

THAMES VALLEY & WESSEX NEONATAL OPERATIONAL DELIVERY NETWORK

SUCTION GUIDELINE: NURSING CARE ON THE NEONATAL UNIT

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Related documents	<p><u>References</u></p> <p>Abraham.A (2020) Endotracheal suctioning. Ashford and St Peters Hospital, Neonatal Intensive Care Unit. Found at; https://ashfordstpeters.net/Guidelines_Neonatal/Endotracheal%20Suctioning%20Oct%202020.pdf</p> <p>APCP (2015) Guidelines for Nasopharyngeal suction of a child or young person, APCP respiratory Group. <u>Association of Paediatric Chartered Physiotherapists</u>, pp1-13. Found at Microsoft Word - SUCTION.docx (csp.org.uk)</p> <p>Bigham.M et al (2009) Ventilator associated pneumonia in the Pediatric Intensive Care Unit: Characterizing the problem and implementing a sustainable solution. <u>The Journal of Paediatrics</u>. April 2009, pp582-87.</p> <p>Bruscetti et al (2016) Frequency of suctioning inside the tube that is used to ventilated newborn babies. Cochrane. Found at: https://www.cochrane.org/CD011493/NEONATAL_frequency-suctioning-inside-tube-used-ventilate-newborn-babies</p> <p>Coles .S and Hallam.E (2020) <u>Clinical Guideline- Suction in self ventilating and ventilated children</u>. University Hospitals Bristol and Weston. Pp1-23. Found at; https://foi.avon.nhs.uk/Download.aspx?r=1&did=8186&f=Suction%20In%20Self%20Ventilating%20And%20Ventilated%20Childre-2_0.pdf</p>

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<p>Implications of race, equality & other diversity duties for this document</p>	<p>This guideline must be implemented fairly and without prejudice whether on the grounds of race, gender, sexual orientation or religion.</p>

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1.0 Aim of Guideline Framework

- To provide a framework to ensure that all infants receiving suctioning are optimally cared for.
- Suctioning is a high risk procedure. To avoid poor outcomes, nurses who perform suctioning must adhere to evidence based guidelines. This guideline describes evidence based best practice for suctioning neonates in the hospital setting.
- Not included within this guideline are the specialised practices of suctioning nasal stents, tracheostomies, naso-pharyngeal airways or infants with repleg tubes insitu.

2.0 Scope of Guideline Framework

The guideline applies to all infants requiring suctioning within Thames Valley and Wessex Neonatal Network Operational Delivery Network.

Thames Valley		
TRUST	Hospital	Designation
Oxford University Hospitals NHS Foundation Trust	- John Radcliffe Hospital, Oxford	NICU
Buckinghamshire Healthcare NHS Trust	- Stoke Mandeville Hospital, Aylesbury	LNU
Frimley Health NHS Foundation Trust	- Wexham Park Hospital, Slough	LNU
Milton Keynes University Hospital NHS Foundation Trust	- Milton Keynes General Hospital	LNU
Royal Berkshire NHS Foundation Trust	- Reading	LNU

Wessex		
TRUST	Hospital	Designation
University Hospital Southampton NHS Foundation Trust	- Princess Anne Hospital	NICU
Portsmouth Hospitals University NHS Trust	- Queen Alexandra Hospital	NICU
Dorset County Hospital NHS Foundation Trust	- Dorset County Hospital, Dorchester	SCU
Hampshire Hospitals NHS Foundation Trust	- Basingstoke and North Hampshire Hospital	LNU
Hampshire Hospitals NHS Foundation Trust	- Royal Hampshire County Hospital, Winchester	LNU
Isle of Wight NHS Trust	- St Mary's Hospital	SCU
University Hospitals Dorset NHS Foundation Trust	- Poole Hospital	LNU
Salisbury NHS Foundation Trust	- Salisbury District Hospital	LNU
University Hospitals Sussex NHS Foundation Trust	- St Richard's Hospital, Chichester	SCU

3.0 Guideline Summary

- All individuals performing suctioning should receive formal training and documented assessment of competence, before suctioning independently.
- Suctioning should be tailored to respond to the infant's behavioural cues and consider their sleep wake cycles wherever possible.

- If a need for suctioning is anticipated, all equipment should be available and in safe working order at the bedside.
- When preparing suction equipment, the suction pressure should be set to 60-120 mmHg / 8-16 kPa (GOS.).
- For all suctioning episodes the lowest negative pressure should be used for suctioning, with the smallest catheter and the shortest suctioning time- that effectively clears secretions.
- Suction pressure may be lowered if the baby is small or unstable, or increased if required to remove thick or tenacious secretions.

ETT suction:

- Where possible ETT suction is a 2 person procedure - especially for the inexperienced practitioner. This will also enable containment and support to be offered to the infant during the procedure.
- The catheter size should not exceed ½ the internal diameter of the ETT tube. For example - ETT of 2.5mm- use a suction catheter size of 5FG.
- Pre-measure the suction catheter to the tip of the ETT and only suction to this depth.
- The time taken to pass and withdraw a suction catheter from the ETT should ideally be 5 - 8 seconds or less for neonates.
- Continuous suction should be used, rather than intermittent suction.
- Do not rotate or twist the suction catheter during withdrawal
- Normal saline instillation should not be routinely used.
- Closed suction is preferable to open suction in ventilated patients.
- It is important that manufacturer's guidelines are referred to for the use of closed suction systems.

NP suction:

- The catheter needs to pass to a depth approximately the distance from the nose to the ear. This should be sufficient to pass the pharynx and stimulate a cough. It is inadvisable to go further and pass through the larynx.
- Catheter size
 - Preterm baby size 4-5 Fr
 - Neonate- birth- 28 days 6Fr
 - Infant 1month-1 year 8Fr

OP suction:

- Aim to insert the catheter when the baby is inspiring, as this will decrease the chance of the catheter being swallowed and entering the stomach.
- The catheter should glide easily through the mouth or oropharynx- never force its passage.
- Catheter size
 - Preterm baby size 4-6 Fr
 - Neonate- birth- 28 days 6-8 Fr
 - Infant 1month-1 year 8-10 Fr
 - Yankauer Sucker- only for the term infant and upwards with large volumes of secretions or very tenacious secretions

4.0 Practice Guidelines

Suctioning is a procedure that needs to be taught and learnt in the clinical setting. Nursing staff should not consider themselves competent to suction as a result of having read this guideline. The guideline is intended as a source of evidence based information and practical guidance that should be used in conjunction with hands on clinical training, to ensure safe, effective and competent suctioning practice.

Basic Steps in Suctioning

1. Only suction when a clear need for suction is identified. Usually by clinical assessment of the infant.
2. Gather required equipment, ensuring:
 - a. The correct size of suction catheter/device.
 - b. The correct setting for suction pressure.
3. Ensure the emergency equipment is close by and the emergency team contact is known.
4. If the infant is being fed continuously, stop the feed to reduce the risk of vomiting.
5. Perform a clinical hand wash.
6. Put on gloves (according to local infection control policy an apron may also be required.)
7. Position the patient to enable easy access to the airway.
8. Perform suction, taking care to suction only to a predetermined length.
9. Assess the infant following the intervention.
10. Ensure infant is recovered and comfortable.
11. Return infant to original position and recommence continuous feeds, if relevant.
12. Dispose of suction catheter/ gloves etc.
13. Perform a clinical hand wash.
14. Document actions and findings

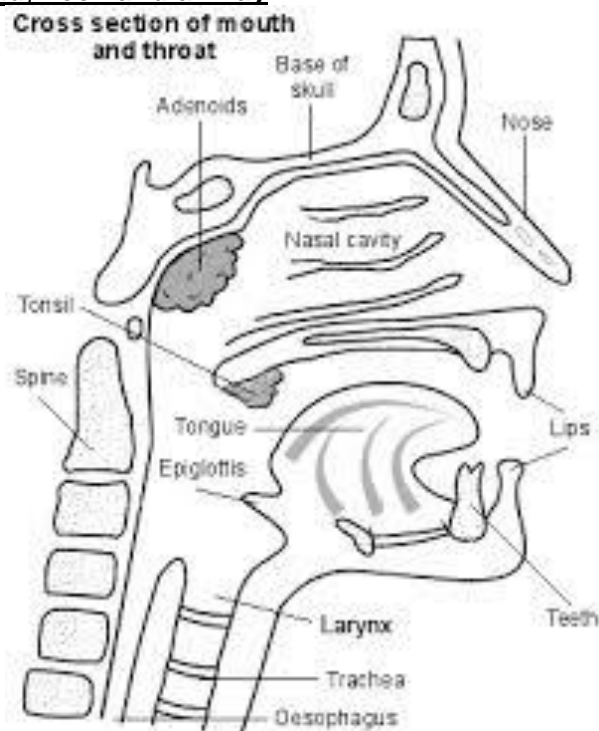
Every nurse taking on the role of suctioning neonates needs to ensure that they make themselves familiar with both the clinical skills and knowledge base behind each of the 14 steps outlined above.

4.1 Purpose of Suction

- Suction is used to clear retained or excessive lower respiratory tract secretions in patients who are unable to do so effectively for themselves. This could be due to the presence of an artificial airway, such as an endotracheal tube or tracheostomy tube, or in patients who have a poor cough due to a variety of reasons such as excessive sedation or neurological impairment'. (GOSH, 2014)

- In self-ventilating patients the upper respiratory tract may need to be suctioned, via the oro or nasopharynx, to enable a child to breathe comfortably, particularly in the presence of increased secretions during a respiratory infection.
- In the intubated patient removing secretions will prevent obstruction, atelectasis and increase lung compliance, whilst optimising oxygenation and ventilation. However there are many potential complications of ETT suction, these include;
 - predispose to bacteraemia
 - hypoxaemia
 - tachycardia
 - bradycardia
 - atelectasis
 - systemic hypertension
 - decreased tidal volume
 - airway mucosal trauma
 - fluctuations in intracranial pressure and cerebral blood flow velocity
 - pneumonia
 - pneumomediastinum
 - Increased TcCO₂
- Although every care should be taken to minimize the occurrence of the above side effects, it is of paramount importance that the objective, the maintenance of a patent airway is achieved. When suctioning is indicated, the decision to withhold suction to avoid potential adverse effects may result in a blocked airway and the risk associated with an emergency reintubation. (GOS 2014)

Reference diagram of the head, neck and airway



4.2 Assessment of the Need for Suctioning

- **Clinical Indications / Findings, that suggest the need for suction;**
 - Increased work of breathing (recession, nasal flaring, chin tug, grunting)
 - Changes in respiratory rate
 - Decreased oxygen saturation
 - Decreased heart rate
 - Increased oxygen requirement
 - Rise in transcutaneous Co₂ (TcCO₂) reading
 - Fall in transcutaneous oxygen (TcO₂) reading
 - Change in ventilation flow pattern- show on ventilator LED display
 - Reduced tidal / minute volume values – show on ventilator LED display
 - Infant may be making unsuccessful attempts to clear secretions i.e. coughing
 - Copious secretions which may be visible in an opaque et tube, spilling out of an infant's mouth, visible collection / plugs of mucous at infants lips
 - Audible secretion sounds with each breath (i.e. rattling or swinging in tube, wet sucking in and out at tip of tracheostomy)
 - Blood pressure fluctuations
 - Irritability / agitation of the infant
 - Cyanosis / pale or mottled appearance
 - Recent history of large amounts of thick / tenacious secretions
 - Examination of the chest x-ray
 - A change in the blood gas values
 - A baby that has just been repositioned will often require suctioning, as the secretions can be 'loosened' by the movement, and obstruct the airway totally or partly.
- Auscultate with a stethoscope before, during and after the procedure in order to evaluate the necessity of and effectiveness of the procedure.
- Remember that it is possible that causes for respiratory distress may be other than a need for suctioning. For example a pneumothorax, fluid overloads or misplaced artificial airway.
- It has been standard practice to avoid suctioning for up to 8-12 hours after endo-tracheal surfactant administration. This is to allow the surfactant as much time as possible to remain in the lungs and achieve its purpose. However, more recent scientific literature indicates that surfactant absorption/ utilisation has actually occurred within 1-2 hours after surfactant administration- and safe suctioning can occur, if required.

4.3 Developmental Care Considerations

- Time procedures to infant's sleep wake cycles wherever possible.
- Whenever possible provide containment and support to the infant during the procedure. This can be done by a parent or other helper when available, but appropriate use of nesting and bedding can also help.
- Tailor the pace of the procedure to respond to the infants behavioural cues and allowing space for the infant to reorganise to a calm state.
- Where possible aim to provide 20-30 minutes of rest post procedure to recover before the next activity.

4.4 Equipment

- Functioning wall suction or a mobile suction unit should be available by every patient who may require suctioning. There should be suction tubing connected to the device (checked at

beginning of shift) and appropriately sized suction catheters and / or Yankauer suction catheter available, which connect into this system.

- The suction system should be checked at the beginning of each shift to ensure it is working, and also to ensure that the pressure level is set correctly.
- When preparing suction equipment in case it is required, the suction pressure should be set to 60-120 mmHg / 8-16 kPa (GOS.)
- A Neopuff, Ambubag or similar should be available next to every patient who may require suctioning (checked at the beginning of the shift).
- Suction catheters for suctioning artificial airways should be available (open or closed system) as appropriate for the size of the airway, ideally less than half the diameter of the artificial airway, so there is still leeway for air flow around the catheter during the suction procedure. See table below.

ETT size in mm	Suction catheter size
2.5	5 FG
3.0 - 3.5	6 – 7 FG
4.0 - 4.5	8 FG

- Suction catheters used for oropharyngeal suction will vary, dependent on the size of the infant, but should be available from FG size 5 to FG size 12 to cover the range of infants cared for on neonatal units.
- The suction catheters should be of a type that is graduated, with two lateral side holes smaller than the end hole. This allows secretions to be collected distally and from the sides of the tube.
- Ensure a new suction catheter is used for each pass, and that the tip of the suction catheter remains clean and untouched during the preparations before suctioning. In particular a suction catheter used for tracheal suctioning should never have first been used for oral or nasal suctioning, as it will be contaminated with bacterial flora.
- Yankauer Suction catheters can be are a more rigid suction device, designed specifically for oro-pharyngeal suction. They can be useful for infants with large volumes of secretions or very tenacious secretions. If used, the appropriate size should be selected, to avoid damage or discomfort to the infant’s mouth.
- Normal saline and a small volume syringe should be available if normal saline lavage is required, (although this should never be done routinely) or the suction system requires flushing after use.
- Change suction extension and collection pot at least every 24 hours – date and time pot and tubing to facilitate this process.
- Change inline suction system at least 24 hourly - date and time to facilitate this process.

4.5 Liquefying Secretions

- When secretions are liquefied they will come more readily up the suction catheter during suction.

- The best way to ensure liquefied secretions is for the infant to be receiving humidified respiratory gases if requiring ventilator support (i.e. high flow therapy, or nasal CPAP / DuoPAP/ BiPAP).
- A Swedish nose humidifier will do the equivalent job for infants with a tracheostomy who are breathing independently.
- A well hydrated infant will naturally have more loose/ liquefied secretions.
- Using saline routinely to liquefy secretions is not recommended, as this practice can;
 - Lead to decreased post suctioning oxygen saturations.
 - Increases bacterial colonisation.
 - Damage bronchial surfactant.
- If saline is instilled via an artificial airway, it will be done with the purpose of;
 - Loosening or mobilising tenacious secretions.
 - Making the infant cough, which may loosen and dislodge secretions.
 - Hoping it may lubricate the ETT.
- This practice should be done only by an experienced practitioner, and with caution. (GOS)
- If saline is used, it should be 0.9% normal saline, and in the volume of 0.1-0.2ml/kg.
- A new plastic saline ampoule should be used for each episode of suction.

4.6 Preparation/ Physiological Stability

- Where possible ETT suction is a 2 person procedure - especially for the inexperienced practitioner. If an assistant is not available, then at the very least someone must be available to assist if a complication arises, such as the baby exhibits a profound negative response, accidental extubation or it becomes necessary to adjust the ventilator settings.
- **The timing of suction should be tailored to each infant, rather than performed to a set schedule.** This will ensure that a patient is not suctioned more than necessary, but conversely should also ensure that the patient is suctioned when needed, so reducing the risk of secretion build up, and increasing the patients discomfort or work of breathing.
- An exception to this rule is the patient with a new tracheostomy where in the first 12-24 hours the patient must be suctioned every 30 minutes and then regularly (as required) until the first tube change. GOS (2014)
- If the patient is on continuous feeds turn the feed off prior to suctioning, to reduce the risk of vomiting.
- Proceed to suction with caution if the patient has recently had a bolus feed, due to the risk of vomiting and subsequent aspiration. If a baby is at high risk, or known to vomit during suction then consider aspirating their total stomach contents before the suctioning episode, and then returning the stomach contents afterwards.
- In the intubated patient, ensure they are adequately sedated.
- For the awake non-ventilated baby, it may be advisable to wrap them securely in a sheet and place in the side lying position, if there is no parent or colleague free to support them.
- In general it should be possible to suction an infant so that they remain physiologically stable throughout the procedure. This may require some skill, planning and careful handling by the infant's nurse. Before commencing suctioning consider carefully;
 - Whether you need the help of one or even two colleagues, to make the process smoother or quicker.

- Is suctioning really required now? It should not be done routinely - although there is a safe minimum frequency of suctioning required for infants with a tracheostomy or ett in situ.
 - Is the infant in the best position to tolerate suctioning? If not, position the patient to enable easy access to the airway.
 - Has the infant just received a lot of handling? Could suctioning be delayed to allow the infant time to recover?
 - If the infant will be receiving more care than just suctioning, could the suctioning be done first when the baby is best able to manage?
 - Would the infant benefit from a parent or colleague providing comfort/ reassurance during suctioning? To assist them in their ability to tolerate the procedure.
- For some infants it may be necessary to anticipate the infants need for increased respiratory support during a suctioning procedure. See section 3.9 on the medically fragile infant.

4.7 Reassess / Evaluation

- Effectiveness of every suction episode should be assessed after the procedure by observing and documenting;
 - Physiologic response to the procedure.
 - Secretions gained- describing colour, consistency and volume.
 - Improvement in breath sounds.
 - Improved oxygen saturations, TcCo2, heart rate, blood pressure, respiratory rate.
 - Decreased work of breathing, improved chest movements.

4.8 Documentation

- Amount, consistency and colour of secretions.
- Degree of tcCO2 changes and amount of time to return to baseline.
- Degree of bradycardia and amount of time to return to baseline.
- Other physiological or behavioural changes.
- Infant's tolerance of the procedure and what technique / equipment worked best for them (i.e. side lying, pre-oxygenation, parental presence).

4.9 The Medically Fragile Infant

- For some infants it may be necessary to anticipate the infants need for increased respiratory support during a suctioning procedure. This is most likely when;
 - They are requiring high levels of respiratory support and only just maintaining acceptable stability already e.g. babies receiving Nitric Oxide, babies receiving high ventilation pressures, babies with chest drains in situ, babies in 100% oxygen.
 - Often particular individual babies are known to tolerate suctioning poorly- and this information is passed on by a colleague who has cared for the baby on the previous shift.
- Additional support may also include;
 - **Pre oxygenating** – this may be simply increasing the FiO2 by 2-3% in anticipation of a slight drop in oxygen saturations during suctioning; to counterbalance the slight decrease in oxygen saturation that otherwise occurs.
 - Increasing the infant's oxygen prior to the procedure, bringing their saturations up to the top end of the acceptable range, so that they tolerate the procedure as well as possible, and the resulting desaturation is minimised.

- Pre oxygenation can significantly reduce the adverse effects of hypoxaemia related to ETT suction, however it can also contribute to long-term adverse effects on the infant. These include retinopathy of prematurity, parenchymal lung damage and oxygen free radical damage and should therefore be done, only when clinically necessary. E Of E 2020.
 - **It is important that nursing staff caring for an infant are familiar with the pathophysiology of their patient before administering oxygen. Some infants with certain congenital heart defects will be develop severe cardiac instability if high levels of oxygen are administered.**
- **Hyperinflating** - this can be carried out for intubated, ventilated infants and consists of electively increasing the PIP or MAP for a brief time around the episode of suction, enabling the procedure to be tolerated. Guidance on this practice suggests;
- Increasing PIP by 10-20% above baseline for approximately 2 minutes prior to suction and continuing after suction until the baby has returned to its pre-suction oxygen saturation level.
 - For infants on HFOV usually MAP is increased by 1-2cmH₂O above baseline for 1-2 minutes prior to suction and continues after suction until pre-suction oxygen saturation levels are achieved.
 - Guidance on which value to change and by how much is often passed on by the nurse caring for the baby on the previous shift, who may also be able to advise how long the baby is likely to take to recover.
 - Care should be taken to ensure that the setting is reduced to the pre-suction level as soon as possible after ETT suction.
- **Hyperventilation**- this can be carried out for intubated ventilated infants any may reduce hypoxaemia and shorten stabilisation and recovery times. It is performed by increasing the ventilator rate setting by 5-10 breaths a minute, above the baseline immediately prior to suction. This elevated rate continues during and after suction, until the infant returns to the pre suction oxygen saturation and TcCo₂ level –if monitored.
- This technique is not usually performed for infants on HVO ventilation, as other options are more appropriate.

These three practices are something that would be discussed and agreed with the medical team and senior nursing staff, and not carried out as a decision made independently by one nurse.

4.10 Parents

- It is the carer's responsibility to ensure the baby's parents understand the rationale for the procedure, as well as the potential complications.
- Parents who are present during suction episodes should be offered the opportunity to provide comfort and support to their baby during the suctioning.

4.11 Training

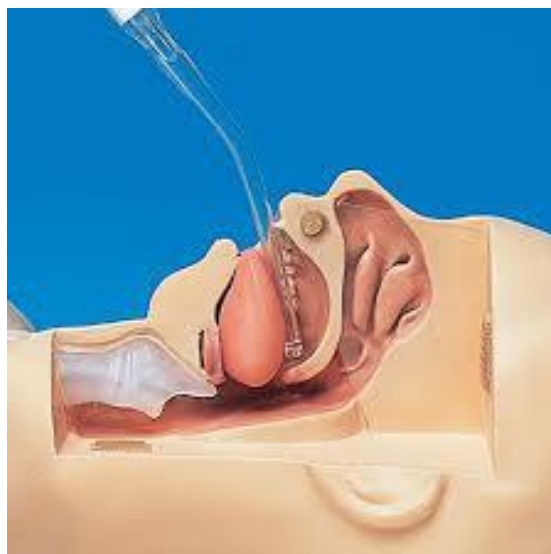
- All individuals performing suctioning- which may be nursing staff, medical staff, physiotherapist or other members of the MDT or the baby's parent(s) or guardian, should receive training in;
 1. Respiratory assessment.

2. Indications for suction.
3. Suction technique.
4. Potential side effects.
5. Signs of clinical deterioration.
6. Basic life support.
7. How to document the procedure.

4.12 Oropharyngeal (OP) and Nasopharyngeal (NP) Suction

- Infants will usually keep their oropharynx and nasopharynx clear by coughing, sneezing and by the protective mechanisms of the gag/cough reflex. NP and OP suction is therefore an invasive procedure and may be traumatic to the infant.
- NP and /or OP suction is most commonly performed on the semi-conscious or unconscious infant who is unable to maintain a safe airway. However babies receiving respiratory support may gather secretions in their oro and/ or naso-pharynx that they cannot effectively clear themselves. Both due to drying of secretions by the continual flow of respiratory gases, or due to physical obstruction of swallowing and cough mechanisms, by an ET tube.
- OP/ NP suction can also be required to remove vomit, blood or other foreign material.
- NP suction can stimulate the vagal nerve, causing bradycardia and more rarely arrhythmia or cardiorespiratory arrest. The risk of this occurring can be minimised by not suctioning aggressively, but using a gentle pressure and steady speed. Should this vaso-vagal response occur, cease suctioning and support the baby to recover, before repeating the suction attempt.
- If endotracheal and oropharyngeal suction are both required, experienced staff identify that by preference they would suction oropharyngeally first, before going on to do endotracheal suction. In their experience ett secretions are more effectively cleared if the op is cleared of secretions first.
- It is regularly noted in practice that babies being nursed on CPAP can build up collections of dry white secretions deep in their oro-pharynx. It is not recommended to routinely suction deep into the oropharynx, however if baby becomes less stable on CPAP, (for example having an increased oxygen requirement or increased work of breathing) it would be appropriate to attempt deeper suction, in case such secretions are the cause of the problem.

Diagram showing Oro-pharyngeal Suctioning, using a Yankauer Suction Catheter



Nasopharyngeal (NP) Suction Process

- If the infant's condition allows, position them side lying with their head slightly elevated in relation to their body and with a degree of cervical extension.
- Select the correct size catheter
 - Preterm baby size 4 - 5 Fr
 - Neonate- birth - 28 days 6 Fr
 - Infant 1month - 1 year 8 Fr
- Estimate the length of catheter insertion required to achieve safe and effective suctioning. The catheter needs to pass to a depth approximately the distance from the nose to the ear. This should be sufficient to pass the pharynx and stimulate a cough. It is inadvisable to go further and pass through the larynx.
- Gently insert the catheter onto the nostril on inspiration without applying suction, directing the catheter towards the opposite eye.
- If obstruction is encountered, withdraw a small amount and gently reinsert, never use any force to push the catheter down.
- Insert the catheter until the infant coughs or resistance is felt. If resistance is felt, withdraw the catheter slightly, then apply negative pressure and withdraw catheter applying continuous suction.
- Do not rotate or twist the suction catheter during withdrawal.
- Remove the catheter if misdirection into the oesophagus is suspected (i.e. swallowing, gagging, suctioning of gastric contents) and dispose of this now unhygienic catheter.

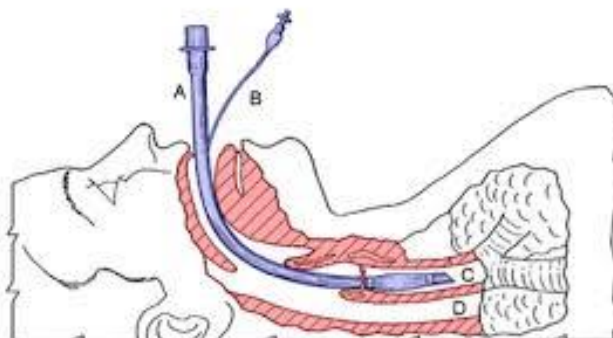
Oropharyngeal (OP) Suction Process

- Consider pre-oxygenating if concerned about SaO or PaO₂.
- Select an appropriately sized catheter- this is individual, but will depend on the size of the baby's oropharynx and the type of secretions being suctioned.
 - Preterm baby size 4 - 6 Fr
 - Neonate- birth - 28 days 6 - 8 Fr
 - Infant 1month -1 year 8 - 10 Fr
 - Yankauer Sucker - only for the term infant and upwards with large volumes of secretions or very tenacious secretions
- Aim to use the smaller size catheter for the infant's age category, as using the smaller sized catheter will minimize trauma to the oral mucosa, however, if the OP secretions are very thick, they may not pass effectively up catheter and the larger size may be required.
- Aim to insert the catheter when the baby is inspiring, as this will decrease the chance of the catheter being swallowed and entering the stomach.
- The catheter should glide easily through the mouth and oropharynx - never force its passage within the mouth.
- If a cough is initiated withdraw from that point, otherwise insert the catheter until resistance is felt, then withdraw slightly and apply the suction continuously as the catheter is moved and withdrawn.
- Gently move the catheter around the mouth, particularly where secretions may have pooled, for example, under the tongue or in the cheek pouches.
- Suction with caution if a baby has an oro-gastric tube in situ, as there is a risk that the suctioning process may accidentally dislodge or alter the position of the tube.
- OP suction may be contraindicated if the baby has had recent facio-maxillary surgery, a complex cleft lip and palate condition, or if there are any concerns about oropharyngeal trauma or lesions. In these situations be guided by the medical team.

4.13 Endo Tracheal Tube Suction (in line / closed or open)

Diagram showing cross section through the head and neck of an intubated adult

(A -Endotracheal tube. C-Trachea. D- Oesophagus)



Open suction

- For ETT suction, set the suction pressure to 60-120 mmHg / 8-16 kPa (GOS).
- Suction pressure may be lowered if the baby is small or unstable, or higher if required to remove thick or tenacious secretions.
- The lowest negative pressure with the smallest catheter and the shortest suctioning time- **that effectively clears secretions**- should be used.
- Measurement of length to suction should be predetermined at the beginning of a shift, by adding the length of the ETT and any additional length of the ETT adaptor(s).
- The catheter size should not exceed ½ the internal diameter of the ETT tube – see the table below.

ETT size in mm	Suction catheter size
2.5	5 FG
3.0 - 3.5	6 – 7 FG
4.0 - 4.5	8 FG

- Use a clean catheter for each pass, and never use the same catheter just used for oral suction as the mouth/ nose are considered contaminated with normal bacterial flora.
- Normal saline instillation should not be routinely performed for ET suctioning.
- Do not rotate or twist the suction catheter during withdrawal.
- Minimize the time spent disconnected from the ventilator, between 6-10 seconds is acceptable, from insertion to the end of withdrawal.
- Allow 20-30 seconds between passes to enable the infant to recover.
- Only apply suction (negative pressure) when the catheter is being withdrawn.
- The number of suction passes should be kept to a minimum.
- If the suction catheter does not have any centimetre marking on it, the length for suctioning should be documented on a measuring tape that is clearly visible on the cot.

- Suction should be to the tip of the ETT in the majority of circumstances. 3 exceptions to this rule are;
 1. Identify from the infant's most recent chest x-ray what position the ETT is sitting within the airway. If the tip is sitting on the carina then one must NOT suction past the end of the ETT. However, if the ETT tip is sitting high and the patient is not coughing it may be necessary to insert the suction catheter beyond the end of tube, although it should never exceed more than 1cm beyond the tip of the ETT.
 2. If there is concern that the ETT is obstructed, this is another situation in which the catheter may be cautiously advanced beyond the tip of the ETT.
 3. Where a qualified physiotherapist or respiratory therapist has advised suctioning beyond the end of the ETT, and the nurse has received training in how to do this safely.
- A small amount of sterile water can be used to clear secretions from the suction tubing after use (not the suction catheter, which will be disposed of after use) This is done by placing the end of the tubing into a bottle of sterile water designated for the purpose. The suction is turned on for 1-2 seconds allowing a larger volume of water to be sucked up the tubing. Flushing away any secretions sticking to the sides of the tubing.

Open Suction Process

- Gather required equipment, ensuring
 - Selection of the correct size of suction catheter/device.
 - Identification of the length required to pass the suction catheter down to the tip of the ETT.
 - Identification of the correct setting for suction pressure.
- Perform a clinical hand wash and /or gel hands - according to local policy.
- Put on gloves (and apron if required).
- Position the patient to enable easy access to their airway.
- Open suction catheter package maintaining the sterility of the catheter.
- Attach catheter end to connection tubing from the suction apparatus.
- Adjust wall suction to desired setting.
- Disconnect the infant from the ventilator- ensuring the ventilator connections are kept clean.
- With clean gloved hand, advance the catheter to the pre-measured depth without applying suction.
- Apply continuous suction whilst slowly withdrawing the catheter.
- If further suction is required repeat the process.

Closed Suction

- Closed suction is preferred to open suction in ventilated patients because closed suction benefits the infant by maintaining positive pressure ventilation, ensuring a stabilised PEEP, allowing a continuous oxygen supply, reducing levels of hypoxia, minimising blood pressure variation, gives less atelectasis and a shorter length of time to return to baseline physiological parameters.

- It is compatible with all modes of ventilation, and particularly beneficial when used on infants receiving High Frequency Oscillatory Ventilation, or Nitric Oxide therapy as there is no interruption to.
- Set the suction pressure to 60-120 mmHg / 8-16 kPa, however, staff should be aware that closed suction is identified in the literature as often requiring suction pressures at the higher end of the recommended range, to ensure effective removal of secretions occurs.
- The suction is equally as effective with closed suction, as when using open suction. However, the noise of the suctioning is muted by the closed system and may give the impression it is less effective.
- Normal saline instillation should not be routinely performed for ET suctioning.
- There are a range of different inline circuits for suctioning infants. All the systems are similar in principle, but do vary between manufacturers. It is important that manufacturer's guidelines are referred to for instruction for use and that all staff receives training in the clinical setting and assessment of competence.
- The suction catheter within the closed suction system is marked with bands of colour at different lengths along the catheter. It will be necessary to identify before suctioning, which colour band will be the 'reference colour' during the suction episode.
- The reference colour is determined by the size of the ETT and its length within the baby's trachea. When suctioning the infant, the pre-determined reference colour will be used to guide how far in the suction catheter is passed, as the colour band will be viewed in an observation window.
- When setting up the system for the first time, it is usually necessary to place a special Y adaptor on the end of the ETT, to enable the suction system to be attached. The original connector from the end of the ETT tube should be retained, as if the suctioning system is removed, the ETT tube cannot be ventilated without this connector in place.
- Ensure the visible presence of the black tip of the closed circuit suction catheter within the dome component, following suction. Otherwise air can leak out from the catheter tip and cause the plastic sheath around the catheter will swell up with air. If this occurs, remove the catheter briefly from the Y adaptor, and squeeze the air out of the sheath, then replace immediately.
- Closed suction catheters must be flushed with normal saline after each episode of suctioning.
- If secretions plugs can be seen on the tip of the catheter, despite flushing after use, then the catheter can be disconnected briefly and the tip wiped with a sterile wipe. If this is ineffective the catheter should be changed.
- The control valve is lockable and is usually kept locked between episodes of suctioning, to prevent accidental depression of the valve.
- In line suction should be changed a minimum of every 24hours.
- If the ventilator indicates air leak, following suctioning- check that all the suction connections are tightly in place and secure.
- If collecting a specimen to send to the laboratory for microscopy, culture and sensitisation then use a new in-line suction catheter to do the procedure- this can then be left in place afterwards.

Closed Suction Process

- Prepare for suctioning by
 - Selection of the correct size of suction catheter/device, if a new catheter is being put in place.
 - Identification of the length required to pass the suction catheter down to the tip of the ETT and its correlating colour or number.
 - Identification of the correct setting for suction pressure.
- Perform a clinical hand wash and /or gel hands- according to local policy.
- Put on gloves (and apron if required).
- Position the patient to enable easy access to their airway.
- Unlock in line suction.
- Stabilize the catheter and endotracheal tube with the non-dominant hand.
- Advance the catheter to the premeasured depth, whilst pulling back the plastic sheath.
- Depress the control valve to apply suction and wait 1-2 seconds to obtain the full suction pressure.
- Maintain the suction whilst withdrawing the suction catheter fully, whilst stabilizing the endotracheal tube to prevent dislodgement.
- Ensure the catheter tip is fully retracted at the end of suctioning to prevent obstruction of the ETT.
- Check viewing port for secretions and assess the patient.
- If further suctioning is required repeat procedure.
- If further suction is required repeat the process.
- Clean the catheter of debris by flushing sterile 0.9% saline via the irrigation port whilst simultaneously applying suction.

Version Control:

Version	Date	Details	Author(s)	Comments
1 DRAFT	8 Aug '16	New Guideline produced by the TV Neonatal ODN Quality Care Group circulated to TV&W Lead Nurses for comments/feedback.	KR (Chair)	Comments/feedback received
1	Oct '16	Updated with comments/feedback received presented to TV&W Neonatal ODN Governance Group for ratification	KR (Chair)	Approved with agreed comments.
2	March 2020	Updated and amended	KR (chair)	Ratified by TV & W governance group March 2020
3	March 2023	Updated and amended	Guideline group	Ready for review
4	June 2023	No comment received- minor changes made, new references added.	Guideline group	Guideline Ratified
Review Date:	June 2026			

Appendix 1

10 Controversies of Suctioning: The Evidence Base

1. Suctioning should never be performed routinely, only as indicated by individual patient assessment and following the clinical signs.
2. Hyper-oxygenation before suction has been found in adult studies to prevent hypoxia, however due to concerns about the effect of high oxygen levels on preterm infants, it is not recommended to be performed routinely for neonates.
3. Whenever possible use a suction catheter with an external diameter that is a maximum of 50% of the internal diameter of the ETT.
4. The lowest effective suction pressures are considered the best choice, for minimizing iatrogenic effects of suctioning.
5. Studies have shown better physiological stability for infants receiving closed suctioning. However, the financial cost of the closed and open systems is comparable.
6. When drawing back the suction catheter during ETT suction, continuous suction should be used, rather than intermittent suction as it minimizes the risk of tracheal damage and alveolar collapse.
7. A long duration of suctioning is not best practice, ideally 5 - 8 seconds or less for neonates.
8. Pre-measured suctioning to the approximate tip of the ETT is considered the best practice for normal suctioning, as current available evidence suggests that deep suctioning could be harmful.
9. There is no recent evidence to support the routine instillation of saline.
10. There is no evidence that lung volume recruitment manoeuvres following suction are beneficial.