

WINTER ILLNESS

Bronchiolitis

Cough in children

Fever in children

Acute gastroenteritis in children

Acute asthma in children: are nebulisers or spacers best?

Key Advisers

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1. Bronchiolitis

Most infants presenting with wheeze in the first year of life have bronchiolitis. Most cases of bronchiolitis occur between 2 and 5 months of age, in airways with very small calibre.

Bronchiolitis is usually caused by Respiratory Syncytial Virus, but can also be caused by rhinovirus, adenovirus, influenza and parainfluenza viruses. It starts with 2–3 days of coryzal symptoms and progresses to cough and wheeze with fever and tachypnoea.

Wheezes and crackles are usually heard throughout the chest. Focal chest signs suggest alternative diagnoses such as pneumonia or aspiration.

Infants with bronchiolitis often get worse for the first 72 hours of their illness and then start to improve. Symptoms may take several weeks to resolve, with a median duration of approximately 12 days. Children and parents need support during this time.

Bronchiolitis has a 1–2% mortality rate and infants with hypoxaemia related to small airways obstruction may need treatment with racemic epinephrine and steroids in addition to oxygen, intravenous fluids and nasogastric feeding.

Management of bronchiolitis is mostly supportive

Interventions such as bronchodilators, adrenaline, steroids and antibiotics have not been shown to be beneficial in uncomplicated bronchiolitis. Management is supportive but may include the need for oxygen, nasogastric feeding or intravenous fluids. Primary care clinicians need to know the features of moderate to severe bronchiolitis so that they can manage it appropriately but also so that they can educate the parents of children with bronchiolitis about recognising deteriorating illness.

Assessment of severity

Table 1: Assessment of severity of bronchiolitis

| | Mild | Moderate | Severe |
|--|---|---|---|
| Respiratory rate <i>breaths/minute</i> | Under 2 months >60/min 2–12 months >50/min | >60/min | >70/min |
| Chest wall indrawing | None/mild | Moderate | Severe |
| Nasal flare | None/mild | Present | Present |
| Grunting | Absent | Absent | Present |
| Feeding | Normal | Less than usual Frequently stops Quantity >1/2 normal | Not interested Choking Quantity <1/2 normal |
| History of behaviour | Normal | Irritable | Lethargic |

Any criterion in the severe category designates the child as severely ill

Recognising severe illness in children

- Behaviour and feeding both go from interested infant, to infant not interested
- **Respiratory rate**
 - A newborn may breathe up to 60 breaths/min
 - A 1-year-old: 40 breaths/min
 - A 5-year-old: 30 breaths/min

If the rate is high, look for potential respiratory failure using 2 key signs

 - effort, **and**
 - effectiveness of effort
- **Increased effort** is indicated by sounds
 - Stridor in upper airway obstruction
 - Wheeze or grunting in lower airways obstruction
 - Accessory muscle use producing nasal flare, heaving chest, intercostal and subcostal indrawing
- **Effectiveness of effort** is indicated by looking at the chest movement and listening to breath sounds to judge ventilation:
 - A silent chest
 - Falling heart rate
 - Falling level of consciousness
 - Falling respiratory rate in severe illness

are all preterminal events.

During respiratory failure, skin colour changes from pink to pale, to mottled.

Pale colour indicates vasoconstriction and mottled indicates terminal circulatory collapse.

Reference: Bone J. *Recognising the very ill child*
NZ Doctor 14 Mar 2007.

When to refer with acute bronchiolitis

As a general rule **refer infants earlier rather than later**: if in doubt get specialist advice.

Refer all infants immediately with; severe illness (see Table 1), progressive dehydration, where there is clinical concern about hypoxia or a history of apnoea.

Refer early

- If less than 8-weeks-old or if birth was significantly premature (<32 weeks gestation)
- If there has been apnoea or significant comorbidity (heart and lung disorders, immune-compromise)
- If illness is getting worse after 72 hours or home care is uncertain

Management of bronchiolitis at home

Most infants with bronchiolitis can be safely managed at home. Supportive care plus careful observation for signs of deterioration are the keys.

Supportive care may include:

- Keeping the child's environment smokefree
- Keeping the child well hydrated
- Small frequent feeds
- Minimal handling
- Normal saline nasal drops before feeds
- Caregiver hand washing to prevent spread to other children

Written instructions will help caregivers to keep an eye on feeding patterns and behaviour and to monitor for:

- Respiratory rate
- Indrawing
- Grunting
- Nasal flare
- Sleepiness
- Colour

Infants with a moderate episode of bronchiolitis need to be reviewed within 24 hours and a firm appointment (time, place, person) helps to ensure the child is seen. (For an example of written instructions for caregivers see page 23)

2. Cough in children

Cough in children has different causes to cough in adults and symptomatic treatment is rarely needed or effective.¹ The smaller airways are vulnerable to inflammatory disease causing swelling and obstruction by mucous secretions. Coughing assists clearance of mucous, so do not attempt cough suppression.

It is reasonable to categorise childhood cough as:

- Acute cough – lasting less than two weeks
- Persistent cough – lasting two to four weeks
- Chronic cough – lasting over four weeks

Acute cough

Acute cough is usually viral

Most acute cough in children is associated with viral upper respiratory tract infections (URTI). The majority of these (70–80%) will resolve within one week although 5% will persist for more than four weeks.

No over-the-counter or prescription medicines are effective for the symptomatic relief of acute cough in children but there does appear to be a significant placebo effect. Over-the-counter cough and cold medicines are a significant cause of morbidity, especially from accidental overdose.

It follows that we should look for something soothing and safe for children with acute cough. Honey and lemon drinks have stood the test of time and can be made at home at little cost. However, water should not be boiled, firstly because children are not usually used to hot drinks and secondly because there is risk of scalding.

Aspiration may be missed

Characteristics of an acute cough may raise suspicion of specific causes such as the barking cough of croup or the paroxysmal cough of pertussis. When there are no symptoms of a viral infection, careful consideration needs to be given to an aspiration episode, particularly in younger children. Aspiration most often occurs when an older sibling has fed a young child unsuitable food.

Cough soon after birth is cause for concern

Cough that begins at, or within a few weeks of birth always raises concern. Congenital causes include tracheomalacia, tracheo-oesophageal fistula or laryngeal cleft. Cough starting within a few weeks of birth raises the additional possibilities of suppurative lung disease, aspiration, gastro-oesophageal reflux or infection with *chlamydia trachomatis*. Cough in a neonate often warrants discussion with a paediatrician.

Chronic cough

Cough continuing beyond four weeks needs careful evaluation

Although a non-specific post-viral cough is still the most likely diagnosis, children who continue to cough beyond four weeks need evaluation to exclude more specific causes. Evaluation of a significant ongoing cough includes history and physical examination with consideration of the need for chest x-ray and, if the child is old enough, spirometry.

Passive or active smoking is a common cause of cough in children. Fifty percent of children over the age of two years, with at least two family members who smoke, have cough.

Some specific causes suggested by the history and examination are described in Table 2:

Table 2: Specific causes of chronic cough suggested by the history and examination

| Chronic cough | Specific cause of cough |
|---|--|
| Accompanying wheeze | Asthma or aspiration |
| Stridor | Tracheomalacia, foreign body |
| Moist cough, clubbing or Failure to Thrive | Suppurative lung disease, cyanotic heart disease, cystic fibrosis, immune or ciliary disorders |
| Aspiration episodes or swallowing difficulties | Foreign body or aspiration |
| Paroxysmal cough or family members with persistent cough | Pertussis |
| Honking cough absent during sleep | Psychogenic or habit cough |
| Staccato cough with or without conjunctivitis | Chlamydia |

Cough from post-nasal drip, gastro-oesophageal reflux and 'cough variant asthma' are unusual in children

Studies show that post-nasal drip is unlikely to cause cough in children and the cough is more likely to be related to coexistent lower airway pathology. The use of medications to 'dry up' nasal secretions is therefore unlikely to help the cough.

Gastro-oesophageal reflux has been suggested as a common cause of cough in adults but there is no convincing evidence that it is a common cause of cough in children.

Some children with isolated persistent cough without wheeze receive a diagnosis of 'cough variant asthma'. However there is no evidence that this is really a form of asthma. Few children with isolated chronic cough have eosinophilic inflammation, atopy or airway hyperresponsiveness and they do not respond to bronchodilators or corticosteroids.

Cough may be the predominant feature of asthma but is usually accompanied by wheeze. Isolated chronic cough with no apparent underlying cause is more likely to be related to a hypersensitive cough reflex.

Treatment of chronic cough targets the cause not the symptoms

Symptomatic treatment of chronic cough is usually not effective or appropriate. It is the underlying cause, which should be the target of therapy.

- Antihistamines are proven to have no benefit in chronic cough and are associated with high levels of side effects
- Cough suppressants such as dextromethorphan, pholcodine and codeine are contraindicated in children
- Menthol inhalations are not effective and are associated with risk of scalding injuries from boiling water
- There is no evidence for effectiveness of herbal remedies
- Emetics, such as guaifenesin, ammonium chloride, ipecacuanha and squill, are used in low doses as expectorants but are not effective

Nevertheless, the significant placebo effect of cough medicines may convince parents that one is needed. A simple soothing demulcent, with ingredients such as honey and lemon, syrup or glycerol, may help reduce coughing and irritation. It is best to avoid those with high sugar content. Lozenges are associated with risk of choking for children, especially those under the age of three years.

All children with cough will benefit from a smokefree environment.



3. Fever in children

Search for a cause

Manage the symptoms

Fever is an appropriate response to infection and has some beneficial effects. For example, fever can make the environment less favourable for microorganisms to multiply and certain parts of the immune system work better at slightly higher temperatures. However, sustained high temperature adds to insensible fluid loss and risk of progressive dehydration.

Febrile convulsions occur in 3–4% of children with fever. Although they are associated with fever, they are not prevented by antipyretic medications such as paracetamol. Febrile convulsions, if they do occur, are usually brisk and not likely to cause brain damage or learning disabilities. Complex febrile seizures can occur and may be prolonged. If prolonged (>15 minutes) they should be treated with rectal diazepam.

Antipyretic medications along with physical interventions, such as cool drinks and reducing excessive layers of clothing, can be appropriate to manage discomfort which may be associated with fever.

| Measuring the temperature of children under five years | |
|--|--------------------------------|
| √ Electronic thermometer in axilla | X Oral thermometer |
| √ Chemical dot thermometer in axilla | X Rectal thermometer |
| √ Infra-red tympanic thermometer | X Forehead crystal thermometer |

Stratification of risk for serious pathology clarifies management decisions

Risk stratification for children with fever

Practitioners will always want to conduct a careful search for a focus of infection for any child with a fever and this can be combined with assessing the risk of serious pathology. Urinalysis of a clean catch urine sample is an essential part of this assessment when no obvious causes are apparent.

Table 3: High risk of serious pathology

| High risk features | |
|---------------------------|---|
| Colour | Pale, mottled, ashen or blue |
| Activity | Weak, high-pitched continuous cry Diminished level of consciousness Appears ill Unable to rouse or if roused does not stay awake |
| Respirations | Grunting RR >70 breaths/min Moderate to severe chest indrawing |
| Hydration | Reduced skin turgor Capillary refill time ≥ 3 secs |
| Other | Non blanching rash Bulging fontanelle Neck stiffness Focal neurological signs Focal seizure Bile stained vomiting Swelling of limb or joint, non-weight bearing, not using an extremity High temperatures need to be interpreted with regard to other signs and symptoms, however T >39°C should be regarded as a high risk feature |

Any of the above features place a child in a high-risk category for serious pathology.

The child needs immediate admission to hospital.

Table 4: Intermediate risk for serious pathology

| Intermediate risk features | |
|-----------------------------------|--|
| Colour | Normal |
| Activity | Not responding normally to social cues Wakes only with prolonged stimulation Decreased activity No smile |
| Respirations | Nasal flaring: age over 12 months Age 0–2 months, RR >60 breaths/min Age 2–12 months, RR >50 breaths/min Age >12 months, RR >40 breaths/min Crepitations |
| Hydration | Dry mucous membrane Poor feeding in infants Reduced urine output |
| Other | Fever for ≥ 5 days |

In the absence of high-risk features, any of the above features places a child at intermediate risk of serious pathology.

Depending on the findings and circumstances, one or more of the following may be appropriate:

- Referral for urgent paediatric assessment
- Telephone consultation with a paediatric specialist
- Firm arrangements, time/place/person, made for a further review
- Written and verbal instructions on warning symptoms that may occur and how to respond to them

Table 6: Features of some of the serious causes of fever in children

| Diagnosis to be considered | Signs in conjunction with fever |
|--|---|
| Meningococcal disease | Non blanching rash PLUS one of: An ill looking child, petechiae or purpura, capillary refill time >3 secs, meningism |
| Meningitis | Neck stiffness, bulging fontanelle, decreased level of consciousness, limpness (NB Neck stiffness and bulging fontanelle are relatively insensitive signs of meningitis) |
| Herpes simplex encephalitis | Focal neurological signs, focal or generalised seizures, decreased level of consciousness |
| Pneumonia If wheeze is present the diagnosis of pneumonia is less likely | Tachypnoea: Age 0–2 months, RR >60 breaths/min Age 2–12 months, RR >50 breaths/min Age >12 months, RR >40 breaths/min Crepitations, nasal flaring under 12 months, chest indrawing, cyanosis |
| Urinary tract infection | Vomiting, poor feeding, lethargy, irritability, abdominal pain or tenderness, dysuria or increased frequency, offensive urine or haematuria |
| Septic arthritis | Swelling of a limb or joint, not using an extremity, non-weight bearing |
| Kawasaki disease (very rare) | Fever >5 days WITH at least four of the following: Rash, conjunctivitis, lymphadenopathy, cracked lips, skin peeling |

Be alert for signs of septicemia, i.e. significant fever (>38°C) **PLUS** lethargy (not interested, not feeding) and/or significant dehydration (dry mucous membranes, poor urine output, capillary return >2 secs) and/or fast respiratory rate with increased effort and signs of poor effectiveness of effort.

If a child becomes rapidly ill or is particularly ill, with a rash, **consider and exclude meningococcal disease**. The rash may present as a morbilliform or subtle petechial rash before progressing to a purpuric rash.



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 |
|--|
| Viruses – approximately 70% <ul style="list-style-type: none"> - Rotaviruses - Noroviruses - Enteric adenoviruses - Caliciviruses - Astroviruses - Enteroviruses |
| Bacteria – 10 to 20% <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> |
| Protozoa – less than 10% <ul style="list-style-type: none"> - <i>Cryptosporidium</i> - <i>Giardia lamblia</i> - <i>Entamoeba histolytica</i> |
| Helminths <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?

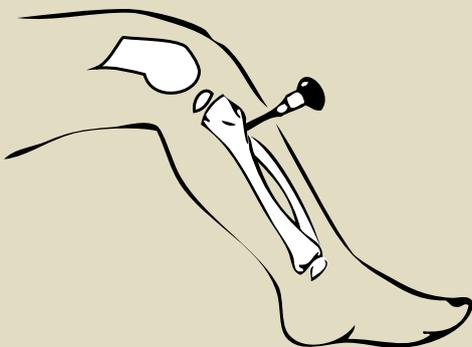
Features of shock in a child may include:

- 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.

5. Acute asthma in children

aged 1–15 years: are nebulisers or spacers best?

Spacers and nebulisers are equally effective

Many clinical trials have found spacers and nebulisers to be equally effective for delivering high dose bronchodilators in acute asthma and they have comparable clinical outcomes.⁴

Spacers have the advantages of being:

- Less frightening, especially for children
- Not dependent on a power supply
- Easier to maintain
- Cheaper

The cylindrical spacers that are available on Practitioners Wholesale Supply Orders are suitable. A mask is used for young children. Depending on the individual child, they can usually manage without a mask once they are over three to five years.

Salbutamol is given through the spacer one puff at a time, and 4 deep breaths are encouraged to take up each puff. Six puffs should be given every 20 minutes up to the recommended dose. Depending on response, referral may be indicated.

The recommended dose for **salbutamol** in a spacer for **acute severe asthma** is:

Salbutamol MDI 100 microgram puffs

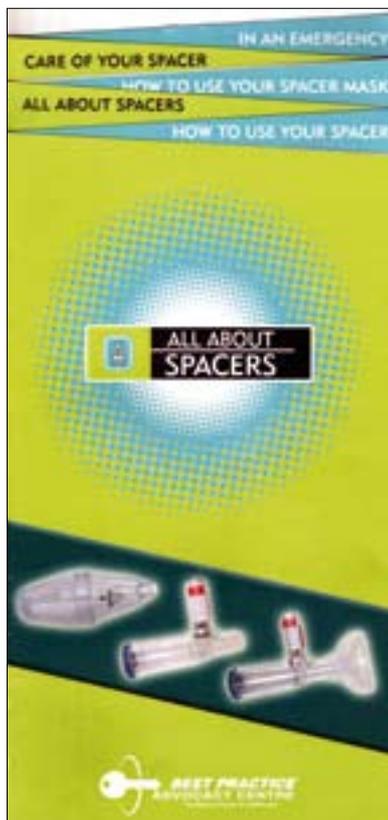
- Age <5 years – 6 puffs
- Age >5 years – up to 12 puffs

The use of Prednisolone should also be considered. 'Redipred' liquid 5 mg/ml is available, the recommended dose is 2 mg/kg once daily.

**Patient information on spacer use and maintenance is available from
bpac^{nz} and can be ordered by faxing **0800 27 27 69** or visit
www.bpac.org.nz**

References

1. Landau L. Acute and chronic cough. Paediatric Respiratory Reviews. 2006;7s: S64–S67.
2. Elliott E. Acute gastroenteritis in children. BMJ. 2007;334:35–40.
3. Gastroenteritis Pathway Team. Starship Health Gastroenteritis Clinical Guideline. 2006 Available from: <http://snipurl.com/1gxmqq>
4. Cates C, Crilly J, Rowe B. Holding chambers (spacers) versus nebulisers for beta-agonist treatment of acute asthma. Cochrane Database Syst Rev. 2006;2: CD000052.



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