

Document Control

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3. Introduction

- 3.1.** This document sets out Northern Devon Healthcare NHS Trust's best practice guidelines for all pleural procedures.

Several lung diseases can affect the pleura (lining of the lung) e.g. cancer, infection, heart failure. These can cause a fluid collection (pleural effusion) or collapsed lung (pneumothorax). The diagnosis and treatment of these conditions often requires samples of fluid to be taken or chest drains to be inserted into the thorax.

4. Purpose

- 4.1.** The following general principles can be applied in order to improve the:

- Safety of pleural procedures
- Training of staff

In accordance with best practice guidance from the British Thoracic Society (BTS) Pleural Disease Guidelines 2010

This guideline applies to all clinical teams and must be adhered to. Non-compliance with this guideline may be for valid clinical reasons only. The reason for non-compliance must be documented clearly in the patient's notes.

5. Definitions / Abbreviations

- CXR - Chest x-ray
- US – Ultra sound

6. General Principles of Pleural Procedures

6.1. Principles

Pleural disease is a common problem affecting both the acute patients within the hospital and in the outpatient setting. Often the consequences of pleural disease require practical intervention (e.g. diagnostic or therapeutic pleural aspiration, Intercostal drain insertion). Various organizations have recognized the morbidity and mortality associated with these procedures (British Thoracic Society, National Patient Safety Agency).

This guideline does not cover the indications for pleural procedures, only the procedure themselves.

In general out of hours pleural procedures should be avoided unless the patient is compromised by their effusion. If an out of hour's procedure is deemed necessary consideration should be given to undertaking a therapeutic aspiration rather than a drain. For patients in the Emergency Department they should either have a drain inserted prior to transfer to the ward or a clear plan for who will insert the drain, where it will be done and a timeframe for this to be completed. If there is no-one within the on call team who is competent to insert a drain then the on call ITU consultant can be contacted for assistance, this should be a consultant to consultant referral.

All pleural procedures within the department of Medicine should be performed in the procedures room on Glossop ward unless the patient is too unwell to move off a ward. Please refer to the Procedure Room Standard Operating Policy.

For other ward areas there should be at least 2 people present (one doing the procedure and an assistant to help and re-assure the patient)

Bleeps/phones should be handed to another responsible person e.g. ward clerk to prevent distraction during any procedures.

No one should perform **any** pleural procedure without senior supervision unless they have the appropriate evidence that they are competent to perform the procedure unsupervised (e.g. Work place based assessments).

For all pleural procedures a modified theatre checklist should be performed once all personnel are present and before the procedure starts. This should then be filed in the medical records.

6.2. Diagnostic Pleural aspiration for effusions

A recent CXR should be available before aspiration. The procedure should be explained to the patient including any potential complications (bleeding, infection, and pneumothorax). Consent should be recorded in the notes and a modified theatre checklist completed once everything is ready.

Pleural ultrasound should be used to identify a safe site for aspiration and the site marked. (There are almost no indications for an urgent Out of Hours diagnostic aspiration and these should be done in hours when US is available). Direct US guided aspiration or immediately prior to the aspiration are better than the 'X marks the spot' method.

The patient should be positioned depending on the site of pathology and size of effusion. Ideally the triangle of safety (see Appendix B) should be used with the patient semi-reclined and hand (on the side of aspiration) behind the head. For a localised effusion the patients will need to be appropriately positioned.

A diagnostic pleural aspiration should be performed with a fine bore (21G) needle and a 50 ml syringe under aseptic technique (sterile gloves, sterile field, skin sterilising fluid and clean dressing). The needle should be passed superiorly to a rib to avoid the neurovascular bundle. Local anaesthetic should be offered to the patient but is often not required unless the operator is inexperienced or if it is likely to require several attempts.

If there is diagnostic suspicion of infection and a pleural fluid pH is to be measured, aspirated pleural should immediately be drawn into a heparinised blood gas syringe which should then be capped while awaiting analysis to avoid exposure of the fluid to the air. Do not perform pH analysis if the fluid is clearly purulent.

Fluid should be sent for analysis (see Appendix A)

CXR is only required post-procedure following a particularly difficult procedure requiring several attempts or if the patient becomes symptomatic.

6.3. Therapeutic aspiration of pleural fluid

A recent CXR should be available before aspiration. The procedure should be explained to the patient including any potential complications (bleeding, infection, and pneumothorax). Consent should be recorded in the notes and a modified theatre checklist completed once everything is ready.

Pleural ultrasound should be used to identify a safe site for aspiration and the site marked. Direct US guided aspiration or immediately prior to the aspiration are better than the 'X marks the spot' method. Every effort should be made to obtain an US and the procedure delayed until the next working day if possible - when US is freely available. If there is any diagnostic doubt then US should always be employed to confirm the presence of fluid.

The patient should be positioned depending on the site of pathology and size of effusion. Ideally the triangle of safety (see Appendix B) should be used with the patient semi-reclined and hand behind the head.

- The procedure should be performed under aseptic technique.
- After cleaning the skin the identified site should be infiltrated with 1% lidocaine (max dose 3mg/kg), initially superficially with a 25g needle and then at a depth up to and including the pleura using a 21g needle.
- Pleural fluid should be aspirated with this needle to confirm the presence of fluid and allow measurement of depth (skin to fluid). The needle should be passed over the superior surface of a rib.
- Depending on the patient's size a wide bore cannula (16-18g) is then passed into the pleural space. The needle is withdrawn to confirm flow of fluid. The end of the cannula should be covered as much as possible to reduce the amount of air introduced into the pleural space.
- Attach 3-way tap to cannula.

- To two of the ports attach 50ml syringe and tubing and collecting bag. Do not use 'open system' into jug/bottle.

No more than 1.5L should be aspirated at one sitting to avoid re-expansion pulmonary oedema.

Do not perform therapeutic aspiration with a needle as this is likely to cause damage to the visceral pleura causing pneumothorax/haemorrhage.

If the skin to parietal pleura depth is greater than the length of a cannula an alternative system must be used. This can either be a Seldinger chest drain or a Rocket aspiration kit. These are available on request from Glossop Ward.

Fluid should be sent for analysis as for diagnostic aspiration if not sent previously (see section 5.2 and Appendix A)

CXR should be performed after the procedure.

6.4. Intercostal (Seldinger) Drain Insertion

Written consent for intercostal chest drains should be obtained except in emergency situations. Pain, infection, drain dislodgement and drain blockage are the most frequent complications in small-bore chest drains. A modified theatre checklist should be completed once everything is ready.

For equipment required see Appendix C.

Pleural ultrasound should be used to identify a safe site for aspiration and the site marked. Direct US guided aspiration or immediately prior to the aspiration are better than the 'X marks the spot' method. Every effort should be made to obtain an US and the procedure delayed until the next working day if possible - when US is freely available. If there is any diagnostic doubt (or only a small amount of fluid) then US should always be employed to confirm the presence of fluid.

The preferred position for drain insertion is with the patient semi-reclined on the bed, slightly rotated with the arm on the side of the lesion behind the patient's head.

Insertion should be in the **triangle of safety** (see Appendix B) unless an area is specifically identified under image guidance. The second intercostal space in the mid-clavicular line can be used for apical pneumothoraces (but should be discussed with a senior physician first).

Prior to insertion of an intercostal drain an attempt to aspirate the pleural contents should be made; if this is not possible then intercostal drainage should not be attempted.

Aseptic technique

Chest drains should be inserted in a clean area using full aseptic technique including gowns, drapes, sterile gloves and skin cleansing.

Local anaesthetic

Lidocaine 1% should be used to anaesthetise the skin, periosteum and pleura (maximum dose 3mg/kg). The pleura are very sensitive and special attention should be made to ensure adequate analgesia. If the patient experiences significant discomfort during insertion of the drain the procedure should be stopped and further lidocaine infiltrated.

Seldinger Technique

- The needle is introduced into the pleural space and contents aspirated to confirm position.
- The depth to the pleural surface should be noted on the needle.
- A small incision in the skin is made. This must be larger than the circumference of the drain. For 18g drains 7.5mm should be sufficient.
- The guide wire is inserted through the needle using the needle to direct the wire inferiorly or superiorly as appropriate.
- The needle is withdrawn.
- The dilator is inserted over the guide wire with a twisting motion. It should only be 1-2cm beyond the depth of the pleura.
- The drain is inserted over the guide wire once the dilator has been withdrawn. The depth of the drain should be enough to ensure the distal drainage hole is within the pleural cavity.
- The end of the guide wire must be protruding from the distal end of the drain before the drain is fully inserted
- The guide wire and stiffener are withdrawn
- The drain should be capped off with the three way tap whilst it is secured to the chest wall.
- The drain should then be connected to an underwater seal

Securing and removing

Drains should be sutured to the chest wall. Purse string sutures are not appropriate and should not be used. If the skin incision is greater than the drain the suture should close the incision up to the drain. The drain should be tied appropriately by the suture.

To reduce the risk of drains falling out they should also be secured using the round adhesive Hollister attachment device.

To remove a chest drain the drain is removed briskly and firmly during a breath hold. An assistant then applies a waterproof dressing to the drain incision site. Sutures are not usually necessary but occasionally pleural fluid can continue to leak and therefore a suture may be required.

After care

For effusions, no more than 1500mls should be drained at any one time and no more than 4L over 24hours.

Make sure the ward staff is aware the drain is in situ and that a chest drain chart is started.

Chest drains for pneumothoraces should not be clamped unless specific instructions given by a Senior Respiratory Doctor

Prescribe adequate analgesia.

6.5. Education and Training

Responsibility for education and training lies with the Pleural Lead, Dr Alison Moody. It will be provided through practical sessions on a chest wall simulator and direct observation on the ward. Competencies will be assessed and written confirmation issued.

7. Consultation, Approval, Review and Archiving Processes

The author consulted with all relevant stakeholders. Please refer to the Document Control Report.

Final approval was given by the Lead Clinician for Medicine on 27th September 2011.

The guidelines will be reviewed every 3 years. The author will be responsible for ensuring the guidelines are reviewed and revisions approved by the Lead Clinician for Medicine in accordance with the Document Control Report.

All versions of these guidelines will be archived in electronic format by the author within the Respiratory Team policy archive.

Any revisions to the final document will be recorded on the Document Control Report.

To obtain a copy of the archived guidelines, contact should be made with the author.

8. Monitoring Compliance with and the Effectiveness of the Guideline

Monitoring of implementation, effectiveness and compliance with these guidelines will be the responsibility of the Pleural Lead. Where non-compliance is found, it must have been documented in the patient's medical notes.

9. References

BTS Pleural Disease Guideline 2010 Thorax: 65 Supplement 2

NPSA Rapid response report (NPSA/2008/RRR003, 15th May 2008)

10. Associated Documentation

- [Consent policy](#)
- [Standard Infection Control Precautions Policy](#)

APPENDIX A – Fluid Analysis Samples Required

Fluid analysis samples required:

Biochemistry

Test	Container	Simultaneous Blood sample required?	Indication
Protein	Red/yellow top vacutainer	Yes	All samples
LDH	Red/yellow top vacutainer	Yes	All samples
pH	Blood gas syringe	No	Suspected infection in non-purulent fluid
Glucose	Fluoride oxalate vacutainer	Yes	Rheumatoid effusion
Amylase	Red/yellow top vacutainer	No	Pancreatitis –related effusion

Microscopy and Culture

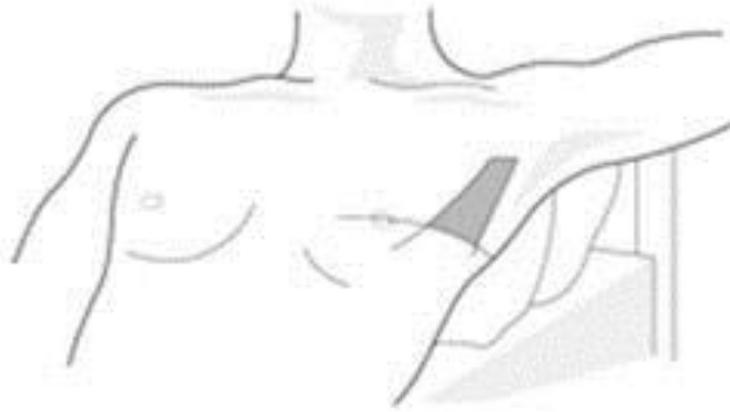
- Samples sent in Plain universal container
- State likely diagnosis
- State current and recent antibiotic use
- If patient unwell with (possible) empyema phone on-call Consultant Microbiologist for urgent Gram stain

Cytology

- Send maximum of 50 mls in Plain universal container.
- State previous history of malignancy and likely diagnosis (if known)

APPENDIX B – The Triangle of Safety

Triangle of safety



Borders:

Lateral border of pectoralis major	(Anterior)
Lateral edge of latissimus dorsi	(Posterior)
5 th intercostal space	(Inferior)
Base of axilla	(Superior)

APPENDIX C – Equipment for Intercostal Chest Drains Insertions

Equipment for Intercostal Chest drain insertions:

- Chest drain ward procedures pack – 12F for pneumothorax or simple effusions
- Needles 2x21g, 1x25g
- 1% lidocaine – 20mls
- Skin cleansing fluid
- Gauze swabs
- Sterile gloves
- 1-0 or 2-0 silk suture on straight needle
- Hypafix / tegaderm
- Hollister adhesive attachment device
- Chest drain bottle and tubing
- Sterile water