CPAP

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Background

• 20 - 40% of all hospitalizations among children worldwide are due to acute respiratory infections

• Pneumonia is the leading cause of death in children worldwide (1.6 million deaths/year)

• Respiratory Distress Syndrome (RDS), due to lung immaturity and lack of surfactant in the alveoli, results in collapsing lungs which need pressure to inflate
Background (cont’d)

• Bubble CPAP was developed in the 1970’s at Columbia University’s Children’s Hospital of New York²

• CPAP is used as an aid in treatment of respiratory distress

• Advanced airway management and support is limited in many low- and middle-income countries

• CPAP is a low-tech device which can be used in limited resource settings
Why CPAP?

• Non-invasive:
  – No trauma from intubation
  – Reduction of risk of ventilator associated pneumonia
  – Reduction in ventilator induced lung injury
  – Enhances patient comfort

• Decreases respiratory rate:
  – Research in Ghana showed a reduction in respiratory rate by 16 breaths per minute with the use of CPAP vs. no CPAP\textsuperscript{3}

• Provides oscillatory pressure:
  – The bubbles created in CPAP produce chest vibrations that may contribute to improved gas exchange
How does CPAP work

• Provides gentle oscillatory pressure

• Pressure travels to alveoli:
  1. “Splints” alveoli and airway open
  2. Improves gas exchange
  3. Decreases work of breathing
  4. Decreases respiratory rate
Mechanics of CPAP - 5 Key Parts

1. Pressure source
2. Inspiratory tubing
3. Expiratory tubing
4. Delivery method (i.e.: Nasal prongs/mask)
5. Water bottle

Additional components:
Humidification (dependent on patient needs)
Oxygen Source (dependent on patient needs)
Columbia University mechanics
Inspiratory Tubing

Power Source

Grey Tubing

Oxygen Adaptor (2)

White Adaptor

CPAP Machine

Expiratory Tubing

PRN Adapter

Safety pins/Rubber Bands

Nasal Prong

Delivery Method

P: 5.0 Auto

On/Off

7 cm water with 1 cap of Vinegar

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When not to use CPAP

• When patient
  • Is NOT breathing

• Is unresponsive (coma)

• Is having uncontrolled seizures

• Needs a mechanical ventilator (if available)

• Has had intra-abdominal surgery
When not to use CPAP

When a patient has:
- Nose or facial trauma
- Pneumothorax
- Tracheo-esophageal atresia
- Diaphragmatic hernia
- Severe cardiovascular instability
- Upper airway abnormality
  - Cleft palate/Choanal atresia
Potential complications

1. Gastric distention
2. Vomiting and aspiration
3. Nasal obstruction and dry nose or airway
4. Nasal septal erosion or necrosis
5. Pneumothorax
6. General intolerance & feeding intolerance
7. Trauma
8. Oxygen toxicity

* The majority of the problems can be attributed to inappropriate use, wrong device or a lack of training and experience. Review the set up/application instructions to ensure proper use.
Moh recommendations

Newborns with severe respiratory distress who fulfil the following criteria;

• Weight of > 1000 grams

• APGAR score of ≥4 at 5 minutes

• Respiratory distress defined as a Silverman Anderson Score of ≥ 4

• (Note - newborns with a score >6 should be considered for early referral to a facility capable of offering mechanical ventilation where possible)
# Silverman Anderson score

<table>
<thead>
<tr>
<th>Feature</th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest Movement</td>
<td>Equal</td>
<td>Respiratory Lag</td>
<td>Seesaw Respiration</td>
</tr>
<tr>
<td>Intercostal Retraction</td>
<td>None</td>
<td>Minimal</td>
<td>Marked</td>
</tr>
<tr>
<td>Xiphoid Retraction</td>
<td>None</td>
<td>Minimal</td>
<td>Marked</td>
</tr>
<tr>
<td>Nasal Flaring</td>
<td>None</td>
<td>Minimal</td>
<td>Marked</td>
</tr>
<tr>
<td>Expiratory Grunt</td>
<td>None</td>
<td>Audible w/ stethoscope</td>
<td>Audible</td>
</tr>
</tbody>
</table>

Total Score of 0 indicates **no respiratory distress**

Total Score of 4-6 indicates **moderate distress**

Total Score of 7-10 indicates **severe distress.**

**Total Silverman Score:** ______
ASANTE