Royal Cornwall Hospitals NHS Trust

Policy Under Review

Please note that this policy is under review. It does, however, remain current Trust policy subject to any recent legislative changes, national policy instruction (NHS or Department of Health), or Trust Board decision. For guidance, please contact the Author/Owner.

Information Category	Detailed Information
Document Title:	Pneumothorax Neonatal Clinical Guideline V3.2
This document replaces (exact title of previous version):	Pneumothorax Neonatal Clinical Guideline V3.1
Date Issued / Approved:	February 2025
Date Valid From:	February 2025
Date Valid To:	December 2026
Author / Owner:	Sarah Tabrett; Advance Neonatal Nurse Practitioner and Hazel Greene; Paediatric Registrar
Contact details:	01872 252667
Brief summary of contents:	This guideline is for the use of medical and nursing staff in the Neonatal Unit caring for newborns that develop a pneumothorax.
Suggested Keywords:	Neonatal, neonate, newborn, pneumothorax, chest drain.
Target Audience:	**RCHT:** Yes **CFT:** No **CIOS ICB:** No
Executive Director responsible for Policy:	Chief Medical Officer
Approval route for consultation and ratification:	Neonatal Audit and Guidelines Group
Manager confirming approval processes:	Caroline Chappell

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Information Category	Detailed Information
Name of Governance Lead confirming consultation and ratification:	Michael Cross
Links to key external standards:	None required
Related Documents:	https://starship.org.nz/guidelines/chest-drains-in-the-neonate/. https://bnfc.nice.org.uk/drugs/lidocaine-hydrochloride/. https://pubmed.ncbi.nlm.nih.gov/31217701/.
Training Need Identified:	No
Publication Location (refer to Policy on Policies – Approvals and Ratification):	Internet and Intranet
Document Library Folder/Sub Folder:	Clinical/ Neonatal

This document is only valid on the day of printing.

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Pneumothorax Neonatal Clinical Guideline

V3.2

February 2025

UNDER REVIEW

1. Aim/ Purpose of this Guideline

1.1. This guideline is for the use of medical and nursing staff in the Neonatal Unit caring for newborns that develop a Pneumothorax.

1.2. This version supersedes any previous versions of this document.

Data Protection Act 2018 (UK General Data Protection Regulation – GDPR) Legislation

The Trust has a duty under the Data Protection Act 2018 and UK General Data Protection Regulations 2016/679 to ensure that there is a valid legal basis to process personal and sensitive data. The legal basis for processing must be identified and documented before the processing begins. In many cases we may need consent; this must be explicit, informed, and documented. We cannot rely on opt out, it must be opt in.

Data Protection Act 2018 and UK General Data Protection Regulations 2016/679 is applicable to all staff; this includes those working as contractors and providers of services.

For more information about your obligations under the Data Protection Act 2018 and UK General Data Protection Regulations 2016/679 please see the Information Use Framework Policy or contact the Information Governance Team

Royal Cornwall Hospital Trust rch-tr.infogov@nhs.net

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2. The Guidance

2.1. Background

A pneumothorax is an air leak that develops between the visceral and parietal pleura following the rupture of an over distended alveolus. The incidence is 1-2% of live births. The incidence is higher in preterm infants who often have underlying respiratory distress syndrome. Surfactant administration reduces the risk of developing a pneumothorax in these infants. Other risk factors for pneumothorax include meconium aspiration syndrome, pneumonia, transient tachypnoea of the newborn, pulmonary hypoplasia, and any form of respiratory support (invasive and non-invasive). Pneumothoraces also develop spontaneously.

2.2. Signs and symptoms

2.2.1. A pneumothorax should be suspected in any infant with an **increasing oxygen requirement** or **sudden onset of respiratory distress.**

2.2.2. There should be a **high level of suspicion in any mechanically ventilated infant** with an unexplained deterioration in oxygenation, ventilation, or cardiovascular status.

2.2.3. Newborns with a small pneumothorax may be asymptomatic, however signs often accompanying a pneumothorax include:

- Tachypnoea.
- Grunting.
- Pallor.
- A new or increasing oxygen requirement.
- Increased respiratory effort.
- Chest asymmetry with enlargement of the affected side.
- Decreased breath sounds on the affected side.

2.2.4. A large pneumothorax becomes an emergency when the air collection is under pressure, resulting in a **tension pneumothorax**. This results in collapse of the ipsilateral lung and shift of the mediastinum to the contralateral side, secondary to increased intrathoracic pressure.

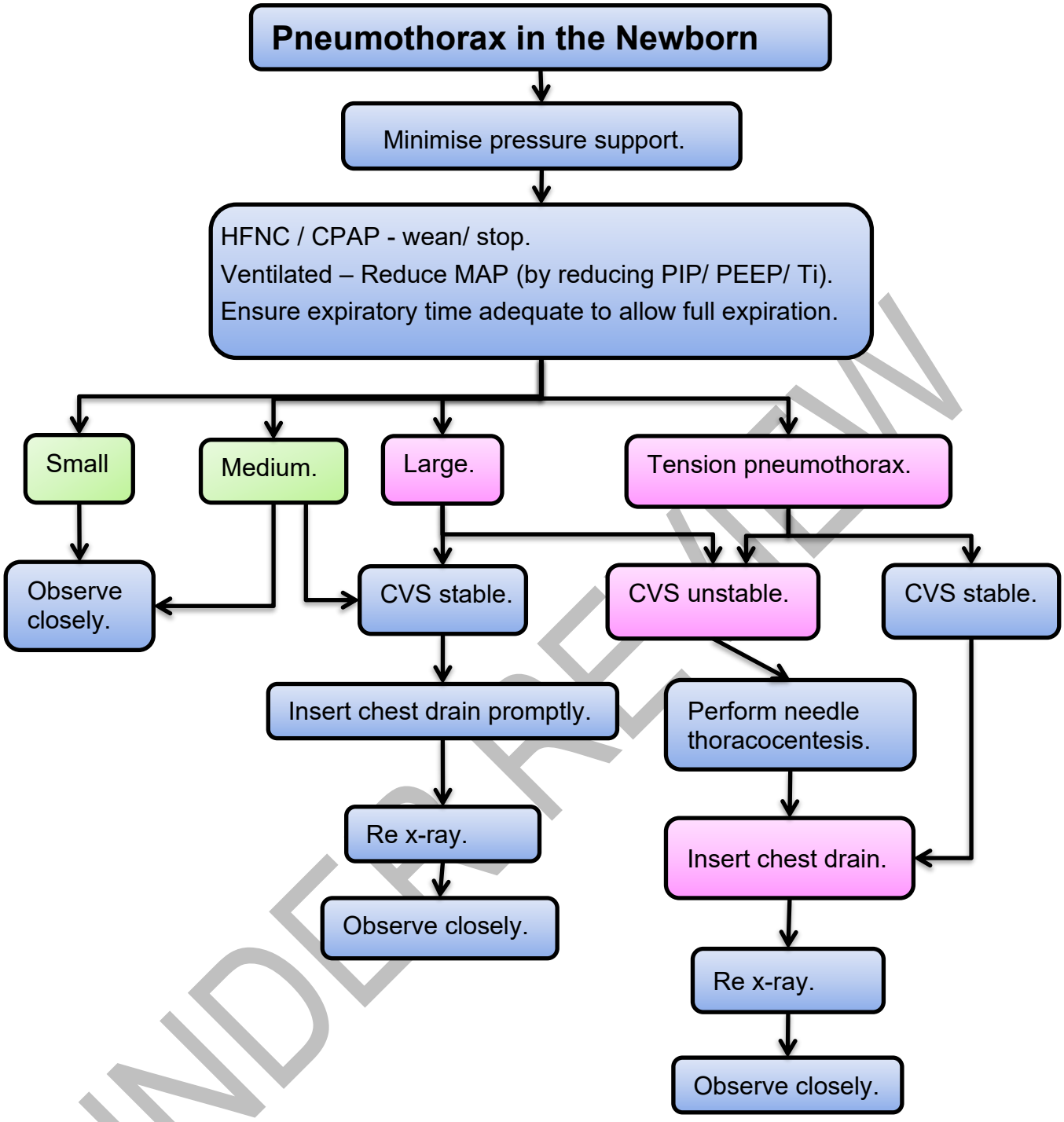
2.3. Diagnosis

The diagnosis of a pneumothorax can be made with the aid of transillumination with a fibreoptic light. When the probe is placed on the chest, the affected hemithorax will light up. Transillumination is more difficult in larger babies, but with modern equipment may be possible. If the child is haemodynamically stable the diagnosis should be confirmed on chest x-ray. In an unstable newborn the chest x-ray should be deferred, and immediate evacuation of the pneumothorax should be performed (See Section 2.4 Management).

2.4. Management

See flow chart on next page.

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Abbreviations:

HFNC - high flow nasal cannula.

CPAP - continuous positive airway pressure.

MAP - mean arterial pressure.

PIP - peak inspiratory pressure.

PEEP - positive end expiratory pressure.

Ti - inspiratory time.

CVS – Chorionic villus sampling.

***Not all ventilated infants need chest drains inserted, especially those on a relatively low mean airway pressure. Sometimes a needle thoracocentesis may be all that is necessary.**

2.5. Procedure: Needle Aspiration of Chest

Needle aspiration is an emergency procedure only. Care must be taken to avoid laceration of the lung or puncturing blood vessels.

2.5.1. Equipment

- 21 gauge (green) or 23 gauge (blue) butterfly needle – a cannula, 24g may cause less lung trauma.
- 3 way tap.
- 10 ml syringe.
- Chlorhexidine (see appendix 4).
- 1 pair sterile gloves.

2.5.2. Procedure

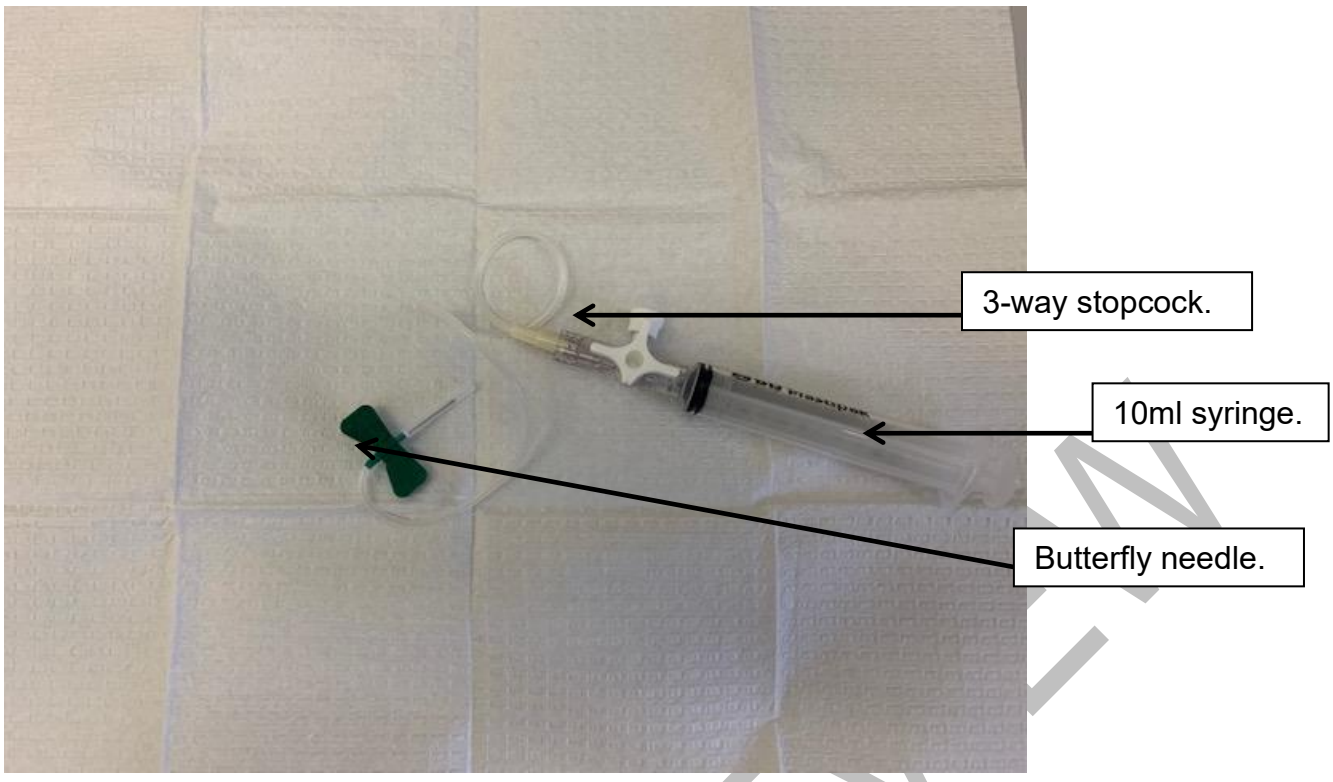
- Infant supine, prepare area with chlorhexidine.
- Insert needle into the pleural space (directly over the top of the rib in the 2nd or 3rd intercostal space in the mid-clavicular line) until air is aspirated into the syringe, then expel air through the 3-way stopcock.





Images taken by RCHT Advanced Neonatal Nurse Practitioner Sarah Tabrett.

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Images taken by RCHT Advanced Neonatal Nurse Practitioner Sarah Tabrett.

2.6. On-going care

Following needle aspiration insertion of an intercostal catheter is usually required for on-going management.

2.6.1. **Indications**: Pneumothorax or Pleural Effusion.

We stock 2 types Seldinger chest drains:

- Cook Fuhrman pigtail pleural drain sets, 8.5Fr for >2kg and 6.0Fr for < 2.0kg.
- Thal Quick straight chest drain size 8.0 and 10.0 Fr.

2.6.2. **Advantages of Pigtail drains**

Less traumatic insertion and fewer complications Suitable for very preterm babies.

2.6.3. **Disadvantages**

May kink or obstruct due to its softer consistency.

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2.6.4. **Components of pleural drain pack**

- 18 G introducer needle.
- J-wire guide (Length 40cm).
- Dilator.
- Radiopaque pigtail catheter with 1cm markings (First marker at 7cm).
- 3 way stopcock.
- Multipurpose tubing adapter.

You will also need 5ml syringe, mosquito artery or similar forceps and a sterile procedure pack e.g., long line pack.

2.6.5. **Preferred drain site: 4th or 5th** intercostal space, above a rib (to avoid injury to intercostal vessels which run under the rib) in the **mid axillary line,** well clear of the nipple.

Ensure adequate analgesia and sedation e.g., Morphine.

2.6.6. **Prior to Procedure**

2.6.6.1. Glove and gown as per unit guideline for aseptic technique.

2.6.6.2. Position the patient supine with procedure side tilted slightly upward.

2.6.6.3. Prep the skin site as per unit guideline *(see appendix 4).*

2.6.6.4. Identify correct landmark.

2.6.6.5. The use of a transparent sterile drape if available, enables continued visibility of landmark.

2.6.6.6. Lignocaine 0.5%-1% local infiltration. Maximum 0.3mls/kg.

2.6.6.7. Assemble needle and syringe (option to attach 'steri strip' 1-1.5cm distal to needle tip to reduce risk of inserting it too far into chest cavity- see photo on following page).

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Images taken by RCHT Advanced Neonatal Nurse Practitioner Sarah Tabrett.

2.6.7. **Procedure**

2.6.7.1. Slowly insert needle with attached forceps at 90 degree angle to the rib. Gently angle anteriorly for pneumothorax, aspirating until air is obtained or if draining a pleural effusion, aim posteriorly and aspirate until fluid is obtained.

2.6.7.2. Remove the syringe and advance soft J end of J-Wire, using its introducer through the needle to a length of 5cm into the chest (the J wire is very long, be aware of asepsis, 2-person technique advised).

2.6.7.3. Remove the needle gently and hold on to the J-wire where it exits the chest wall as soon as the needle tip is out. This is to avoid accidentally removing the J-wire.

2.6.7.4. Advance the dilator over the wire using a rotating action to pass through the chest wall. Then withdraw the dilator, again securing the J-wire to avoid inadvertently removing it.

2.6.7.5. Feed the pigtail catheter (coiled porthole end first) over the J-wire and advance into the chest cavity, up to the first black mark (7cm) for the extreme preterm babies and at the 2nd-4th mark for bigger babies based on measurement of targeted position.

2.6.7.6. Remove the J-wire.

2.6.7.7. Use steri-strips to anchor pigtail to the skin.

2.6.7.8. Place 2 transparent sterile dressings, directly opposite each other to encase the catheter securely within dressing over insertion site.

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Images taken by RCHT Advanced Neonatal Nurse Practitioner Sarah Tabrett.

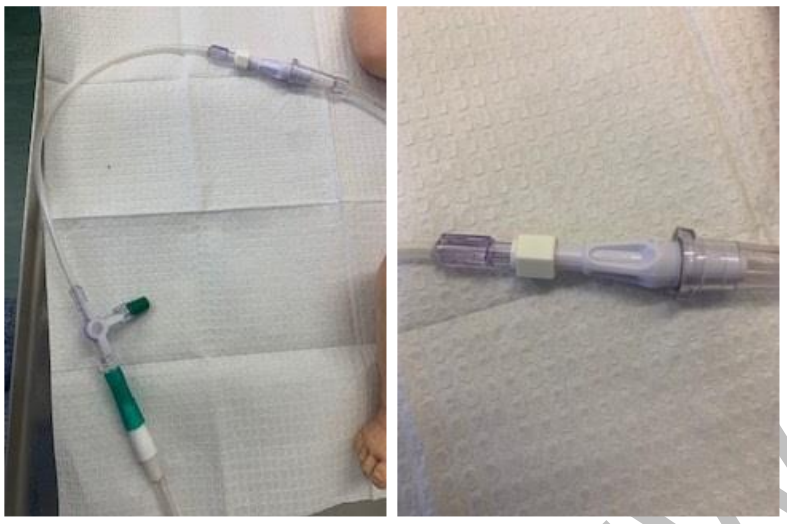
2.6.7.9. Picture showing Pigtail drain, connecting directly onto 3-way extension, then green connector onto underwater drainage system.



Images taken by RCHT Advanced Neonatal Nurse Practitioner Sarah Tabrett.

2.6.7.10. Picture showing Quick Thal drain with white connector in between catheter and three way tap extension. See pictures on the following page:

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Images taken by RCHT Advanced Neonatal Nurse Practitioner Sarah Tabrett.

2.6.7.11. Push firmly the underwater drainage system on to the small green connector and fill bottle with 20ml sterile water or to the water fill line. Fix securely at level BELOW baby.

2.6.7.12. If low grade suction requested, then use grey connector in suction tubing to connect other end of drainage system to standard suction tubing. (See image below).

2.6.7.13. Normal starting suction is 5-10cm H20.

2.6.7.14. Dispose of sharps, clean equipment, document on Chest Drain procedure form.

2.6.7.15. Request CXR to confirm position of catheter and document in notes.

2.6.7.16. Ensure the baby is left comfortable, supported and on adequate pain relief. See attached nursing care in appendix 3.

3. Monitoring compliance and effectiveness

Information Category	Detail of process and methodology for monitoring compliance
Element to be monitored	Key changes to practice.
Lead	Neonatal Guidelines Lead.
Tool	Adherence to guidelines will be monitored as part of the ongoing audit process on a Word or Excel template.
Frequency	As dictated by audit findings.

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Information Category	Detail of process and methodology for monitoring compliance
Reporting arrangements	Neonatal Audit and Guidelines meeting.
Acting on recommendations and Lead(s)	Neonatal Business meeting.
Change in practice and lessons to be shared	Required changes to practice will be identified and actioned within 3 months. A lead member of the team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders.

4. Equality and Diversity

4.1. This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the Equality Diversity And Inclusion Policy or the Equality and Diversity website.

4.2. Equality Impact Assessment

The Initial Equality Impact Assessment Screening Form is at Appendix 2.

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Appendix 1. Governance Information

Information Category	Detailed Information
Document Title:	Pneumothorax Neonatal Clinical Guideline V3.2
This document replaces (exact title of previous version):	Pneumothorax Neonatal Clinical Guideline V3.1
Date Issued/Approved:	February 2025
Date Valid From:	February 2025
Date Valid To:	September 2026
Directorate / Department responsible (author/owner):	Sarah Tabrett; Advance Neonatal Nurse Practitioner and Hazel Greene; Paediatric Registrar
Contact details:	01872 252667
Brief summary of contents:	This guideline is for the use of medical and nursing staff in the Neonatal Unit caring for newborns that develop a pneumothorax.
Suggested Keywords:	Neonatal. Neonate. Newborn. Pneumothorax. Chest drain.
Target Audience:	**RCHT:** Yes **CFT:** No **CIOS ICB:** No
Executive Director responsible for Policy:	Chief Medical Officer
Approval route for consultation and ratification:	Neonatal Audit and Guidelines group
General Manager confirming approval processes:	Caroline Chappell
Name of Governance Lead confirming consultation and ratification:	Tamara Thirlby
Links to key external standards:	None required
Related Documents:	https://starship.org.nz/guidelines/chest-drains-in-the-neonate/. https://bnfc.nice.org.uk/drugs/lidocaine-

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Information Category	Detailed Information
	hydrochloride/. https://pubmed.ncbi.nlm.nih.gov/31217701/.
Training Need Identified?	No
Publication Location (refer to Policy on Policies – Approvals and Ratification):	Internet and Intranet
Document Library Folder/Sub Folder:	Clinical/ Neonatal

Version Control Table

Date	Version Number	Summary of Changes	Changes Made by
August 2016	V1.0	Reviewed and approved at Neonatal Guidelines Meeting	Author: Sarah Tabrett. Advanced Neonatal Nurse Practitioner. Hazel Greene Paediatric Registrar Formatter: Kim Smith. Staff Nurse.
June 2020	V2.0	Full Update: Update to formatting. Images updated. 2.6.1. weight updated in number 1 of this section.	Sarah Tabrett. Advanced Neonatal Nurse Practitioner.
December 2021	V2.1	Chest drain appendix added.	Sarah Tabrett; Advanced Neonatal Nurse Practitioner.
October 2022	V2.2	Pictures within document updated for clarity of process (taken by NNU team) Information about THAL quick drain kit added (2.6.1)	Sarah Tabrett; Advanced Neonatal Nurse Practitioner.
September 2023	V3.0	Full review and update to new Trust template. No amendment to guidance required. Full definitions of abbreviations included.	Sarah Tabrett; Advanced Neonatal Nurse Practitioner.

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Date	Version Number	Summary of Changes	Changes Made by
July 2024	V3.1	Guidance updated regarding chlorhexidine. Appendix 4 added.	Charlotte Lea; Consultant Paediatrician
January 2025	V4.2	Appendix 4 updated regarding Yellow Card reporting.	Charlotte Lea; Consultant Paediatrician

All or part of this document can be released under the Freedom of Information Act 2000.

All Policies, Strategies and Operating Procedures, including Business Plans, are to be kept for the lifetime of the organisation plus 6 years.

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Appendix 2. Equality Impact Assessment

Section 1: Equality Impact Assessment (EIA) Form

The EIA process allows the Trust to identify where a policy or service may have a negative impact on an individual or particular group of people.

For guidance, please refer to the Equality Impact Assessment Policy (available from the document library) or contact the Equality, Diversity and Inclusion Team rcht.inclusion@nhs.net

Information Category	Detailed Information
Name of the strategy / policy / proposal / service function to be assessed:	Pneumothorax Neonatal Clinical Guideline V3.2
Directorate and service area:	Neonatal
Is this a new or existing Policy?	Existing
Name of individual completing EIA (Should be completed by an individual with a good understanding of the Service/Policy):	Neonatal Audit and Guidelines group
Contact details:	01872 252667

Information Category	Detailed Information
1. Policy Aim - Who is the Policy aimed at? (The Policy is the Strategy, Policy, Proposal or Service Change to be assessed)	This guideline is aimed at clinical staff responsible for the management of neonatal infants suspected or diagnosed with a pneumothorax.
2. Policy Objectives	As above.
3. Policy Intended Outcomes	Safe and evidence based management of neonatal infants suspected or diagnosed with a pneumothorax.
4. How will you measure each outcome?	See section 3 above.
5. Who is intended to benefit from the policy?	Clinical staff and patients.

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Information Category	Detailed Information
6a. Who did you consult with? (Please select Yes or No for each category)	• Workforce: Yes • Patients/ visitors: No • Local groups/ system partners: No • External organisations: No • Other: No
6b. Please list the individuals/groups who have been consulted about this policy.	**Please record specific names of individuals/ groups:** Neonatal Audit and Guidelines group
6c. What was the outcome of the consultation?	Approved.
6d. Have you used any of the following to assist your assessment?	**National or local statistics, audits, activity reports, process maps, complaints, staff or patient surveys:** No.

7. The Impact

Following consultation with key groups, has a negative impact been identified for any protected characteristic? Please note that a rationale is required for each one.

Where a negative impact is identified without rationale, the key groups will need to be consulted again.

Protected Characteristic	(Yes or No)	Rationale
Age	No	
Sex (male or female)	No	
Gender reassignment (Transgender, non-binary, gender fluid etc.)	No	
Race	No	Any information provided should be in an accessible format for the parent/carer's needs- i.e., available in different languages if required/ access to an interpreter if required.

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Protected Characteristic	(Yes or No)	Rationale
Disability (e.g., physical or cognitive impairment, mental health, long term conditions etc.)	No	Those parent/ carers with any identified additional needs will be referred for additional support as appropriate- i.e., to the Liaison team or for specialised equipment. Written information will be provided in a format to meet the family's needs e.g., easy read, audio etc
Religion or belief	No	All staff should be aware of any beliefs that may impact on treatment decisions.
Marriage and civil partnership	No	
Pregnancy and maternity	No	
Sexual orientation (e.g., gay, straight, bisexual, lesbian etc.)	No	

A robust rationale must be in place for all protected characteristics. If a negative impact has been identified, please complete section 2. If no negative impact has been identified and if this is not a major service change, you can end the assessment here.

I am confident that section 2 of this EIA does not need completing as there are no highlighted risks of negative impact occurring because of this policy.

Name of person confirming result of initial impact assessment: Neonatal Audit and Guidelines Group.

If a negative impact has been identified above OR this is a major service change, you will need to complete section 2 of the EIA form available here:
Section 2. Full Equality Analysis

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Appendix 3. Care of a Neonatal Chest Drain

Image taken by RCHT Advanced Neonatal Nurse Practitioner Sarah Tabrett

Emergency equipment:



- 1x clamp for **each** chest drain.
- sterile gloves.
- Steristrips.
- iv3000 dressing.
- sterile scissors.
- clinell wipe.

Bedside equipment checks:

- Mindray alarm limits.
- Thoracic suction if needed (5KPa).
- Airway suction.
- Stethoscope.
- Analgesia prescription.

Routine care:

1. Hourly patient observations of HR (heart rate), RR (respiratory rate), SpO2 (oxygen saturation), temperature, equal chest rise, work of breathing, pain score and thoracic suction pressures (if using).
2. Raise head of the incubator to aid drainage and reposition infant regularly, paying attention not to dislodge drain.
3. Visually inspect insertion site and dressing, hourly, looking for inflammation or redness of skin/ oozing, insertion length marking, dressing integrity.
4. Inspect drain collection tubing regularly to look for kinks/ loops. Check connections and position of 3-way-tap/ clamp if in use.
5. Observe drainage bottle hourly and record any swinging or bubbling of the water, any increase in water level above the fill line (roughly 30mls) and colour of any liquid drained. **The drainage bottle must remain below patient's chest level at all times.** It should **always** be kept vertical and securely fixed to the incubator. The water level **must** remain **above** the inlet to avoid introduction of air on inspiration.

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Where multiple drains are in situ, each bottle should be accurately labelled to identify position.

6. Administer analgesia as prescribed/ required.

7. Chest drains do **not** require clamping for transfer of infants or as part of routine chest drain care. Clamping of chest drains should **only** happen in emergency situations (see accidental disconnection of chest drainage system) or as part of a medical plan to assess readiness for removal of chest drain.

8. Report any significant changes to medical team and document.

9. When the chest drain is clamped/ 3-way-tap closed, the infant should be closely observed for clinical signs of a reaccumulating pneumothorax: A new or increasing oxygen requirement, increased respiratory effort, chest asymmetry with enlargement of the affected side, decreased breath sounds on the affected side. ANY of these symptoms require an **urgent** senior medical review.

Emergency care:

Accidental displacement of a chest drain: **THIS IS AN EMERGENCY EVENT** and needs to be escalated appropriately- pulling the emergency bell and calling 2222 for a neonatal emergency call if the neonatal team are not on NNU. Call for immediate help whilst occluding insertion site with a gloved finger/ sterile gauze then close site with Steristrips arranged in a "X" or star arrangement, depending on size. Cover with IV3000 dressing. Immediate assessment of infant's respiratory status is required followed by preparation for insertion of a new chest drain.

Image taken by RCHT ANNP Sarah Tabrett



Accidental disconnection of chest drainage system: Immediately apply a clamp directly to chest drain and call for urgent medical help. Clean drainage system tubing 10-15 cm below disconnection site and cut where cleaned. Connect sterile connector to tubing, clean end of chest drain and reconnect to drainage system. **Unclamp chest drain**. Assess infant's respiratory status as per hourly obs. and observe for resumed function of chest drain, prior to disconnection. Report any changes to infant's clinical condition or swinging/ bubbling/ drainage of chest drain to medical team. Consider full replacement of chest drainage system.

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Appendix 4. Chlorhexidine on the Neonatal Unit

Babies born <34 weeks AND <8 days old.

- 0.5% chlorhexidine decanted away from the baby's bed space.
- Bottle to be discarded once open for >7days.
- All bottles to be labelled when opened and discarded if no date.

Babies > 34 weeks OR >7 days (i.e., day 8 onwards if born <34 weeks).

- 2% chlorhexidine via an applicator.

Lumbar Puncture- all babies.

- 0.5% chlorhexidine decanted away from the baby's bed space.
- Bottle to be discarded once open for >7days.
- All bottles to be labelled when opened and discarded if no date.

Chlorhexidine used for skin cleaning can cause injury and burns to neonatal skin. As well as local incident review, a Yellow Card must be completed should this occur. The Yellow Card system can be accessed here: https://yellowcard.mhra.gov.uk.

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