

4. Acute gastroenteritis in children

Presentation of gastroenteritis may suggest cause

Viral infections cause most gastroenteritis in children in New Zealand. They usually produce low-grade fever and watery diarrhoea, without blood.

Rotavirus, the most frequent viral pathogen, tends to be seasonal, with late winter peaks, and most frequently affects children between 6 months and 2 years of age. Most children will come in contact with the virus and, as immunity is long lasting, infection is uncommon in adults.

Norovirus affects all ages, as immunity does not last long. Infection tends to occur as outbreaks in institutions such as preschools, childcare centres, hospitals and rest homes.

Bacterial infections are more likely to be associated with higher fevers and blood or mucus in the stool. They may also be associated with abdominal pain or systemic effects, from spread of the bacterial pathogens themselves or associated toxins.

Viral infections are usually transmitted by the faecal-oral route or by respiratory droplets but they can linger on contaminated surfaces. Bacterial infections are often acquired by the ingestion of contaminated food or drink which has not been properly cooked, stored or processed. Chicken, beef, pork, seafood, ice cream and reheated rice are all frequent sources of bacterial gastroenteritis.

Water may be contaminated with viruses, bacteria or protozoa.

Most Gastroenteritis in children is viral

There are many causes of acute gastroenteritis in children (Table 7)² but the majority are caused by rotavirus or norovirus.

Table 7: Causes of acute gastroenteritis in children

Pathogens causing acute gastroenteritis in children
<p>Viruses – approximately 70%</p> <ul style="list-style-type: none"> - Rotaviruses - Noroviruses - Enteric adenoviruses - Caliciviruses - Astroviruses - Enteroviruses
<p>Bacteria – 10 to 20%</p> <ul style="list-style-type: none"> - <i>Campylobacter jejuni</i> - Non-typhoid <i>Salmonella</i> spp. - Enteropathogenic <i>E. coli</i> - <i>Shigella</i> spp. - <i>Yersinia enterocolitica</i> - Shiga toxin producing <i>E. coli</i> - <i>Salmonella typhi</i> and <i>S. paratyphi</i> - <i>Vibrio cholerae</i>
<p>Protozoa – less than 10%</p> <ul style="list-style-type: none"> - <i>Cryptosporidium</i> - <i>Giardia lamblia</i> - <i>Entamoeba histolytica</i>
<p>Helminths</p> <ul style="list-style-type: none"> - <i>Strongyloides stercoralis</i>

Management involves considering four important questions

The following four-step approach to the management of gastroenteritis in children is based on recommendations from Starship Hospital³ but adapted for use in primary care.

1. **Is the child shocked?**
2. **Is it really viral gastroenteritis?**
3. **Is the child dehydrated?**
4. **Can the child be managed safely at home?**

1. Is the child shocked?

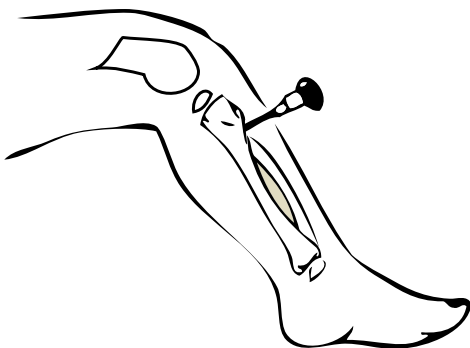
Features of shock in a child may include:

- Limpness
- Drowsy or comatose
- Rapid, thready pulse
- Cold, blue peripheries
- Hypotension
- Anuria

Skin retraction and capillary refill are less reliable signs.

Shock is an emergency and the child will need immediate hospitalisation. Consider the need for intravenous or intraosseous access if there will be any delay in getting hospital care.

Intraosseous infusion



For a detailed explanation of the technique, equipment, indications etc required for **intraosseous infusion** visit the following website: <http://snipurl.com/1hr9v>

2. Is it really viral gastroenteritis?

The differential diagnosis of viral gastroenteritis is not always easy. Sometimes in the middle of an epidemic the diagnosis can be mistakenly applied to a child who has another cause for their symptoms. It is worth remembering:

- Not all vomiting is gastroenteritis
- Not all diarrhoea is gastroenteritis
- Not all gastroenteritis is viral

Not all vomiting is gastroenteritis

Vomiting may precede diarrhoea in rotavirus, but isolated vomiting always raises suspicion of another cause. Bile stained vomiting means bowel obstruction until proven otherwise.

Surgical conditions that may present with vomiting include:

- Pyloric stenosis (typical age about 6 weeks)
- Intussusception (typical age about 6–10 months)
- Appendicitis
- Intestinal obstruction

Other possible causes include:

- Infections such as urinary tract infection, otitis media, pneumonia
- Metabolic disease such as diabetic ketoacidosis and inborn errors of metabolism
- Head injury
- Poisoning

Not all diarrhoea is gastroenteritis

Other causes for diarrhoea need to be considered. These include:

- Antibiotics or other medications
- Spurious diarrhoea secondary to constipation
- First time presentations of chronic diarrhoea, such as coeliac disease

Not all gastroenteritis is viral

Bacterial gastroenteritis has higher complication rates and worse outcomes than viral gastroenteritis. Factors that may raise suspicion of bacterial gastroenteritis include:

- Blood or mucous in the stool
- Higher fevers
- Systemic toxicity
- Abdominal pain
- Association with outbreak linked to contaminated food source

Suspicion of bacterial gastroenteritis is an indication for stool culture. *Campylobacter* is the most common form of bacterial gastroenteritis. Antibiotics are not indicated for *campylobacter* gastroenteritis unless the child is systemically unwell, as they may prolong the diarrhoea or carriage of the organism.

If the child is systemically unwell, erythromycin may be considered.

3. Is the child dehydrated?

Documented recent weight loss is a good indication of the level of dehydration but these measures are often not available. Unfortunately clinical estimates are not very accurate and the categories of dehydration, which can be defined by them, are very broad.

Table 8: Signs of dehydration in a child

	Clinical signs of dehydration	Pinch test
No dehydration	No signs	Skin fold retracts immediately
Dehydration	Two or more of: <ul style="list-style-type: none">- Restlessness or irritability- Sunken eyes- Thirst- Deep acidotic breathing	Slow retraction of skin fold – visible for less than 2 seconds
Severe dehydration with or without shock	Two or more of: <ul style="list-style-type: none">- Abnormally sleepy or lethargic- Sunken eyes- Drinking poorly	Very slow retraction of skin fold – visible for over 2 seconds

4. Can the child be managed safely at home?

Children over 6 months with viral gastroenteritis of less than 24 hours duration, low-grade fever, mild levels of dehydration, no abdominal pain and minimal systemic symptoms can usually be managed safely at home. The decision is often a difficult clinical judgement and will be strongly influenced by home circumstances and ability to provide regular medical follow up.

Oral rehydration is safe and effective for most children

Oral rehydration therapy for dehydration from gastroenteritis is safer and more effective than intravenous therapy for all degrees of dehydration other than shock. However it requires a lot of input from the child's caregiver.

Vomiting is not a contraindication to oral hydration. Most children with gastroenteritis who vomit, will still absorb a significant percentage of any fluid given by mouth or nasogastric tube.

Fluid replacement occurs in two phases: rehydration and maintenance

Commercial oral fluid replacement solutions, such as Plasmalyte and Pedialyte, are mixtures of sodium and potassium salts, a base (citrate or bicarbonate) and a carbohydrate. They are designed to correct deficits in water and electrolytes caused by diarrhoea. If the child is lethargic and the skin feels dry and inelastic, dehydration is likely to be associated with low sodium. If the child has hypernatraemic dehydration, thirst is extreme and the skin feels doughy.

Breast milk, formula, cow's milk (if the child is over one year), clear soup or rice water are all suitable. Highly diluted juice or lemonade can be used if there is not a better alternative, at a dilution rate of one part juice to five parts water. Lemonade is diluted with warm water to get rid of the bubbles.

Cola, tea, coffee or sports drinks are not suitable because of their high stimulant or sugar content

Rehydration phase

During the rehydration phase, fluid is given at a rate of 5 ml per minute by teaspoon or syringe. The small volumes decrease the risk of vomiting. The rate (1 teaspoon/minute) is easy to calculate and administer for a parent sitting at the bedside. This can be changed to 25 ml every 5 minutes once the child stops vomiting.

This rate will rehydrate a moderately dehydrated 1-year-old in 2 to 4 hours and a 2-year-old in 3 to 5 hours.

Frequent review (at least 2 hourly) is advisable in the rehydration phase. A child who is not rehydrating at this rate of oral replacement will require nasogastric or intravenous fluids.

Maintenance phase

Once the child is rehydrated, hydration is maintained by giving maintenance requirements plus additional fluid to replace the fluid in every loose stool, or the child will slip back into dehydration.

Fluid requirements to maintain hydration

Table 9: Approximate fluid requirements to maintain hydration

Weight kg	Maintenance requirements ml/hour
5	20
10	40
15	50
20	60
25	70
30	75

Replacing additional fluid loss in stool

In rehydrated children whose losses are not unusually profuse, advise parents to give both maintenance fluids plus roughly 50–100 ml for each diarrhoeal stool for a child under two years and 100–200 ml for a child over two years. As with replacement, this volume should be given in small aliquots rather than as a single large bolus.

Children who have profuse ongoing diarrhoea need to have the diarrhoea measured to calculate the additional fluid replacement required.

Drug therapy rarely needed for gastroenteritis in children

Antibiotics

Even in bacterial gastroenteritis, antibiotics are not usually indicated. Antibiotics may prolong the duration of diarrhoea and are best administered on the basis of a laboratory result.

Antibiotics are required for bacterial gastroenteritis complicated by septicaemia and for cholera, shigellosis, amoebiasis, giardiasis and enteric fever.

Antidiarrhoeal and antiemetic drugs have risks of adverse effects

Anti-diarrhoeal agents, such as loperamide, should be avoided in children under the age of 12 years. They may reduce the duration of diarrhoea but adverse effects such as sedation, ileus and respiratory depression can occur.

Antiemetic medications are not recommended. They may reduce vomiting but do not reduce the need for intravenous rehydration. They may induce sedation, making oral rehydration more difficult.

Oral zinc may help

Oral zinc therapy given at onset of symptoms can reduce the duration and severity of acute diarrhoea but is usually not necessary.

Lactose intolerance is usually mild and self limiting

Although lactose intolerance is common after viral gastroenteritis it is usually mild and self-limiting and does not require treatment. If it does persist, a lactose-free formula is recommended for four to six weeks but this is not necessary as a routine for all children with gastroenteritis.