

Assessment and management of **INFECTIOUS GASTROENTERITIS**

Key concepts:

- The majority of infectious gastroenteritis is self-limiting and most people manage their illness themselves in their homes and do not seek medical attention
- The key clinical issue is the prevention of dehydration
- Laboratory investigations are not routinely required for most people
- In the majority of cases, empirical use of antibiotics is not indicated

Spring and summer bring warmer weather, relaxed outdoor eating, camping and an increase in cases of food associated illness. Every year about 200,000 New Zealanders acquire a food associated illness and rates are higher than in other developed countries.¹

Gastrointestinal diseases account for the majority of all disease notifications in New Zealand, however notified cases are only the tip of the iceberg. Most cases of acute gastrointestinal illness (from any cause) are self limiting and only a proportion of people require a visit to a GP. Complications occur in a small number of cases (see sidebar). People who are at extremes of age, have co-morbidities or who are immunocompromised are especially at risk.

Causes of infectious gastroenteritis

Causes of infectious gastroenteritis in New Zealand are listed in Table 1. Campylobacter is the most frequently identified pathogen followed by Salmonella and Giardia. Norovirus is commonly associated with outbreaks of vomiting and diarrhoea in institutions, cruise ships and after social functions.

Acute complications from infectious gastroenteritis

- Dehydration and electrolyte disturbance
- Reduced absorption of medications taken for other conditions (including oral contraceptives, warfarin, anticonvulsants and diabetic medications)
- Reactive complications e.g. arthritis, carditis, urticaria, conjunctivitis and erythema nodosum
- Haemolytic uraemic syndrome (acute renal failure, haemolytic anaemia and thrombocytopenia)

Table 1: Causes of infectious gastroenteritis in New Zealand²

| Bacterial | Protozoa | Virus |
|------------------------------|-----------------|----------------------|
| Campylobacter | Giardia | Norovirus |
| Salmonella | Cryptosporidium | Rotavirus |
| Yersinia | | Enteric adenoviruses |
| Shigella | | |
| <i>E coli</i> O157 | | |
| Vibrio | | |
| Listeria | | |
| <i>Clostridium difficile</i> | | |

Identifying pathogens

Identification of the pathogen may be useful in some cases such as in people who may require treatment with an antibiotic, to avoid the spread of infection to others or to identify any food source that could be a public health risk.

If identification of the pathogen would be useful, ask about:²

- Changes to normal diet, in particular food from different sources, alternative water sources, consumption of unsafe foods such as raw or undercooked meat, unpasteurised milk (*E. coli* O157, *Salmonella* sp., *Campylobacter* sp., *Giardia* sp., *Listeria monocytogenes*) and raw seafood (*Vibrio* sp.)
- Contact with other unwell people (*Shigella* sp.,

E. coli O157, *Salmonella* sp., *Campylobacter* sp., *Giardia* sp.)

- Attendance or employment at a day-care centre (Rotavirus), cruise ships, institutions (Norovirus)
- Recent hospitalisation or use of antibiotics (*Clostridium difficile*)
- Swimming in fresh water lake, river or swimming pools (*E. coli* O157, *Salmonella* sp., *Campylobacter* sp., *Cryptosporidium*)
- Recent visits to farms, petting zoos or contact with pets with diarrhoea (*E. coli* O157, *Salmonella* sp., *Campylobacter* sp., *Cryptosporidium*)
- Travel to a developing country (wide range, mainly enterotoxigenic *E. coli*)

There are seasonal peaks related to different pathogens e.g. summer peaks of *Campylobacter* sp., spring peaks of *Cryptosporidium*.

Food associated illness can be prevented

Good food handling and hygiene principles remain the key to prevention.

The New Zealand Food Safety Authority (NZFSA) has run two key campaigns recently – promoting the four ‘Cs’ (clean, cook, cover and chill) and the 20+20 rule (wash hands for 20 seconds and dry for 20 seconds).¹

The four ‘Cs’ of food safety.¹

Clean: food preparation areas, utensils, equipment and yourself.

Cook: raw foods well and leftovers until steaming hot. Ensure minced meat, chicken and sausages are cooked thoroughly.

Cover: all foods in the fridge, cupboard and outdoors. Separate and store raw and cooked foods so there is no chance of cross-contamination.

Chill: store ready-to-eat foods between 0–4°C. Any leftover cooked food should be covered and chilled (within two hours).

Patient information is available from:

www.nzfsa.govt.nz/publications/publications-all-booklets-a-z.htm

The NZFSA has also produced a guide providing up-to-date advice on food safety for Marae – Te Kai Manawa Ora. Sharing kai is a core element of Māori culture, and the marae is often the centre of this experience. The guide aims to help maintain the mana and dignity of marae cooks by providing them with hints and tips for keeping food safe.

The guide is available from:

www.nzfsa.govt.nz/consumers/Māori-pacific-other-cultures/marae-food-safety-guide/

Resources about safe food handling and regulations for food handlers can also be found on the NZFSA website. If food handlers have symptoms of infectious gastroenteritis, they should be excluded from work until they have been asymptomatic for at least 48 hours, to prevent transmission of infection.

History provides a guide to further management

Patient history should aim to elicit information on the severity of the illness and may also provide clues which will help identify the pathogen.^{2,4}

Consider:

- Frequency and duration of diarrhoea or vomiting
- Recent fluid intake and urine output
- Characteristics of the diarrhoea e.g. presence of blood or mucus
- Any other symptoms, in particular abdominal pain, fever or patient is systemically unwell
- General medical history/social support
- Patient age, medication and co-morbidities
- Any underlying medical condition that predisposes the patient to infectious diarrhoea, e.g. immunosuppressive medications, AIDS, gastrectomy
- Pregnancy (risk of dehydration or if still unwell at the time of delivery risk of infection of the baby)

Examination

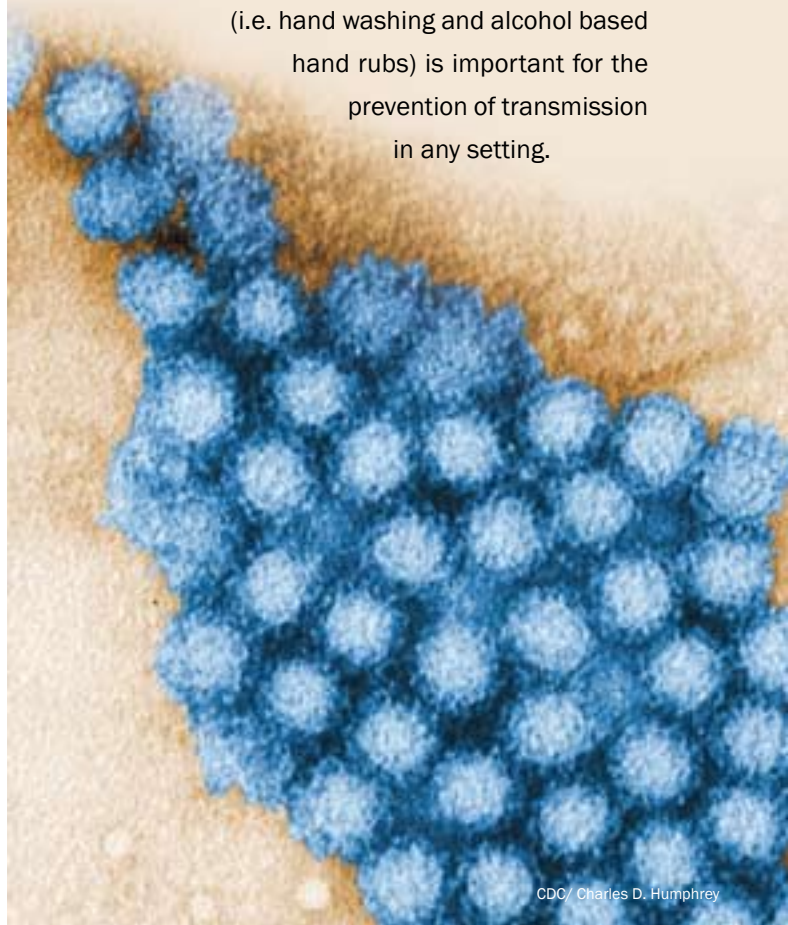
The aim of clinical examination is to further clarify the degree of dehydration and to exclude other causes.

Examination includes an assessment of the patient's:

- General appearance (looking unwell, eyes sunken, anterior fontanelle sunken in an infant)
- Alertness (irritability and restlessness in a child or lethargy)
- Temperature
- Pulse, BP (including a check for postural hypotension)
- Respiratory rate and character (especially in children)
- Skin turgor, state of mucous membranes and presence/absence of tears
- Capillary refill
- Abdomen

Norovirus is increasingly being implicated in cases of acute gastroenteritis³

Norovirus, and closely related Sapovirus, are increasingly being found as the cause of many cases of acute gastroenteritis. They are thought to cause 50% of food borne outbreaks. Outbreaks commonly occur in long term care facilities, cruise ships and hospitals as well as after social functions. In New Zealand 34 norovirus outbreaks were reported (961 cases) between April and June 2009, as well as 20 outbreaks of gastroenteritis (320 cases). Norovirus is highly contagious and as few as ten viral particles may be sufficient to infect an individual. The incubation period is usually 24 to 48 hours, (range 18 to 72 hours) and cases are considered infectious for 48 hours after the resolution of symptoms. Transmission is by contact with infected patients or their environment, via droplet contamination and airborne spread. Therefore hand hygiene (i.e. hand washing and alcohol based hand rubs) is important for the prevention of transmission in any setting.



CDC / Charles D. Humphrey

Dehydration

In the majority of adults the most useful clinical signs include dry mucous membranes, the absence of tears, low urine output and hypotension. An accurate assessment of dehydration can be difficult, particularly in children and elderly people.

In children the most useful clinical signs for identifying dehydration are an unwell appearance, prolonged capillary refill time (of more than two seconds) abnormal skin turgor, absence of tears, low urine output and an abnormal respiratory pattern (initially rapid breathing then deep, rapid breathing).^{5,6}

N.B. Hypernatraemic dehydration may be a complication of infectious gastroenteritis in infants aged under one year. This can occur if the infant has been given an inappropriately concentrated formula or rehydration solution. If a child seems more unwell than would be expected from the history, consider hypernatraemic dehydration. The infant may not appear to be dehydrated but the key clinical finding is a doughy feel to the skin. Specialist advice about rehydration is recommended.⁶

In elderly people, clinical signs of dehydration may be unreliable. The eyes may appear sunken because of reduced periorbital fat, changes in collagen and elastin may make skin turgor an unreliable sign and the tongue may often be dry because of mouth breathing.⁷

Laboratory investigation of infectious gastroenteritis

Urea and electrolytes


Investigation of urea and electrolytes is not routinely recommended in the assessment of patients with

infectious gastroenteritis. One exception may be the assessment of dehydration in frail elderly people.

Faecal testing

A laboratory diagnosis may be useful for people who:

- Have persistent diarrhoea (no improvement after several days)
- Have bloody diarrhoea
- Have recently travelled overseas/ immigrant
- Are food handlers
- Are aged less than five years or greater than 70 years
- Attend childcare
- Live in or have recently visited rural areas
- Have eaten raw seafood
- Are immunocompromised
- Have received antibiotics / chemotherapy
- Have been recently hospitalised

 See Best Tests “Laboratory Investigation of Infectious Diarrhoea” January 2008 for more detail on appropriate testing.

The key messages about faecal testing are:

- If laboratory testing is indicated, a single stool specimen for faecal culture is usually appropriate
- Tests for *Giardia* and *Cryptosporidium* are done on a single sample and should only be requested if there are risk factors such as recent overseas travel, tramping trips or drinking from rivers and springs
- Testing for “ova and parasites” is rarely indicated initially except for people who have recently travelled overseas

Management of infectious gastroenteritis

Management of a person with infectious gastroenteritis will depend upon the clinical condition of the affected person and in some circumstances the risk to public health e.g. diarrhoea in a person who is a food handler or childcare worker. It is important that food handlers are excluded from work until they have been asymptomatic for at least 48 hours, to prevent transmission of infection.

Most people who seek medical care require no medical intervention other than advice on appropriate oral rehydration. In children and elderly people the threshold for hospital admission should be lower because of the higher risk of dehydration. In elderly people other factors such as co-morbidities, general frailty or social circumstances may not allow management at home.⁷

Aim to prevent dehydration

Dehydration can be prevented in most people who have infectious gastroenteritis by increasing their intake of usual fluids. The aim is to replace lost water and electrolytes.

If dehydration occurs oral rehydration is the treatment of choice for both children and adults.

Children who are not dehydrated

Children with diarrhoea who are not dehydrated should continue to be offered normal food and fluids as tolerated. Fatty and sugary foods should be avoided as these may cause nausea and osmotic diarrhoea.⁷ Children who are not dehydrated will usually refuse to drink an oral rehydration solution.⁸

To prevent dehydration sufficient fluid must be provided both for normal maintenance and to replace that lost from diarrhoea. A general guide for replacement of these lost

What fluid to use for oral rehydration?

A simple recipe for a homemade oral rehydration solution from WHO is:⁹

- 1 L of clean drinking water or cooled boiled water
- 8 tsp sugar
- 1 tsp salt

Stir until the salt and sugar dissolves. Store in the fridge.

Oral rehydration solutions such as Pedialyte solution for children or Enerlyte powder for adults (available on PSO), can be used. Chilling the oral rehydration solution (or freezing into ice blocks) can improve palatability. Pedialyte is available in bubblegum or fruit flavours.

Carbonated drinks, undiluted juices, tea, coffee and sports drinks are not suitable because of their high stimulant or sugar content. High sugar content is likely to cause osmotic diarrhoea. Fruit juice or lemonade must be diluted by one part to five parts water.⁶





Travellers Diarrhoea

Travellers diarrhoea is diarrhoea that starts during or soon after overseas travel. There are a wide range of causative organisms and specific pathogens are identified in about 50% of cases only.⁷ Risk factors for travellers diarrhoea include visiting countries with poor water and food handling practices, summer travel, camping and eating from street stalls.

For most people with travellers diarrhoea, symptoms resolve within three to four days however it frequently causes disruption to planned holiday or business activities.¹⁴ There are increased risks of complications for children, elderly people, those who are immunocompromised and people with co-morbidities.

Information should be given to travellers on self management options to minimise dehydration and disruption to activities. This should include advice on:

- Fluid replacement including safe sources of fluids and homemade rehydration solutions
- Use of loperamide to manage symptoms
- When to seek medical advice. Medical advice should be sought for young children and elderly people, if hydration is unable to be maintained, if symptoms persist (vomiting lasting more than 24 hours, diarrhoea lasting more than three days), if there is bloody diarrhoea or fever, or if cholera is suspected (profuse “rice-water” stools)

- Antibiotics – the use of empiric antibiotics should be discussed with the traveller. Evidence shows that ciprofloxacin will usually shorten the course of the traveller’s diarrhoea within 20–36 hours.^{7,14} Clinicians usually recommend prompt self treatment in moderate to severe cases. A single dose of 750 mg or 500 mg twice daily for three days is recommended. Some parts of Asia have quinolone resistant *Campylobacter*.

Prophylactic antibiotics are not recommended for the prevention of travellers diarrhoea unless the person is at high risk of severe illness or when watery diarrhoea would be difficult to manage (e.g. patient with a stoma).^{7,14}

There is no single vaccine that will prevent travellers’ diarrhoea because of the wide range of potential pathogens. Specific vaccines are available for rotavirus, hepatitis A, typhoid and cholera. The vaccine Dukoral provides protection against cholera and about 50% of the strains of enterotoxigenic *E. coli*.¹⁴

Travellers who have ongoing symptoms after returning home should be assessed in the normal way, but there should be a lower threshold for requesting a faecal specimen or for prescribing an empiric antibiotic, if not already used.⁷



fluids in children is to give, after each loose stool:⁷

- 50–100 mL of fluid in children aged under two years
- 100–200 mL of fluid in children aged from two to ten years
- As much fluid as tolerated, but at least 200 mL in children aged over ten years

Children who are dehydrated

If the child has both vomiting and diarrhoea, rehydration is more difficult and dehydration is more likely to occur. Fluids should be offered frequently in small volumes. Suggested rates are 1 mL/kg every five minutes, or 5 mL per minute given with a teaspoon or syringe.⁶ If vomiting occurs, wait five to ten minutes before offering fluids again and continue to offer small amounts.

The aim is to rehydrate within four hours. To be effective, oral rehydration therapy does require intensive input from the child's parents or caregiver. Clinical reassessment may be required if symptoms persist or attempts at oral rehydration fail.

Rehydration in adults

Adults with infectious gastroenteritis should be advised to increase their fluid intake to at least 2 L a day and in addition to have 200 mL of fluid for every loose stool. Small volumes taken frequently are appropriate if the patient is vomiting.

Most adults should be advised to continue their normal diet but to avoid fatty and sugary foods.

The role of antidiarrhoeal drugs

In adults, loperamide can be useful for symptomatic control of mild to moderate diarrhoea. It is not recommended for use in children or in people who have bloody diarrhoea. The use of antidiarrhoeal drugs such as loperamide has been linked to prolonged illness in

The use of ondansetron in children

The use of antiemetics in children with gastroenteritis is usually discouraged. However there is evidence that single dose treatment with ondansetron may be useful in children with gastroenteritis and dehydration, who have not tolerated oral rehydration and who may otherwise require referral to hospital.

Strawberry flavoured wafers are available that dissolve within seconds in the mouth. Beneficial results include a reduction in vomiting, increased oral intake, few adverse effects and ultimately less need for IV rehydration.¹⁰ Adverse effects include headache, dizziness and constipation, although in a small number of cases of children with gastroenteritis, an increase in diarrhoea may occur.¹⁰

Treatment with single dose ondansetron may be an option when attempts at oral rehydration have failed, the child is aged over six months and the parents have been informed of the risk of adverse effects and the cost.

Ondansetron is not subsidised in New Zealand for this indication. Some GPs have tablets available in their surgery for purchase when required (estimated cost \$4 for 4 mg, \$5 for 8 mg). The dose is calculated based on weight (0.15 mg/kg) or body surface area.¹¹ Approximate doses in children aged over six months are 4 mg for children up to 30 kg and 8 mg for children over 30 kg.

Table 2: Antibiotics in infectious gastroenteritis^{4,7,12,13}

| Causative agent | Cases when antibiotics are indicated | Antibiotic treatment |
|----------------------|--|--|
| Campylobacter | <p>Most patients recover with symptomatic treatment only. Antibiotics have little impact on duration and severity of symptoms but eradicate stool carriage.</p> <p>Antibiotic treatment is indicated if symptoms are severe or prolonged. Treatment may also be reasonable in food handlers, childcare workers and those caring for immunocompromised patients.</p> <p>For pregnant women nearing term, Campylobacter gastroenteritis should be treated with erythromycin to prevent exposure of the neonate to Campylobacter during vaginal delivery.</p> | <p>First choice Erythromycin 250 mg – 500 mg (child 10 mg/kg) three times daily for five days</p> <p>Alternative Norfloxacin 400 mg twice daily for five days is an alternative although resistance is likely if the infection was acquired overseas</p> |
| Salmonella | <p>Routine treatment with antibiotics is usually unnecessary and may prolong excretion.</p> <p>Treat in severe disease or immunocompromised patients.</p> | <p>First choice Norfloxacin 400 mg orally twice daily for three to five days</p> <p>Alternative Co-trimoxazole (400 + 80 mg tablets) two tablets twice daily for three to five days</p> |
| Giardia | <p>Antibiotic treatment is recommended for symptomatic people and those who have tested positive for the organism, to contain the spread.</p> | <p>First choice Ornidazole 1.5 g orally once daily for one to two days</p> <p>Or Metronidazole 2 g (child 30 mg/kg) orally once daily for three days</p> |
| Shigella | <p>Antibiotics are not usually indicated for mild cases.</p> <p>Treat if symptoms are severe. Use ciprofloxacin in immunocompromised patients.</p> | <p>First choice Co-trimoxazole (400 + 80 mg tablets) two tablets twice daily for three to five days (if the organism is sensitive)</p> <p>Alternative Norfloxacin 400 mg orally twice daily for three to five days or Ciprofloxacin 500 mg twice daily for three to five days</p> |
| Yersinia | <p>Antibiotics are not usually required.</p> <p>Treat if symptoms are severe.</p> | <p>First choice Doxycycline 200 mg stat then 100 mg daily for five days</p> <p>Alternative Co-trimoxazole (400 + 80 mg tablets) two tablets twice daily for three to five days or Ciprofloxacin 500 mg twice daily for three to five days</p> |

patients with shigellosis, toxic megacolon in patients with *C. difficile* and haemolytic uraemic syndrome in children with toxin producing *E. coli*.⁴

The role of antiemetics

Antiemetics are not usually recommended for use in infectious gastroenteritis because the risk of adverse effects may outweigh the benefits. In adults with severe vomiting, a single dose of an antiemetic (IM or buccally) may give symptomatic relief and allow successful oral rehydration.⁷

The role of antibiotics

In the majority of cases, empirical use of antibiotics is not indicated as most illness is self limiting. Antibiotics are not useful for any cases of infectious gastroenteritis caused by *E. coli* or *Cryptosporidium*. Cases where antibiotics may be used are outlined in Table 2.

ACKNOWLEDGMENT Thank you to **Dr Rosemary Ikram**, Clinical Microbiologist, Medlab South, Christchurch for expert guidance in developing this article.

References:

1. New Zealand Food Safety Authority (NZFSA). Foodsafe week: Beat the bugs this summer. Available from www.nzfsa.govt.nz (Accessed November 2009).
2. bpac^{nz}. Laboratory investigation of infectious diarrhoea. Best Tests, January 2008.
3. ESR. New Zealand Public Health surveillance report September 2009: Covering April – June 2009. Available from: www.surv.esr.cri.nz/PDF_surveillance/NZPHSR/2009/NZPHSR2009Sept.pdf (Accessed November, 2009).
4. Thielman NM, Guerrant RL. Acute Infectious Diarrhoea. NEMJ 2004;350:38-47.
5. Canavan A, Arant BS. Diagnosis and management of dehydration in children. Am Fam Physician 2009;80(7):692-7.
6. Gavin R. Gastroenteritis. Starship Children's Health Clinical Guideline. June 2006. Available from: www.starship.org.nz/Clinical%20Guideline%20PDFs/Gastroenteritis.pdf (Accessed November 2009).
7. Clinical Knowledge Summaries (CKS). Gastroenteritis. Available from: www.cks.library.nhs.uk (Accessed November 2009)
8. Cowley C, Graham D. Management of childhood gastroenteritis. N Z Fam Prac 2005;32(2):110-6.
9. World Health Organisation (WHO). WHO Rehydration Project. Home made ORS recipe. Available from: <http://rehydrate.org/solutions/homemade.htm> (Accessed November 2009).
10. Freedman SB, Adler M, Seshadri R, Powell EC. Oral ondansetron for gastroenteritis in a paediatric emergency department. NEJM 2006;354:1698-1705.
11. Medsafe. Ondansetron. Medicine data sheets. Available from: www.medsafe.govt.nz (Accessed November 2009).
12. bpac^{nz}. Antibiotic choices for common infections. BPJ 2009;21:20-8.
13. Casburn-Jones AC, Farthing MJG. Management of infectious diarrhoea. Gut 2002;52:296-305.
14. Hill DR, Ryan ET. Management of travellers' diarrhoea. BMJ 2008;337:863-7.

