

Non-invasive Respiratory Support Nursing Guidance

Standard, Equipment, Preparation, Procedures (arrival to NNU from labour suite, extubation to non-invasive support, optimising care), Potential complications, Notes & References

Standard:

All infants who require non-invasive respiratory support will have it administered safely and effectively.

Equipment:

- Resuscitation equipment, correctly set-up and working
 - Neopuff© attached to oxygen and air blender
 - Suction set to 8-10 kPa and appropriate sized catheters
 - Easy access to intubation equipment
- CPAP (Continuous Positive Airway Pressure) driver or HFNC (High Frequency Nasal Cannulae) driver
- CPAP circuit or HFNC circuit (a disposable water path, a vapour transfer cartridge and a delivery tube. Vapotherm Low Flow Circuit is used in the NNU)
- CPAP generator
- Fischer Paykel heater and humidifier chamber with manual water feed set and 1000 ml bag of sterile water
- Scissors
- Hydrocolloid dressing (such as Comfeel, extra-thin DuoDERM (if considered necessary)
- Appropriate size prongs/mask and hat

Equipment setup in preparation to receive baby ([hyperlink](#))

Infants stabilised on PEEP (Positive End Expiratory Pressure) in delivery room, on arrival to NNU – general points

- The correct incubator temperature and humidity (if required) should be established prior to transfer from resuscitaire.
- The transfer onto non-invasive respiratory support should be done smoothly and quickly to minimise loss of positive airway pressure.
- A neutral thermal environment should be maintained by adjusting environmental factors.

CPAP guide:

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Implementation Date: 7 3 18

Review date 7 3 28

- While on the resuscitaire, remove the 'knitted' hat; measure the baby's head to ascertain the correct hat size. To determine the correct size - measure around the middle of forehead, across the ears to the nape of neck.
- Apply CPAP hat while on resuscitaire, with supportive PEEP, prior to transferring to incubator
 - the hat sits just above the eye brows
 - the back of the hat extends to the base of the neck;
 - the ears should be completely covered by the hat (check to make sure ears are not folded)
 - the button holes in the hat should be positioned over infant's ears
- Use the nasal prong and mask sizing guide to select the prong that best fits the baby
 - if the baby is between sizes, select the larger size.
 - prongs that are too small may lead to over tightening of the straps to eliminate a leak.
 - a mask that is too small may create pressure points on the nose and prevent a good seal from forming.
- Transfer baby to the incubator via scales to obtain a weight.
- Apply the CPAP mask or prongs immediately, trying to minimise the time of any break in CPAP pressures from resuscitaire to incubator and secure appropriately
 - the nasal prong should fill entire nare without causing blanching of external nare, if blanching of the nares occurs, go to the smaller size
 - a small space should be present between nares and prong base and the prong base and the upper lip
- Weave generator straps through the button holes/slits in the hat
- Split the inspiratory and pressure lines and secure and with secondary Velcro ties
- Strap the pressure lines under the velcro at the front of the hat
- Turn on the CPAP flow of gas to achieve desired pressures 4-6cm H₂O. Titrate FiO₂ as required.
- Connect the saturation probe to the bedside monitor
- Insert an oro-gastric tube, aspirating any gas
- Position baby prone and optimise comfort. Avoid excessive flexion, extension, or rotation of the head and neck
- Suction as clinically indicated

HFNC guide

- Transfer baby to the incubator via scales to obtain a weight

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- Once in the incubator select appropriate size nasal cannula for gestation of the baby (premature, neonatal, infant)
- Recommended cannula size will vary depending on the inner diameter of the nares and the outer diameter of the prongs. Vapotherm recommend that the prongs should not occlude greater than 50% of the internal diameter of the nares and suggest the following as a guide:

	Cannula Sizes	Weight	Tip OD
	Premature	<700g	1.5 mm
	Neonatal	<1100g	1.5 mm
	Infant	>1100g	1.9 mm

- Confirm and select HFNC settings appropriate to the baby's gestation or respiratory requirement – a flow 6L/min is usual
- Select temp according to the flow rate
 - For a flow of 5-6L/min temp should be 36-37⁰ C
 - For a flow of 7-8L/min temp should be 37⁰ C
- Place the cannula on the baby; allow the temperature to rise to the set point before attaching the cannula to the delivery tube
- Connect the saturation probe to the bedside monitor.
- Insert an oro-gastric tube, and aspirate any gas.
- Place baby in the prone position and optimise comfort. Avoid excessive flexion, extension, or rotation of the head and neck.
- Suction as clinically indicated.

Extubation onto non invasive respiratory support

The decision to extubate a baby onto non invasive respiratory support should be agreed between medical and nursing staff caring for the infant. Normal escalation procedures apply if there is concern regarding the infants' suitability.

Timing:

- The decision to extubate is based on a number of factors:
 - the work of breathing and spontaneous respiratory effort
 - the ventilator rate, pressure and FiO₂ settings and recent blood gas and Hb results
- Personnel

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- there should be an appropriate skill mix present to aid extubation and support post procedure monitoring
- medical staff/ANPs should be informed of planned timing of the procedure
- Nursing responsibilities
 - confirm with medical/ANP staff the type and settings of the non-invasive respiratory support
 - check that the resuscitation and intubation trolley is readily available
 - prepare, check and confirm functioning of CPAP/HFNC driver
 - establish whether or not Caffeine Citrate is required and confirm it has been given if appropriate
 - undertake nursing 'cares' in advance of the procedure to allow baby to recover post procedure
 - aspirate gastric contents and delay feeding until post procedure
 - undertake a respiratory assessment (including breath sounds, respiratory rate, rhythm, work of breathing) and carry out ETT and naso-pharyngeal suction if required
 - position baby supine
 - inform parents of planned extubation where possible, however if it is not possible to contact parents, this should not delay extubation.

For CPAP

- If considered necessary cut hydrocolloid dressing (such as Comfeel, extra-thin DuoDERM) to the desired size and apply to the upper lip
 - application of a hydrocolloid dressing will obscure visualisation of the skin and may lead to excessive moisture and or alter the positioning of the nasal prongs/mask; both may damage skin integrity
- Extubation onto CPAP is a 2 person technique
 - first person
 - hold the ETT in place
 - second person
 - release the ties of the ETT, and removes the 'knitted' hat
 - determine the correct size of hat and mask/prong using (see **CPAP guide**), whilst ETT remains insitu
 - apply and secure the hat/mask/prongs (see **CPAP guide**)
 - withdraw and discard the ETT
- Turn on the CPAP flow of gas to achieve desired pressure, titrate FiO₂ as required

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Extubation onto CPAP should be done quickly and smoothly to avoid loss of pressure.

For HFNC

- Extubation onto HFNC in a 2 person technique
 - first person
 - hold the ETT in place
 - second person
 - release the ties of the ETT, and remove the 'knitted' hat
 - determine the correct size of prong (see **HFNC guide**), whilst ETT remains insitu
 - apply and secure the prongs (see **HFNC guide**)
 - withdraw and discard the ETT
- Attach the cannulae to the patient delivery circuit

Extubation onto HFNC should be done quickly and smoothly to avoid loss of pressure.

Immediate optimisation of non invasive respiratory support

- Insert an oro-gastric tube, and aspirate any gas
- Place baby in the prone position and optimise comfort. Avoid excessive flexion, extension, or rotation of the head and neck
- Continue to monitor heart rate, respiratory rate, saturation level and temperature; report any deviations from the accepted ranges
- Promote thermoregulation by providing a neutral thermal environment
- Maximise skin integrity - damage to the nares, columella and nasal bridge occurs when poorly fitted or mobile prongs cause friction/pressure. Excessive moisture from humidification and secretions will also increase friction and undermine skin integrity
 - ensure correctly fitting hat and mask/prongs are used
 - prevent twisting or tension on the CPAP circuit
 - monitor skin integrity, circuit humidity and temperature
- Obtain a blood gas if increased FiO₂ or increased work of breathing
- If baby shows signs of deterioration escalate to medical staff/ANPs:
 - frequent episodes of apnoea and bradycardia (more than 2/hour)
 - increased work of breathing
 - requiring stimulation/ventilation breaths/Neopuff for recovery
 - increased FiO₂ (10-20% from previous baseline)

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- persistent hypoxaemia (oxygen saturation <85%)
- respiratory acidosis (pH < 7.25, pCO₂ > 8kPa)
- Aim for minimal handling

Documentation

- Document hat and mask/prong sizes mask/prong changes and skin assessments in EPR

Potential Complications

- CPAP & HFNC: Obstruction of nasal tube/prongs from mucus plugging or kinking
- CPAP application: Nasal excoriation; pressure necrosis, scarring, septal erosion & distortion, nasal stubbing, pain, abrasive conjunctivitis
- CPAP delivery: abdominal distension & feed intolerance, increased work of breathing, pneumothorax, lung over-distension, condensation and instillation into the airways
- HFNC application: Nasal excoriation,
- HFNC delivery: abdominal distension, excessive PEEP leading to pneumothorax, condensation and instillation into the airways

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