LEARNING & DEVELOPMENT

Diarrhoea and vomiting in a child

No matter how hygienic a household, most children will experience bouts of gastroenteritis. To complement a previous CPD article on acute diarrhoea in adults, Sarah Marshall looks at the condition in children.

Diarrhoea — the passing of loose or watery stools, usually accompanied by an increase in stool volume and frequency — can occur for many reasons but when of rapid onset the most likely cause is gastroenteritis. In the UK this condition is usually self-limiting but it can result in significant morbidity and use of healthcare services. In preschool children acute gastroenteritis is responsible for 204 out of every 1,000 GP consultations annually, with seven out of 1,000 cases being severe enough to merit hospital admission. Typically preschool children will experience at least one episode a year.

In children, acute gastroenteritis is usually viral. It is predominantly due to rotavirus infection (see Panel 1). Adenovirus or norovirus can also be culprits. Less common pathogens in children include campylobacter, salmonella, Escherichia coli and cryptosporidium.

Symptoms of gastroenteritis generally include diarrhoea (of sudden onset) with or without vomiting, accompanied by nausea, fever and abdominal pain. Vomiting is more likely to feature with viral infections than bacterial, with a concomitant increased risk of dehydration. Bacterial enteric infections are more likely to be associated with severe pain in the abdomen and sometimes blood in stools. Symptoms of viral gastroenteritis tend to pass more quickly than those of bacterial gastroenteritis. Vomiting usually lasts for a day or two (and in most children resolves in three days) and diarrhoea usually lasts for less than seven days (but can last for up to two weeks).

When to refer
Pharmacists should refer a child to a GP if:

- Vomiting and diarrhoea last three days or more
- Diarrhoea lasts more than 14 days, in the absence of vomiting
- Vomiting lasts longer than 24 hours, in the absence of diarrhoea
- Abdominal pain is worsening
- Blood is present in stools (as well as bacterial gastroenteritis, this may indicate inflammatory bowel conditions or anatomical disorders)
- He or she has recently travelled abroad
- He or she has “red flag” symptoms of dehydration (refer immediately; see later) or shock (refer to accident and emergency department immediately)
- He or she has concurrent medical conditions
- He or she is at increased risk of developing dehydration (see later)
- Diarrhoea is induced by drugs
- Parents or carers are unable to cope
- He or she has concurrent medical conditions

Symptoms suggesting a diagnosis different from gastroenteritis should also be referred. Vomiting with little or no diarrhoea, for example, can indicate a urinary tract infection, pneumonia, otitis media or meningitis, and pharmacists should ask about accompanying symptoms.

Reflect on knowledge gaps
1. What are the red flag symptoms for dehydration?
2. What is the vaccination schedule for rotavirus?
3. What is “toddler’s diarrhoea”?

Before reading on, think about how this article may help you to do your job better.
Gastroenteritis usually causes relatively mild abdominal cramps so those with significant pain, especially if there is little diarrhoea or vomiting, should be referred. Abdominal pain in infants can be difficult to detect but indications include screaming, a red face and pulling up legs. A hard abdomen can be due to muscle spasm, which can be a sign of a more serious condition. Pain that begins centrally and moves to the right side of the abdomen may indicate appendicitis. Chronic diarrhoea (lasting more than 14 days) suggests a non-infective cause, such as ulcerative colitis, coeliac disease, or toddler’s diarrhoea (see Panel 2, p3). Symptoms of food allergies and intolerances (eg, to lactose or gluten) can also include diarrhoea and vomiting.

Treatment
The mainstay of treatment in children is oral rehydration therapy to reduce the risk of complications such as dehydration (see below). Other over-the-counter treatment options, such as antidiarrhoeal preparations, aim to relieve symptoms. Paracetamol can be used for pain or fever and, in gastroenteritis, may be preferable to ibuprofen to avoid gastrointestinal side effects. Suppositories are a prescribable option for children who cannot tolerate oral therapy.

In a few cases, GPs might prescribe antiemetics or antibiotics.

Oral rehydration therapy Oral rehydration solutions (ORSs) are used to replace fluid and electrolytes. ORSs contain sodium, potassium and glucose or another carbohydrate, such as rice powder, as well as citrate or bicarbonate to correct any acidosis, and are formulated to be of optimal osmolarity. The carbohydrate promotes the absorption of the electrolytes and water. ORSs containing rice are suggested to be superior because they release glucose slowly, enhancing this transport across the intestinal wall. (A recent systematic review found that rice-based ORS was beneficial in treating diarrhoea but studies were from developing countries — where the cause of diarrhoea is more likely to be bacterial and children are more likely to suffer malnutrition — and it is unclear whether this benefit would extend to children in the UK.)

The contents of each sachet are made up with 200ml of drinking water for children or freshly boiled and cooled water for infants. The solution can be kept for 24 hours in a refrigerator. Solutions should be made up exactly following the manufacturers’ instructions to avoid the increased risk of intussusception (where one portion of the intestine telescopes into another part). In large scale safety trials there was no evidence of an increased risk of intussusception with Rotarix or RotaTeq but both are contraindicated in infants who may be at greater risk of this adverse effect (eg, those with a history of intussusception or uncorrected congenital gastrointestinal tract malformations).

Although both Rotarix and RotaTeq have been shown to be safe and effective, incorporating rotavirus vaccination into the childhood immunisation schedule is not considered cost-effective.

Panel 1: Rotavirus infection and vaccination

In England and Wales rotavirus is responsible for about 130,000 cases of gastroenteritis each year in children under five-years old and between 12,700 and 18,000 children are admitted to hospital as a result of infection. Rotavirus is highly infectious. It is mainly transmitted by the faecal-oral route but respiratory transmission is also possible. Diarrhoea, vomiting and stomach cramps develop after about 48 hours. These symptoms can persist for three to eight days. In the UK rotavirus infection occurs predominantly from January to May each year. Most children will have been infected by the age of five years, resulting in a degree of immunity to symptomatic infection.

Vaccines Two rotavirus vaccines (Rotarix and RotaTeq) have been licensed in the UK to prevent gastroenteritis but only one (Rotarix) is currently available. This contains a live attenuated strain of human rotavirus. Two doses of 1ml of the oral vaccine are required, with at least a four-week interval between them. Vaccination should be completed before 24 weeks of age.

Common side effects are loss of appetite, diarrhoea, vomiting, abdominal pain, flatulence, regurgitation of feeds, fever, fatigue and irritability. The vaccine virus is excreted in stools so carers should be advised to wash their hands after changing nappies. Rotavirus vaccines should be given with caution to infants who are in contact with people who are immunocompromised.

In 1999 a rotavirus vaccine, Rotashield, was withdrawn from the market due to a small but increased risk in the development of intussusception (where one portion of the intestine telescopes into another part). In large scale safety trials there was no evidence of an increased risk of intussusception with Rotarix or RotaTeq but both are contraindicated in infants who may be at greater risk of this adverse effect (eg, those with a history of intussusception or uncorrected congenital gastrointestinal tract malformations).

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Antimotility agents Antidiarrhoeal preparations

Antimotility agents and adsorbents are not recommended for use in children because some are associated with adverse effects and others have not been proven to be effective. However, for completeness, they are discussed briefly below. It is vital that fluid intake is maintained if these products are used.

Opioids, such as morphine and loperamide, are proposed to reduce diarrhoea by decreasing intestinal motility and this allows fluid and electrolytes to be absorbed from the intestine. In addition they may reduce secretions into the gastrointestinal tract. These actions reduce the fluidity of the bowel contents.

Loperamide has been shown to be effective in reducing the duration of diarrhoea in children. It acts within an hour, binding to opiate receptors in
Loperamide has been combined with paralytic ileus and abdominal distension, and constipation, and, rarely, drowsiness, megacolon. Side effects include dizziness and increase transit time. Loperamide also acts on the anal sphincter, increasing its tone. Pharmacy-only and general sale list preparations are not licensed for use in children under 12 years of age. The dose is two 2mg capsules initially followed by one capsule after each loose stool, to a maximum of eight capsules daily for P products. (The maximum daily dose for GSL products is six capsules.)

Loperamide syrup may be prescribed for acute diarrhoea associated with bloating and flatulence.

Morphine is a traditional over-the-counter remedy for diarrhoea and is often used in combination with adsorbents. However, its effectiveness is debatable. Various products are available, some of which are licensed for children as young as six years. For example, morphine (combined with attapulgite and activated attapulgite; see below) tablets are licensed for children from the age of six years.

Diphenoxylate (combined with atropine as co-phenotrope to discourage abuse) is a synthetic pethidine derivative. Pharmacy products may not be used for children under the age of 16 years but the drug is licensed for prescription use in children from the age of four years. Codeine is also available on prescription to treat diarrhoea in children aged 12 years and over.

**Adsorbents** It is suggested that adsorbent agents work by adsorbing microbial toxins, micro-organisms and water onto their surface, allowing them to be excreted in the faeces, but evidence is lacking.

Light kaolin (hydrated aluminium silicate) can be used alone or with other agents such as morphine or calcium carbonate. Kaolin Mixture BP is licensed for treatment of diarrhoea in children of six years and over. Side effects include flatulence and stomach cramps. Junior KAO-C diarrhoeal suspension (kaolin and calcium carbonate) can be used in children as young as one year old. Large doses can lead to alkalosis or hypercalcaemia. Flatulence and belching may also occur. Entrocalm also contains kaolin and calcium carbonate. Although kaolin is likely to be safe in children evidence for its effectiveness is lacking and the BNFC advises against its use.

Attapulgite is hydrated aluminium magnesium silicate. Once heated to increase its adsorptive capacity it is referred to as “activated” attapulgite. Both forms are used in combination with morphine (eg, Diocolm). Bismuth subsalicylate is not suitable for children under 16 due to a risk of Reye’s syndrome. Panel 3 summarises the licensed use of different antidiarrhoeals for different ages but it should be emphasised that these products are not recommended for acute diarrhoea in children.

**Antibiotics** Because most cases of acute gastroenteritis in children are viral and relatively short lived, causative organisms are not usually identified and antibiotics are mostly inappropriate. In addition, they may be a further cause of diarrhoea. Evidence for their role is mixed.
Antibiotics may be indicated, in consultation with a specialist, for some vulnerable groups, if a bacterial or protozoal pathogen is isolated or suspected, or if infection has spread beyond the gastrointestinal tract.2

**Antiemetics** In addition to being distressing, vomiting increases the risk of dehydration and makes failure of oral rehydration therapy more likely. However, there is only limited evidence to support the use of metoclopramide or ondansetron in gastroenteritis in children. There is also concern that antiemetics could lead to worsening diarrhoea as a consequence of fluid and toxin retention1 and the risk of side effects is higher. The use of antiemetics is, therefore, not recommended.2

**Probiotics** Probiotics have been studied for the treatment of acute diarrhoea but the variety of strains and formulations presents difficulties. There is limited evidence of some clinical benefit with some probiotics but the National Institute for Health and Clinical Excellence concludes it is insufficient to recommend their use in children. Lactobacillus GG has been associated with a shorter duration of diarrhoea but preparations should be chosen based on data of efficacy.9 Parents may ask about probiotics after gastroenteritis to “balance gut bacteria”. Not all products are marketed for use in children.

**Dehydration** Dehydration is the most serious complication of diarrhoea and can develop rapidly, especially in young children. Diarrhoea causes loss of water and electrolytes, which is worse if vomiting is also present. This may result in acidosis, circulatory failure, decreased perfusion of vital organs, renal failure and death.

Children and infants are at increased risk of dehydration if they are:1

- Passing six or more diarrhoeal stools in 24 hours
- Vomiting three times or more in 24 hours
- Unable to keep down fluids
- Below 12 months of age (particularly those younger than six months)

Infants of low birthweight or who have stopped breastfeeding as a result of the illness are also at increased risk.

Dehydration can be graded according to severity and symptoms (see Panel 4). Children who appear unwell or are deteriorating, or who show signs of altered responsiveness (such as irritability, or lethargy; so called “red flag” symptoms) are at risk of developing clinical shock.2 They may require hospital admission to replace depleted fluids and electrolytes orally, via a nasogastric tube or intravenously.

**Fluid management and feeding** Children with gastroenteritis who are being managed at home can be divided into two groups according to their level of hydration: no detectable dehydration and clinical dehydration. Each requires a different fluid management strategy.1

**No detectable dehydration** Babies and children who have no detectable dehydration should continue to be fed as usual and should be encouraged to take extra fluids. However fruit juices, fizzy drinks and degassed carbonated drinks (popular home remedies for diarrhoea) should be avoided. These drinks contain sugar and water but their electrolyte content is low (they do not replace sodium, potassium as well as ORSs) and their high osmolarity may worsen diarrhoea.

Those at risk of dehydration should be offered ORS as a supplemental fluid but no specific volumes are recommended.

**Clinical dehydration** In children with symptoms or signs of dehydration, fluid and electrolytes should be rapidly replaced (ie, over three or four hours). Rehydration with ORSs should be started even if a child is referred to a doctor. Recommendations as to volumes necessary vary between product literature and other sources. In addition, some recommendations do not seem user-friendly towards parents or carers. (For example, according to Clinical Knowledge Summaries, for a child weighing 10–20kg the volume of fluid required to maintain hydration is “1,000ml plus 50ml/kg for every kg over 10kg”.)

Generally, to replace lost fluids and electrolytes in children under five years old, ORS should be given in small sips at a rate of 50ml/kg body weight over the first four hours.2 ORS should also be used instead of the child’s usual drinks or feeds for this period but where children are breastfed, this should be continued. NICE considers that stopping breastfeeding, even for a few hours, could lead to difficulties for

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<th>Panel 4: Symptoms of dehydration and shock2</th>
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<tr>
<td><strong>No clinically detectable dehydration</strong></td>
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<tr>
<td>Appears well</td>
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<td>Alert and responsive</td>
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<td>Normal urine output</td>
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<td>Skin colour unchanged</td>
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<td>Warm extremities</td>
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*Red flag symptoms indicating children at risk of progression to shock. Red flag signs that a GP would look for on examining a child include: sunken eyes, dry mucous membranes, tachycardia, tachypnoea and reduced skin turgor. As well as the symptoms above, clinical shock would be indicated by tachycardia, tachypnoea, weak peripheral pulses, prolonged capillary refill time and hypotension.

Paracetamol may be preferable to ibuprofen for pain or fever in gastroenteritis.
both mother and baby (eg, discomfort and permanent cessation of breastfeeding). There is also evidence that stopping breastfeeding increases the risk of dehydration. For children over the age of five years, 200ml of ORS should be given after every loose stool as well as encouraging children to maintain their usual fluid intake.²

If children refuse ORSs their usual fluids (eg, milk or water, but not juices or fizzy drinks) can be tried, provided they do not have red flag symptoms.²

In the past, advice on feeding in diarrhoea has included fasting for 24 hours but this is no longer appropriate. Clinical Knowledge Summaries recommends that children who want to eat should be offered soups and foods high in carbohydrates initially, followed by their normal diet. NICE advises that patients should not have solid food during rehydration but, following rehydration, children should be offered their normal diet as soon as they are ready to eat. NICE notes that prolonged withholding of food may lead to malnutrition whereas the presence of food in the intestine promotes mucosal health and the absorptive capacity of the gut. Once any dehydration is resolved it is important that children receive their usual volume of liquids to maintain hydration as well as any additional fluids to counter any ongoing fluid loss from diarrhoea. In the past it has been recommended that milk be introduced slowly following gastroenteritis, or that specialised formula milks (eg, lactose-free) be used initially. This stemmed from concerns about transient mucosal lactase deficiency following gastroenteritis leading to lactose intolerance but there is little high quality evidence to support this approach.¹,²

NICE recommends that following rehydration:³

- Breastfeeding and other milk fluids should be encouraged. Full strength milk may be given immediately (ie, it is not necessary to dilute milk or formula)
- Fluid intake should be encouraged (avoiding fruit juices and fizzy drinks) until the child is fully recovered

Check your learning...

- If children remain at risk of dehydration it may be necessary to give ORS, 5ml/kg, after each loose motion

General advice

Gastroenteritis is unpleasant but self limiting and can usually be managed at home. In addition to treatment advice, pharmacists can also give the following advice on prevention:

- Hands should be washed with warm running water and soap (eg, after changing nappies, using the toilet and before preparing or eating food).
- Toilets should be cleaned with a disposable cloth and disinfectant.
- Infected surfaces, such as flush handles, wash basins, taps and door handles, should also be cleaned.
- Towels used by infected children should not be shared.
- Children should stay out of school or nursery while they have gastroenteritis and should not return until 48 hours after the last bout of vomiting or diarrhoea.⁴
- Children should not use paddling or swimming pools until 14 days after the last episode of diarrhoea.⁴

References

Act: practice points

Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist’s CPD portfolio.

- Make sure your staff can explain how oral rehydration solutions should be prepared and the appropriate volumes to give.
- Make sure you can advise on the use of probiotics in children.
- Visit the Health Protection Agency website and look at information on infection control in schools.

Evaluate

For your work to be presented as CPD, you need to evaluate your reading and any other activities. What have you learnt? How has it added value to your practice? (Have you applied this learning or had any feedback?) What will you do now and how will this be achieved?

Record

Consider making this activity one of your nine CPD entries this year.