Neonatal respiratory distress including CPAP
Clinical Guideline Presentation

45 minutes
Towards your CPD Hours
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Term</th>
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<tr>
<td>BGL</td>
<td>Blood glucose level</td>
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<tr>
<td>CSCF</td>
<td>Clinical services capability framework</td>
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<tr>
<td>CPAP</td>
<td>Continuous positive airway pressure</td>
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<tr>
<td>CXR</td>
<td>Chest x-ray</td>
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<tr>
<td>OGT</td>
<td>Oral gastric tube</td>
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<tr>
<td>PCO₂</td>
<td>Partial pressure of carbon dioxide</td>
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<td>RDS</td>
<td>Respiratory distress syndrome</td>
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<tr>
<td>SpO₂</td>
<td>Peripheral saturation of oxygen</td>
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Objectives

• Identify neonates requiring respiratory support following birth
  ◦ Diagnosis and management of respiratory distress
  ◦ Indications for transfer/retrieval

• Review the management principles for a neonate requiring CPAP
Signs of respiratory distress

- Tachypnoea (> 60 breaths/minute)
- Audible expiratory grunt
- Sternal, intercostal/lower costal recession
- Nasal flaring
- Cyanosis or $O_2$ requirement
Causes of respiratory distress

- Hyaline membrane disease
- Infection – Group B streptococcal disease
- Retained fetal lung fluid – Transient tachypnoea of the newborn (TTN)
- Aspiration – meconium, blood or liquor
- Pneumothorax
- Congenital abnormalities
**Oxygenation**

- Give $O_2$ to maintain $SpO_2$ within target ranges
  - Term baby: 92–98%
  - Preterm baby: 90–95%

- Continuously monitor:
  - $O_2$ concentration
  - $SpO_2$ – preferably on right upper limb
  - Respiration and heart rate
Blood cultures

- Collect blood cultures and full blood count
- Collect surface swabs if indicated
- Check blood culture results:
  - At 24 hours
  - Again at 48 hours
- If positive, contact higher level service to discuss duration of antibiotic therapy
Antibiotics

• Aim to commence within 30 minutes of diagnosis

• If no local policy, recommend:
  ◦ Penicillin 60 mg/kg/dose 12 hourly OR
  ◦ Ampicillin 50 mg/kg/dose 12 hourly

  AND
  ◦ Gentamicin 2.5mg/kg ≥ 30 weeks daily or if < 30 weeks every 36 hours

• Check Gentamicin level before 3rd dose
Fluids

• Insert IV cannula and commence fluids 10% Dextrose at 60 mL/kg/day
• Consider umbilical venous catheter if IV difficult to achieve
• Small trophic feeds (2 mL/kg 3 hourly) may be started if stable and respirations comfortable
Chest x-ray

• To identify pathology - especially:
  ◦ Pneumothorax
  ◦ Congenital diaphragmatic hernia
  ◦ Chest masses

• Level 3 neonatal services
  ◦ Arrange review at Level 5 or Level 6 Nursery
Blood glucose

- Refer to Queensland Clinical Guideline: *Newborn hypoglycaemia*
- Aim for BGL 2.6 mmol/L or greater
- Treat BGL < 2.6 mmol/L
- Monitor 4–6 hourly for 24 hours or as indicated by BGL
Supportive care

- Maintain temperature
  - Axillary 36.8–37.2°C
  - Skin 36–36.2°C
- Minimal handling – disturb only when absolutely necessary
- Blood gases not routinely required
Consultation and referral

• Level 2 and 3* - Contact a higher level service to discuss:
  ◦ Initiation of treatment
  ◦ If O₂ requirements reach 30%
  ◦ If O₂ need rapidly rises (>10% over 2 hours)
  ◦ If neonate < 35 weeks gestation
  ◦ Daily for ongoing advice and support

• Level 6 can be contacted by *any* level of service for advice

*Nursery levels according to Clinical Services Capability Framework*
CPAP

• Continuous Positive Airway Pressure (CPAP) is the application of positive pressure to the airways of spontaneously breathing neonates throughout the respiratory cycle
• Manage in Level 4 nursery or above
• Resource requirements (human and equipment) as per CSCF
Benefits of CPAP

- Reduces $O_2$ requirements
- Reduces the work of breathing
- Reduces apnoea, bradycardia & episodes of $O_2$ desaturation
- Decreases need for ventilation
- Reduces risk of extubation failure
- Reduces the natural duration of RDS
- May prevent the need for transfer
Indications for CPAP

• Signs of respiratory distress
• $O_2$ requirement $\geq 30\%$ to maintain $SpO_2$ within target range
• Commence on CPAP if $O_2$ requirement $< 30\%$ and there are other significant signs of respiratory distress
Patient interface

• CPAP generator creates pressure in circuit
• Circuit for continuous flow of humidified gasses
• Interface device to connect to neonate’s airway
Patient interface

- Short binasal prong
  - Hudson prongs
  - Snorkel midline device
- Nasal mask
- Long nasopharyngeal tube
  - Not routinely recommended
Commencing CPAP

• Commence CPAP at 8 cm H₂O
  ◦ Starting high and decreasing with improvement is preferable to starting low and increasing with deterioration

• Give O₂ to maintain SpO₂ within target range

• Use gas flow at the lowest level that achieves desired pressure
Expected clinical course

- Acute disease normally lasts 1–3 days
- Signs of improvement
  - ↓ in respiratory rate
  - ↓ work of breathing (grunting, sternal/intercostal recession, nasal flaring)
  - ↓ in O₂ needs
  - Improved CXR appearance/lung volume
  - Improved blood gas (if measured)
Weaning CPAP

• Commence weaning when:
  ◦ $\text{SpO}_2$ consistently $> \text{target range}$
  ◦ Grunting ceased/recession reduced

• Wean $\text{O}_2$ before pressure
  ◦ Wean to 21% then
  ◦ Pressure 1 cm every 2–4 hours until 5 cm H$_2$O is reached

• Cease when stable in 21% and 5 cm H$_2$O
Deterioration

• Signs of failure of CPAP delivery
  ◦ $O_2 > 50\%$ to maintain $SpO_2$
  ◦ Rapid rise in $O_2$ requirement
  ◦ Respiratory acidosis ($pH < 7.25$)
  ◦ Recurrent apnoeic episodes
  ◦ Increased work of breathing

• Requires immediate medical assessment and CXR
Complications: Air Leaks

- Air leak syndromes (pneumothorax, pneumomediastinum, pneumopericardium, pulmonary interstitial emphysema (PIE))
- Clinical signs:
  - Increasing respiratory distress/↑PCO₂
  - Oxygen desaturation
  - Decreased air entry/asymmetrical chest movement or appearance
Pneumothorax

- Emergency management when neonate rapidly deteriorating:
  - Needle thoracocentesis
  - Intercostal catheter

- Refer to Appendix B in Guideline
Complications: Pressure injury

- Results from pressure of CPAP devices
- Source of discomfort, site for infection, long term functional and/or cosmetic sequelae
- Requires vigilant clinical surveillance to avoid pressure, traction, friction and moisture
Pressure injury prevention

• Measure and size interface for each neonate
• Position binasal prongs with 2 mm gap between horizontal section and nose
  ◦ No blanching of surrounding skin
• With cares inspect for signs of pressure injury
• Document presence/absence, location and extent of any injury
Complications: Other

• **Abdominal distension** - gas enters stomach and gastrointestinal tract
  ◦ Insert shortest available OGT, aspirate or free drainage
  ◦ Use size 8 FG - especially if large air aspirates or abdominal distension
  ◦ Use lowest flow of gas to achieve pressure

• **Over inflation** - excessive pressure can:
  ◦ Increase work of breathing
  ◦ Reduce cardiac output
Monitoring

• Continuously:
  ◦ Heart rate, Respiratory rate, SpO₂, PiO₂

• Vigilant surveillance:
  ◦ Circuit integrity & equipment function, condensation
  ◦ Interface correctly positioned
  ◦ OGT position
  ◦ Abdominal distension
Neonatal care

- Suction—as required
- Cares 4–6 hourly with 1–2 staff
- Inspect for pressure injury with cares
- Aspirate OGT regularly
- Minimal handling
- Incorporate principles of developmental care
- Use a family centred approach
Other therapies

• Prophylactic CPAP
  ◦ Not recommended

• Humidified high flow nasal cannula
  ◦ Routine use instead of CPAP for acute lung disease is not recommended

• INSURE technique
  ◦ Routine use followed by CPAP not recommended for ≥ 32 weeks gestational age
Key Points

• Timely and appropriate management of respiratory distress improves outcomes
• Use the statewide guidelines to guide management
• Contact a higher level nursery for support and advice when necessary
• Involve the parents