UHL Neonatal Guideline: CPAP Nursing Care

University Hospitals of Leicester NHS Trust

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1. Introduction and Who Guideline applies to

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 H_2O. 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.

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 complication of CPAP in neonates.
- The incidence of nasal trauma can be minimised 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.

Related documents:
Continuous Positive Airway Pressure CPAP, BIPAP, SIPPV in Neonates UHL Neonatal Guideline C17/2023
Respiratory Distress Syndrome - Neonates at Risk UHL Neonatal Guideline.pdf C32/2018
Less Invasive Surfactant Administration (LISA) UHL Neonatal Guideline C47/2020

2. Guideline Standards and Procedures

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.
- There are currently several machines available for use – the Medin mini and NC3 are the principal machines of choice in small babies with evolving or established chronic lung disease. The Arabella and SiPAP machines will be phased out through 2023 but are still useful for babies requiring basic CPAP.
- Initial CPAP is determined by the flow and should read between 5cm and 8 cm H_2O. The pressure required 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 always be humidified.
- 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 are a very important aspects of 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 and make of hat is used, as there are a variety in use depending on the machine used. 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.
- The following Youtube video demonstrates the correct application of the Medin nasal interface.
  Medin Miniflow® - Instructions for use
  https://www.youtube.com/watch?v=o9TS7qSZfdY

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 every 6 hours as a minimum unless the infant cannot tolerate this. Some babies will settle better with one interface and this needs to be recorded in the daily care plan for handover.
- It has been shown that continuous use of one type of interface increases the risk of nasal injury. Therefore, the aim should be to have at least some short periods alternating from mask to prongs to help with skin care even if the infant is better on one interface over another.
- The prongs/mask are secured using the straps from the generator across the infant's cheeks. The angle of their position is dependent on the machine used (see pictures). Do NOT over tighten especially when using prongs as this will disrupt the seal achieved.
- Care should be taken with the straps for the Medin mini to ensure the Velcro ends do not rest on the baby's skin as the edge can cause abrasion.
- The inspiratory and expiratory tubing should rest gently in or above the straps on the baby's forehead and should not exert an upwards pull or pressure.

- 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.
- A Skin barrier dressing is to be applied prior to commencing CPAP and it is to be replaced every 24 hours. Ensure that it is secure and cannot migrate over the nostrils blocking the airway.

2.5 PRESSURES AND FLOW

- CPAP pressures initially will be between 7 and 8cm H_2O but may be lower in the weaning phase.
- The flow is initially set at 8L/m. Pressure is achieved by altering the flow.
- When using the Medin Mini, the flow may need to be altered as the baby's position is changed to maintain the desired CPAP pressure.
- A significant leak is apparent when the flow rate in L/min is higher than the CPAP pressure shown by the machine. This often can be improved by adjustment of the interface (mask or prongs) position.
- 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 individualised to the infant's needs.
- Monitor for "rain out" (excess condensation) in the tubing just above the interface as this requires clearing as soon as building up.
- Monitoring of the infant's vital signs, heart rate, respiratory rate and oxygen saturations should be in place.
- Ensure that the infants 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 individualised 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 24 hours:

- Remove Skin barrier dressing from nasal area using an appeal wipe.
- Check Nasal area for signs of pressure damage
- Complete blue sticker checklist for CPAP care on ITU observation chart

Every hour check visually:

- The generator is positioned correctly
- The nose should not be pushed upwards or squashed
- The eyes should be clearly visible
- The baby in optimal posture with no kinking of the CPAP tube inside the incubator.
- The exhaust tubing should be free so that pressure is not applied to the nose.
- 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:

- Pressure relieved should be short-lived and only alter the strap slightly.
- The nose should be inspected for signs of redness, indentation, bruising or bleeding.
- Ensure that the Skin Barrier Dressing (used for skin protection) 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.

2.8MONITORING INFANTS WITH CPAP

Hourly observations should be recorded for each infant including:

- Mode of CPAP and interface in use
- Heart Rate
- Respiratory rate
- Oxygen saturations
- PEEP
- Flow of gas
- FiO2
- Humidity temperature
- Position of infant

The machine used to deliver CPAP or BiPAP/NIPPV should be clearly recorded on the ITU chart and the time of any changes noted.

2.9 PARENTS

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

3. Education and Training

None

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Documentation of hourly and 2 to 4 hourly physical checks in all infants receiving CPAP (100%)	Documentation audit	Nursing audit lead		Local Audit Group

5. Supporting References

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6. Key Words

CPAP Hats, Humidification, Humidified, Nasal trauma, Oxygen, Pressure, Respiratory distress syndrome, Traumatic injuries,

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The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

Contact and review details			
Guideline Lead (Name and Title) J Lavelle – Advanced Neonatal Nurse R McCoy - Sister			**Executive Lead** Chief Nurse
Details of Changes made during review:			
Date	**Issue Number**	**Reviewed By**	**Description Of Changes (If Any)**
August 2013	**1**	Neonatal Guidelines Meeting	text approved subject to amendments
Sept 2015 Oct 2015	**2**	Neonatal Governance Meeting	Amendments, appendices added (REM guidelines lead), Circulation to senior nurses.
Nov 2018	**3**	Guideline review and Neonatal Governance Meeting	
Jan 2023 – July 2023	**4**	Neonatal Guidelines Meeting Neonatal Governance Meeting Women's Quality & Safety Board	Included examples of different CPAP machines and includes a link to application video. Section 2.4 Guidance added regarding alternating prongs/masks, frequency, and positioning. Skin barrier dressing information added. Section 2.5 – initial pressures changed from 4-6cm H_2O to 7-8cm. Added guidance around baby position change and pressure changes, plus leak identification. Section 2.6 now includes excess condensation point Section 2.7 added 24 hourly checks to be performed. Hourly check for kinking of the tube added. Section 2.8 mode and machine used to be recorded. Format update

Appendix 1: Application of CPAP illustration guide

CPAP hat for use with transport incubator system, SiPAP and Arabella.

Visible Eyes

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

Fitting the Hat

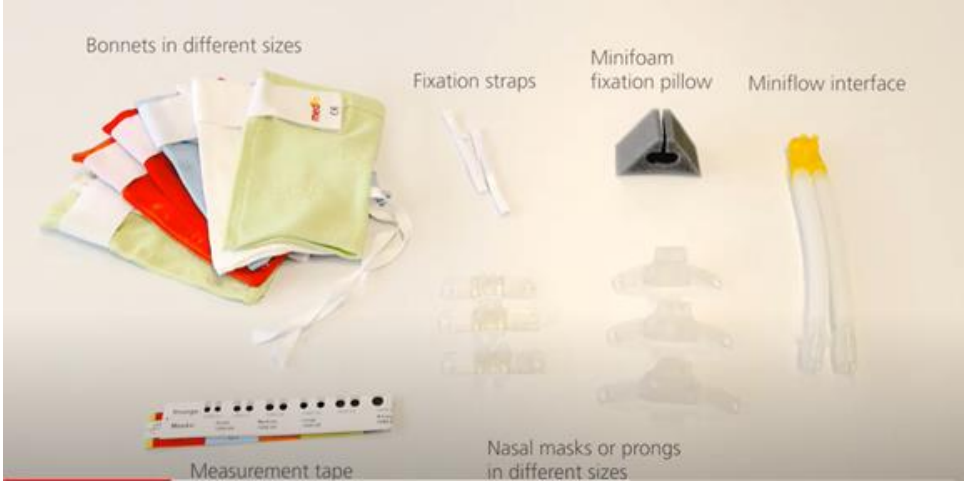
Use the tape measure provided to select the correct size of hat. To ensure the correct size is used, only one finger should be able to pass underneath. If the hat becomes loose please change it.

Correct Mask and Prongs

The use of correct size of the prongs and mask is essential to maintaining a good seal. If tolerated, please rotate between masks and prongs

CPAP hat for Medin Mini and Medin NC3

Note lower position of straps for stabilising the interface



Use of Dummy

A dummy also helps by reducing flow out the mouth.

Avoid Pressure to the Nose

Leave the exhaust tubing free so that pressure is not applied to the nose.

Inspiration and Pressure Lines

Secure the clear tubes (except for the exhaust - which is free) coming from the generator with the central velcro strips, each tube is secured with either of the secondary velcro strips on the top of the hat.

Duoderm or Other Hydrocolloid Dressing

Duoderm to be used as a pressure relieving device if the skin is red, non-blanching, bruised or broken, especially to the septum or bridge of the nose. It is very important to inspect the applied duoderm when used, to ensure that this has not become displaced (potentially occluding the airway). Therefore when being used document the time and date, and inspect that it has remained in place at every inspection.

Regular Inspection

Every **1-2 hours**, relieve the pressure from nasal area by lifting the prongs/mask away from the face, allowing inspection of the area. Document clearly on the ITU chart when nasal pressure relief care has taken place, as well as in the notes. Always ask for a review if you have any concerns.

Nasal Care

Includes observing the area, noting the condition of the skin, ensuring that the area is clean, applying a hydrocolloid dressing such as duoderm if needed, suctioning the nasal and oral pharynx if required.

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!

S
- stockings (AES)
- straps
- splints

T
- 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)

O
- oxygen related devices: masks, nasal cannulas, CPAP, NIPPY, trachies

P
- probes (t˚, SATs, etc.)
- plaster casts
- DVT prevention devices
- Pans (bed pans)

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)

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