Bronchiolitis

What is bronchiolitis?

Bronchiolitis is an acute viral infection of the lower respiratory tract that occurs primarily in the very young. It is a clinical diagnosis based upon typical symptoms and signs. Bronchiolitis is generally a self-limiting illness, and management is mostly supportive.

There is some discrepancy between the use of 'bronchiolitis' in the UK and in the USA and other parts of Europe, and no universally accepted definition for such a common condition.[1] In the UK, the term describes an illness in infants, beginning as an upper respiratory tract infection (URTI) that evolves with signs of respiratory distress, cough, wheeze, and often bilateral crepitations. In North America, bronchiolitis is used to describe a wheezing illness associated with an URTI in children up to the age of 2 years (whilst this would be described as a 'viral-induced wheeze' in the UK).[2] This causes difficulties in interpreting results of clinical trials, as the populations may display considerable heterogeneity. This article is based on UK guidelines.

What causes bronchiolitis? (Aetiology)[3]

Bronchiolitis is caused by a viral infection, most often respiratory syncytial virus (RSV). This is responsible for up to 80% of cases. Other possible viral causative agents include human metapneumovirus (hMPV), adenovirus, rhinovirus, and parainfluenza and influenza viruses. In some cases there may be infection with more than one virus.

Bronchiolitis epidemiology[4]

- Bronchiolitis occurs in infants under the age of 2 years, peaking between the ages of 3 months and 6 months.

- It is the most common lower respiratory infection in the first year of life in the UK. Around a third of babies develop bronchiolitis before the age of 1 year, and 2-3% of infants with bronchiolitis require hospitalisation.
- In 2019/20 in England, there were 47,506 admissions for bronchiolitis. [5]
- Peak incidence is in the winter months (October to March). There tends to be an annual 6- to 8-week epidemic where incidence peaks.
- In 2021, there was an unprecedented summertime surge in bronchiolitis cases in the UK, probably due to a very low number of cases in the prior winter (itself due to Covid-19 control measures) and resulting low levels of RSV immunity. [6]

Risk factors [7] [8]

Environmental and social risk factors:

- Older siblings.
- Nursery attendance.
- Passive smoke, particularly maternal.
- Overcrowding.

Breastfeeding is considered protective and should be encouraged for this and other reasons.

Most admissions (85%) for bronchiolitis are in infants born at term with no risk factors. Risk factors for severe disease and/or complications include:

- Prematurity (<37 weeks).
- Low birth weight.
- Mechanical ventilation when a neonate.
- Age less than 12 weeks.
- Chronic lung disease (eg, cystic fibrosis, bronchopulmonary dysplasia).

- Congenital heart disease.[9]
- Neurological disease with hypotonia and pharyngeal discoordination.
- Epilepsy.[10]
- Insulin-dependent diabetes.[10]
- Immunocompromise.
- Congenital defects of the airways.
- Down's syndrome.[11]

Bronchiolitis symptoms (presentation)[4]

The National Institute for Health and Care Excellence (NICE) guidelines state that bronchiolitis should be diagnosed in children under the age of 2 years who present with a 1- to 3-day history of coryzal symptoms, followed by:

- Persistent cough; **and**
- Either tachypnoea or chest recession (or both); **and**
- Either wheeze or crackles on chest auscultation (or both).

Other typical features include fever (usually of less than 39°C) and poor feeding. Consider an alternative diagnosis such as pneumonia if temperature is higher and crackles are focal. Consider viral-induced wheeze or early-onset asthma if there is wheeze without crackles, episodic symptoms and/or a family history of atopy. These, however, are rare in children under the age of 1.

Very young babies may present with apnoea alone, with no other signs.

Assessment in primary care

Take a history, and examine the child, making note of capillary refill time, respiratory rate, heart rate, chest signs, etc. Following examination, measure oxygen saturation in any child with suspected bronchiolitis.

Consider referral to secondary care if the respiratory rate is >60 breaths/minute, or if there is inadequate fluid intake or there are signs of dehydration; also, if the child is less than 3 months of age or was born prematurely, or there is comorbidity (particularly respiratory or heart disease, or immunodeficiency). Take into account social circumstances and the ability of the carer to assess deterioration.

Refer immediately for emergency hospital care if any of the following are present:

- Apnoea (observed or reported).
- Marked chest recession or grunting.
- Respiratory rate >70 breaths/minute.
- Central cyanosis.
- Oxygen saturation of less than 92%.
- The child looks seriously unwell to a healthcare professional.

Consider referring for hospital care if one or more of the following are present:

- Respiratory rate >60 breaths/minute.
- Difficult breastfeeding or inadequate oral fluid intake (50-75% of usual volume)
- Clinical signs of dehydration (reduced skin turgor, and/or a capillary refill time of three or more seconds, and/or dry mucous membranes, and/or reduced urine output).
- Persistent oxygen saturations of less than 92%.

The decision of whether or not to refer should take into account any known risk factors for severe bronchiolitis (see "Risk factors", above).

Other factors may alter the threshold to refer, such as:

- Social circumstances.
- The carer's skill and confidence in managing the child at home, including identifying 'red flag' symptoms of serious illness.

- The distance to secondary care in case of deterioration.

Differential diagnosis

- Viral-induced wheeze. Consider if there is wheeze but no crackles, a history of episodic wheeze, and/or a family or personal history of atopy.
- Pneumonia. Consider if temperature is above 39°C and there are persistent focal crackles.
- Asthma.
- Bronchitis.
- Pulmonary oedema.
- Foreign body inhalation.
- Oesophageal reflux.
- Aspiration.
- Cystic fibrosis.
- Kartagener's syndrome.
- Tracheomalacia/bronchomalacia.
- Pneumothorax.

Investigations

- Pulse oximetry.
- Viral throat swabs for respiratory viruses (in secondary care).

Chest X-ray, blood tests and blood gases are not advised for the routine management of bronchiolitis, unless there is evidence of deterioration and worsening respiratory distress. As above, fever >39°C or focal chest signs would prompt investigations such as a chest X-ray to rule out alternative diagnoses such as pneumonia, or complications.

Bronchiolitis treatment and management [4] [12]

Primary care

- Most infants with acute bronchiolitis will have mild, self-limiting illness and can be managed at home. Supportive measures are the mainstay of treatment, with attention to fluid input and nutrition.
- Advise the parents that the illness is self-limiting and symptoms tend to peak between 3-5 days of onset.
- Anti-pyretic agents are needed only if a raised temperature is causing distress to the child.
- Within general practice, a doctor's role is to assess current severity of illness and, for those with mild-to-moderate disease, to support and monitor. Consider whether the presentation is in the early stages of disease, when a child is more likely to become worse before improving. Careful safety netting is important, teaching parents to spot deterioration and to seek medical review should this occur.
- If referring to hospital, give supplementary oxygen whilst awaiting admission in children whose oxygen saturations are persistently below 92%.

Secondary care

NICE recommends admission for children with bronchiolitis assessed in a secondary care setting if they have any of the following:

- Apnoea (observed or reported).
- Persistent oxygen saturation (when breathing air) of:
    - Less than 90%, for children aged 6 weeks and over.
    - Less than 92%, for babies under 6 weeks or children of any age with underlying health conditions.
- Inadequate oral fluid intake (50 to 75% of usual volume), taking account of risk factors and using clinical judgement.
- Persisting severe respiratory distress, eg, grunting, marked chest recession, or a respiratory rate of over 70 breaths/minute.

NICE advise that supplemental oxygen be given for babies and children who have oxygen saturations that are:

- Persistently less than 90%, for children aged 6 weeks and over.

- Persistently less than 92%, for babies under 6 weeks or children of any age with underlying health conditions.

Even amongst hospitalised children, supportive care is the mainstay of treatment, including oxygen and nasogastric feeding where necessary. Upper airway suction may be useful if there is difficulty feeding or a history of apnoea. Continuous positive airway pressure (CPAP) may be considered in those who have impending respiratory failure. High-flow nasal cannula oxygen (HFNC) is commonly used for bronchiolitis in secondary care as it is thought to reduce the need for CPAP and ventilation, although its efficacy is disputed.[13]

Other treatments have shown inconsistent or little evidence of benefit and NICE guidelines advise against using them:

- Bronchodilators: no benefit has been found in improving oxygen saturations, reducing time to resolution or need for/duration of hospital admission.[14]
- Corticosteroids: trials have consistently failed to provide evidence of benefit.[15]
- Nebulised racemic adrenaline (epinephrine) - racemic = 1:1 mixture of the dextrorotatory and levorotatory isomers: one study reported that inhaled racemic adrenaline was no better than inhaled saline.[16]
- Hypertonic saline: thought to act by unblocking mucous plugs and reducing airways obstruction. A Cochrane Review concluded that there was low- to medium-quality evidence that its use did slightly reduce length of hospital stay and clinical severity scores.[17]
- Antibiotics: there is minimal evidence to support their use, except in a small subset of patients with complications or respiratory failure.[18]
- Montelukast.[19]
- Ribavirin: may reduce the need for mechanical ventilatory support and the number of days in hospital but there is no clear evidence of clinically relevant benefits (eg, preventing respiratory deterioration or mortality).[20]

- A 2023 Cochrane review found low-certainty evidence that passive slow expiratory techniques (a type of chest physiotherapy) may produce a mild to moderate improvement in bronchiolitis severity. Conventional techniques and forced expiratory techniques do not appear to provide any benefit in bronchiolitis.[21] NICE recommend considering chest physiotherapy assessment in babies in children who have comorbidities (eg, severe tracheomalacia) that may impair clearing of secretions.

NICE recommends that babies and children with bronchiolitis should only be discharged from hospital if:

- They are clinically stable.
- They are taking adequate oral fluids.
- They have maintained adequate oxygen saturations (90% or higher in children aged 6 weeks or over, 92% in babies aged less than 6 weeks or children of any age with underlying health conditions) for 4 hours, including a period of sleep.

Prognosis[12]

- Most children with bronchiolitis make a full recovery.
- The illness is typically self-limiting, lasting 3-7 days. The cough settles within three weeks in most.
- Bronchiolitis is more likely to be severe in children with chronic lung disease, who are under 3 months of age or who were born <32 weeks of gestation.
- There is an association with long-term respiratory conditions such as asthma but it is not known if there is causality.
- Death from bronchiolitis is uncommon. In England there are around 70 deaths per year due to bronchiolitis. Most deaths occur in infants younger than 6 months or in those with underlying cardiac or pulmonary disease.

Prevention of bronchiolitis

Immunoprophylaxis

Recent years have seen the development of agents which provide passive immunity to RSV: RSV immunoglobulin (RSV-Ig) which has been superseded by palivizumab, a monoclonal antibody. It has been shown to reduce RSV-related hospitalisation and intensive care admissions significantly. The Joint Committee on Vaccination and Immunisation recommends that it should be used by those at high risk of severe RSV disease:[22]

- Those with bronchopulmonary dysplasia (BPD, also known as chronic lung disease) due to prematurity or chronic lung disease.
- Those at high risk due to congenital heart disease.
- Those at high risk due to severe combined immunodeficiency syndrome.

The first dose should be administered before the start of the RSV season.

Nirsevimab is a monoclonal antibody against the RSV fusion protein with an extended half-life.[23] It was approved for RSV prophylaxis by the UK's Medicines and Healthcare Products Regulatory Agency in 2022. A trial is underway to determine its efficacy in a real-world setting, and it may be used routinely for all infants if the results are promising.[24]

Infection control

Disease transmission may be limited by :

- Hand washing.
- Use of gloves and aprons or gowns when in direct contact with the patient.
- Isolation of infected patients in cubicles.

Further reading

- Bronchiolitis in children; NICE Guideline (May 2015, last updated August 2021)
- Bronchiolitis in children; NICE Quality Standard, June 2016

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