



Endotracheal Suctioning

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Guideline History

Date	Comments	Approved By
5.10.20	Written by Ancy Abraham and ratified by Neonatal Guidelines Group	Dr. S. Edwards

Patients first • Personal responsibility • Passion for excellence • Pride in our team

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 1 of 25
---	---	-----------------	--------------	-------	--------------

Contents

Page

1. Guideline
 - a. Introduction
 - b.
2. Supporting References
3. Supporting Trust Guidelines
4. Guideline Governance
 - a. Scope
 - b. Purpose
 - c. Duties and Responsibilities
 - d. Approval and Ratification
 - e. Dissemination and Implementation
 - f. Review and Revision Arrangements
 - g. Equality Impact Assessment
 - h. Document Checklist
5. Appendices

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 2 of 25
---	--	-----------------	--------------	-------	--------------

Endotracheal Suctioning

Introduction

To provide a framework to ensure that all infants receiving suctioning are optimally cared for using the best available evidence to minimise variations in practice.

Airway suction is necessary to remove excessive lower respiratory tract secretions in patients who are unable to do so effectively themselves for a variety of reasons. The presence of an endotracheal tube (ETT) impairs the body's ability to mobilise and expel secretions and may increase mucous production.

ETT suctioning is an essential component of care for the intubated baby. Successful suctioning of an intubated patient improves gas exchange, oxygen saturation, arterial blood gas values and breath sounds. It decreases the peak inspiratory pressure and airway resistance, increases dynamic compliance and tidal volume delivery, and removes secretions (American Association of Respiratory Care, 2010).

The need for suctioning should be based on assessment of the infant's clinical status. Qualified staff should assess the need for ETT suctioning as a routine part of the patient assessment. The amount and type of secretions removed via suctioning in the past 12 hours should be considered.

INDICATIONS:

- Audible or visible secretions in the ETT
- Coarse/ decreased breath sounds on auscultation
- Reduced chest movement/ Increasing work of breathing
- Deterioration of oxygen saturations and/ or blood gas values
- Increasing transcutaneous CO2 levels
- Bradycardia
- Changes in respiratory rate and pattern
- Increased agitation or irritability
- Increased peak inspiratory pressure during volume-controlled mechanical ventilation or decreased tidal volume during pressure- controlled ventilation.
- Sawtooth pattern on the flow- volume loop on the monitor screen of the ventilator (check that there is no excess water in the ventilator tubing as this can give the same saw tooth pattern on the flow volume loop). (See Appendix 1.)
- To obtain an ETT secretion sample to rule out pulmonary infection.
- If babies have been repositioned. (Gardner and Shirland, 2009)

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 3 of 25
---	--	-----------------	--------------	-------	--------------

COMPLICATIONS ASSOCIATED WITH ETT SUCTIONING:

Airway suction is necessary to remove secretions and prevent obstruction. However, serious complications may result from the procedure:

- Atelectasis
- Hypoxia/Hypoxemia
- Bronchoconstriction/ Bronchospasm
- Tissue trauma to the trachea and /or bronchial mucosa
- Increased microbial colonisation of lower airway
- Changes in cerebral blood flow and increased intracranial pressure
- Hypotension/ hypertension
- Cardiac arrhythmias
- Pneumothorax
- Pain and discomfort (Gillies and Spence, 2011)

SALINE INSTILLATION:

Normal saline should not be routinely instilled prior to ETT suction in infants. It should only be instilled in infants who have thick, tenacious secretions. The amount of normal saline to use is 0.25 -0.5ml (0.25ml for <2kg, 0.5ml for >2kg infant) (Shorten *et al*, 1991). A new ampoule of saline and syringe should be used for each episode of suction. Routine use of normal saline instillation may be associated with the following **adverse events:**

- Decreased oxygen saturation
- Bronchospasm
- Tachycardia
- Increased intracranial pressure
- Increased arterial blood pressure
- Dislodgement of bacteria that colonize the ETT into the lower airway
- Pain, agitation (American Association of Respiratory Care, 2010)

Optimal hydration and adequate warming and humidification of inspired gas is necessary to maintain the normal consistency of secretions and reduce the risk of a blocked ETT. Investigations into the underlying causes of excess or thick secretions should be explored and addressed, i.e. potential sepsis.

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 4 of 25
---	---	-----------------	--------------	-------	--------------

RECOMMENDED SUCTION CATHETER SIZE & LENGTH:

The size of the suction catheter should not exceed one-half the diameter of the ETT. This is to ensure that there is still air flow around the catheter during the suction procedure. For closed suction, multiply the ETT diameter by 2 to ascertain the correct size (see table below).

ETT size in mm	Suction catheter size	Colour
2.0mm& 2.5mm	5FR	Grey
3.0mm	6FR	Green
3.5mm	7FR	Ivory

(Manufacturer’s recommendation, Kimberly-Clark)

Y-Adapter size selection:

Each Y Adapter has a number printed on it

Match the number on the Y connector to the size of the ETT

DEPTH OF SUCTIONING

The suction catheter should be inserted to a pre-determined length and **should not** be advanced beyond the ET tube tip, usually the length of the ETT plus the adapter. Deep suction, is when the suction catheter is passed beyond the tip of the ETT to the carina where the resistance is met and / or the infant coughs, followed by withdrawal of the catheter by 1 cm before application of negative pressure. Deep suction CAN cause mucosal damage, possible tracheal/bronchial perforation and haemorrhage, bradycardia and hypotension. DEEP SUCTION IS THEREFORE NOT RECOMMENDED IN NEONATAL CARE.

(Gillies and Spence, 2011)

Length of suction catheter (depth) in cm= Position of ETT at nares / lip (in cm) + distance from nares/lip to the Y port.

METHODS OF ETT SUCTIONING:

There are two methods of ETT suctioning: **open** and **closed**. The open suctioning technique requires disconnecting the patient from the ventilator, while the closed suctioning involves attachment of a sterile, closed in-line suction catheter to the ventilator circuit which allows the passage of suction catheter through the artificial airway without disconnecting the patient from the ventilator. Disconnection can cause a fall in functional residual capacity, lung recruitment and possible atelectasis therefore **CLOSED SUCTION IS THE PREFERABLE METHOD IN NEONATES**. This is especially important when the infant is receiving HFO and/ or Nitric Oxide Therapy.

RECOMMENDED NEGATIVE PRESSURE AND LENGTH OF TIME NEGATIVE PRESSURE SHOULD BE APPLIED.

The duration of the suctioning event should be limited to less than 15 seconds. The lowest negative pressure that will effectively clear the secretion should be used. The recommended negative pressure for neonates is 10-13 kPa (80-100 mmHg)

(Taylor *et al.*, 2011)

COMFORT MEASURES:

Suctioning is considered as one of the most frequent, painful and uncomfortable procedures infants are exposed to in the neonatal intensive care setting (Ward-Larson 2004). Facilitated tucking or containment holding is a developmentally sensitive, comfort measure that can relieve pain in VLBW infants during ETT suctioning. This can be done by a parent or other helper when available.

(Shamali *et al.*, 2017)

SURFACTANT ADMINISTRATION VIA ETT & SUCTION

Suctioning prior to surfactant administration may lessen the probability of endotracheal tube blockage following administration. **Suction should be avoided for at least one hour** after surfactant administration unless signs of significant airway obstruction occur.

(Manufacturer's recommendation-Curosurf)

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 6 of 25
---	---	-----------------	--------------	-------	--------------

ASSESSMENT OF NEED

For all type of suction, an assessment of need should be undertaken:

- Have the physical parameters changed?
- Is the chest moving?
- What was the result of the most recent blood gas?
- Auscultate the chest - Are the breath sounds noisy? Is air entry equal?
- Has the tidal volume or minute volume decreased?
- Has the oxygen requirement increased?
- When was the last suction performed and what were the secretions like?
- Has the infant recently been handled or repositioned?

If the decision is made not to carry out suctioning, clear reasoning should be documented in the notes to demonstrate an active thought process rather than an oversight, i.e. "Suctioning not carried out at this time as chest clear bilaterally with no audible secretions present".

Equipment required:

Functioning wall suction unit and tubing.

Neopuff with same PIP &PEEP /FiO2 currently delivered to infant with appropriate sizes mask.

Closed suction systems as appropriate for the size of the ETT.

Saline ampule and 2ml /5ml syringe if necessary.

Nonsterile gloves

Sterile water to flush suction tubing.

Clinical waste bag.

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 7 of 25
---	--	-----------------	--------------	-------	--------------

PROCEDURE: for Closed Section process

Action	Rationale
<ol style="list-style-type: none"> 1. Undertake an assessment of the need for suctioning. 2. Ensure emergency airway management equipment is available. 3. If parents are present explain the procedure, the reason for suction and inform them of what to expect during the procedure 4. Perform hand washing according to unit policy. 5. Put on gloves 6. Set the suction pressure at 10-13 kPa. 7. Attach suction tubing to suction catheter 8. Ensure comfort of the infant prior to, during and after the procedure. 9. Check the length required to pass the suction catheter down to the tip of the ETT and its correlating colour or number. <p>Measurement of length to suction should be performed at the beginning of the shift, by adding the length of the ETT and any additional length of the adapter.</p> <ol style="list-style-type: none"> 10. Unlock the suction by twisting the thumb control valve by 180 degrees. 	<p>Suctioning should be performed following an assessment of need, and only when clinically indicated due to the potential complications associated with the procedure.</p> <p>To provide necessary emergency care as needed.</p> <p>To obtain parents cooperation and to prevent unnecessary distress, especially if they wish to be present during the procedure.</p> <p>To minimize the risk of cross infection. Suction is a clean procedure and standard infection control practices apply.</p> <p>To reduce the risk of suction induced trauma, atelectasis and hypoxia. Suction pressure may be lowered if baby is small or unstable, or higher if required to remove thick or tenacious secretions.</p> <p>Positioning, nesting/ swaddling and comfort holding can reduce the pain and increase the comfort of the infant.</p> <p>To prevent trauma from deep suctioning.</p> <p>To ensure suctioning can be carried out quickly if needed.</p> <p>To allow the catheter to pass into the ETT.</p>

<p>11. Throughout the procedure support the ETT and the Y adapter with one hand.</p> <p>12. Instill saline only if deemed necessary(0.25ml-0.5ml).</p> <p>13. Advance the catheter to the tip of the ETT (Shallow suctioning). Pass the catheter down the ET tube 1-2cm a time until you see the appropriate colour (as calculated before) in the observation area.</p> <p>14. Depress the thumb control valve completely and wait 1-2 seconds. Slowly pull back the catheter until you see the BLACK MARK in the rinse chamber next to the saline flush port, keeping the suction on by depressing the thumb valve.</p> <p>15. Rinse the suction catheter: After each use, attach the syringe of sodium chloride to the saline flush port. Depress the thumb valve to turn on suction and slowly introduce the saline ensuring your suction is on at all times. The sodium chloride must be directed to the catheter and suction tubing rather than into the patient. When finished, disconnect the syringe and replace the flush port cap.</p> <p>16. Lift and turn suction control valve 180 degrees to the lock position.</p> <p>17. Reassess the patient, including auscultation, the infants colour, activity respiratory effort, heart rate, SPO3 and TCPCO2 are to be monitored before, during and after the procedure.</p>	<p>Supporting the ETT will stabilise the airway during suction, prevent unplanned extubation or dislodgement and reduce discomfort.</p> <p>Normal saline should not be routinely instilled prior to ETT suctioning due to the associated adverse events.</p> <p>To reduce the risk of tracheobronchial trauma, including bleeding, pneumothoraxes and the possibility of vagal stimulation leading to bradycardia.</p> <p>Apply suction only on withdrawal of catheter, not on insertion to reduce the risk of trauma to the tracheal mucosa.</p> <p>Catheters left within the ETT will increase airway resistance and affect the gas flow. Catheters withdrawn too far will break the seal and cause the circuit to lose pressure.</p> <p>To minimize the risk of infection, to prevent drying of secretions within the suction tubing and the catheter is ready for the next use.</p> <p>This will prevent the accidental application of saline to the patient.</p> <p>To prevent accidental depression of the valve during other care activities.</p> <p>To identify whether further suction is needed and evaluate efficacy of procedure.</p>
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<p>18. Repeat the procedure if needed. Give time between episodes to allow the patient to recover.</p> <p>19. Flush the suction tubing with water at the end of the session. This can be done by placing the end of the tubing into a small bottle of sterile water or into a gallipot with sterile water to clear the secretions from the suction tubing.</p> <p>20. Turn off suction and neopuff and place the vent tubing and the closed suction system in a position that will not create any stress/traction to the ETT.</p> <p>21. Ensure the infant has recovered from the procedure and is comfortable.</p> <p>22. Once the procedure is completed take of your gloves and disposed and wash your hands according to unit policy.</p> <p>23. Document procedure in the ventilatory support chart and in the progress notes, noting infant’s response, the type and quantity of secretions.</p> <p>24. In line suction should be changed every 24 hours and the day change sticker should be attached to it.</p> <p>25. If the catheter bag has blown up it can be managed by removing the catheter from the Y adapter, squeeze the air out of the catheter bag and replace immediately.</p>	<p>To ensure the airway is clear.</p> <p>To prevent the risk of infection.</p> <p>To prevent damage to baby or equipment.</p> <p>To promote the safety and comfort of the patient.</p> <p>To prevent risk of infection.</p> <p>To promote continuity of care and provide indication for frequency of suction required.</p> <p>To prevent delayed changes which increase infection risk.</p> <p>To prevent leakage in system and optimize ventilation support</p>
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PROCEDURE: for Open Suction process.

Action	Rationale
<ol style="list-style-type: none"> 1. Assemble all equipment as above. 2. Where possible, this procedure requires two persons. 3. Ensure emergency airway management equipment are readily available. 4. Wash hands according to unit policy and wear gloves as per unit infection control policy. 5. Prior to suction depth of catheter insertion and appropriate size of the catheter should be measured by calculating the length of the ETT at the lips and adding the external length of the tube to the end of the green port. 6. Set the suction pressure between 7 – 11 kPa. The lowest negative pressure with the smallest catheter and the shortest suctioning time-that effectively clears secretions should be used. 7. Determine baseline observations of the infant. 8. Ensure comfort of the infant throughout the procedure. 9. Attach suction catheter to suction tubing. The hand holding the suction tubing is now considered as unclean and should not touch the suction catheter during the procedure 10. Use a clean catheter for each pass. 11. Disconnect the ETT from the ventilator tubing at ETT adapter and hold carefully. 12. Normal saline instillation should not be routinely performed for ETT suctioning. 13. Pass the suction catheter to the predetermined length, ensuring catheter is only passed the length of the ETT. 14. Apply negative pressure as the catheter is withdrawn by occluding the side port 	<p>To promote comfort and safety</p> <p>To ensure patient safety when undertaking the procedure</p> <p>To minimize the risk of cross infection.</p> <p>To avoid damage to the airways from deep suctioning.</p> <p>To reduce the risk of suction induced trauma, atelectasis and hypoxia.</p> <p>To ensure patient is safe and to evaluate efficiency of procedure.</p> <p>To minimize the risk of cross infection and prevent contamination/infection and damage to equipment.</p> <p>To avoid the associated adverse events.</p> <p>Deep suctioning could be harmful to the trachea and bronchi.</p>

<p>of the catheter and the procedure should not take more than 10 seconds.</p> <p>15. Reconnect ventilator tubing to ETT as soon as the suction is completed.</p> <p>16. Assess the infant's response to suction. The infant should be allowed to recover from any adverse effects before a second pass. The infant may require a small increase in Fio2.</p> <p>17. Wrap the catheter around the dominant hand, then pull back the glove over the soiled catheter and discard into the clinical waste bin. Apply hand gel.</p> <p>18. Auscultate the chest and evaluate the efficacy of the procedure.</p> <p>19. If procedure needs repeating, use new catheter / glove and repeat as above.</p> <p>20. Flush the suction tubing with water at the end of the session.</p> <p>21. Wash hands</p> <p>22. Document procedure.</p>	<p>To reduce the risk of trauma to the tracheal mucosa.</p> <p>To recommence ventilatory support and prevent risk of atelectasis.</p> <p>To avoid sudden deterioration.</p> <p>To reduce the risk of infection</p> <p>To identify whether further suction is needed and evaluate the efficacy of the procedure.</p> <p>To ensure the effectiveness of procedure and minimize the risk of cross infection.</p> <p>To prevent drying of secretions within the suction tubing and to minimize the risk of infection.</p> <p>To reduce the risk of infection</p> <p>To promote continuity of care.</p>
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In line (closed) suction set up



1. Choose the correct size suction system (For this multiply the ETT diameter by 2).



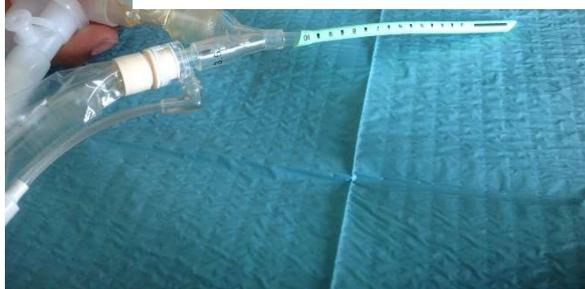
3 Remove the green ETT connector and attach the suction port.



2. Match the ETT size to the suction port and connect the inline suction to the port with the same ETT size written on it.



4. In smaller babies ETT must be cut to shorten the dead space.



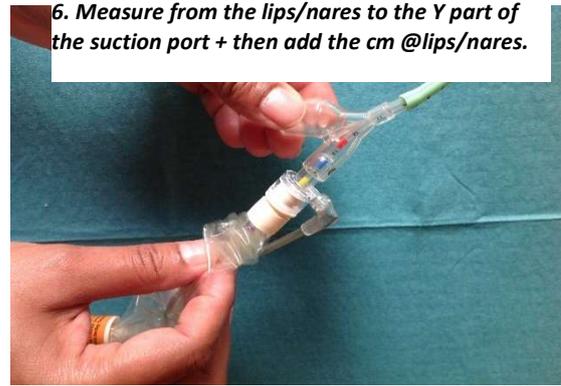
5. Ventilator goes to the other port.



Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 13 of 25
---	---	-----------------	--------------	-------	---------------



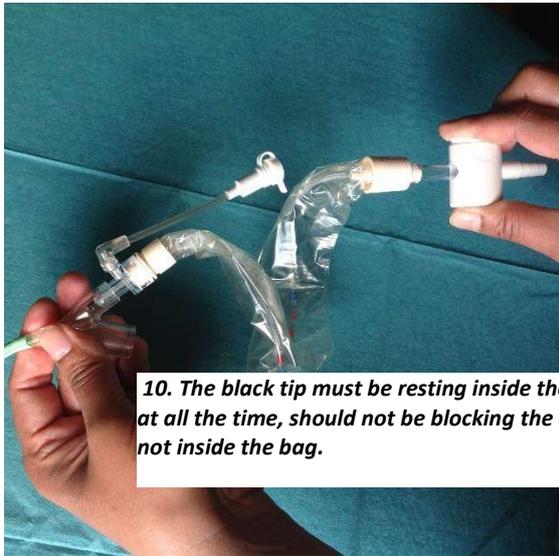
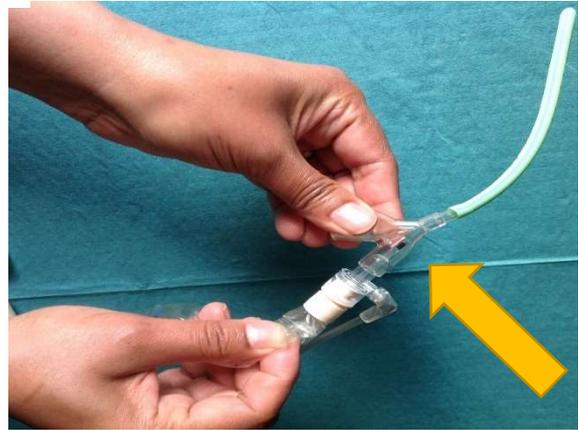
7. Turn on suction at the wall & connect the suction tubing to the white nozzle. Pull the white button and twist it on the side 180 degree.



6. Measure from the lips/nares to the Y part of the suction port + then add the cm @lips/nares.

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 14 of 25
---	---	-----------------	--------------	-------	---------------

8. Stabilise ETT with one hand. With the other hand advance the catheter down the ETT to the pre-measured length. Do not advance the catheter beyond the measurement. The black tip is very hard and may induce bradycardia if it hits the carina.



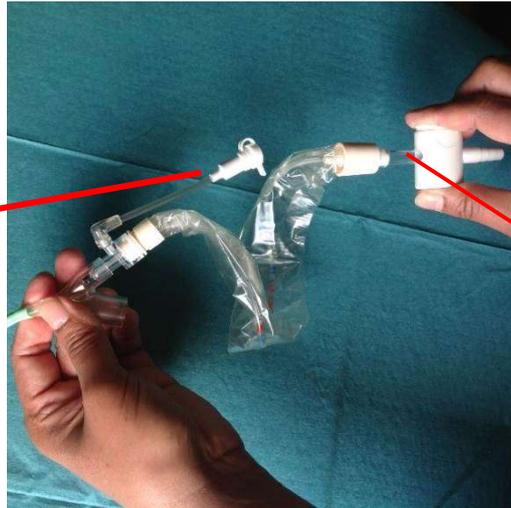
10. The black tip must be resting inside the inner dome at all the time, should not be blocking the airway, and or not inside the bag.

9. Support & hold the ETT & Y adapter with one hand. With the other hand apply suction by pressing in the white button and withdrawing the catheter at the same time until you see the black tip in the inner dome /rinse chamber.



11. The day change sticker indicates the day when the next closed suction system change is due. For example, on Wednesday you would attach the Thursday sticker to the valve. Which is when the catheter must be changed.

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 15 of 25
---	---	-----------------	--------------	-------	---------------



Saline flush pot

Viewing port for the secretion

2. Supporting References

Reference

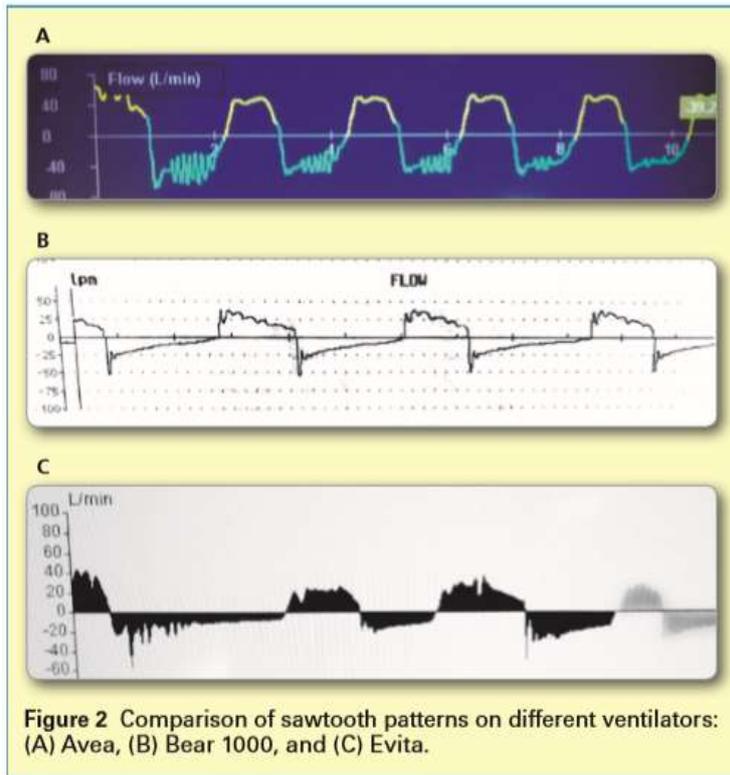
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Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 17 of 25
---	--	-----------------	--------------	-------	---------------

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Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 18 of 25
---	--	-----------------	--------------	-------	---------------

Appendix: 1



3. Supporting relevant trust guidelines

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 20 of 25
---	--	-----------------	--------------	-------	---------------

4. Guideline Governance

a. Scope

This guideline is relevant to all staff caring for babies across neonatal intensive care, transitional care and maternity.

b. Purpose

- i. This guideline aims to facilitate a common approach to the management of babies admitted under neonatal care. At times deviation from the guideline may be necessary, this should be documented and is the responsibility of the attending consultant.
- ii. This guideline is subject to regular review to ensure ongoing evidence based practice.

c. Duties and Responsibilities

What is expected from the health care professionals using this guideline to look after infants.

d. Approval and Ratification

This guideline will be approved and ratified by the Neonatal Guidelines Group.

e. Dissemination and Implementation

- i. This guideline will be uploaded to the trust intranet 'Neonatal Guidelines' page and thus available for common use.
- ii. This guideline will be shared as part of ongoing education within the Neonatal Unit for both medical and nursing staff.
- iii. All members of staff are invited to attend and give comments on the guideline as part of the ratification process.

f. Review and Revision Arrangements

- a. This policy will be reviewed on a 5 yearly basis.
- b. If new information comes to light prior to the review date, an earlier review will be prompted.
- c. Amendments to the document shall be clearly marked on the document control sheet and the updated version uploaded to the intranet. Minor amendments will be ratified through the Neonatal Guidelines Group. A minor amendment would consist of no major change in process, and includes but is not limited to, amendments to documents within the appendices.

Section 1 Endotracheal Suctioning	Current Version is held on the Intranet	First ratified:	Review date:	Issue	Page 21 of 25
---	--	-----------------	--------------	-------	---------------

g. Equality Impact Assessment

<p>Background</p> <ul style="list-style-type: none"> Who was involved in the Equality Impact Assessment
<p>Methodology</p> <ul style="list-style-type: none"> A brief account of how the likely effects of the policy was assessed (to include race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation, age) The data sources and any other information used The consultation that was carried out (who, why and how?)
<p>Key Findings</p> <ul style="list-style-type: none"> Describe the results of the assessment Identify if there is adverse or a potentially adverse impacts for any equalities groups
<p>Conclusion</p> <ul style="list-style-type: none"> Provide a summary of the overall conclusions
<p>Recommendations</p> <ul style="list-style-type: none"> State recommended changes to the proposed policy as a result of the impact assessment Where it has not been possible to amend the policy, provide the detail of any actions that have been identified Describe the plans for reviewing the assessment

h. Document Checklist

To be completed (electronically) and attached to any document which guides practice when submitted to the appropriate committee for approval or ratification.

Title of the document:

Policy (document) Author:

Executive Director:

		Yes/No/ Unsure/NA	<u>Comments</u>
<u>1.</u>	Title		
	Is the title clear and unambiguous?		
	Is it clear whether the document is a guideline, policy, protocol or standard?		
<u>2.</u>	Scope/Purpose		
	Is the target population clear and unambiguous?		
	Is the purpose of the document clear?		
	Are the intended outcomes described?		
	Are the statements clear and unambiguous?		
<u>3.</u>	Development Process		
	Is there evidence of engagement with stakeholders and users?		
	Who was engaged in a review of the document (list committees/ individuals)?		
	Has the policy template been followed (i.e. is the format correct)?		
<u>4.</u>	Evidence Base		
	Is the type of evidence to support the document identified explicitly?		

		Yes/No/ Unsure/NA	Comments
	Are local/organisational supporting documents referenced?		
5.	Approval		
	Does the document identify which committee/group will approve/ratify it?		
	If appropriate, have the joint human resources/staff side committee (or equivalent) approved the document?		
6.	Dissemination and Implementation		
	Is there an outline/plan to identify how this will be done?		
	Does the plan include the necessary training/support to ensure compliance?		
7.	Process for Monitoring Compliance		
	Are there measurable standards or KPIs to support monitoring compliance of the document?		
8.	Review Date		
	Is the review date identified and is this acceptable?		
9.	Overall Responsibility for the Document		
	Is it clear who will be responsible for coordinating the dissemination, implementation and review of the documentation?		
10.	Equality Impact Assessment (EIA)		
	Has a suitable EIA been completed?		

Committee Approval (Neonatal Guidelines Committee)

If the committee is happy to approve this document, please complete the section below, date it and return it to the Policy (document) Owner

Name of Chair

Date

Ratification by Management Executive (if appropriate)

If the Management Executive is happy to ratify this document, please complete the date of ratification below and advise the Policy (document) Owner

Date: n/a