

# Cough in children

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## Key concepts

- The cause of cough in children is often different than for adults and management reflects this
- The majority of children with acute cough will have a viral upper respiratory tract infection
- An accurate diagnosis, guided by history and examination, should be made whenever possible to allow successful management of the cough
- Management of chronic cough depends on the underlying diagnosis
- In children without symptoms and signs of a specific serious underlying disease process, the recommended approach is to watch, wait and review

CHILDREN WHO COUGH are frequently seen in general practice. Determining what is “normal” cough from that which is abnormal can be challenging for both parents and primary care teams. Cough is a protective reflex and children who have no evidence of illness may cough an average of 11 times over a day.<sup>1</sup>

Children are not small adults and the causes of cough in children may be different to the causes in adults.<sup>2,3</sup>

The assessment of children with cough, particularly when the cough is chronic, should be carried out in a systematic way. This should assist with the formation of an accurate diagnosis whenever possible and then allow successful management of the cough.

In New Zealand, bronchiectasis and pertussis continue to be prevalent, especially in the upper North Island. This is despite the fact that worldwide the incidence of these diseases is declining. Factors such as over-crowding, a lower socio-economic environment and late presentation to healthcare facilities are thought to play a significant role in the continuing prevalence of these diseases in New Zealand.

## History and examination guide diagnosis

### Acute cough is likely to be caused by a viral upper respiratory tract infection

The majority of children with acute cough will have a viral upper respiratory tract infection (URTI) and cough will be just one of the several ubiquitous symptoms. In these

children, a clinical diagnosis of a viral URTI can be made and the role of symptomatic management outlined to the parents.

It is important however, not to overlook any symptoms that may suggest a more serious but less common cause for the cough. Also plan a review if the child deteriorates or the cough persists. Asking a question such as “Can you tell me about the cough?” will often help reveal other information that may point to red flags in the history (👉 see sidebar “Detecting serious illness in children”).

### Listen to the concerns of parents

Cough in children, regardless of the underlying reason, can cause significant distress, disruption of daily activities and a lack of sleep for both the child and the parents. Ask open questions following the standard “FIFE” format such as:

- **Feelings:** What are your concerns?
- **Ideas:** What do you think is the cause of the cough?
- **Function:** How is the cough affecting your child and yourself?
- **Expectations:** What do you think is needed to help resolve the cough?

Responses to these questions should help uncover parental concerns, suggest areas requiring further direct questioning and guide the type and range of advice given. In many cases the answers may also reveal the likely diagnosis.

### Consider personal, family history and environmental factors

Aspects of the child's personal, family and social history may provide clues to the underlying reason for a cough.

Ask about:

- The child's personal medical history e.g. a history of atopy, recurrent infections, poor growth
- The family history (particularly a history of any respiratory conditions)
- Any exposure to environmental factors e.g. cigarette smoke, pets, damp living conditions
- The immunisation status of the child and others in the family
- Tuberculosis (TB) if the family is from a high risk country or if there is any history of contact with a person with TB

This information may not always be required e.g. in a child with a likely URTI or the information may already be known e.g. a patient who regularly consults the same GP at a practice. Take the opportunity to measure height and weight, to check on overdue recalls, to provide advice about a smoke-free home or to check oral health.

### Ask key questions if the cause of the cough is not clear

Determining the cause of a cough may not always be straight forward, particularly if the cough becomes chronic (persisting for more than four to six weeks). If the responses to initial open questions have raised concerns then further direct questioning is required.

There are several key considerations that may be useful to help make an accurate diagnosis in children with


## Detecting serious illness in children<sup>4,5</sup>

It is estimated that less than 1% of children presenting to general practice will have a serious illness. The role of the GP is therefore to detect and diagnose these very ill children while also appropriately reassuring parents of children who are less unwell. Complicating this further is that the initial consultation may be at an early stage in an illness when the diagnosis is not clear and there is little indication of the potential severity. Time can be a useful diagnostic tool in general practice. Provide a "safety net", particularly if a diagnosis has not been reached.<sup>6</sup> This may include verbal, or preferably written, information for parents that outlines symptoms or signs of worsening illness, instructions on how to access after hours care and a clear plan for follow-up.

Although the majority of children with an acute cough are likely to have a viral URTI the possibility of a more serious problem should be considered. History and examination may reveal the presence of red flags that can help to determine which children require further investigation or referral.

Red flags in children who cough:<sup>7</sup>

- Neonatal onset of cough
- Cough during feeding
- Sudden onset of cough or a history of choking that may suggest foreign body inhalation
- Chronic, wet cough with sputum production
- Continuous, unremitting or worsening cough
- Presence of associated features such as shortness of breath, hypoxia or cyanosis, rapid breathing, stridor, night sweats, weight loss or haemoptysis
- Signs of chronic lung disease e.g. chest wall deformity, digital clubbing, poor growth
- Parental concern that persists despite reassurance
- Clinician's instinct

 For guidance on assessing a child with fever see "Identifying the risk of serious illness in children with fever" Page 30.

cough. These include:

1. How long has the child been coughing for?
2. What does the cough sound like?
3. Is the cough wet or dry?
4. Does the child cough at night?
5. What is the age of the child?
6. Are there any associated symptoms?
7. What triggers the cough?

### How long has the child been coughing for?

Cough in children can be categorised as:

- Acute cough – lasting for less than two weeks
- Sub-acute or persistent cough – lasting two to four weeks
- Chronic cough – lasting for more than four weeks

Acute and sub-acute cough in children is usually due to a viral respiratory tract infection that will spontaneously resolve within one to three weeks in 90% of children.<sup>8</sup>

Other serious causes of acute cough e.g. pneumonia, pertussis, foreign body inhalation should however, be

considered and excluded if possible. The acute cough may also indicate the start of a chronic cough condition. In some cases, chronic cough lasting more than four weeks is caused by recurrent viral infections over winter, each incompletely resolving before the next infection. A careful history should distinguish this from true chronic cough. Children with chronic cough are likely to require review as the underlying cause of the cough may not initially be clear and the type of cough may change over time.

It is also important to ask about the onset of the cough. A cough associated with a very sudden onset or a history of choking may suggest inhalation of a foreign body, particularly in younger children.

### What does the cough sound like?

The character or the quality of the cough may in some cases suggest a specific cause, termed as classically recognised cough (Table 1). However, in practice this may have limited value. Unless the child is coughing in the waiting or consulting room, the GP is dependent on a description of the cough from the parents.

Other causes should not be excluded on this basis alone e.g. a “pertussis-like” paroxysmal cough may be due to *Bordetella pertussis* but could also be caused by a

**Table 1:** Classically recognised cough and underlying causes (adapted from Chang et al, 2006<sup>8</sup>)

Cough type	Suggested underlying disease process
Barking, brassy or croupy cough	Acute or spasmodic croup, tracheomalacia (tracheal collapse), habit cough (psychogenic)
Honking cough (usually absent during sleep)	Habit cough
Paroxysmal (with or without inspiratory “whoop”)	Pertussis*
Staccato cough in infants	Chlamydia infection
Chronic wet cough in mornings only	Suppurative lung disease
Cough associated with wheeze and breathlessness	Consider asthma

\* Any child with a cough, especially sub-acute or chronic, may have pertussis. Typical symptoms are uncommon and not diagnostic. It may be overlooked when cases are sporadic and over diagnosed during an epidemic. Immunisation is the best strategy.

viral infection such as adenovirus, parainfluenza virus, respiratory syncytial virus (RSV) or mycoplasma.

The age of the child may also alter the character of cough e.g. infants aged under six months with pertussis do not usually “whoop”.

### Is the cough dry or wet?

Determining whether the cough is dry and irritating or wet and “rattly” may help to diagnose the cause, particularly if the cough is chronic. A chronic cough with purulent sputum in a child requires further assessment as it always indicates underlying disease.<sup>9</sup>

A wet cough in older children and adults is often called a “productive” cough, but this term has limited value for many younger children as they tend to swallow sputum rather than cough it up, often resulting in vomiting. It may be more useful to ask if the child has vomited.

Research has shown that subjective reporting of a wet cough by parents is consistent with findings of airway

secretions at bronchoscopy.<sup>10</sup> A wet cough was shown to be always associated with an increase in airways secretions, however a dry cough did not always signify an absence of secretions. In addition, a dry cough may be reported early in an illness and then evolve into a wet cough as secretions increase.<sup>10</sup> Parents should be made aware of when it is appropriate to bring the child back for review and also advised about signs that may suggest worsening illness (see Page 27 for guidance on information that can be given to parents).

### Does the child cough at night?

Sleep generally suppresses “normal” and habit cough (see sidebar “Habit cough syndrome”) and although nocturnal cough is often associated with asthma, this is less likely for children in the absence of any other associated symptoms such as wheeze.

Nocturnal cough is often a reason for presentation for medical attention because the cough may cause significant anxiety for the parents, be more noticeable and disturb sleep for the whole family. Although nocturnal cough may

**Table 2:** Neonatal causes of chronic cough<sup>9</sup>

Diagnosis	Features
Aspiration (usually milk)	A moist cough that follows feeding  Irritability, arching or choking after feeds. Usually in a child with an underlying congenital cause such as tracheo-oesophageal fistula or laryngeal cleft. Only rarely in a child with normal anatomy and development.
Congenital malformation: compression of airway or tracheobronchomalacia	Stridor, wheeze, cough  Recurrent respiratory infections
Cystic fibrosis	Varied presentation - respiratory symptoms (often cough), gastrointestinal complications (intestinal and pancreatic), failure to thrive
Primary ciliary dyskinesia	Chronic, persistent rhinitis since birth
Lung infection in utero or in the perinatal period	Chlamydia, cytomegalovirus, respiratory syncytial virus

be the symptom that drives the parent to bring the child to the GP, evidence suggests that parental reporting of nocturnal cough can be subjective.<sup>11</sup>

### How old is the child?

The age of the child when the cough started may be important in helping determine the diagnosis. Any unexplained persistent cough that begins in the neonatal period (the first 28 days of life) requires investigation and usually indicates significant disease (Table 2).<sup>7</sup> Discussion with, or referral to, a paediatrician is usually recommended.

### Foreign body inhalation

Once children are old enough to put small objects in their mouths, the possibility of aspiration of a foreign body should be considered. Most cases of foreign body aspiration occur in children aged less than four years. Ask parents about the potential for foreign body aspiration, such as access to any small object or consumption of small, smooth foods (e.g. peanuts, raisins, grapes). If foreign body inhalation is suspected then the child should be referred to secondary care for further investigations.

### Are there any associated symptoms?

Does the child only have a cough or are there other symptoms? The presence of any associated symptoms may help determine the underlying cause of a cough. Examples may include:

- A cough associated with runny or blocked nose, sore ears or throat, fever or irritability suggests viral infection
- A cough that started after an episode of choking strongly suggests foreign body inhalation
- A cough that is associated with wheezing and breathlessness may suggest asthma
- A history of night sweats and haemoptysis in a “high-risk” child could suggest tuberculosis

## Habit cough syndrome<sup>7,9,12,13</sup>

Habit (psychogenic) cough is estimated to be the cause of persistent cough in children in 3–10% of cases. Diagnosis should only be made after other causes have been excluded, such as a transient or chronic tic disorder or Tourette’s syndrome. The typical characteristics which may suggest this diagnosis include:

- A dry, harsh, often honking, repetitive cough. In some cases however, it may be more a “clearing of the throat”
- An initial association with an upper respiratory tract infection
- A cough that tends to decrease during enjoyable activities and be absent during sleep
- A cough that may occur before speaking and at times of stress and increases in the presence of parents and teachers
- The cough may be disruptive to others while the child appears indifferent to it
- The cough is usually able to be reproduced upon request
- There may be secondary gain from the cough such as increased parental attention or absence from school
- A history of psychosocial problems such as abuse, anxiety, school phobia or depression

Management includes identification of, and assistance with, any problems at home or school, behavioural intervention and speech-language therapy.

## Normal respiratory and heart rates vary with age

An assessment of respiratory and heart rate can give good information about how unwell a child is. The table below gives a range of normal values that are appropriate at varying ages during childhood.

Age (years)	Respiratory rate (breaths/min)	Heart rate (beats/min)
<1	30–60	100–160
1–2	24–40	90–150
2–5	22–34	80–140
6–12	18–30	70–120
>12	12–16	60–100

## What triggers the cough?

Ask about any factors that may trigger the cough e.g. exercise, excitement or cold air. Also ask about environmental factors e.g.:


- Is the house smoke-free?
- Are there family pets?
- Is the house damp?

Cough that only appears in specific situations e.g. before speaking, with stress, at school, that disappears at night and that is reproducible upon request may be a habit cough (see sidebar “Habit cough syndrome”).

## Examination

The clinical examination of a child who presents with cough should include:

- An assessment of how “well” the child is
- Temperature, hydration, pulse rate and respiratory rate (see sidebar “Normal respiratory and heart rates vary with age)
- Height and weight
- Ear/nose/throat examination – primarily checking for signs consistent with upper respiratory tract infection. N.B. Cough can be triggered in some people by an irritation of the auricular branch of the vagal nerve e.g. by wax or a foreign body in the auditory canal.
- A check for clinical signs suggestive of allergy e.g. allergic “shiners” (dark circles under the eyes), nasal speech, eczema
- Chest examination including observation e.g. accessory muscle use, indrawing, chest deformity and chest auscultation for localised or generalised chest signs
- A check for digital clubbing

 Best practice tip – In some young children it can be difficult to get them to take breaths that are deep enough to give reliable findings on auscultation. Asking children to “pant like a big dog” with their mouth open or to “huff” (breathe out forcibly) may reveal chest signs that are not apparent with normal shallower breaths and also may stimulate a cough which enables the quality (dry or wet) to be heard.

## Investigations for cough

Investigations are not required for children with acute cough who are likely to have a diagnosis of a viral URTI.

### Sputum

Sputum culture may be indicated in an older child with a chronic, wet cough. Most young children swallow their sputum and are unable to produce a sample that is of sufficient quality to provide useful results.

### Spirometry

Spirometry is indicated for children with chronic, dry cough who are old enough to master the technique (usually school-age children).<sup>13</sup> Spirometry may give information about airway obstruction and responsiveness to a bronchodilator. N.B. If the child is asymptomatic and normal results are obtained, this does not exclude a diagnosis of asthma.<sup>14</sup> Peak flow is generally not used as a diagnostic tool for asthma as it has not been validated for this use and results are not repeatable.


### Radiography

A chest x-ray should be considered if a child has a:

- Chronic cough of unknown aetiology
- History of aspiration (acute onset of cough, choking episode)
- Persistent signs on chest examination (deformity, focal findings on auscultation)

N.B. A normal chest x-ray does not exclude the presence of an inhaled foreign body.

## Management of acute cough in children

The majority of children who present to general practice with acute cough will have a viral URTI. In children without symptoms and signs of a specific serious underlying disease process, the recommended approach is to watch, wait and review. Investigations are not usually required and treatment should be aimed at providing symptomatic relief ( see “Do cough and cold medicines work in children” Page 32).

Parents should be given information that enables them to make an informed decision about if and when to bring the child back for review. This may include information on:

- The symptoms to expect
- The duration of these symptoms
- Symptoms and signs of worsening illness
- The plan for follow up
- The potential hazards and ineffectiveness of cough and cold medicines

Among the many children who present with acute cough, it is important to identify the child who may have a predominantly lower respiratory infection and be unwell, with fever, tachypnoea, decreased oxygen saturation and chest signs. Antibiotics may be indicated depending on the diagnosis and a follow up appointment should be arranged to check for clinical improvement and resolution of chest signs. If the child is very unwell, referral for further assessment, chest x-ray and treatment in a secondary care setting may be required.

## Management of chronic cough in children

Management of chronic cough depends on the underlying diagnosis. If symptoms and signs found in the history and examination suggest there is a specific underlying disease causing the cough, then treatment should be aimed at this condition. In some cases, the child may need further investigations before a diagnosis can be made.

## Bronchiectasis is still common in New Zealand

The incidence of bronchiectasis has declined in most developed countries in the world due to improved living conditions and increased vaccination rates, but this illness still persists in New Zealand. It is most prevalent in Māori and Pacific children, especially those living in the lowest socioeconomic areas of the country e.g. Northland.<sup>15</sup>

Bronchiectasis is a “chronic, wet cough”, defined as irreversible widening of the bronchi in the lungs. It is characterised by inflammation, destruction of bronchial walls and chronic bacterial infection. Severe or recurrent respiratory infections such as pneumonia, tuberculosis or pertussis often result in bronchiectasis, especially if access to care or treatment is delayed.

A New Zealand based study found that the prevalence of bronchiectasis among children in Auckland was approximately one in 6000, with a disproportionately higher rate among Pacific and Māori children.<sup>15</sup> An alarming finding was that the level of bronchiectasis seen in these children was severe, with bilateral lung destruction and a wide range of co-morbidities and underlying disease processes.<sup>15</sup> Although bronchiectasis is usually most prevalent in pre-school children, the median age of children with bronchiectasis in Auckland was eight years.<sup>15</sup>

Early recognition of children with a “chronic, wet cough”, especially those with recurrent respiratory infections, is critical in reducing the incidence of bronchiectasis in New Zealand.<sup>15</sup> Practices also need to consider culturally appropriate ways of communicating this disease risk and expressing the importance of seeking early treatment. Consider supplying information in other languages and involving Māori and Pacific health providers.

Causes of chronic cough in children include:<sup>7</sup>

- Persistent respiratory infection including post viral cough, chronic bronchitis, bronchiectasis, cystic fibrosis, pertussis and tuberculosis
- Passive exposure to cigarette smoke
- Asthma
- Recurrent aspiration e.g. secondary to reflux, congenital abnormality
- Habit cough
- Upper airway cough syndrome
- Gastro-oesophageal reflux
- Cardiac causes e.g. congestive heart failure, congenital heart disease
- Medication e.g. rarely ACE inhibitors

## Indications for referral

Referral indications for a child with cough include:

- Cough that does not resolve despite simple management
- Suspected foreign body aspiration
- Haemoptysis
- Recurrent pneumonia (or chest signs that do not resolve)
- Suppurative lung disease
- Congenital lung lesions or disease
- Immunodeficiency states
- Cardiac abnormalities

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