Clinical Guidance

Paediatric Critical Care: Severe Bronchiolitis

Summary
This guideline is for those patients with severe bronchiolitis who are being considered for critical care, thus interventions like chest x-ray, bloods, fluid restriction and antibiotics are appropriate. For other patients please see the NICE guideline.

Document Detail	
Document type	Clinical Guideline
Document name	Paediatric Critical Care: Severe Bronchiolitis
Document location	GTi Clinical Guidance Database and Evelina London Website
Version	v3.0
Effective from	*14th September 2022*
Review date	*14th September 2025*
Owner	Head of Service, PICU
Author(s)	Jon Lillie (PICU Consultant) Jennie Lambert (PICU Consultant)
Approved by, date	Evelina London Clinical Guideline Group, September 2022 Antimicrobial Stewardship Committee, October 2022
Superseded documents	PICU: Severe Bronchiolitis v2.0
Related documents	Securing endotracheal guideline, DNase, neonatal collapse, Pertussis , guideline non-bronchoscopic alveolar lavage , paediatric ARDS
Keywords	Evelina, child, Paediatric, intensive care, STRS, Retrieval, Paediatric critical care, PICU, bronchiolitis, bronch, rsv, pneumonia
Relevant external law, regulation, standards	
This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.	

Change History		
Date	Change details, since approval	Approved by
August 2022	Lancet reference added Addition of info about ventilation. Sats target ≥90% from >92% Addition of hyperlinks – bronchiolitis outside critical care, pertussis, neonatal collapse, DNase, ARDS.	ELCGG September 2022

Paediatric Critical Care

Severe bronchiolitis

Bronchiolitis is a common viral respiratory condition associated with lower airway obstruction, air trapping and atelectasis. It is the leading cause for UK hospital admission in infants under 1 year of age. Respiratory Syncytial Virus (RSV) is the commonest pathogen, although any respiratory virus can lead to the same clinical picture in this age group. Most cases are mild and self-limiting, but some will progress to needing admission to paediatric critical care. At any stage of the illness, supportive care is the only indicated therapy, but for those who require respiratory support, interventions like chest x-ray (CXR), bloods, fluid restriction and antibiotics are appropriate. For other patients please see the NICE guideline and trust guideline Bronchiolitis outside critical care.

Clinical presentation

- Cough, coryza
- Difficulty breathing/ respiratory distress
- Poor feeding
- Fever
- Apnoeas (esp <2 months)
- Wheeze/ crackles
- Cyanosis/ hypoxia

Criteria for severe disease

- Saturations< 90% despite oxygen
- Respiratory rate > 70 breaths/minute
- Signs of severe respiratory distress
- Apnoea
- Decreased level of consciousness
- Lower threshold in high risk group (see right)

High risk groups

- Neonates
- Prematurity
- Pre-existing respiratory condition
- Congenital heart disease (CHD)
- Neuromuscular conditions (may not have signs of distress)
- Immune deficiency

Differential diagnoses

- Bacterial LRTI/sepsis
- Pertussis
- Inhaled foreign body
- Congenital cardiac disease – e.g. TAPVD
- Anaphylaxis
- Other causes of neonatal collapse

Baseline investigations

- Nasopharyngeal aspirate for respiratory viruses
- Baseline CXR
- Full blood count with differential (pertussis-lymphocytosis)
- Electrolytes (including plasma sodium)
- Blood gases unhelpful in directing need for respiratory support

Management principles on ward / HDU

- Maintain oxygen saturations ≥90% unless congenital heart disease/CHD (seek advice)
- Apnoea monitoring if required (history, <2 months)
- Minimal handling
- Suction nasal secretions if obstructed with mucus
- Non-invasive respiratory support by humidified high flow nasal cannula at 2 L/kg/min or CPAP 5-6cm H_2O (CPAP offers better resp support). Reassess frequently.
- Small volume, frequent nasogastric feeds if possible
- Reduce enteric fluid intake to 50mL/kg/day (risk of fluid overload/ hyponatraemia/ seizures)
- If IV fluid required-must be isotonic (e.g. 0.9% sodium chloride with 5% glucose). Run at 50mL/kg/day.
- Antibiotics: co–amoxiclav IV: treat empirically if referred for PICU (30-40% have bacterial isolates). Consider cefotaxime/ ceftriaxone if apnoea/ neuro concerns or penicillin allergy.

- **There is no role for nebulised therapies in bronchiolitis** (salbutamol, steroids, hypertonic saline, adrenaline, ipratropium bromide respiratory stimulants e.g. caffeine)
- **No effect on severity, length of stay or length of illness**
- **Can delay escalation to critical care in those with severe symptoms.**

Assessment for ventilatory support & PICU transfer

- Severe respiratory distress or risk of respiratory arrest
- Lack of clinical improvement or deterioration on non-invasive respiratory support
- O_2 requirement ≥60% to maintain saturations ≥90%
- Persistent or recurrent apnoeas
- Deterioration in level of consciousness
- Neuromuscular patients may not be able increase their work of breathing- watch for tachycardia, consider blood gas

Intubation and ventilation

Bronchiolitics often have significant ventilatory drive with forced expiration. May be hard to match this with positive pressure ventilation. Anticipate haemodynamic decompensation during induction of anaesthesia and difficult ventilation after intubation with a non-compliant chest and lots of secretions - loss of sympathetic drive & muscle relaxed.

- **Prepare: fluid bolus, inotropic support, intubation checklist**
- **Optimise: pre-oxygenation**
- Decompress stomach by nasogastric tube aspiration
- Consider volume bolus (10mL/kg) prior to anaesthesia
- Ensure end tidal (et)CO_2 monitoring connected
- Mask ventilate with slow respiratory rate (20-30) to achieve good chest movement
- Consider need for cuffed ETT to minimise leak/ facilitate higher pressure ventilation if needed.
- **Initial ventilation: i-time 0.8s, RR 20-30, PEEP 5cm H_20, Enough PIP to move chest (ideally <30cm H_20)**
- Secure ETT (securing ETT guideline) and CXR
- Review chest and ventilation settings regularly
- Target oxygen saturations ≥90% unless CHD
- Target etCO_2 5-10kPa
- Sedate with morphine & muscle relax as required
- Suctioning ETT as needed
- Regular physiotherapy +/- DNase infiltration on PICU
- May need to consider nursing prone in PICU in challenging oxygenation/ ventilation.
- Arterial line usually not required unless progresses to ARDS

Troubleshooting difficulties on ventilator- DOPES

- **D**isplaced ETT-check etCO_2 and exact length of tube
- **O**bstruction- suction ETT and check passes to end of ETT
- **P**neumothorax-clinical examination- can be difficult to exclude if chest hyper-expanded due to air trapping
- **E**quipment- check ventilator settings including O_2.
- **S**tomach- Ensure decompressed with nasogastric tube

Assess DOPES first, CXR if problem not resolved

Additional management on PICU

- Bronchoalveolar lavage specimen for viral + bacterial culture
- White cell count, haemoglobin, electrolytes, CRP & PCT
- Nasal ETT unless concerns of respiratory/ CVS instability
- Many smaller infants do not require IV sedation
- Antibiotics: if feeds tolerated change to enteral co-amoxiclav
  - Addition of gentamicin if high fever/WCC/CRP/PCT
- Consider echocardiogram, resp. referral, further investigations if atypical history (e.g. multiple admissions, failure to thrive)

References *Bronchiolitis NICE guideline 2021; Hanna. Acta Paediatr. 2003; Kneyber. Int Care Med 2005; Lillie. PICS UK 2012; Cunningham. Lancet 2015; Milesi, Lancet Vol 43, Jan 2022 Identifying & predicting severe bronchiolitis profiles at risk for developing asthma.*