

The following complications can occur as a result of unmanaged dehydration in pediatrics:

- shock from decreased total body water, hypoxemia, and tissue acidosis;
- intoxication; or
- death from severe complications when severe dehydration is not addressed by prompt rehydration (Cellucci, 2019).

Referral

Refer to a physician/NP if client presentation is consistent with those identified in the *Immediate Consultation Requirements* section or clients who do not respond to treatment (IPAG, personal communication, October 20, 2019).

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