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Contemporary Practice in Paediatrics

Clinical Guidelines on the Management of Acute Bronchiolitis

JW **Cheng**, MF **Yeung**, TWY **Cheung**, EYL **Poon**, KK **Siu**, YP **Tsang**, OY **Wong**, KF **Lau**, AM **Li**, SC **Sit**, AYC **Tam**

Explanatory Notes on Level of Evidence and Grading System on Recommendation

The definition of types of evidence and grading recommendations originate from the US Agency for Healthcare Research and Quality (AHRQ).

Levels of Evidence

Level	Type of evidence
Ia	Evidence obtained from meta-analysis of randomised controlled trials
Ib	Evidence obtained from at least one randomised controlled trial
IIa	Evidence obtained from at least one well-designed controlled study without randomisation
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case control studies
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities

Grading of Recommendations

Grade	Type of recommendation
A (Levels Ia, Ib)	Requires at least one randomised control trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation
B (Levels IIa, IIb, III)	Requires availability of well-conducted clinical studies but no randomised clinical trials on the topic of recommendation
C (Level IV)	Requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates absence of directly applicable studies of good quality

Department of Paediatrics & Adolescent Medicine, United Christian Hospital, 130 Hip Wo Street, Kwun Tong, Kowloon, Hong Kong SAR, China

JW **Cheng**（鄭正禧） *MBBS(HK),FHKAM(Paed),FHKCPaed*
EYL **Poon**（潘綺靈） *MBChB(CUHK), FHKAM(Paed), MRCPCH*
YP **Tsang**（曾玉萍） *MBBS(HK), FHKCPaed, FHKAM(Paed)*

Department of Paediatrics, Kwong Wah Hospital, 25 Waterloo Road, Yaumatei, Kowloon, Hong Kong SAR, China

MF **Yeung**（楊萬鋒） *LMCHK,FHKAM(Paed), FHKCPaed*

Department of Paediatrics & Adolescent Medicine, Tuen Mun Hospital, 23 Tsing Chung Koon Road, Tuen Mun, N.T., Hong Kong SAR, China

TWY **Cheung**（張穎頤） *MBBS(HK),FHKCPaed,FHKAM(Paed)*
OY **Wong**（黃譪然） *MBChB(CUHK), FHKCPaed, FHKAM(Paed)*

Department of Paediatrics & Adolescent Medicine, The University of Hong Kong, Duchess of Kent Children's Hospital, Sandy Bay, Hong Kong SAR, China

KK **Siu**（邵嘉嘉） *MBChB, MRCPCH(Paed), FHKAM (Paed)*

Department of Paediatrics, Prince of Wales Hospital, The Chinese University of Hong Kong, 30-32 Ngan Shing Street, Shatin, N.T., Hong Kong SAR, China

AM **Li**（李民瞻） *MD(CUHK), FHKCPaed, FHKAM(Paed)*

Private Practice, Hong Kong SAR, China

KF **Lau**（劉家輝） *MBChB(CUHK), FHKCPaed, FHKAM(Paed)*
SC **Sit**（薛守智） *MBBS(HK), FHKCPaed, FHKAM(Paed)*
AYC **Tam**（譚一翔） *MBBS(HK), FHKCPaed, FHKAM(Paed)*

Correspondence to: Dr AYC **Tam**
Email: alfredtam@children818.com

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Evidence is graded upon the methodological qualities. Guidelines normally contain many different recommendation based upon different levels of evidence. It is important that users are aware of the level of evidence on which each guideline recommendation is based. The link between guideline recommendation and the supporting evidence should be made explicit. Separating the strength of the recommendation from the level of evidence helps in situations where extrapolation is required to take the evidence of a methodologically strong study and apply it to the target population. Gradings of recommendation in addition to level of evidence allow more flexibility for future revision. However, it is important to emphasis that the grading does not relate to the importance of the recommendation.

Introduction

Bronchiolitis is the commonest lower respiratory tract disease in infants. It mainly occurs in children under two years of age. Most cases requiring hospitalisation involve infants less than 12 months. It has been reported that bronchiolitis accounted for 5.05 to 6.6% of all paediatric admissions in Hong Kong.[1,2] Bronchiolitis tends to be a self-limiting disease in most cases. However, it can still cause significant morbidity in the infected infants. Children with underlying medical diseases, such as prematurity, cardiac disease or underlying respiratory disease, are particularly prone to develop severe diseases.

Since the previous version of the guidelines developed by the Hong Kong College of Paediatricians issued in 2006, additional studies have shed new light on the evidence behind various treatment and prevention strategies for bronchiolitis, particularly on the use of systemic steroids, bronchodilators, hypertonic saline and respiratory support modalities such as high flow nasal cannula.

Definition

Bronchiolitis is a clinical diagnosis made by clinical history and physical findings. It is defined by a consensus guideline from UK as a seasonal viral illness characterised by fever, nasal discharge and dry, wheezy cough. Clinical examination may reveal fine inspiratory crackles and/or high pitched expiratory wheeze.[3]

Aetiology

Respiratory syncytial virus is the most common cause of bronchiolitis and accounts for 50% to 86% of cases.[1,4,5] Other viruses, including human rhinovirus, human metapneumovirus, influenza, adenovirus, coronavirus and parainfluenza viruses, are also found to be aetiological agents of bronchiolitis.

Epidemiology

Bronchiolitis remains one of the commonest reasons for paediatric inpatient admissions. A local study has estimated the annual hospitalisation incidence to be 3551-3949 and 1176-1242 per 100,000 children under 1 year old and between 12 to 23 months.[6] Two other more recent studies have shown that the annual RSV hospitalisation rate for infants younger than 6 months and under 1 year to be 233.4-311.2 per 10,000 children and 266.7-341.4 per 10,000 population in Hong Kong respectively.[7,8] Various studies have described a male predominance in bronchiolitis and RSV infection with a male to female ratio of 1.3-2.2 to 1.[1,6,8] Bronchiolitis is generally a benign disease and mortality is rare. One of the above study found that there were 3 deaths with the primary diagnoses of bronchiolitis and RSV bronchiolitis in all HA hospitals in 2 years period while death rate of 17.8-39.2 per 1,000,000 per person-year for RSV infection in children aged between 0 to 4 years old was reported in another article.[6,8] Despite having a low mortality, bronchiolitis is one of the paediatric respiratory disorders which is associated with the longest median stay in hospital of 3 days.[6] Seasonal variation in incidence is well known to exist in RSV infection. In contrast to other countries like the United States of America and the United Kingdom, where activity of RSV infection is usually highest during the winter months, it has been demonstrated that the peak season for RSV infection in Hong Kong was between April and October.[1,7,8]

Clinical Features and Diagnosis[1-4] (Grade B)

Diagnosis of bronchiolitis is based on history and physical examination:

A. Symptoms

- Affected children are aged up to 2 years, with the majority less than 12 months
- Fever in 30% of cases, usually of less than 39°C
- Viral upper respiratory tract prodrome: rhinorrhea and cough, followed by onset of respiratory distress and wheezing in next few days
- Apnoea may occur in very young infant
- Poor feeding

B. Physical findings

- Tachycardia
- Tachypnoea
- Increased respiratory effort: intercostal and/or subcostal insucking, use of accessory muscles, nasal flaring and grunting
- Fine inspiratory crackles
- High-pitched expiratory wheeze
- Prolonged expiration
- Central cyanosis may occur in severe cases

Investigations

A. Current evidence on the clinical utility of chest X-ray (CXR) consistently showed that CXR is not of clinical value in typical bronchiolitis, adds cost, and increases the risk of inappropriate antibiotics use.[9-12] Routine CXR not recommended in children presenting with simple bronchiolitis as it does not improve management and may lead to treatments of no benefit. CXR is not indicated except in the following conditions:[13-17] (Grade B)
   1. Children for whom intensive care is contemplated
   2. Children with unexpected clinical deterioration
   3. Children with suspected alternate cause of respiratory distress
   4. Children with underlying cardiopulmonary diseases

   Current evidence is insufficient to demonstrate a good correlation between chest radiography findings and disease severity.

B. Viral testing is not routinely recommended as the underlying viral aetiology is generally not correlated with specific clinical features or responsiveness to treatment[13,15,18-23] (Grade C)

C. Haematological and biochemical investigations are not routinely indicated. They may be useful to rule out coinfection or secondary bacterial infection, and to assess the general status of the patient[13-15,18-19,22] (Grade B)

D. Pulse oximetry detects hypoxemia not suspected by physical examination but its role in predicting clinical outcomes requires further studies[13,14,19,24,25] (Grade C)

E. Blood gas analysis is warranted in patients with[18,26] (Grade C)
   1) Severe respiratory distress
   2) Impending respiratory failure

Factors Associated with Severe Disease

From literature and guidelines, severity of bronchiolitis can be classified into:

1) Epidemiological Factors[14,27]

Patient	Family
Male	Young maternal age
Prematurity (born before gestational age of 37 week)	Maternal lower socioeconomic status and education level
Post menstrual age (PMA) <=60 week or <3 months old at presentation	Multi-parity
Breast fed <2 months or not on breast feeding	Bedroom sharing with 2 or more household members
Day care centre attendance	Passive household smoking

2) Underlying Medical Conditions

Patients being diagnosed with chronic lung disease (or bronchopulmonary dysplasia in old nomenclature), congenital heart defects with significant haemodynamic shunting, neuromuscular disease, immunological deficiencies and presence of chromosomal abnormalities all associated with increased risk of severe RSV infection.[13-15]

Indications for Hospital Admission/PICU Admission

There is no study locally concerning the above issues. In international guidelines, as many patients are being managed in the community, indications for both hospital admission and/or PICU admission are mainly determined by the clinical severity of the RSV infections.

Scoring systems shown little evidence towards determining the need for admission or predictive duration of hospital stay.[15,28]

Severity of RSV infection, as suggested by different international guidelines from the United States of America, Australia and the United Kingdom, can be divided into 2 parts - 1) if the disease affects the activities of daily living (general behaviour and feeding) of the child, and 2) presenting vital signs (including respiratory rate at rest, presence of signs of respiratory distress, oxygen saturation SpO2 in room air, and whether presence and frequency of apneic episodes) of the child at presentation to medical service providers.

The Australasian bronchiolitis guidelines[15] categorised the above items into a bedside clinical assessment tool, which is adopted below:

	Mild	Moderate	Severe
Behaviour	Normal	Mild or intermittent irritability	Increasing irritability or lethargic, fatigue
Feeding	Normal	Mild decrease or difficulty in feeding (less than 50-75% of usual volume or signs of clinical dehydration)[14]	Refuse or reluctant to feed Dehydrated on clinical assessment
Respiratory rate	Normal to mild tachypnoea	Increase in respiratory rate	Marked increase or decrease in respiratory rate
Apnoea	No	Brief apnoea	Frequent and/or prolonged apnoea
Use of accessory muscles	No to mild chest wall retractions	Moderate chest wall retractions, tracheal tug, nasal flaring	Marked chest wall retractions, tracheal tug and nasal flaring
Oxygen saturations	>=92% in room air	90-92% in room air	<90% in room air, hypoxaemia

Cases presenting with moderate severity should be carefully assessed for the need for hospital admission, taking into account the underlying patient and family risk factors as discussed above. Capability of family members in taking care the child and recognising signs of deterioration are important considerations on deciding whether to admit the patient or not.[14,15]

Patients presenting with severe symptoms may be candidates for PICU admission.

Pharmacological Management

Bronchodilators (Beta-2-agonists and Anticholinergics)

There is currently no evidence to recommend the routine use of beta2-agonists for the management of acute bronchiolitis in children. However, trial of inhaled bronchodilators may be warranted in severe cases followed by a reassessment for efficacy of treatment. (Level Ia, Grade A)

Beta-2-agonists

Similar to previous years of evidence, updated meta-analysis on the trials of bronchodilators in the treatment for first-time wheezers presenting with acute bronchiolitis did not have consistent evidence to show improvement in outcomes such as oxygen saturation or reduction in length of hospitalisation.[26,29-32]

Several meta-analyses and systemic reviews have shown that bronchodilators may improve clinical symptom scores, but do not affect disease resolution, need for hospitalisation or length of stay. Given the inter observer variability with interpretation of clinical scores, and no objective measure is able to correlate them, they are not considered validated measures of bronchodilator efficacy.[13,33]

Bronchodilator treatment in outpatient settings were not shown to reduce the rate of hospitalisation. Similarly, inpatient bronchodilator treatment did not show a reduction in the duration of hospitalisation.[29]

While many large meta analyses and systemic reviews do not suggest routine administration of inhaled bronchodilators as inpatient nor outpatient treatment, some studies recommend that bronchodilators may provide modest to short term clinical improvement and a one time trial of inhaled bronchodilators may be warranted for infants and children with bronchiolitis and severe disease, showing persistently increased respiratory effort, hypoxemia, apnoea or respiratory failure.[30,32] With trials of bronchodilator use, the child should be evaluated for the efficacy soon after treatment.

Recent studies have identified multiple viral bronchiolitis phenotypes with heterogeneity in clinical presentation, indicating the need to consider phenotype-specific treatment strategies. Groups of infants with viral bronchiolitis that were proposed to likely will benefit from beta 2-agonist (including Infants with a history of wheezing, nocturnal cough, atopy or strong family history of asthma) may warrant a trial of bronchodilator.[34]

Due to the lack of robust criteria to identify infants with viral bronchiolitis that may benefit from bronchodilators from those who do not, with reassessment of clinical condition, it is appropriate to continue to administer beta 2 agonist to those who benefit from this medication.

Overall, given the lack of evidence suggesting its efficacy, the adverse side effects and the cost associated with these treatments, bronchodilators are not effective in the routine management of bronchiolitis but individualised use can be considered with appropriate evaluation and assessment.

Ipratropium Bromide

The use of ipratropium is not recommended in the treatment of bronchiolitis. (Level IV, Grade C)

There is no recent trial to document the efficacy of this

medication. Only the NICE guidelines[14] documented that it does not recommend the use of ipratropium in treatment of bronchiolitis. Other international guidelines have no recommendation on its use.

Nebulised Adrenaline

There is insufficient evidence to support the routine use of nebulised adrenaline in out-patient or in-patient treatment of bronchiolitis. Single administration trial may be considered in children >3 months with moderate to severe disease with evaluation of effect. (Level Ia, Grade A)

A Cochrane systemic review[30] in 2011 and two large multi-centered trials[26,35] found that adrenaline did not change hospital length of stay, improve clinical scores nor decrease the need for supportive therapy (O2, ventilation support, NG tube feeding).

Based on this evidence, the routine use of neb adrenaline is not recommended for in-patient which also concur with recommendations from international guidelines.[13-15,18,36-39]

The Cochrane systemic review[30] also found that adrenaline maybe effective in reducing hospital admission especially in first 24 hours of AED attendance. A Canadian trial[36] also showed that combined treatment with nebulised adrenaline and dexamethasone reduced admissions. Along with finding from a multi-centered trial[40] that on demand inhalation is associated with shorter length of hospital stay compared with a fixed schedule inhalation, a few international guidelines[14,18,36,37] suggest that a dose of adrenaline trial may be considered with monitoring of clinical response.

Nebulised Hypertonic Saline

The use of nebulised hypertonic saline for the treatment of bronchiolitis is controversial. (Level IV, Grade C)

Nebulised hypertonic saline acts as a mucolytic, enhances and stimulates ciliary action. Several studies have demonstrated beneficial effects of nebulised hypertonic saline on reducing hospital length of stay, clinical severity scores and risk of hospitalisation in infants treated as outpatients. However, these studies were heterogeneous and limited by their study design and sample size. The National Institute for Health and Care Excellence (NICE) published its guidelines on the management of children with bronchiolitis in June 2015 and recommend avoidance of all nebulised therapies,[14] the same view is also expressed in the Australian guidelines.[15] The American Academy of Pediatrics suggests its use should only be considered in those infants with a prolonged length of hospital stay.[13] One recent study however provided evidence that in severe cases with bronchiolitis admitted to intensive care, administration of nebulised hypertonic saline led to reduced duration of respiratory support and length of stay.[41]

Ribavirin

Ribavirin is not recommended for routine use in the treatment of bronchiolitis. (Level IV, Grade C)

Ribavirin is the only anti-viral medication approved for use against RSV. It is a guanosine analog and inhabits RSV replication. Use of ribavirin in RSV disease remains controversial because of its expense, uncertainties regarding its efficacy and questions of side effects to exposed healthcare workers. Its routine use is not recommended but may be considered in immunocompromised host.[42-48]

Palivizumab

Palivizumab is not recommended for routine use in the treatment of bronchiolitis. (Level IV, Grade C)

A humanised monoclonal anti-RSV antibody against the RSV F glycoprotein and hence prevents cell fusion. Palivizumab has been shown to reduce disease severity in high risk groups. However, its administration is restricted because of its expensive cost. Currently its prophylactic use is recommended to selected patient groups, namely those with a gestational age of <29 weeks, chronic lung disease of prematurity, haemodynamically significant congenital heart disease, airway abnormality, neuromuscular disease that impairs airway clearance and immunodeficiency.[13] Currently there is no evidence to support the routine use of palivizumab in the treatment of acute RSV bronchiolitis.[49]

Antibiotics

Antibiotics are not recommended for routine use in the treatment of bronchiolitis. (Level Ia, Grade A)

Antibiotics are often prescribed in acute bronchiolitis, especially in infants with evidence of coinfection and whose illness needed intensive care unit admission. The most recent Cochrane review does not support the routine use of antibiotics as only a small proportion of infants with severe RSV bronchiolitis developed proven secondary bacterial infection.[50,51]

Leukotriene Receptor Antagonists (LRA) - Montelukast

LRAs are not recommended for routine use in the treatment of bronchiolitis. (Level IV, Grade C)

Cysteinyl leukotrienes, a class of lipid mediators are released during RSV infection and contribute to the pathogenic changes in the airways. Few studies have

investigated the role of LRA in infants with acute viral bronchiolitis and none have documented a positive response. Therefore at present routine use of LRA is not recommended.[52,53]

Corticosteroids

Systemic or inhaled corticosteroids are not recommended for routine use in the treatment of bronchiolitis. (Level Ia, Grade A)

Currently available evidence does not recommend the use of systemic or inhaled corticosteroids in infants with bronchiolitis.[15] Although there may be a subgroup of patients who could benefit from corticosteroids (high risk for the subsequent development of asthma), the effect is slow and demands repeated systemic doses with a potential risk of adverse effects.[40,54]

Non-pharmacological Management

Respiratory Support

Oxygen supplementation is recommended for children with bronchiolitis if their oxygen saturation is less than 92%.[40] [Level IV, Grade C]

Non-invasive ventilation (CPAP or HHFNC) should be considered in children with bronchiolitis with hypoxia (oxygen saturations less than 92%) and moderate to severe respiratory distress. [Level Ib, Grade A]

The benefit of supplemental oxygen therapy has not been specifically studied. The absolute oxygen saturation at which to commence supplemental oxygen therapy has ranged in studies from 90 to 94%. No RCTs have reported long-term neurodevelopmental outcomes in babies with bronchiolitis. Due to the lack of this long-term evidence on the safety with oxygen saturation targets of less than 92%, both the NICE guideline and Australasian bronchiolitis guideline recommend commencing oxygen therapy below this level.[15]

Continuous Positive Airway Pressure

Continuous positive airway pressure (CPAP) is recommended in children with moderate or severe bronchiolitis, especially in young infants with bronchiolitis who presented with apnoea. [Level IIa, Grade B]

First line nasal CPAP reduces duration of ventilation and hospital stay as compared with invasive ventilation.[55,56] Pre-emptive nasal CPAP is used for moderate to severe acute bronchiolitis.[56] Studies show that CPAP reduces capillary PCO2, improves oxygenation and clinical respiratory distress.[57] Common criteria for initiating CPAP are respiratory distress, high oxygen requirement or increasing PCO2 and apnoea.[14,58]

Humidified High Flow Nasal Cannula

Humidified High Flow Nasal Cannula (HHFNC) could be an effective intermediary therapy in children with moderate bronchiolitis, bridging standard and critical care. [Level Ib, Grade A]

HHFNC has increasingly been used as an alternative to CPAP. It is better tolerated than nasal CPAP. Reviews and studies have concluded that HHFNC may be feasible in infants with bronchiolitis and may decrease the need for intubation.[59-61]

Several recent RCTs compare the efficacy of HHFNC versus CPAP or standard oxygen therapy. Infants with bronchiolitis who received high-flow oxygen therapy outside the PICU had lower rates of escalation of care due to treatment failure than infants who received standard oxygen therapy.[61] In addition, use of HHFNC prevents intensive care admission in children with moderately severe bronchiolitis attending emergency department, for whom standard oxygen therapy failed.[62] This shows that HHFNC can be an effective intermediary therapy, bridging standard and critical care.

There is no significant difference on the rate of intubation and PICU length of stay for HHFNC and nasal CPAP use in moderate to severe acute bronchiolitis.[63] Nasal CPAP has a higher success rate as compared to HHFNC, in terms of improvement in apnoea, respiratory distress and oxygen saturation etc.[63] [Level Ib] We conclude that HHFNC is a reasonable alternative to nasal CPAP in children with moderate bronchiolitis, with better tolerability.

Mechanical Ventilation

Mechanical ventilation should be considered for infants who do not improve with intermediary therapies of nasal CPAP or HHFNC. [Level IIb, Grade B]

Mechanical ventilation may be necessary in infants with insufficient support by nasal CPAP or HHFNC. Risk factors include prematurity, low birth weight, bronchopulmonary dysplasia, apnoea, low oxygen saturation, poor oral intake and severe retraction on admission.[20,64]

There is no consensus on which ventilator technique is the best for children with bronchiolitis.[65,66] Both volume and pressure cycled ventilation has been used. The use of high frequency oscillation has been successful in some case reports.[67,68]

Fluid and Nutrition

Use of isotonic fluids is recommended (Level Ia, Grade A)

Inpatients should receive sufficient fluid to avoid dehydration. (Level IV, Grade C)

Inpatients should be monitored for overhydration. (Level IV, Grade C)

Feeding by gastric tube can be used in cases of moderate or severe respiratory distress.[69-71] *(Level Ia, Grade A)*

Monitoring hydration status is necessary should dehydration be suspected. (Level IV, Grade C)

Respiratory distress due to increased work of breathing may cause inadequate feeding and dehydration.[58] Tachypnoea and fever also increases fluid loss, worsening the dehydration.[69,72] Oral feeding may be sustained in milder cases by small volume frequent feeds. Nasogastric, orogastric or intravenous fluids should be given for infant who cannot maintain hydration orally.[13-15] Intravenous fluids may decrease the risk of aspiration by minimising interference with breathing, but it creates a catabolic state due to low calorie intake, and also increases the risk of fluid overload and electrolyte imbalance.[69,72] Infants may achieve a better nutritional status and nitrogen balance though gastric tube feeding.[58]

An open randomised trial showed no significant differences in rates of intensive care unit admission, need for ventilatory support, or adverse effects between nasogastric and intravenous hydration.[70] A randomised pilot study comparing intravenous and gastric tube hydration showed no difference regarding the duration of oxygen supplementation or length of stay.[69]

Current guidelines recommend that infants should receive enough fluids to restore fluid loss and avoid dehydration. Fluid retention due to inappropriate secretion of antidiuretic hormone (SIADH) has been reported in bronchiolitis,[73,74] thus side effects of overhydration should be monitored, especially in those with severe disease. Suggested monitoring includes body weight, electrolytes, serum and urine osmolality.[58] Use of isotonic fluids is recommended to avoid iatrogenic hyponatremia.[14,15,75]

Monitoring

Continuous oxygen saturation is not required for infants with oxygen saturation levels of more than 92%. (Level Ib, Grade B)

There is currently no specific evidence-based score system and absolute discharge criteria available for bronchiolitis and more research has been recommended.[14,15]

After initial assessment, although it has been shown that oxygen saturation levels will directly lead to ward admission, routine use of continuous saturation monitoring is not required for infants with oxygen saturation levels of more than 92%, or stable infants already on oxygen supplementation, with evidence suggesting that it increases the length of hospital stay for patients.[15,25,76] Intermittent monitoring on an as-needed basis has been suggested to be a safe practice for bronchiolitic children.[77,78]

Routine venous or arterial blood gas testing is not recommended. If supplemental oxygen concentration of >50% is required and/or the child has impending respiratory failure, it is suggested that a capillary blood gas level can be taken.[14]

Chest Physiotherapy and Suctioning

Chest physiotherapy is not necessary for the majority of patients, but may be considered in children who have relevant comorbidities. (Level Ia, Grade A)

Routine upper airway suctioning is not recommended. (Level Ia, Grade A)

Maintenance of nasal patency by normal saline nasal irrigation may be considered. (Level IV, Grade C)

Nine randomised controlled trials comparing chest physiotherapy vs no intervention have showed no significant difference in disease severity, respiratory parameters, oxygen requirements or length of stay.[79] Chest physiotherapy can be considered in children who have relevant comorbidities (e.g. neuromuscular diseases) when there may be difficulty in clearing secretions,[14] with possible benefit of upper airway suctioning for children in respiratory distress or difficulty in feeding, especially for apnoeic children.[14] Routine airway suctioning and chest physiotherapy has however been recommended against due to its potential harm.[14,15,80]

There has also been a study suggesting that a single normal saline nasal irrigation improves oxygen saturation in bronchiolitis infants.[81]

Prognosis

Bronchiolitis is a self-limited illness that often resolves without complications in healthy infants. (Level IIa, Grade B)

The mortality rate in children hospitalised with RSV bronchiolitis in developed countries is low. Complications of apnoea, respiratory failure, secondary bacterial infection and mortality are increased in young infants (6 to 12 weeks), those with low birth weight, underlying cardiopulmonary disease or immunodeficiency.[82-84]

RSV and rhinovirus lower respiratory tract infections increase the risk of recurrent wheeze and have a negative effect on lung function in the first decade of life.[85-89]

Prevention[13]

Enhance hand hygiene (washing with soap or with alcohol-based rubs) and avoiding contact with individuals with respiratory tract infections could minimise transmission of infectious agents. (Level IIa, Grade B)

Minimising passive exposure to cigarette smoke (including smoking cessation program to parents) could reduce the risk and severity of bronchiolitis. (Level IIa, Grade B)

Encouraging exclusive breastfeeding for at least 6 months to decrease the morbidity of respiratory infections. (Level IIa, Grade B)

Palivizumab (RSV passive immunisation) decreases the risk of hospitalisation due to severe RSV illness among preterm infants and those with chronic lung disease and haemodynamically significant congenital heart disease. (Level IIa, Grade B)

Influenza is an uncommon but preventable cause of bronchiolitis. To reduce the risk of influenza-related hospitalisations or deaths, annual influenza immunisation is recommended for everyone older than six months. (Level III, Grade C)

Evaluation and Follow-up Actions for Persistent or Recurrent Wheezing

There is currently no evidence to support inhaled glucocorticoids for the prevention of subsequent wheezing episodes in infants and children with bronchiolitis.[90] *(Level Ib, Grade A)*

There is no evidence to support montelukast for the prevention of recurrent or persistent wheezing after bronchiolitis.[91-93]*(Level Ib, Grade A)*

Follow up for bronchiolitis will depend on the situation of the patient. Patients who have strong family history of atopy, or those who suffer from severe or recurrent bronchiolitis may require further workup to monitor clinical progress and look out for differential diagnoses or development of asthma. (Level IV, Grade C)

Declaration of Conflicting Interest

The authors declare that they have no any conflict of interest.

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