



GUIDELINE

Continuous Positive Airway Pressure (CPAP)

| | |
|-----------------------|------------------------------|
| Scope (Staff): | Nursing and Medical Staff |
| Scope (Area): | NICU KEMH, NICU PCH, NETS WA |

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this [disclaimer](#)

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Aim

This guideline outlines the management and use of Continuous Positive Airway Pressure (CPAP) in the neonatal unit.

Risk

Inappropriate use of CPAP and inadequate monitoring can compromise patient safety and result in adverse outcomes.

Background

Continuous Positive Airway Pressure (CPAP) is used 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.

CPAP can be used to treat:

- Infants with clinical signs of respiratory distress
- In the weaning process from ventilator support
- Splinting of upper airway in infants with obstructive apnoea
- Infants with apnoea of prematurity

Key Points

Indications of CPAP Failure and the need for escalation of care

Sudden deterioration or prolonged apnoea requires immediate action, call for assistance ([Recognising and Responding to Clinical Deterioration](#))

- Notify the shift coordinator and medical staff if
 - There is an increase in oxygen requirements
 - Increased work of breathing
- Clinical indications to consider intubation (should be discussed with the senior registrar or consultant)
 - A rising PaCO₂ to > 60mmHg and falling pH < 7.25 despite CPAP.
 - Increasing FiO₂ and hypoxia.
 - Recurrent apnoea requiring stimulation and resuscitation.
 - Incipient collapse.

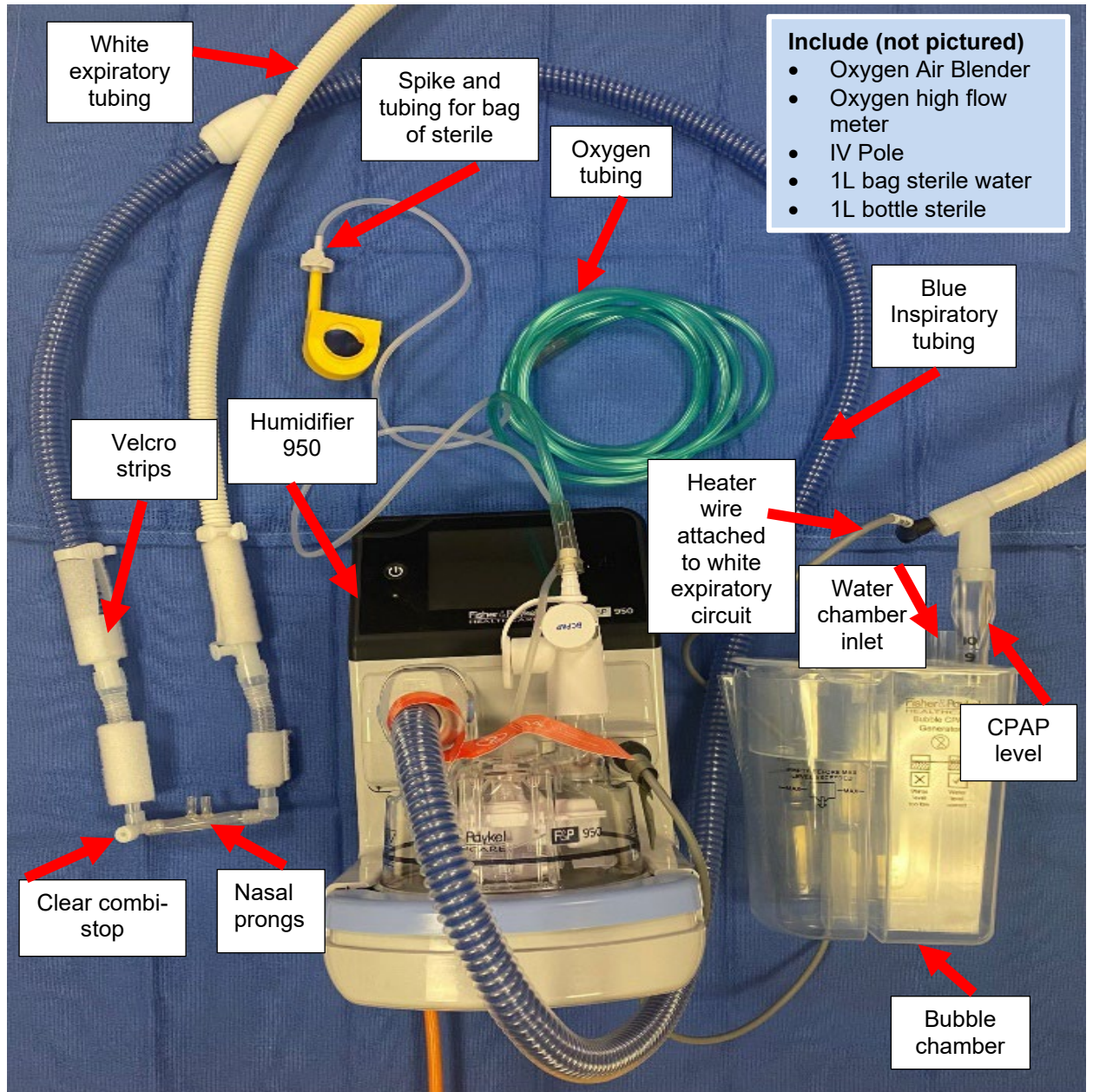
Continuous Positive Airway Pressure (CPAP)

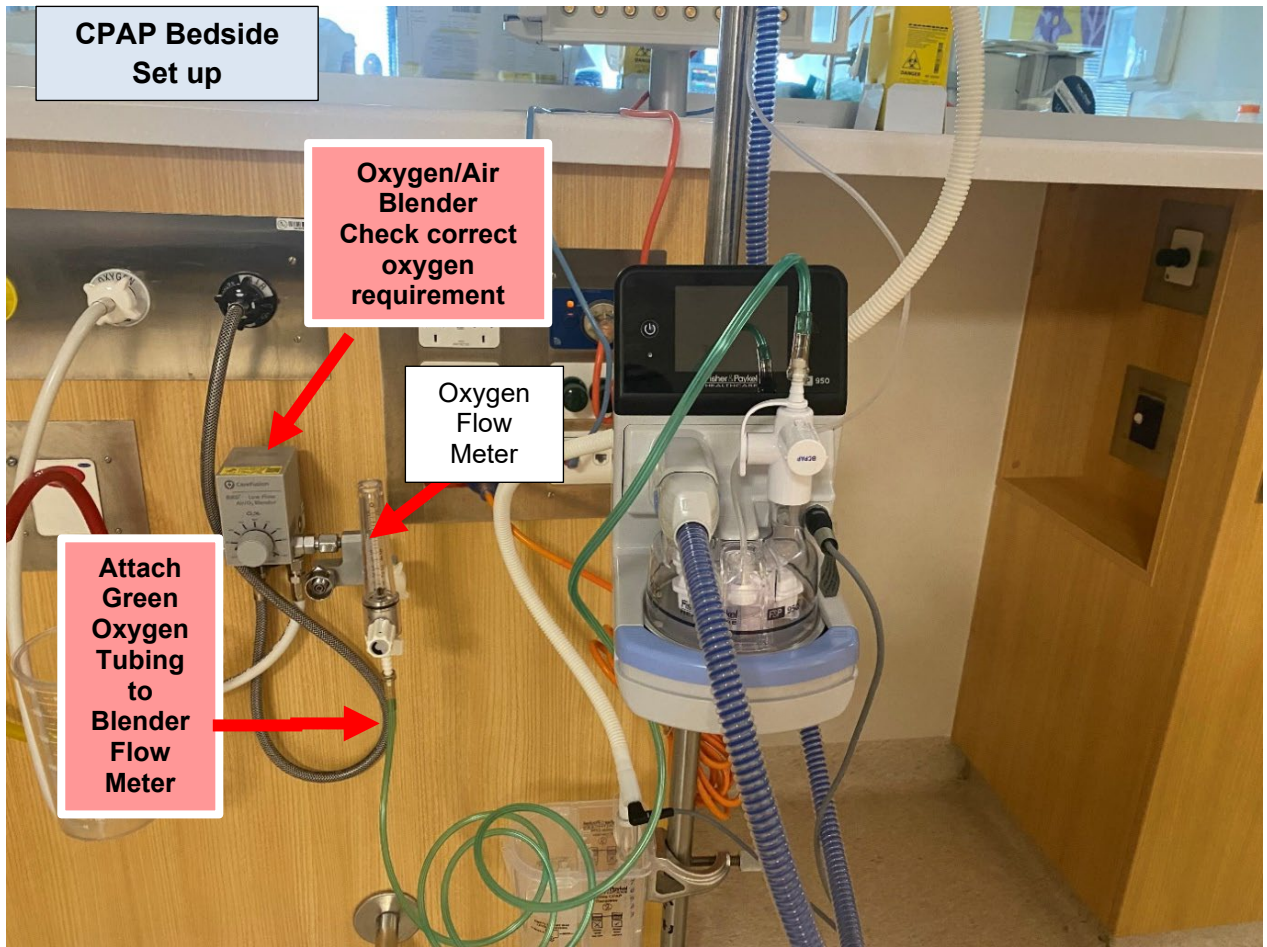
- Administration of surfactant replacement therapy.

Transition from Intubation (mechanical ventilation) to CPAP

Please refer to [Extubation: Planned and Unplanned](#)

CPAP Equipment and Set Up





Prong sizing

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

| Prong Size | Recommended weight |
|------------|--------------------|
| Size 0 | < 700 grams |
| Size 1 | 700-1250 grams |
| Size 2 | 1250-2000 grams |
| Size 3 | 2000-3000 grams |
| Size 4-5 | > 3000 grams |

Application of CPAP to Neonate

Prior to attaching circuit to nasal prongs

- Adjust the CPAP gauge to the pressure setting of 5-7 cm/H₂O or as ordered.
- Adjust the oxygen flow to 5-8 L/min, occlude the prongs and observe the bubble chamber for bubbles (make sure combi-stop in place). Bubbling should be constant but not excessive.

- Adjust the oxygen to meet appropriate oxygen saturation levels.
- Ensure circuit connections and oxygen delivered are correct. See [equipment set-up picture](#)

Insertion and securing nasal prongs

Nasal prongs are the preferred method of delivering CPAP. A CPAP mask may be used (after discussion with shift coordinator or CNC) where there has been trauma to the nasal septum and nares from the nasal prongs.

- Select appropriate nasal prong for size of infant.
- Use clear combi stop to seal the outlet port on the prongs.
- Hydrocolloid dressing is to be used to assist with providing an effective seal.
 - hydrocolloid dressing is to be applied prior to the insertion of the prongs.
 - application of nasal hydrocolloid dressing allows correct size nasal prong selection for weight to be used on infants despite the variance of individual nares size.
 - also assist with reducing the movement of prongs in the nares.
- NeoSeal device can be used in conjunction with Hydrocolloid dressing when there is an inability to maintain adequate seal. See [Appendix 3](#)

| Hydrocolloid Dressing Application Steps | Additional Information |
|--|--|
| 1. Apply post admission to stabilised babies receiving CPAP therapy | |
| 2. Using plastic templates corresponding to weight range, cut and customise to fit infants' facial features. | For best results, nasal hydrocolloid dressing holes should be punched smaller than prong diameter. |
| 3. Apply to a clean and dry nasal area | Consider using a barrier wipe. Allow area to dry this facilitates better adhesion. |
| 4. Align punched holes with centre of nares. | |
| 5. Gently press hydrocolloid dressing onto upper lip, then using fingertips press hydrocolloid dressing upwards following contours of nose excluding any air | |
| 6. Finally secure nasal hydrocolloid dressing at the bridge of nose either by overlapping edges or pinching edges together to ensure a seal. | |

| Hydrocolloid Dressing Application Steps | Additional Information |
|---|---|
| 7. 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). |
| Review hydrocolloid dressing at each hat release to ensure the punched holes have not enlarged allowing excessive movement. | |
| Nasal hydrocolloid dressing 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 hydrocolloid dressing for 24-48 hours to enable airing and healing and revert to bonnet and ties system to secure prongs. | |

CPAP Mask

CPAP pressure delivery via mask may be alternated with nasal prongs 4 hourly when there is evidence of septal redness / trauma. **Routine use of mask is not advised.** Discuss with CNC / Shift coordinator prior to use as mask should only be used in **special circumstances** and should only be considered for use if the [QRG Treatment of Skin Injury related to CPAP](#) has been unsuccessful.

- 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.

NOTE: Ensure correct size prongs are used when alternating between the nasal prongs and mask.

Securing CPAP circuit

CPAP Cap System

Equipment

- CPAP Cap x1 (size appropriate)
- Long Velcro strip x2
- Short Velcro strip x2
- Chin strap x1
- Self-adhesive Velcro wrap x2
- Securing device / toggle x1

| Steps | Additional Information |
|--|--|
| 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). | E.g. Not the same as a head circumference measurement. |

| Steps | Additional Information |
|--|---|
| 2. Place cap around the nape of the neck, over ears and across the middle of the forehead (turban style). | |
| 3. 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. |
| 4. Gather the top of cap together with a twist and use toggle creating a snug fitting cap. | |
| 5. Place self-adhesive Velcro lengthwise around the inspiratory and expiratory corrugated CPAP tubing as close as possible to the nasal prongs connection. | See equipment set-up picture |
| 6. Position nasal prongs in nares, ensuring a downward arch. | |
| 7. Secure the CPAP tubing in place with the long Velcro strips. | |
| Note: Cap should not be tight as excessive moulding will result. | |
| The CPAP cap is to be change weekly or when visibly soiled. | |

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.

Equipment

- Snug fitting woollen bonnet.
- Blue ties (for securing CPAP tubing).
- Velcro (hook and fastener).
- Skin prep swab.
- Hyrdocolloid dressing.

| Steps | Additional Information |
|---|------------------------|
| 1. Apply skin prep to cheeks. Cut 2 pieces of hydrocolloid dressing with round corners sized to fit cheeks. | |
| 2. Apply hook Velcro cut into an oblong to each piece of hydrocolloid dressing on cheeks. | |

| Steps | Additional Information |
|--|--|
| 3. 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. | <p>Reduces the risk of nasal and septal trauma.</p> <p>Ensure the cut edge of the wrapped Velcro strips face away from the eyes.</p> |
| 4. Apply a well-fitting bonnet with ties. The ties are to be placed appropriately, to facilitate securing of CPAP tubing with ties in the correct position. | i.e. When the bonnet is in-situ, they are at the level of the tip of the ears |

Nursing Care

- It is preferable that all infants use the CPAP Cap System.
- Parents are encouraged to participate in CPAP cares, under direct supervision of nursing staff.
- The CPAP Cap must be released for several minutes with routine handling and cares to minimise moulding of the head and pressure areas occurring.
 - Strictly 3-4 hourly for infant's < 34 weeks and 3-6 hourly for all other infants.
- 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 2 mm gap between prongs and septum.
- To reduce incidence of nasal trauma, ensure tubing is appropriately secured with clip.
- Observe the bubble chamber for bubbling, this ensures positive pressure is being delivered. Bubbling assists recruitment of alveoli and gas exchange.
- Removal of nasal hydrocolloid dressing must only be done using an 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.
 - Do not trim hydrocolloid dressing that is already on the infants' skin, remove and replace if necessary.
- Babies who are very active may cause the holes in the hydrocolloid dressing 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.

- To help prevent the weight of the CPAP tubing 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. Infants on respiratory support MUST always be weighed by two nursing staff members.
- Refer to Appendix 2 for Developmental Positioning of stable and unstable infants.

Observations

All infants receiving CPAP MUST have continuous monitoring and have hourly observations documented (Heart Rate, Respiratory Rate, Oxygen Saturations).

CPAP pressure, flow and amount of oxygen being delivered must be checked and documented hourly. This includes assessing for leaks and ensuring adequate bubbling.

The nares and septum should be viewed hourly to allow for early identification of any pressure areas.

Documentation

Document the following on the MR489, CPAP nursing check form and/or progress notes:

- Nasal hydrocolloid dressing last changed
- Condition of septum and nares
- Evidence of head moulding. See [Appendix 1](#)
- Infant's position
- CPAP effectiveness
- Date of CPAP cap change (weekly)
- Document on MR489 chart and score the presence of scaphocephaly according to the 'Scaphocephaly Rating Scale', [Appendix 1](#). (Note: preterm infants with a history of excessive moulding may need to maintain 3-4 hourly hat release past 34 weeks CGA)

Discontinuation of CPAP

Weaning CPAP in an infant who is clinically stable

- Wean FiO₂ first then CPAP pressure
- Cease CPAP completely without cycling when clinically stable, in CPAP of 5cmH₂O and in air

Re-establish CPAP at previous level or consider HHF if

- Requires oxygen
- Worsening apnoea

- Respiratory rate consistently over 60
- Or increased work of breathing

Or transition to HHF at 4L/min if clinically stable at CPAP of 5cmH₂O

- If previous attempt(s) to cease CPAP unsuccessful
- Or has persistent oxygen requirement on CPAP

Interval between attempts to wean should be 48 hours or greater.

Transferring between nurseries:

Note when transferring between nurseries, ensure that on arrival to the receiving nursery, the respiratory support circuit and oxygen requirement is checked by the receiving nurse and coordinator at handover to ensure respiratory support circuit connections are correct ([Transport of Neonates within the Nursery and within the Hospital](#))

Related CAHS internal policies, procedures and guidelines

Neonatology Clinical Guideline


- [Extubation: Planned and Unplanned](#)
- [Monitoring and Observation Frequency](#)
- [Skin Care Guideline](#)
- [Transport of Neonates within the Nursery and within the hospital](#)

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Excellence
Collaboration
Accountability
Equity
Respect

Neonatology | Community Health | Mental Health | Perth Children's Hospital

Appendix 1: Scaphocephaly Rating Scale

Scaphocephaly Rating Scale

Pre Term infants are at risk of altered skull shape called Scaphocephaly. This is due to the altered external environment during a time of rapid brain growth.

| | Nil | Minimal | Moderate | Severe | |
|------------|---|---|--|---|--------------------|
| Top View |  |  |  |  | Posterior bulging |
| Side View |  |  |  |  | Frontal bossing |
| Front View |  |  |  |  | Temporal narrowing |
| | <p>Nil:</p> <ul style="list-style-type: none"> Regular position changes | <p>Minimal:</p> <ul style="list-style-type: none"> Regular position changes as appropriate/ tolerated | <p>Moderate:</p> <ul style="list-style-type: none"> Regular position changes - progress to side lying Use peanut pillow for cares Alert Physio Check for head turn preference | <p>Severe:</p> <ul style="list-style-type: none"> Regular position changes - progress to side lying Use peanut pillow for cares Contact CNC to consider soft CPAP beanie Consider using supine positioning | |

Appendix 2: Developmental Positioning for infants on CPAP

Once an infant is stable on CPAP then rotation through different positions including supine will contribute to infant's developmental care. There is no specified gestational age or weight criteria. Nutrition via continuous milk feeds (CMF) does not stop the use of a supine position. Stable is defined as:

- Stable O₂ requirements for 48 hours.
- 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 CO₂).
- 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



Back view

D1 Supine facing Lt /D2 Supine facing Rt



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
- Tolerating 75% full enteral feeds

Unstable baby

A1 Prone facing Lt / **A2** Prone facing Rt



Front view



Top view

B1 ¼ turn Prone facing Lt/ **B2** ¼ turn facing Rt



Front view



Back view

CPAP babies who only tolerate ¼ turn prone - when cycling off CPAP please place prone.

Check with coordinator or CNC before implementing Stable baby position changes

Appendix 3: NeoSeal Application

NeoSeal's are designed to help improve the seal and skin integrity when using bubble CPAP on neonates. The NeoSeal creates a barrier between the neonate's septum, nares and the CPAP prongs. NeoSeal's are designed to adhere to the nasal prongs, not the neonates skins to provide a soft bumper to protect the nasal septum and help to prevent skin break down NeoSeal's should be used in conjunction with hydrocolloid dressing and a wound care plan for septal/ nasal trauma. NeoSeal's come in three different sizes micro, small and large.

Aim

The aim of the NeoSeal is to help maintain a seal and skin integrity of the neonate when using bubble CPAP. NeoSeals maximise the CPAP effectiveness by maintaining consistent adequate PEEP thus minimising atelectasis and reduces over handling. These measures in turn aim to decrease the length of stay.

Criteria for use

Inability to maintain consistent CPAP pressure (bubbling) despite optimal patient positioning with the use of hydrocolloid dressing

Septal/nasal trauma

Directions for use

Step 1. Peel NeoSeal from liner

Step 2. Slip the NeoSeal over nasal prongs with **adhesive facing the nasal prongs**

Step 3. Place nasal prongs as per CPAP guidelines

Step 4. Replace NeoSeal ever 3-5 days or when wet or soiled



Sizes

Micro: CPAP prongs size 0-1

Small: CPAP prongs size 2

Large: CPAP prongs size 3

Appendix 4: QRG Treatment of Skin Injury related to CPAP

Injury Identified – requires immediate CNC/ CNS/ Medical review
 Commence Wound Care Plan
 Medical photography with parental consent required
 Complete CIMS



Nasal Injury

- Check prong and hat size
- Check 2mm gap between prongs and nasal septum
- Remove hydrocolloid dressing – do not site over nasal injury
- Use Neoseal
- Secure tubing with clip
- If skin is broken – Commence Stratamed

Only consider mask use if the above treatment is unsuccessful.

Ear Injury

- Check hat size
- Apply coconut oil to injury. Apply Stratamed if skin broken
- Use ear protectors



| Prong Size | Recommended weight |
|------------|--------------------|
| Size 0 | <700 grams |
| Size 1 | 700-1250 grams |
| Size 2 | 1250 - 2000 |
| Size 3 | 2000 - 3000 grams |
| Size 4-5 | >3000 grams |

| Hat Size | Head Circumference |
|-------------|--------------------|
| Extra Small | <25cm |
| Small | 25-30cm |
| Medium | 30-35cm |
| Large | 35-40cm |

Refer to CPAP guideline, CNS's, CNC's and Wound Care Nurse for further resources