Scope
This guideline is aimed at all healthcare professionals involved in the care of infants within the neonatal service.

Aim
To ensure that all infants receiving CPAP are optimally cared for and to reduce the incidence of nasal trauma.

Key Points
- Traumatic injuries to the nose are a common complication of CPAP in neonates.
- The incidence of nasal trauma can be minimized by good fixation methods and nursing techniques.
- Hourly visual checks and two-hourly physical checks are required (listed in section 2.7) and are regularly audited.
- Some of the most important points are illustrated in Appendix 1.

1. Background
Continuous Positive Airway Pressure (CPAP) is the application of positive pressure to the airway of a spontaneously breathing infant throughout the respiratory cycle.

CPAP predominantly works by preventing collapse of the alveoli with marginal stability. The recruitment of more alveoli helps to increase the Functional Residual Capacity (FRC) thus improving oxygenation and decreasing intrapulmonary shunting. Endogenous surfactant is conserved; the breathing pattern regulates with stabilization of the rib cage, which reduces recession and increases efficiency of the diaphragm.

Listed uses for CPAP on the Neonatal unit include;
- Respiratory Distress Syndrome (RDS)
- Apnoea of prematurity
- Prevention of extubation failure
- Transient Tachypnoea of the Newborn (TTN)
- Infants with Chronic Lung Disease (CLD)

In practice CPAP consists of a controlled flow of gas administered to the baby using a ‘flow driver’ to circulate humidified gas through a CPAP circuit to the larynx or nose. The level of care administered is measured by a pressure reading in cm H₂O. In order to raise or lower the pressures given to the baby the flow of gas in L/m can be increased or decreased.
The evidence, clinical studies and controversies regarding CPAP have been extensively reviewed elsewhere and are not discussed here. The guidelines focus mainly on the practical aspects of CPAP administration in neonates.

2. Practice Guidelines

2.1 PRIOR TO COMMENCING CPAP

- Infants should be nursed in a safe environment with access to suction, oxygen and resuscitation equipment at each cot side.
- CPAP drivers should be well maintained and cleaned.
- The flow should be set, initially at 8L/m and the oxygen at the infant’s individual requirements.
- Initial PEEP (Positive End Expiratory Pressure) is set at 5cmH₂O to 8cm H₂O, however this is dependent on infant’s current condition.
- Alarms on the CPAP driver should be set according to the manufacturer’s guidance.

2.2 HUMIDIFICATION

- CPAP circuits used on the unit should be humidified at all times.
- Ensure that the humidifier is on and warmed prior to connecting to the infant.
- Sterile water for irrigation is used to fill the chamber.
- Don’t over-fill the chambers or let them dry out
- Humidification is delivered to the infant at 37°C.

Humidification and warming of the inspiratory gases is a very important aspect on CPAP. In normally breathing infants the flows are very low compared to the gas flows that occur when administering CPAP. High flow gases dry the mucosa, decrease the muco-ciliary function and increase the airway resistance. It is ideal to deliver gases at a chamber temperature of 37°C with humidity.
2.3 CPAP HATS

- Ensure the correct size hat is used, as there are a variety of sizes available. Use the tape measure provided to guide you on the correct size. Measurements should be taken from the base of the neck to the middle of the forehead and back to the base (NOT the head circumference). Be aware that it may be necessary to go up or down a size to ensure the best fit.
- The hat should be put on the infant’s head prior to connecting the generator. Ensuring that the ears are in a normal position and flat against the head, and fit from the brow to the nape of the neck.
- The open end of the hat should be tied off (not too tight) to ensure a snug and secure fit.
- Eyes should be clearly visible.
- The hat size should be regularly reviewed for correct sizing and changed when elasticity is lost or is dirty.

2.4 NASAL PRONGS/MASKS

- Use the sizing guide provided by the manufacturer to correctly gauge the size of the prongs/mask needed.
- Attach the prongs/mask to the generator prior to attaching to the infant.
- Bring the generator towards the nose and gently insert the prongs into position whilst supporting the weight of the equipment.
- Prongs should be positioned correctly so that they are square onto the nose and not tipped at an angle. They should NOT be pressed hard against the nasal septum (this is to prevent damage to the lateral walls of the nostrils and the nasal septum)
- Masks should be place evenly on the nose to create a seal and minimize gas leak especially to the eyes.
- The eyes should be clearly visible without any of the mask touching them.
- Prongs/mask should be kept clean, patent and free from obstruction.
- Alternate between prong and mask when the infant tolerates this.
- The prongs/mask are secured using the straps from the generator horizontally across the infant’s cheeks. Do NOT over tighten.
- The exhaust tubing should be free so that pressure is not applied to the nose.
- Correct fitting of the prongs/mask, careful observation of the nose and immediate response to any indicators of nasal damage should be employed by carers.
- If skin protection (e.g. Duoderm) is needed, ensure that it is secure and cannot migrate over the nostrils blocking the airway.
2.5 PRESSURES AND FLOW

- Initial PEEP is usually between 4-6cm H$_2$O but greatly varies depending on the infant’s condition.
- The flow is initially set at 8L/m. Pressure is achieved by altering the flow.
- Decisions on pressure should be made between the medical and nursing team and documented in the care plan and notes.
- Indications for adjusting the pressure are:
  - Degree of RDS
  - Effort of breathing
  - Blood gas
  - Chest X ray
  - Oxygen requirements
  - Apnoeas, bradycardias and desaturations

- The use of a ‘dummy’ can help to settle a baby and create a better seal, which will help to maintain better pressures.
- If pressure needs to be significantly increased this could be an indication of a more serious problem such as a pneumothorax or need for intubation and ventilation. Medical review is required immediately.

2.6 GENERAL CARE

- Suction may be required, but this is individualized to the infant’s needs.
- Monitoring of the infant’s vital signs, heart rate, respiratory rate and oxygen saturations should be in place.
- Ensure that the infant’s face is kept clean from secretions.
- Clean behind the infant’s ears during cares (as preterm infants may be nursed with CPAP for many weeks).
- An oro-gastric tube (OGT) is used in preference to a naso-gastric tube (NGT), to prevent distortion to the nostrils and ensure a good seal with the prongs or mask.
- The OGT should be aspirated prior to every feed to reduce gas and help prevent abdominal distention ‘CPAP belly’.
- If the infant is not having any feeds the OGT can be kept open on free drainage. Continue to aspirate the OGT every 4-6 hours.
- Mouth care will be needed due to the high flow gases causing the mouth to become very dry.
- Consideration must be given to the developmental needs of the baby and each should have individualized care to achieve this.
- The use of positioning aids should be used to maintain comfort and correct positioning.
- Time and care should be taken to ensure that the CPAP is secure, well fitted and safe.
2.7 CARE OF THE NOSE AND FACE FOR INFANTS RECEIVING CPAP

Traumatic injuries to the nose are the most common complication of CPAP in neonates. Nasal prongs may rub and damage the internal aspects of the nasal septum, whereas masks are found to cause trauma to the nasal septum and nasal philtrum or the bridge of the nose. Both problems can be minimized by good fixation methods and nursing techniques.

Every hour check visually:
- The generator is positioned correctly
- The nose should not be pushed upwards or squashed
- The exhaust tubing should be free so that pressure is not applied to the nose.
- The eyes should be clearly visible
- Tapes should not be too tight or cause indentation
- Check humidification chamber for water level (Do not over-fill or allow to dry out!)

2-4 hourly physical checks
- Prongs/mask should be removed and pressure relieved from the nose and face.
- The nose should be inspected for signs of redness, indentation, bruising or bleeding.
- If skin protection (i.e. Duoderm) is needed ensure that it is secure and cannot migrate over the nostrils causing the airway to block.
- The ears should be inspected to ensure that they are not creased or folded. Remember to clean behind the ears.
- If there are any changes or concerns re-check in 1 hour and ask for a review.
- Document care on an ITU chart and record any findings in the notes.
- Prongs/mask should be checked to ensure that they are clean and patent prior to being place back on the infant's nose.

2.8 MONITORING INFANTS WITH CPAP

Hourly observations should be recorded for each infant including:
- Heart Rate
- Respiratory rate
- Oxygen saturations
- PEEP
- Flow of gas
- FiO2
- Humidity temperature
- Position of infant
2.9 PARENTS

- Keep parents informed of progress on CPAP
- If baby is settled encourage parents to have a cuddle or Kangaroo care.

References

Cahill, S. Continuous Positive Airway Pressure (CPAP) Nursing Guidelines. NHS Forth Valley 2012


Audit Criteria

Documentation of hourly and 2 to 4 hourly physical checks in all infants receiving CPAP (100%).

Guideline Development

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>August 2013</td>
<td>Neonatal Guidelines Meeting – text approved subject to amendments</td>
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<tr>
<td>Sept 2015</td>
<td>Amendments, appendices added (REM guidelines lead), Circulation to senior nurses.</td>
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<tr>
<td>Oct 2015</td>
<td>Neonatal Governance Meeting</td>
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<tr>
<td>Nov 2018</td>
<td>Guideline review and Neonatal Governance Meeting</td>
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NB: Paper copies of guidelines may not be the most recent version. The definitive version is held in the Badgernet library and the Trust Policies and Guidelines Library.
Appendix 1:

Visible Eyes

Ensure that the hat fits from the brow to the nape of the neck with the eyes clearly visible.

Fitting the Hat

Use the tape measure provided to select the correct size of hat.

Maintain Good Pressure

The use of a dummy helps to create a better seal which helps to maintain good pressures.
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<tr>
<th><strong>Avoid pressure to the nose</strong></th>
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<td>Leave the exhaust tubing free so that pressure is not applied to the nose.</td>
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| **Duoderm (or other hydrocolloid dressing) is not to be used as a pressure-relieving device.** It is only to be used if the skin is red, non-blanching, bruised or broken. | **Duoderm should be changed every 24 hours or sooner if it becomes displaced. Document the use of duoderm and the reasons for its use in the notes.** |

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<tr>
<th><strong>Regular inspection</strong></th>
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<td>Every 1-2 hours, relieve the pressure from the nasal area by lifting the prongs/mask away from the infant's face, allowing inspection of the area. If baby is pressure-dependent, consider 3-4 hourly pressure relief. Document in notes if baby is unable to tolerate more frequent pressure relief.</td>
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<tr>
<th><strong>Inspiration &amp; Pressure lines</strong></th>
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<td>Secure the tubes coming from the generator with the central Velcro strip. Split the inspiration and pressure lines and secure with the secondary Velcro strip.</td>
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Appendix 2: STOP Poster (prevention of device-related pressure ulcers)

University Hospitals of Leicester NHS Trust – Tissue Viability Service

Skin Inspectors
STOP Device Related Pressure Ulcers!

Remember the 3 Ps:

Position
(ensure correct position i.e device not pressing on patient’s skin)

Protection
(use protective dressing or gel pad)

Prevention
(incorporate regular checks 4 - 6hrs in the daily HAPU prevention regime)

S
- stockings (AES)
- straps
- splints
- tubes /catheters/lines
- NG / PEG tubes
- tube drains
- ET tubes
- CAPD/urinary/ s.p. catheters
- i.v., CVP/TPN lines
- tapes and ties
  (tracheostomy tapes)

T
- oxygen related devices:
  masks, nasal cannulas, CPAP, NIPPV, trachies
- probes (t*, SATs, etc.)
- plaster casts
- DVT prevention devices
- Pans (bed pans)

O

P

Warning signs?

- Blanching / Non-blanching redness under the device
- Painful, sore area under the device
- Hardened area or blister under the device
- Discolouration – dark red, purple, black with the shape of the device
- Broken skin/ ulcer where the device has been resting

NB! Ensure the elements of 3 Ps are documented on the repositioning chart

J.D. 21/03/14