

# Clinical assessment and management of children with bronchiolitis

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## **Clinical assessment and management of bronchiolitis**

### **Aims and intended learning outcomes**

There is a respiratory surge expected this winter in paediatric setting. The children's nurse will have a central role in delivering high-quality care and support to both child and family during this time. To support the children nurse in their preparation this article will summarise the pathophysiology of bronchiolitis, describe the clinical assessment and management of the illness including recent national policy changes whilst also considering the impact of COVID-19 on the health system and families.

After reading this article and completing the time out activities you should be able to:

- Summarise the epidemiology and pathophysiology of bronchiolitis.
- Describe the clinical assessment of a child diagnosed with bronchiolitis.
- List the risk factors for bronchiolitis and be aware of the importance of infection control.
- Outline the impact of COVID-19 on this diagnosis
- Discuss the support that a family needs when their child is ill with bronchiolitis.

### **Background**

Bronchiolitis is common seasonal respiratory virus that affect infants, it can lead to hospitalisation and can potentially be life-threatening (Carande, et al 2018). The illness is distressing and often peaks over a 6-8 week period in the winter months (NICE, 2021). Signs of the virus include a dry wheezy cough, fever and nasal discharge. If examining the chest, a high-pitched wheeze and fine inspiratory crackles may be heard (Deshpande and Northern, 2003; NICE, 2021). Bronchiolitis can be caused by many different viral pathogens, however respiratory syncytial virus (RSV) positive bronchiolitis is responsible for 80% per cent of all cases in the UK (NICE, 2021). It is estimated that over 30,000 under 5's will be hospitalised every year because of RSV, with 6% requiring admission to Paediatric Intensive Care Units (PICU), overall normally 1 in 6 of all hospital admissions of babies and children will be due to bronchiolitis (Reeves et al., 2017). The majority of admission occur in infants who are otherwise healthy, however, certain underlying conditions increase the risk of the infant developing more severe illness such as premature babies and babies born with heart and lung disorders. Infants who are hospitalised and develop a severe RSV infection are at increased risk of developing a recurrent wheeze and around 30 infants die of RSV each year in the UK (Reeves et al., 2017). Paediatric settings are currently preparing for a respiratory surge (Davies et al 2021). A major concern is the substantial pressure a potential overlap of the COVID-19 pandemic and seasonal bronchiolitis will put on healthcare systems this year (Guedj et al., 2021). With on-going concerns regarding COVID-19 having an impact on the delivery of safe care and the child and family needs changing as a result of the pandemic refreshing on knowledge is essential for a children's nurse. It should be noted that whilst children have been relatively spared by the COVID-19 pandemic, there are reports of a multisystem inflammatory syndrome and long-term COVID-19 effects in children have started to emerge (Guedj et al 2021).

### Time out 1

Reflect on conversations that you have had with parents of infants suffering from bronchiolitis. What did their concerns focus upon? Did they for instance explore the origins of the illness or was the sole concern signs and symptoms management? How did they narrate the event especially as regards the speed of onset and context of the child's illness? How important did it seem to understand the developing experiences of the parents?

### **Pathophysiology**

Lung changes that mimic acute inflammatory obstruction in the small airway are key to the pathophysiology of bronchiolitis. The pathophysiology begins with an acute infection in the epithelial cells that line the bronchi and bronchioles. The invasion of virus or other infectious agents leads to colonisation of the respiratory tract that causes destruction of cilia and epithelial necrosis (Florin, Plint and Zorc, 2017). This destruction triggers the inflammatory response, cellular infiltration of neutrophils and lymphocytes that consequently lead to oedema of the submucosa. Goblets cells that are found in the epithelium of the respiratory tract increase the secretion of mucus which when combined with desquamated epithelial cells forms a thick mucus plug. Air gets trapped and lobular collapse happen due to the mucus plug causing an obstruction of the bronchioles. This affects the infant's ability to adequately self-ventilate as there is a decrease in the air flow due to the now narrowed respiratory tract, leading to mismatch ventilation-perfusion and decrease effectiveness of the alveoli in the lungs. Blood flow continues through the lungs with oxygen moving from the alveoli into the blood and carbon dioxide travelling from the body to alveoli's, but overtime this the decreased effectiveness of alveoli impacts on gas exchange and can result in hypoxaemia (Yanney and Vyas, 2008).

### **Risk factors for RSV-positive bronchiolitis**

The largest population at risk from RSV-positive bronchiolitis is infants who are born prematurely. They have an increased risk of hospitalisation compared to full-term infants (Boyce et al., 2000; Grimwood et al., 2008; Ghazaly and Nadel, 2018) and are at increased risk of admission to PICU (Ghazaly and Nadel, 2018). This is due to premature birth before sufficient maternal immunoglobulin G can be passed on to the infant, which results in inadequate immunity during early months to prevent RSV infection (Boyce et al., 2000). The airways of premature infants are smaller and can easily be obstructed with oedema, resulting in increased respiratory effort and poor gas exchange (Boyle et al., 2012). The children's nurse must be aware of the factors that are linked with an increased risk of bronchiolitis and increased severity of illness, these include: history of prematurity, chronic lung disease, congenital heart disease, cystic fibrosis, Down's syndrome, immunodeficiency, infants less than 3 months of age, neuromuscular disorders, non-breastfed infants, males, previous hospitalisation, ethnicity, family smoking and multiple infants from a birth (NICE, 2021). Awareness of the risk factors associated with bronchiolitis will support the children's nurse when discussing the illness with families and providing family centred care.

### Time out 2

Return now to the reflections that you noted down in response to time out 1. Did any of the children you reflected upon then suffer from a pre-existing health condition such as cystic fibrosis? Parents of such children may not yet have developed confidence and expertise in managing acute illness episodes and they might also have accrued additional anxiety as regards to a vulnerable offspring. How in your experience do such parents react? Does that help to shape your care response?

## **Transmission**

Pathogens causing bronchiolitis are highly contagious and can be transmitted through direct and indirect contact (such as contaminated surfaces) of respiratory secretions. It is estimated that RSV has a reproduction rate of 1.2-3.0 (Barr et al, 2019). Indoor crowding in colder season is also thought to increase transmission (Florin, Plint and Zorc, 2017) leading the virus to easily spread through households, nurseries and hospitals. Even with early years setting remaining open transmission of all bronchiolitis pathogens was reduced during the initial onset of COVID-19 pandemic due to the impact of the implemented protective measures, with a study finding 82.5% lower admission than predicted in France (Gruedj et al, 2021). However, with measure being relaxed a surge in transmission has been predicted putting further pressure on the healthcare system, with summer 2021 PHE surveillance showing an increased number of RSV in the community (DHSC 2021).

### Time out 3

Explore now any protocol developments planned in your place of work to help counter a possible increase of bronchiolitis hospital admissions alongside persistent presence of COVID-19 virus during winter months. What do the plans focus upon, cross infection control within hospital, liaison with community care services and GPs?

## **Diagnosis**

A full detailed history and examination are used to diagnose bronchiolitis. An child with bronchiolitis will normally present with one- or two-day history of upper respiratory tract infection. Other common signs and symptoms include a fever usually less than 39°C, poor feeding, a moist cough, respiratory distress which is due to the involvement of the lower respiratory tract and the production of hypersecretion of mucus (NICE 2021). Most cases are able to be managed at home by parents with symptoms peak between 3 and 5 days. The NICE (2021) red flag system should prompt a referral to hospital from primary care, the criteria includes any report of the following:

- increased working of breathing, such as grunting, nasal flaring and marked chest recession,
- fluid intake of 50-75% of normal or less,
- no wet nappies for more than 12 hours,
- signs of exhaustion,
- any apnoea's or cyanosis
- persistent oxygen saturation of less than 92% in room air

An important marker when considering the severity of bronchiolitis is an infant's ability to feed, therefore documentation of changes in feeding is vital. To diagnose the viral pathogens causing the illness a nasopharyngeal aspirate can be obtained but the decision to undertake this procedure should be decided by a medical clinician. It is important to gain a definitive diagnosis as differential diagnosis includes asthma, cardiac failure, neonatal sepsis and pneumonia (Beattie, 2006).

## **Treatment**

Most cases of bronchiolitis are mild and can be managed by the parents in the home environment. When providing treatment at home parents need to be educated on safety information regarding bronchiolitis (NICE 2021). Parents should be assisted in caring for their infant as appropriate practical care given by parents such as adjusted feeding regime may lead to avoidance of hospital admission. The nurse should educate the family on adjusted feeding regime by offering the infant smaller amounts of milk more frequently. This will help prevent the infant becoming increasingly tired as they will only drink and digest a small amount at each feed but still receive adequate fluid amount. Parent will need to be aware that their infant may deteriorate further at home despite their efforts, safety netting should be put in place with families advised to take their infant to ED if they do not tolerate or wake for feeds and have less than three wet nappies in 24 hours (Goldstein, 2021). Parents may understandably feel very anxious by the speed of the onset of the condition, this will be compounded by the lack of sleep they may have experienced while caring for their infant, they may have fears around differential diagnosis, underlying conditions and prematurity. Specific individualised reassurance needs to be given and time needs to be taken to listen to parental concerns and offer clear advice on when to gain additional help (Goldstein 2021). Parents should be fully supported and enabled to play a practical role in the treatment of the child whether the child is admitted to hospital or cared for at home.

## **Hospital Admission and Treatment**

The predominant treatment given to an infant admitted to hospital with bronchiolitis is supportive care led by nurses and consists of oxygen, hydration and nutrition (RCPC, 2020), which should minimise the use of aggressive treatment. Care provided must include a detailed discussion with families to help them to support their infant throughout the illness.

An infant requires admission to hospital if they have any of the following:

- Apnoea (observed or reported)
- Persistent oxygen saturation in air less than 90% for infants over 6 weeks and 92% infants under 6 weeks with underlying health conditions
- Reduced fluid intake (50%- 75% of usual volume)
- Respiratory distress such as grunting and marked chest recession and a respiratory rate over 70 breaths/minute (NICE 2021)

Oxygen management, clinical monitoring of their vital signs, ability to feed and level of fatigue are frequently used to treat the infant. The infant should have their oxygen saturations recorded and supplemental oxygen commenced if saturations are less than 90% for infants over 6 weeks and 92% infants under 6 weeks with underlying health conditions in air (NICE, 2021). The infant may also require nasal suctioning to clear secretions when necessary and adjusted feeding regimes. High-flow humidified oxygen devices are increasingly used to manage oxygen saturations, as they provide effective oxygen administration and airway humidity (Roger, Greaves and Paul, 2017), and potentially reduce upper airway resistance and provide some positive pressure. However, a systematic review looking at 34 papers including 3 randomised controlled trials found that high-flow humidified oxygen should only be started if an infant has deteriorated since starting nasal cannula oxygen and concluded that there is no evidence for commencing high-flow humidified oxygen as an early intervention for an infant with bronchiolitis in ED (O'Brien et al, 2019). Regularly monitoring and observation including Paediatric Early Warning Score is required to ensure signs of decompensation are not overlooked. Other key signs for decompensation the children's nurse should be aware of include children younger than 6 months, hypoxemia, retractions or use of accessory muscles on presentation to ED (Dadlez, et al 2017). Adjusted feeding regime should encourage oral feeding if tolerated and nasogastric fluids should be commenced when the infant cannot take enough fluid by mouth and intravenous fluid if nasogastric feeding is not tolerated (NICE 2021).

An infant with either recurrent apnoea or increased work of breathing with respiratory failure may require admission to a PICU for respiratory support, with infants with co-morbidities 36% more likely to be admitted (Ghazaly and Nadel 2018). Respiratory support is commonly delivered to a bronchiolitis infant via continuous positive airway pressure (CPAP) (NICE, 2021). CPAP has been used since the 1970s in the management of bronchiolitis as it increases airway pressure which prevents the airways from collapsing and is delivered via a mask or nasal prongs secured to the infant (Beasley and Jones, 1981).

Time out 4

Briefly profile as you might for a parent what constitutes an increasingly serious case of bronchiolitis, that might mandate admission to hospital. How would you describe the impact on the illness on the infant's lungs, explaining the signs they witness in their child?

### **Considerations as a result of COVID-19**

With concerns around ongoing COVID-19 cases maintaining robust infection control processes is essential, however, it is still crucial to maintain the flow of patients through the hospital and the COVID-19 status of an infant should not impact on initial assessment and onset of treatment (RCPCH 2020). All infants requiring admission should undergo a COVID-19 test and PHE guidelines on PPE and appropriate isolation and social distancing should be followed at all times (PHE 2021). If a cubicle is not available a risk assessment should be performed locally and a cubicle given to vulnerable patients. Social distancing must be ensured if cohort nursing before virology available. Patient requiring aerosol generating procedures such as high-flow humidified oxygen should not be cohort nursed until a negative virology is confirmed. A further consideration is the potential parental fear

regarding their infant being admitted if cases of COVID-19 are significant within the hospital. With an ill infant the parent will understandably be concerned that they will be exposing their child to a greater risk by going to the hospital. The risk of deterioration is an essential consideration, the development of local protocols that deal with the threat of COVID-19 and other respiratory disease should take place ahead of anticipated winter increase (RCPCH 2020) and should be explained to the parents to help ease concerns regarding possible cross contamination. Mainstream and social media are important platform for sharing information including public health messages that will support parents obtaining the correct timely support, however, releasing information this way brings the risk of misinformation also spreading.

### **Family support**

Infants seen with bronchiolitis are often young, nevertheless, it is key for all those working with families to consider the impact of PPE on how they have discussions and build a rapport with families. Child friendly approaches have been widely adopted with healthcare professional decorating PPE, using smiling eye and open body language. When having discussion with parents and families start the conversations by asking how the family is doing. COVID-19 has dramatically altered healthcare experiences for both child and family (Rapheal, et al 2021). If mothers have given birth to their infant they may have had some if not all of their maternity care during the pandemic and evidence has established that maternal anxiety and depression have substantially increased in the last 18months (Davenport et al 2021 and Motrico et al 2021). For an infant diagnosed with underlying illness or born prematurity, families have had to navigate diagnosis, treatment and any hospitalisation in an unfamiliar healthcare setting. Families are still experiencing significant difficulties that will be compounded by the anxiety, fear and worry of having a sick infant. The children's nurse is in an ideal position to help to alleviate family anxiety. The children's nurse should, regardless of whether the child is being cared for in hospital or at home, take time to provide parents or caregivers clear and detailed understanding of the condition and ensure they know how to recognise signs of deteriorations such as the use of accessory muscles or reduced feeding and what action to take. This may aid in reducing the fear or uncertainty experienced by the care giver. If the caregiver does not feel comfortable in monitoring the child, then the children's nurse should advocate for the family and involve the family in decision making, with healthcare providers stating parental anxiety an influencing factor in admitting children (Barwise-Munroe et al 2018).

Current hospital restrictions may provide an additional concern to parents. Most hospital settings are still heavily restricting visitors to the hospital and only allowing one parent to remain on the ward setting at a time. The nature of such restriction may impact on the nurse's ability to provide family centre care as not all parents/care givers will be present and may leave the resident parent without direct contact with their usual support network. A parent who remains on the ward may feel isolated without support during a stressful time. Consideration also should be given to the impact such polices are having on exacerbating health inequalities. Parents may have competing priorities that could impact on them remaining on the ward such as work or taking care of other children, such considerations are often a more disproportionate challenging for minority groups (Rapheal, et al 2021).

Support if possible should be offered and the nurse could for example arrange discounted parking or meal vouchers. If an official letter is needed to confirm the infant's condition and admission to hospital for parent's workplace or to support parents to access benefits this should be provided. The children's nurse will need to support parents whether they are on the ward or elsewhere, regular updates and time is needed to sit with family to actively listen to their questions and concerns and to provide a compassionate response to their needs. Every parent's needs will differ and the nurse has a responsibility to ensure that each person's needs are met (Kelsall-Knight, 2012).

### **Prevention and infection control**

Prophylaxis medication is available to prevent RSV infection in infants at high risk of developing severe infection via the administration of palivizumab (Roger, Greaves and Paul, 2017). Studies have shown a marked reduction in RSV hospitalisation for high-risk infants administered palivizumab (American Academy of Pediatrics, 1998, and Narbona-Lopez, Uberos and Checa-Ros, 2016). Palivizumab is a humanised RSV neutralising monoclonal antibody that prevents lower respiratory tract infections (Sorrentino and Powers, 2000). It is administered annually via an intramuscular injection to infants at high risk of developing severe infection before the onset of bronchiolitis season. NICE (2021) guidelines do not include the administration, however, it is recommended by the Joint Committee on Vaccination and Immunisation in the UK (Public Health England (PHE) 2013). It has been recommended that Palivizumab administration starts earlier in 2021 following surveillance data from PHE showing an increased number of community-based RSV cases in early summer (DHSC 2021).

Preventive measures that reduce the transmission of bronchiolitis should be actively encouraged. These include avoiding contact with people who have symptoms of upper respiratory tract infections, frequently hand washing and preventing ill infants from attending nursery until their symptoms have resolved. When in hospital infants are often cohort nursed in a bay, ideally this should commence following a negative COVID-19 test (RCHCP, 2020). Cohort nursing enables the nurse to care for a 'bronchiolitis bay' and only care for these children, therefore reducing the transmission of the virus. Paul, Rogers and Bhatt (2016) suggests using a nasopharyngeal aspirate for cohort nursing, but as multiple viruses are often found in one child cohort based on only RSV is not evidence based and may expose a child to unnecessary intervention (Rogers, Greaves and Paul, 2017).

Education is the most important aspect of preventing bronchiolitis infection (Kelsall-Knight, 2012). Information must be given to parents and caregiver on reducing the exposure and transmission of the disease. Handwashing should be reiterated and reinforced, parents should understand that this is the most effective way of preventing transmission. Further measures include the discussion on smoking in the home environment and encouraging the elimination of smoke exposure for anyone with symptoms of a respiratory infection (NICE, 2021). Breastfeeding for more than two months was found to have a protective effect on infants born 33-35 weeks gestation (Carbonell-Estrany et al, 2004). When encouraging breastfeeding support should be offered and signposting to additional support may be required and the mother right to choose should be respected.



Time out 5

Not all children who should receive palivizumab receive it. Consider what advice you would give to a parent if asked about palivizumab administration. What are the side effects? What are the key messages you would want to convey to parents considering the immunisation? To support your answer here you may wish to access <https://www.rcpch.ac.uk/news-events/news/palivizumabpassive-immunisation-against-rsv-pre-term-infants> and chapter 27a in The Green Book <https://www.gov.uk/government/collections/immunisation-against-infectious-disease-the-greenbook#the-green-book>.

## **Prognosis**

It is expected most infants with bronchiolitis will recover within seven to ten days, although the cough may remain present for some weeks and potentially months following the subsidence of the respiratory distress (Beattie 2006). There is an increased risk of a recurrent persistent wheeze in a small number of children. The relationship between persistent wheeze and/or asthma is not yet known (NICE 2021). The impact of COVID-19 on bronchiolitis is also not yet known.

## **Discharge from hospital**

When the child is well enough to leave hospital, the family should be informed that their child may have the symptoms of bronchiolitis – such as a cough or decreased feeding – for up to four weeks, but if the family feels that the child is deteriorating then they should seek medical advice as soon as possible. In order for the child to be discharged from hospital, the children's nurse must ensure that the discharge criteria have been met. The discharge criteria is determined through evidence based practice and includes, but is not limited to, the infant being stable, tolerating oral fluids and having oxygen saturations above 90% for infants over 6 weeks and 92% infants under 6 weeks with underlying health conditions in air for four hours including a period of sleep (NICE, 2021).

## **Nursing care and continued improvements**

The care delivered to an infant with bronchiolitis is decided at local trust level. Research by Carande (2018) found that only 18% of trusts were fully compliant to NICE guidelines, meaning most infants may not have received optimal care. The recent NICE 'Bronchiolitis: Diagnosis and Management of Bronchiolitis in Children Clinical Guideline NG9' (2021) update has implemented new recommendations on when to refer, admit and discharge. The updated advice concentrates on oxygen saturation and includes referring an infant with saturation less than 92%, admitting an infant with persistent oxygen saturation in air less than 90% for infants over 6 weeks and 92% infants under 6 weeks with underlying health conditions, and discharging an infant when they have oxygen saturations above 90% for infants over 6 weeks and 92% infants under 6 weeks with underlying health conditions in air for four hours including a period of sleep (NICE 2021).

Children's nurses have a clear role to play for an infant who presents with bronchiolitis, they should be confident with the pathway of escalation to ensure they can provide families with the correct appropriate advice. Parents need to be correctly educated on how to provide care and safety netting must be put into place if child is to be care for at home (Goldstein, 2021), advice should include information on the increased risk of more severe symptoms in bronchiolitis if someone smokes in the home (NICE 2021). Patient information leaflets must be based on local and national guidelines and be available for all NHS personnel and families. Information provided in leaflets should include rationale for parents to understand interventions and to support safety netting if parents are to be asked to care for their sick infant at home, such key topic areas may include monitoring illness, signs of deterioration, and when and how to seek further support with clear signposting to correct telephones numbers to contact.

When considering the children's nurses role in preparing for the respiratory surge, it is important to remember initial criticism of the NHS for not preparing quickly enough for the COVID-19 pandemic (Davies et al 2021). All lesson can now be used and children's nurse can take an active role in the development of protocols for their department, with winter planning, infection control, escalation, increased bed capacity and workforce are all key areas. Online free resources such as <https://www.rcemlearning.co.uk> and <https://e-lfh.org.uk/> are accessible to all health professional and have developed resources to support practitioner knowledge and ensuring safe care ahead of the predicted rise in cases.

## **Conclusion**

Bronchiolitis is a common illness in children and infants under two years. It is a familiar condition for many children's nurses but is significant with the predicted respiratory surge and the impact COVID-19 is having on parental anxiety and cross infection. Preparation is vital. The information in this article should allow us to revisit and refresh on how we can ensure the delivery of correct supportive care while minimising the spread of COVID-19 and educating and supporting family during what is an unfamiliar and frightening time for them. Bronchiolitis is an illness event with no conclusive way of delivering care to child and infant. Children's nurses should be guided my evidence-based practice and their clinical expertise, this article has suggested key considerations for providing clinical care to the infant to ensure the best possible care can be delivered. Whilst recovery from illness is usual complications can emerge and COVID-19 could complicate the issue. The patient may have residual problems that cause parents a good deal of concern. Children's nurses are highly skilled at supporting family's emotional wellbeing, our ability to provide holistic family centre-care and educating families on risk factors and preventive measure and will be more important than ever in the current healthcare climate.

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