



*Topic Expert Group: Medical care and clinical practice*

**Prevention of Bronchopulmonary Dysplasia (BPD)**

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*Target group*

Very preterm and particularly extremely preterm infants, small for gestational age infants, and parents

*User group*

Healthcare professionals, neonatal units, hospitals, and health services

*Statement of standard*

Bronchopulmonary Dysplasia (BPD) is prevented using evidence-based strategies including avoiding mechanical ventilation, minimally invasive administration of exogenous surfactant, volume targeted ventilation and early caffeine, and administration of systemic steroids in infants still requiring ventilation during their 2<sup>nd</sup> postnatal week.

*Rationale*

Bronchopulmonary Dysplasia BPD results from the effects of non-physiologic stimuli (e.g. inflammation, ventilator induced lung injury, high supplemental oxygen levels) in an infant with underdeveloped lungs and defence mechanisms (e.g. anti-oxidant capacity). (1) Interventions that reduce inflammation (e.g. steroids) or any of these non-physiologic stimuli (e.g. mechanical ventilation) are likely to reduce BPD rates. Some of these interventions may additionally promote the survival of the target group; none decreases the chances of survival. (2)

BPD, defined as supplemental oxygen requirement at 36 weeks post-menstrual age, is a risk factor for later respiratory hospitalisation in infancy, compromised lung function in childhood, neurodevelopmental impairment, and a potential risk factor for chronic obstructive pulmonary disease in later life. (1,3)

*Benefits*

*Short-term benefits*

- Reduced risk of BPD by avoiding invasive mechanical ventilation (risk ratio (RR), 0.91; 95% Confidence Interval 0.84-0.99) (2)
- Reduced risk of BPD by use of minimally invasive surfactant administration (RR 0.75; 0.59-0.94) (4,5)
- Reduced risk of BPD by use of volume targeted ventilation (as opposed to pressure targeting) (RR 0.61; 0.46-0.82) (6)
- Reduced risk of BPD by starting caffeine on postnatal day one or two instead of later (RR 0.51; 0.40-0.64) (7,8)
- Reduced risk of BPD by administration of vitamin A intramuscularly for the first four postnatal weeks (RR 0.87; 0.77-0.98) (9)
- Reduced rate of death or BPD by administration of systemic steroids in ventilated infants (RR 0.72; 0.63-0.82) without increasing the risks of cerebral palsy (10)



### *Long-term benefits*

- Reduced adverse neurodevelopmental outcome if BPD can be prevented (3)

### *Components of the standard*

<b>Component</b>	<b>Grading of evidence</b>	<b>Indicator of meeting the standard</b>
<b>For parents and family</b>		
1. Parents are informed by healthcare professionals about Bronchopulmonary Dysplasia (BPD) and strategies to minimise its risk. (1)	A (High quality)	Patient information sheet
<b>For healthcare professionals</b>		
2. A unit guideline on the management and prevention BPD is adhered to by all healthcare professionals, and includes the following advice: <ul style="list-style-type: none"><li>• Surfactant is administered via a thin intra-tracheal catheter if <math>FiO_2</math> is <math>&gt;0.30</math> or using INSURE (intubate surfactant extubate). (11)</li><li>• Volume targeted ventilation (at 5-7 ml/kg) is used plus adequate PEEP level, if intubation cannot be avoided. (6)</li><li>• Infants on n-CPAP are switched to synchronised nasal ventilation if respiratory distress visible while on CPAP. (12)</li><li>• Caffeine is administered from day 1-2 after birth (10 mg/kg loading, 5 mg/kg/d maintenance for caffeine base). (7,8)</li><li>• Vitamin A is considered (5000 IE i.m. three times/week for week 1-4 after birth). (9)</li><li>• If mechanical ventilation is still necessary during postnatal week 2, postnatal steroid use is considered (dexamethasone at the lowest effective dose possible. (13,14))</li><li>• Efforts to reduce rates of nosocomial infection, as a risk factor for BPD, are</li></ul>	A (High quality)	Guideline



made. (15)		
3. Training on the management and prevention of BPD is attended by all responsible healthcare professionals.	B (High quality)	Training documentation

**For neonatal unit**

4. A unit guideline on prevention and management of BPD is available and regularly updated.	B (High quality)	Guideline
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**For hospital**

5. Training on management and prevention of BPD is ensured.	B (High quality)	Training documentation
6. Institutional BPD rates are monitored together with length of hospital stay and use of supplemental oxygen.	B (High quality)	Audit report

**For health service**

7. A national guideline on management and prevention of BPD is available and regularly updated.	B (High quality)	Guideline
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*Where to go – further development of care*

Further development	Grading of evidence
For parents and family	
N/A	
For healthcare professionals	
<ul style="list-style-type: none"> <li>Investigate in larger numbers whether using synchronised nasal ventilation rather than CPAP is the preferred mode of nasal respiratory support. (6)</li> <li>Evaluate alternative anti-inflammatory strategies, e.g. hydrocortisone, inhaled budesonide, or tracheal instillation of budesonide together with exogenous surfactant to generate more data on their long-term effectiveness and safety. (10,16,17)</li> <li>Investigate the role of eradicating <i>Ureaplasma urealyticum</i> shortly after birth. (18)</li> <li>Investigate oral Vitamin A administration as well as the role of other nutrients. (9,19)</li> <li>Find the optimal drug and dose for postnatal steroid application. (9)</li> <li>Investigate the potential of mesenchymal stem cells in repairing the injured immature lung. (20,21)</li> <li>Investigate the effect of various delivery-room practices (e.g. sustained inflations) and of early enteral feeding on the prevention of BPD. (22)</li> </ul>	<p>A (Moderate quality)</p> <p>A (High quality)</p> <p>A (Moderate quality)</p> <p>A (High quality)</p> <p>A (Moderate quality)</p> <p>A (High quality)</p> <p>A (Moderate quality)</p>



For neonatal unit

N/A

For hospital

N/A

For health service

N/A

### *Getting started*

#### **Initial steps**

For parents and family

- Parents are verbally informed by healthcare professionals about BPD and strategies to minimise its risk. (1)

For healthcare professionals

- Attend training on management and prevention of BPD.
- Apply exogenous surfactant via less/minimally invasive administration via a thin catheter, i.e. without using an endotracheal tube, or via the INSURE method (intubate, surfactant, extubate).
- Use nasal continuous positive airway pressure (n-CPAP) instead of intubation and mechanical ventilation. (22)
- Start caffeine on postnatal day 1 or 2 instead of later.

For neonatal unit

- Develop and implement a unit guideline on management and prevention of BPD.
- Develop information material about BPD for parents.

For hospital

- Support healthcare professionals to participate in training on management and prevention BPD.

For health service

- Develop and implement a national guideline on management and prevention of BPD.

### *Source*

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