CONTINUOUS POSITIVE AIRWAY PRESSURE – BUBBLEFLOW NASAL CPAP

AIM:
To maintain or increase functional residual capacity of the lungs, help prevent alveolar collapse, reduce the work of breathing and improve gas exchange in infants with:

- Clinical signs of respiratory distress
  - In the weaning process from ventilatory support

EQUIPMENT:
Bubble flow circuit and appropriate size Hudson CPAP prongs to achieve a snug fit.

<table>
<thead>
<tr>
<th>Prongs:</th>
<th></th>
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<tbody>
<tr>
<td>size 0</td>
<td>&lt; 700 grams</td>
</tr>
<tr>
<td>size 1</td>
<td>700 – 1250 grams</td>
</tr>
<tr>
<td>size 2</td>
<td>1250 – 2000 grams</td>
</tr>
<tr>
<td>size 3</td>
<td>2000 – 3000 grams</td>
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<tr>
<td>size 4 – 5</td>
<td>&gt; 3000 grams</td>
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- Oxygen-Air blender
- Oxygen high flow meter
- IV pole/stand
- Clear combi-stop for outlet port on prongs
- Humidifier base and temperature probe
- Sterile water for irrigation

KEY POINTS:
1. Adjust the CPAP gauge to the pressure setting of 5-7cm/H₂O or as ordered.
2. Adjust the oxygen flow to 5-8L/min, occlude the prongs and observe the bubble chamber for bubbles (make sure combi-stop in place). Bubbling should be constant but not excessive.
3. Insert and secure an orogastric tube (FG5 for infants ≤1500g, FG6 for infants ≥1501g) for gastric decompression. Decompression of the stomach and the removal of air must be performed 3 – 4 hourly.

4. Too much space between prongs and nares will allow movement and cause trauma. Too little space between prongs and nares will cause blanching around the nostrils indicating too much pressure.

5. CPAP pressure and flow rate should not be altered / increased without discussion with medical staff.

6. CPAP delivery must be maintained at ALL times whenever the infant is handled e.g. cares, weighing and releasing of CPAP cap to avoid atelectasis in CPAP dependant infants. NB. Re-recruitment of alveoli may take up to 4 hrs.

7. Application of nasal comfeel is a 2- person procedure for CPAP dependent infants. One nurse correctly applies comfeel while the other holds prongs in position decreasing the risk of loss of CPAP delivery during application.

8. Ear pads, which can be positioned around the pinna, may be applied if infant’s ears appear to be excessively flattened. Reassess in 72 hours.

9. Position the infant either prone, ¼ turn prone or side lying. A ¼ prone position is preferred for the preterm infant as it encourages optimal expansion of lungs whilst preventing positional deformities. Use appropriate positioning aids to ensure alignment of head and neck (to ensure a patent airway) and shoulder support to prevent pressure on the face from the circuit tubings.

**METHODS OF SECURING CPAP DEVICE**

1. **CPAP CAP SYSTEM** (NEVER place woollen hats underneath CPAP Cap at any time.

   CPAP Cap system comprises of:
   - CPAP Cap x1 (size appropriate)
   - Long Velcro strip x2
   - Short Velcro strip x2
   - Chin strap x1
   - Self adhesive Velcro wrap x2
   - Securing device / toggle x 1

   - Select the appropriate CPAP Cap size. To determine the correct size, measure the circumference from the nape of the neck, across the ears to the middle of the forehead (like a turban) ie. not the same as a head circumference measurement.

   - Place cap around the nape of the neck, over ears and across the middle of the forehead (turban style). Align the stitched marking on the cap to the tip of the left ear. Position overlap (at least 2 cm) of the cap in the middle of the forehead. No overlap means the cap is too small – use the next size up. Gather the top of cap together with a twist and use toggle creating a snug fitting cap.

   - Place self adhesive velcro lengthwise around each corrugated CPAP tubing as close as possible to the nasal prongs connection.
2. **BONNET WITH TIES** (to be used if excessive moulding is observed in an infant ≤30 weeks gestation and/or if nasal skin integrity is compromised). Reassess in 72 hours and recommence CPAP Cap System if moulding/excoriation has resolved.

- Snug fitting woollen bonnet
- Blue ties (for securing CPAP tubings)
- Velcro (hook and fastener)
- Skin prep swab
- Comfeel

- Apply skin prep to cheeks. Cut 2 pieces of comfeel with round corners sized to fit cheeks.
- Apply hook velcro cut into an oblong to each piece of comfeel.
- Apply fastener velcro to prongs, ensuring it is wrapped all the way around the prongs TWICE to increase the distance between the nasal septum and prongs and reduce risk of trauma to nasal septum. Ensure the cut edge of the wrapped Velcro strips face away from the eyes
- Apply a well fitting bonnet with ties. The ties are to be placed appropriately, (ie, when the bonnet is in-situ, they are at the level of the tip of the ears) to facilitate securing of tubings with ties in the correct position.

3. **EME MASK**

CPAP pressure delivery via mask may be alternated with nasal prongs 4 hourly when there is evidence of septal redness / trauma.

- Select the appropriate size mask for the infant. The mask is to be used in conjunction with a size 2 nasal prong to provide a tight seal with the mask.
- Adjust the gas flow rate between 7 – 10 L/m to achieve bubbling.

**NASAL COMFEEL APPLICATION**

- Application of nasal comfeel allows correct size nasal prong selection for weight to be used on infants despite the variance of individual nares size
- It provides an effective seal around the nares which enhances effective bubbling
- It helps protect the septal and intranasal area by keeping the nasal prongs positioned centrally and preventing excess movement side to side and in and out, it does not however prevent nasal trauma due to pressure on septum.

**METHOD OF APPLICATION**

- Apply post admission to stabilised preterm babies receiving CPAP therapy.
Comfeel must be checked at each hat release to ensure the punched holes have not enlarged allowing excessive movement.

Using plastic templates corresponding to weight range. Cut and customise to fit infants facial features.

For best results nasal comfeel holes should be punched smaller than prong diameter. Prong size 0-2 use size 2.0 punch hole, ≥ size 3 use size 2.5 punch hole

Keep backing of newly cut and customised nasal comfeel as the baby’s personal template and return plastic template to resus trolley

Apply after nasal area has been wiped with a barrier wipe (skin prep or convacare barrier wipe) Allow area to dry this facilitates better adhesion

Align punched holes with centre of nares

Gently press comfeel onto upper lip then using finger tips press comfeel upwards following contours of nose excluding any air

Finally secure nasal comfeel at the bridge of nose either by overlapping edges or pinching edges together to ensure a seal

After application closely monitor for signs of prolonged blanching (NB.Transient blanching may be observed but resolves spontaneously with return of circulation and capillary refill)

Nasal comfeel MUST be changed at least 24 hourly with daily hygiene regimen or as required when punched holes are no longer immobilising prongs.

If skin integrity is compromised i.e. inflamed or moist. It may be necessary to remove nasal comfeel for 24-48 hours to enable airing and healing and revert to bonnet and ties system to secure prongs

Remove nasal comfeel when infant is cycling off CPAP and when a PBF/HHF prong is in situ. This prevents an increased work of breathing and CO₂ retention and allows infant to inspire air as well as O₂ delivered by PBF/HHF. This may mean 3-4 comfeel changes per day when infant cycles off CPAP.

Term babies may not require nasal comfeel to be applied if the prongs fit appropriately and effective bubbling is achieved

**CPAP NURSING CARE**

1. It is preferable that all infants use the CPAP Cap System.
2. The CPAP Cap must be released for several minutes every few hours to minimise deformities of the head and pressure areas occurring. Strictly 3 - 4 hrly for infant’s <34weeks and 3 – 6 hrly for all others. Document on MR 489 obs chart. (Note: preterm infants with a history of excessive moulding may need to maintain 3-4hrly hat release past 34 weeks CGA)
3. When inserting the prongs into infant’s nares, position the prongs in a downward arch position but not in contact with the nasal septum, then secure them to prevent distortion of the nares and compression of the septum. Ensure there is always a minimum 2mm gap between prongs and septum.
4. Observe the bubble chamber for bubbling, this ensures positive pressure is being delivered. Bubbling assists recruitment of alveoli and gas exchange.
5. Removal of nasal comfeel must only be done using an orange convacare adhesive removal wipe to reduce trauma to facial skin and aid quicker removal. When removed inspect skin integrity (nares, septum and nose), document any apparent redness or ulceration
6. Infants can be weighed without CPAP if they are stable and only if they are cycling off CPAP for the same amount of time that they are on CPAP (e.g. 4 hrs on 4 hrs off).

7. Babies who are very active may cause the holes in the comfeel to rapidly enlarge and ineffectively hold the prongs in place. These babies will require a soft velcro bolster wrapped around either side of the actual prongs to physically prevent the prongs touching the septum. Ensure that the Velcro bolster is positioned so that the cut edge is placed near the baby’s cheek well away from the baby’s eyes.

8. To help prevent the weight of the CPAP tubings dislodging the prongs from the infant’s face during weighing, repositioning or cuddles with parents – wrap a strappit around both tubes approx 20cms above the infant’s head.

9. Document the following on the MR 489, current CPAP nursing check sheet and/or progress notes:
   a. nasal comfeel last changed
   b. condition of septum, nares
   c. evidence of head moulding
   d. infant’s position
   e. hours on/off CPAP
   f. CPAP effectiveness
   g. Date of CPAP cap change (weekly)

DEVELOPMENTAL POSITIONING FOR STABLE CPAP BABIES

Once an infant is stable on CPAP then rotation through different positions including supine will contribute to infants developmental care, both physical and neurological. There is no specified gestational age or weight criteria and nutrition via continuous milk feeds (CMF) does not preclude the use of a supine position.

Stable is defined as:
- Stable \( \text{O}_2 \) requirements for 48 hrs
- Minimal sternal recession when in supine position
- Respiratory Rate < 80 breaths per minute with minimum work of breathing (e.g. no increase in use of intercostals/accessory muscles and no rising \( \text{CO}_2 \))
- Occasional desaturation episodes and self-resolving bradycardias
- No apnoeas
- Tolerating 75% full intermittent tube feeds or CMF
- Minimal OGT aspirates 4 hourly
- No vomiting
- Infant must be able to maintain appropriate temperature for gestation and weight
- Utilise position chart below to select sequence of positions. This sequence should be customised to suit each individual infant. Any position that affects the stability of infants condition should be avoided until the infant’s condition is stable enough to tolerate it.
Stable baby

C1 ¼ turn Supine on Rt/C2 ¼ turn supine on Lt side

Front view

D1 Supine facingLt /D2 Supine facing Rt

Back view

CPAP babies In white cot swaddled to contain
A1 & A2                                  C1 & C2

Stable baby:
- Minimal respiratory assistance CPAP=5-6cm
- FiO2 ≤ 30%
- No need for inotropes, colloid support to maintain BP
- No sepsis or respiratory or haemodynamic instability
REFERENCES: