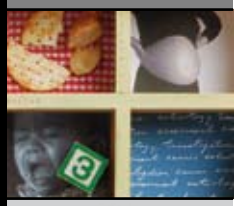

The vomiting child

What to do and when to consult

BACKGROUND
Vomiting is a common, nonspecific sign of a range of childhood illnesses. It may be acute or chronic and the general practitioner has a key role in identifying whether a child needs further investigation and management.

OBJECTIVE
This article outlines the main differential diagnoses, investigation and management of children presenting with acute and chronic vomiting.

DISCUSSION
Viral gastroenteritis is the most common cause of acute vomiting but should only be made after careful consideration of other causes. Management of hydration status in a child with a self limiting case of vomiting is vital. Regular review in the early phases of an undifferentiated vomiting illness will ensure that more fulminant illnesses are not overlooked and that secondary complications of dehydration do not arise. Chronic regurgitation and gastro-oesophageal reflux in infancy are common presentations that require considered management and may be a presenting symptom of food allergy. Other chronic presentations of nausea and vomiting in the older child may require referral for specialist assessment.

Katie Allen
MBBS, BMedSc, FRACP, PhD is a paediatric gastroenterologist/allergist, Department of Gastroenterology and Department of Allergy, Royal Children's Hospital, Principal Research Fellow, Murdoch Childrens Research Institute, and Senior Lecturer, Department of Paediatrics, University of Melbourne, Victoria. katie.allen@rch.org.au

As for most paediatric conditions, the age of presentation and chronicity of symptoms are both important clinical features to assess in the diagnosis and management of nausea in childhood. If the presentation of vomiting is acute the general practitioner needs to ask: 'Does the child have a cause other than infective gastroenteritis?' And regarding hydration: 'Is there any reason why oral rehydration is not appropriate?' 'Does the child need admission to hospital for nasogastric or intravenous rehydration?' If symptoms have been present for weeks or months the GP needs to consider: 'Is the child failing to thrive?' and 'Does the child require referral for specialist investigation?'

What diagnoses should be considered in a child presenting with acute onset vomiting?

Although viral gastroenteritis commonly presents with acute vomiting and diarrhoea, other conditions should always be considered as a cause of these presenting clinical features. An acute presentation of vomiting may be the presentation of another infection (eg. undiagnosed urinary tract infection, meningitis, septicaemia or appendicitis), an acutely evolving surgical abdomen (eg. intussusception, malrotation with volvulus of the midgut) or a metabolic illness (eg. diabetic ketoacidosis) (*Table 1*).

What are the red flags (or reasons to think again) of an acutely presenting child with vomiting?

Any child who is vomiting blood or bile or has severe abdominal pain or abdominal signs needs immediate investigation in a hospital emergency room setting. Other red flags include:

- projectile vomiting
- abdominal distension, tenderness
- high fever
- persistent tachycardia or hypotension
- neck stiffness and/or photophobia.

Children with chronic illness, poor growth and infants under 6 months of age require careful consideration of both differential diagnosis and hydration status. Depending on the clinical signs, emergency room investigations might include a septic work up (full blood count [FBE], blood cultures, urine cultures and lumbar puncture), abdominal X-ray, abdominal ultrasound and barium studies.

What diagnosis should be considered in an infant or child presenting with chronic vomiting?

Vomiting is such a familiar feature of early infancy that Shakespeare described the infant 'mewling and puking in the nurse's arms' as the first of the seven ages of

man. Vomiting, regurgitation and rumination in infancy are symptoms of gastroesophageal reflux. When the latter causes tissue damage (eg. oesophagitis, obstructive apnoea, reactive airway disease, pulmonary aspiration, or failure to thrive), it is gastroesophageal reflux disease. Congenital gastrointestinal anomalies such as malrotation can present in the first year of life. Food allergies are more likely to present in the first year of life at the time of first introduction of the offending antigen into the infant's diet.

Vomiting in the older child is often preceded by nausea. Differential diagnosis of chronic presentations of vomiting in the older child include gastroesophageal reflux, gastritis and cyclical vomiting, and specialist referral is usually warranted for further investigation which may include endoscopy or consideration of nongastrointestinal causes of vomiting such as raised intracranial pressure or inborn errors of metabolism.

What is infant regurgitation?

Infant regurgitation is defined as vomiting occurring two or more times per day for 3 or more weeks in the first 1–12 months of life in an otherwise healthy infant.[1] There are no associated features of retching, haematemesis, aspiration, apnoea, failure to thrive, or abnormal posturing to suggest an inborn error of metabolism (eg. galactosaemia), other gastrointestinal disease, or central nervous system disease as an explanation of the symptom. Congenital obstruction of the gastrointestinal tract should be considered in infants presenting with vomiting in the first week of life, particularly if bile stained.

Since infant regurgitation without evidence of gastro-oesophageal disease is a transient problem, possibly due in part to the immaturity of gastrointestinal motility, treatment goals are to provide effective reassurance and symptom relief. Symptoms often improve with prone positioning after meals,[2] formula thickened with cereal,[3] and smaller volume feedings.

When should gastro-oesophageal reflux disease be considered?

A diagnosis of gastro-oesophageal reflux disease should be considered in the presence of failure to thrive, haematemesis, occult blood in the stool, anaemia, or refusal to eat, and requires referral to a specialist for more formal investigation which may include 24 hour pH monitor and/or gastroscopy.

When should cow's milk allergy be considered?

Cow's milk allergy (CMA) may be associated with presenting symptoms of vomiting and irritability. It affects approximately 2% of infants under 2 years of age in industrialised countries and is the most common form of food allergy in this age group.[4] Differentiation of CMA from a syndrome of benign regurgitation and colic is difficult but important. By definition both regurgitation and colic are not caused by organic disease. Diagnostic criteria of infant colic include paroxysms of irritability or crying that start or stop without obvious cause, last more than 3 hours per day and occur at least 3 days per week for at least 1 week.[1] Colic spontaneously resolves by 4 months of age and is not associated with failure to thrive while regurgitation usually settles gradually over the first 12 months of life and often improves either at the time of introduction of solids or when the child begins to walk.

Importantly, CMA is not limited to formula fed infants as intact cow's milk proteins, such as beta-lactoglobulin and alpha-lactalbumin, are secreted in breastmilk.[5] In most children with CMA, the allergic response develops within 4 weeks of starting cow's milk formula.[6] If CMA is suspected a trial of formula change is warranted which may include infant soy formula for 2 weeks if infants are over 6 months of age. If improvement is not noted following a 2 week trial of soy formula, then specialist referral may be warranted to assess whether progression to extensively hydrolysed

Table 1. Causes of nausea and vomiting in childhood

Acute vomiting, usually in the context of diarrhoea

- Gastrointestinal infections
  - viral (eg. rotavirus, adenovirus, calicevirus)
  - bacterial (eg. campylobacter, shigella, salmonella)
  - protozoal (eg. Giardia, cryptosporidia)
- Food poisoning
  - staphylococcus toxin
- Nongastrointestinal infection
  - urinary tract infection
  - meningitis
  - septicaemia
- Surgical
  - appendicitis
  - intussusception
  - malrotation with or without volvulus
- Food allergy (following recent introduction of new food in the first 2 years of life)
  - cow's milk protein allergy
  - Coeliac disease

Acute vomiting that presents as vomiting alone

- Pyloric stenosis (in infants)
- Appendicitis
- Raised intracranial pressure
- Meningitis
- Surgical obstruction
- Metabolic disease

Table 2. Clinical signs of dehydration

	Mild (<4%)	Moderate (4–6%)	Severe (>6%)
Appearence	Alert	Restless, irritable	Lethargic
Skin turgor	Normal	Slow (1–2s)	Very slow (>2s)
Perfusion	Normal	Cool	Cold
Mucous membranes	Moist	Dry	Dry
Eyes	Normal	Sunken	Sunken
Breathing	Normal	Normal	Deep acidotic
Blood pressure	Normal	Normal	Hypotension
Heart rate	Normal	Normal	Rapid, feeble

formula (Peptijunior or Alfare) is required. There is no place for the use of partially hydrolysed (known as HA formulae) nor other mammalian milks (eg. goat's milk) in the treatment of CMA.[7]

How does CMA present?

Cow's milk allergy can present with immediate reactions (vomiting, perioral or periorbital oedema, urticaria, or anaphylaxis) occurring several minutes to 2 hours after the initial ingestion of cow's milk protein. Immediate reactions are likely to be IgE mediated and can usually be detected by skin prick testing (SPT) or measuring food specific serum IgE antibody levels (RAST testing). By contrast, delayed CMA reactions (vomiting, diarrhoea and severe irritability) occur within several hours to days of newly introduced cow's milk protein and are often difficult to diagnose. Delayed reactions are usually SPT negative and elimination or challenge protocols are required to make a definitive diagnosis. NonIgE mediated forms of food allergy are not associated with anaphylaxis.

Referral to a specialist is recommended in a vomiting infant with suspected CMA who has failure to thrive or bloody diarrhoea. Infants with evidence of immediate reactions to CMA suggestive of IgE mediated food allergy should be urgently referred to a paediatric allergist for SPT.

Management of the acutely vomiting child

It is vital to assess the degree of dehydration and manage accordingly. The clinical guidelines of the Royal Children's Hospital in Melbourne provide an example of an evidence based protocol to aid with clinical decisions around dehydration (see *Resources*). *Table 2* outlines signs and symptoms associated with degrees of dehydration. These relate to clinical signs and change in body weight if a recent reliable weight is available. There are no specific clinical signs associated with mild dehydration (<4% body weight loss). Moderate dehydration (4–6% body weight loss) is best assessed by decreased peripheral perfusion, decreased skin turgor (pinched skin retracts slowly 1–2 seconds) or evidence of deep acidotic breathing. Dry mucous membranes and sunken eyes may also be present although these signs are highly variable and should not be relied on. Signs of severe dehydration (7–9% body weight loss) are more pronounced and include sweaty, cyanotic limbs, rapid weak pulse and low blood pressure.

The child with vomiting should continue to be fed[8] (including breastfeeding as appropriate[9]) unless severely dehydrated. Most children can be rehydrated with oral or nasogastric feeds unless they have severe dehydration, in which case intravenous resuscitation is essential.[10] Antiemetic medications are not recommended in a child acutely presenting with vomiting as they are unlikely to be effective and may be harmful.[11] In the past, infants with viral gastroenteritis were offered diluted formula to try to minimise the presentation of a lactose load to the inflamed intestinal mucosa. This is no longer recommended. If lactose intolerance develops secondary to infectious gastroenteritis, short term use of lactose free formulas should be considered.

Management of mild dehydration

Mildly dehydrated infants and children should be encouraged to increase the frequency of their usual drinks, although undiluted commercial 'soft drinks' (eg. lemonade) should be avoided as they present a significant osmotic load to the intestine which can result in increased diarrhoea. To ensure optimal management at home, parents should be given advice and written handouts to reinforce key messages. Parent friendly handouts are available (see *Resources*).

Key messages to carers include encouraging regular fluid intake even if the child continues to have vomiting or diarrhoea. Gastrolyte can be given in addition to breastfeeding, which should be offered more often than usual while the child is unwell. If the infant is bottle fed, clear fluids or Gastrolyte should be offered for the first 1 2 hours and then normal formula in small but more frequent amounts. A guideline of the amount of fluids offered is a mouthful every 15 minutes if the child has significant ongoing vomiting. Older children should be offered 1 cup (150–200 mL) of clear fluid for every large vomit or episode of diarrhoea. There is no need to restrict food.

Daily review by the GP is appropriate until initial evidence of symptomatic improvement, although babies under 6 months of age with gastroenteritis may need more frequent review in the early stages of the illness. Parents should be advised to return promptly if the child has significant diarrhoea (more than 8–10 watery motions

per day), refuses to drink, has vomiting or diarrhoea continuing after 1 week, or there is evidence of significant dehydration such as few wet nappies, pallor, peripheral shut down or drowsiness. Parents should be counselled that significant abdominal pain requires urgent review.

Management of moderate dehydration

If the child is moderately dehydrated and able to tolerate fluids then a trial of a oral rehydration solution such as Gastrolyte, Hydralyte or Repalyte is appropriate. Hydralyte icy-poles have recently come onto the market and are a well tolerated way to increase fluid intake.

If the child is unable to tolerate fluids then admission to hospital and placement of a nasogastric tube is a safe and effective way to rehydrate most children with moderate dehydration, even if the child is vomiting.

At the Royal Children's Hospital in Melbourne (Victoria) fluid deficit is calculated from the assessment of dehydration (eg. in a 10 kg child 5% dehydration represents a fluid deficit of 500 mL). Fluid deficit is replaced over the initial 6 hours of therapy (in this example 84 mL/hr) and the child's daily fluid maintenance is calculated and given over the subsequent 18 hours (in this example the hourly rate of fluid maintenance for a 10 kg child is 100 mL/kg and daily maintenance is therefore 1000 mL which should be administered over 18 hours = 55 mL/hr). For daily fluid maintenance and rehydration calculations see *Resources*.

Management of severe dehydration

Any child with severe dehydration requires admission to hospital and immediate rehydration until circulation is restored either through intravenous or intra-osseous access. Urgent electrolytes, glucose, FBC, blood gas and urinalysis should be considered as well as consideration of the need for septic work up or urgent surgical consult.

Summary of important points

- Consider other diagnoses before presuming viral gastroenteritis is the cause of vomiting in a child presenting with an acute episode, especially if haematemesis, bilious or projectile vomiting, abdominal tenderness, high fever or meningism is present.
- Children with chronic presentations of vomiting should be referred for specialist assessment if there is evidence of failure to thrive, symptoms suggestive of cow's milk allergy or gastroesophageal reflux disease or in the older child with unremitting symptoms.
- Mild dehydration can be managed at home but moderate dehydration may require hospital admission for nasogastric tube rehydration if oral fluids are not tolerated.
- Severe dehydration requires urgent admission to hospital for intravenous hydration and treatment of shock.

Resources

- Royal Children's Hospital. Clinical practice guidelines: diarrhoea and vomiting: www.rch.org.au/clinicalguide/cpg.cfm?doc_id=5192
- Parent friendly fact sheets: www.rch.org.au/kidsinfo/factsheets (Please note that the correct fluid recipe for lemonade and water is 1:6. The ratio given in the fact sheet is now outdated)
- Royal Children's Hospital. Paediatric handboodk. 7th edn. Blackwell Publishing, 2003. Available from RCH Child Information Centre 03 9345 6429
- Australasian Society of Clinical Immunologist and Allergists (ASCIA). Available at: www.allergy.org.au.

Conflict of interest: none declared.

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afp **CORRESPONDENCE** email: afp@racgp.org.au