Bubble CPAP – Pumani

Bubble CPAP (bCPAP) devices provide both positive pressure and increased fractional concentration of oxygen (FiO₂) to newborns with respiratory distress.

**USE FOR**
- Respiratory distress syndrome
- Increased work of breathing

**STANDARD OF CARE**
Neonatal patients should reach oxygen saturations of 90 – 95% by 15 minutes after birth.

Assess and manage using the TRY algorithm

1. **ASSESS WHICH PATIENT TO PUT ON CPAP**
   - Baby is breathing spontaneously
   - Heart Rate (HR) greater than 100 bpm

   - Weight less than 1500 gm and/or
   - Gestation less than or equal to 32 weeks

   - Weight above or equal to 1500 gm
   - Increased work of breathing
   - RR greater than 80 bpm
   - SpO₂ less than 90% on room air
   - No response to 0.5–1 L/min oxygen

2. **PREPARE DEVICE**
   - Follow hand washing protocol
   - Plug the power cable into the back of the machine and plug into a socket or extension
   - Fill the pressure regulating bottle to 6 cm with clean water then place it into bottle holder
   - Connect the inspiratory tubing to the patient port and the expiratory tubing to the bottle port. Connect to an oxygen source
   - Choose correctly sized prongs
   - Connect the bCPAP prongs between the inspiratory and expiratory tube

**COMPLICATIONS**
- Nasal blockage
- Necrotic septum
- Gastric distention
- Pneumothorax
- Decreased cardiac output
- Pressure leaks
- Power failure

**REMINDER**
If no back up power is available, the baby should receive oxygen from an oxygen cylinder until they can be safely returned to a bCPAP device.

**DISINFECTION & INFECTION PREVENTION**
- Clean hands with soap and water or 70% alcohol before and after handling bCPAP materials that will be used on patients
- Ensure patient related tubing is new or has been disinfected thoroughly before use
- Device: Turn off and wipe down with 70% alcohol
- Bottle: Dispose of water
- Tubing & prongs: Dispose of or IMMEDIATELY follow protocols for disinfection and reuse. Disinfected tubing should be stored in loose rolls, preventing sharp bends or kinks
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Check patient response 15 minutes after bCPAP initiation.

Refer to increasing and decreasing bCPAP treatment algorithms to guide management.

**STANDARD OF CARE:**
Prior to changing bCPAP settings ensure bCPAP is functioning well using **DOPE:**
- **D:** Displacement of prongs
- **O:** Obstruction of prongs or tubing
- **P:** Patient problem (e.g., pneumothorax)
- **E:** Equipment failure (e.g., power cut, tubing leak, see “complications”)

3. **SET INITIAL FLOWS**
   - Turn on the device at the power source. Ensure oxygen source is also opened
   - Start with 6 L/min total flow with 50% FiO₂
   - Using the blending table, determine how much oxygen to set at oxygen source
   - Occlude prongs and check for bubbling

4. **START PATIENT ON bCPAP**
   - Follow hand washing protocol, wear gloves if needed
     - A Suction secretions, apply nasal saline and insert OGT
     - B Put hat on baby. If no hat is available one can be made using stockinette
   - Attach clips to fold of the hat (the clip is between the fold of the hat and the hat – it is not touching the patient’s skin)
   - C Place prongs in patient’s nose leaving 1 mm of space. Attach tubing to hat clips

5. **MANAGE & MONITOR PATIENT**
   - Routinely every 3-4 hours:
     - A Provide a drop of saline to each nostril
     - B Ensure prongs completely fill the nostrils and do not touch nasal septum
     - Re-check for bubbling at desired water level
     - Review DOPE at every monitoring checkpoint (15 minutes after any management change and every 4 hours)
     - Continue, increase, decrease or stop bCPAP treatment according to algorithms
Bubble CPAP

Increase fraction of inspired oxygen (FiO\textsubscript{2}) and/or pressure (water level)

If the device is functioning well, but some or all of the following are present consider increasing bCPAP:

- **O2 saturation less than 90%**
- **RR is greater than 60 bpm**
- **Persistent increased work of breathing (grunting, severe lower chest indrawing, nasal flaring)**

**TIME**

<table>
<thead>
<tr>
<th>START</th>
<th>FiO\textsubscript{2} 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 – 20 min</td>
<td>Is SpO\textsubscript{2} &gt;90%</td>
</tr>
<tr>
<td></td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Increase FiO\textsubscript{2} to 60%</td>
</tr>
<tr>
<td></td>
<td>Is SpO\textsubscript{2} &gt;90%</td>
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<tr>
<td></td>
<td>yes</td>
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<tr>
<td></td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Increase FiO\textsubscript{2} to 70%</td>
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<tr>
<td></td>
<td>Is SpO\textsubscript{2} &gt;90%</td>
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<tr>
<td></td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>Increase FiO\textsubscript{2} to 80%</td>
</tr>
<tr>
<td></td>
<td>Is SpO\textsubscript{2} &gt;90%</td>
</tr>
<tr>
<td></td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>no</td>
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</tbody>
</table>

- **Increase FiO\textsubscript{2} to 90%**
- **Increase water level to 7cm**
- **Call for assistance**
- **Reassess for complications and alternative diagnosis**

**WORK OF BREATHING**

<table>
<thead>
<tr>
<th>Water level 6 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue current FiO\textsubscript{2} and water level</td>
</tr>
<tr>
<td>Assess work of breathing every hour.</td>
</tr>
<tr>
<td>If significant work of breathing is present despite SpO\textsubscript{2} being 90–95%, increase water level by 1 cm up to a maximum of 8 cm</td>
</tr>
<tr>
<td>Monitor HR, RR, SpO\textsubscript{2} &amp; temperature every hour until stable then 3-4 hourly and at 15 minutes after change of settings. <strong>Maintain SPO\textsubscript{2} 90–95%</strong></td>
</tr>
<tr>
<td>Ensure airway is patent</td>
</tr>
<tr>
<td>Instill normal saline drops every 3-4 hours</td>
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<tr>
<td>Document on chart</td>
</tr>
</tbody>
</table>

**OXYGENATION**

- **Is there substantial lower chest wall indrawing & work of breathing**
  - yes
  - Increase water level to 7cm
  - Call for assistance
  - Reassess for complications and alternative diagnosis

- **no
  - Increase water level should never exceed 8cm**

A senior consultant may increase CPAP as they deem necessary. Depending on the bCPAP device in use; maintain a total flow rate of 6-10 L/min and use an oxygen blending table to determine amount of oxygen to set.
DECREASING & WEANING TREATMENT

Bubble CPAP

Select starting point by bCPAP FiO₂ settings.

The patient has been clinically stable for 24 hours on current treatment and has:
- O₂ saturations 90 - 95%
- RR is less than 60 bpm
- No significant signs of increased work of breathing
- No other signs of respiratory distress

Does the baby meet weaning criteria?

**Keep on current CPAP settings and treatment**

**Keep baby warm, implement a feeding plan, observe IPC and involve mother in care**

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CPAP settings above minimum

- FiO₂ > 30%
- Water level > 5 cm
- Total flow rate > 6 L/min

**Decrease CPAP treatment**

- Reduce FiO₂ by 10% every 3-4 hours until FiO₂ is 30%
- Maintain water level
- If baby does not meet weaning criteria at any point, maintain at current settings and treatment

- Maintain FiO₂ of 30%
- Reduce water level by 1 cm every 3-4 hours until water level is 5 cm
- If baby does not meet weaning criteria at any point, maintain at current settings and treatment

- If baby is stable for 3-4 hours with minimal CPAP settings of 30% FiO₂ and water level of 5 cm, stop CPAP
- Put on 1 L/min oxygen via nasal prongs

**Stop CPAP treatment**

- Disconnect baby from CPAP device
- Put on 1 L/min oxygen via nasal prongs

Assess baby at 15 mins, 1 hourly then 3-4 hourly for 12 hours. If baby meets criteria to restart CPAP at any point, restart CPAP and consult

Follow guidelines for weaning off oxygen before removing oxygen

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**Weaning Criteria**

The patient has been clinically stable for 24 hours on current CPAP settings with:
- RR is less than 60 bpm
- SpO₂ 90 – 95%
- No significant signs of increased work of breathing
- No other signs of respiratory distress
**REPAIR & MAINTENANCE**

**Bubble CPAP – Pumani**

Test the device for use by setting up patient circuit. Cover or occlude prongs and check for bubbling.

**DAILY MAINTENANCE**

- Always disinfect the bCPAP device with 70% alcohol using gauze or a cotton swab before first use and between patients.
- Make sure to change water daily. **Do not leave water in bCPAP bottle, water trap or humidifier when device is not in use.**

**PREVENTIVE MAINTENANCE**

- The bCPAP device should be turned on weekly to a total flow of 10 L/min and allowed to run while connected to an oxygen source for at least 15 minutes

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1 **DEVICE DOES NOT TURN ON**
- Check that the power cable is securely attached
- Check that the power socket is turned on

2 **IF THE SILVER BALLS IN THE O₂ OR FLOWMETER ARE NOT MOVING**
- Tap the front of the flowmeter firmly with your knuckle or the handle of a screwdriver
- If the silver ball within the flowmeter still does not go up, contact the maintenance department to request cleaning of the flowmeter and to check that all internal tubing is still connected

3 **IF THE WATER IN THE bCPAP BOTTLE IS NOT BUBBLING**
- Check that the CPAP prongs fully fill the nostrils and that the patient’s mouth is not open
- If the prongs are well-fitted, remove from the patient’s nose and occlude the prongs with your finger
- If the water is still not bubbling check the seal at the patient port
- If the seal is deteriorating or cracked, contact the maintenance department

4 **IF THE TOTAL FLOWMETER DOES NOT GO UP TO 10 L/MIN**
- Contact the maintenance department to request an internal filter change

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**CONTACT A TECHNICIAN OR MAINTENANCE DEPARTMENT IF DEVICE CONTINUES TO NOT WORK PROPERLY AFTER ADDRESSING THE COMMON ISSUES**

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