CLINICAL GUIDELINE

Adult chest drain

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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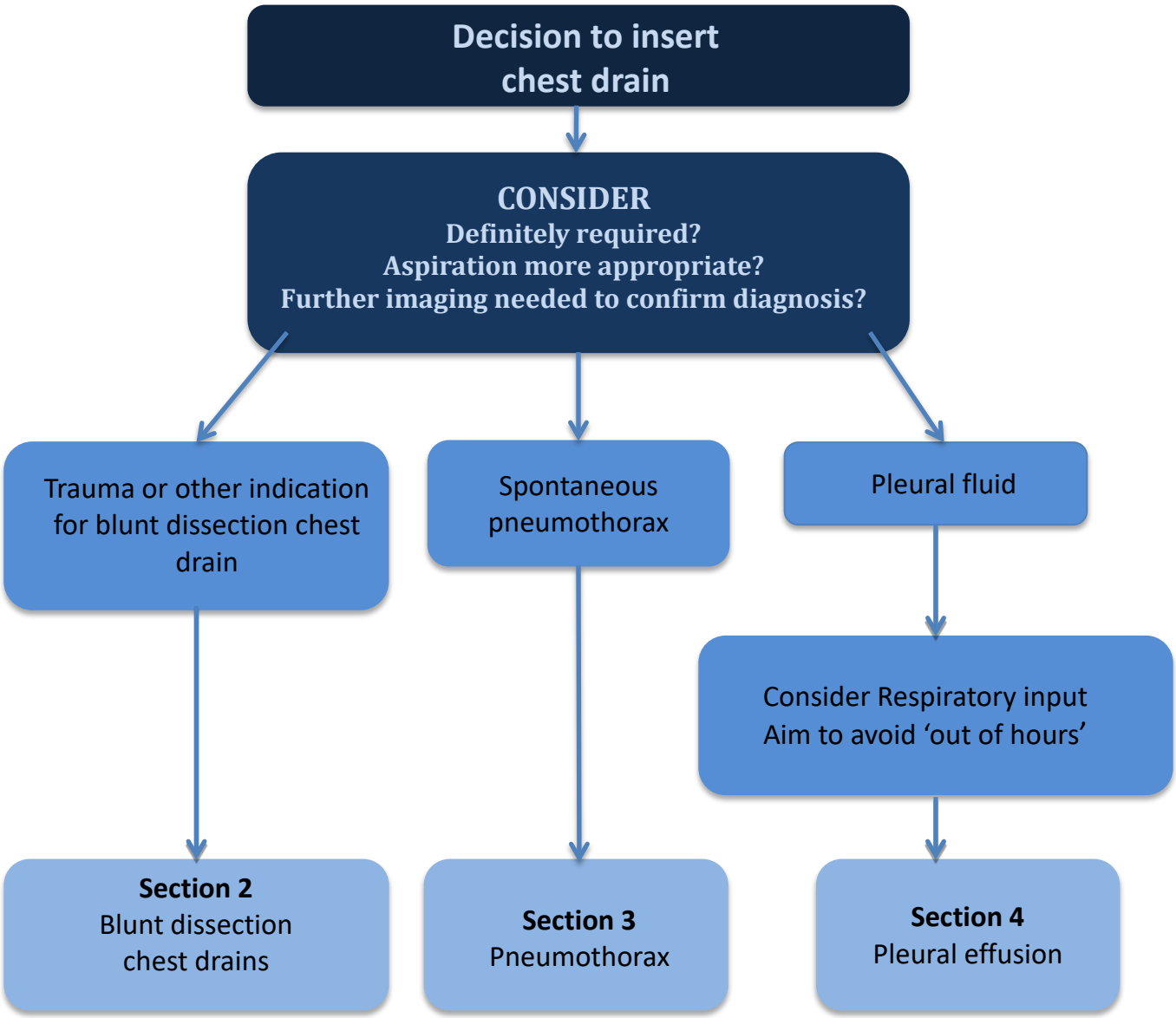
Important Note:

The online version of this document is the only version that is maintained.
Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

NHS Greater Glasgow and Clyde Adult Chest Drain Guideline (2025)

Decision Flowchart



Contents

1 Background

1.1 Introduction

Intercostal chest drains (ICDs) are used to remove air, fluid, blood or pus from the pleural space. The insertion of chest drains, whilst in the majority of cases a straightforward process, can sometimes be associated with serious complications including patient death[1]. In 2008 the National Patient Safety Agency issued a Rapid Response Report[2] highlighting 12 deaths related to ICD insertion, and subsequent surveys suggested that most trusts had encountered a major complication following ICD insertion. Complications causing patient harm included solid organ injury caused by trocars or dilators, guidewires lost into the pleural space, intrapleural or drain site infection, drain dislodgement and pain. Serious complications and deaths occurred with Seldinger (guidewire) drain insertion as well as with blunt dissection drains.

1.2 The Scope of these Guidelines

These guidelines are intended for use in all clinical areas within NHS GGC including the Emergency Department, Medical wards, Surgical wards and Respiratory units. Surgical chest drains used for trauma are out with the scope of this guideline.

There are National guidelines available for specific clinical indications, including the British Thoracic Society (BTS) guidelines on pleural disease,[1] a subsequent Clinical Statement on Pleural Procedures[7] and the Advanced Trauma Life Support (ATLS) manual[4]. These local guidelines for GG&C draw heavily from these sources and are designed to complement rather than replace national guidelines, with specific reference to locally used equipment and protocols.

1.3 Indications for Chest Drain

Under certain circumstances chest drains are used for the management of air or fluid within the pleural cavity. Broadly speaking the situations where a chest drain may be required can be divided into four categories. The first of these is in the context of trauma, generally haemothorax and/or pneumothorax. A blunt dissection drain is recommended in these circumstances (Section 2) and the ATLS guidelines should be used for reference[4]. This situation is out with the scope of our guideline. Secondly, a chest drain is sometimes required for a spontaneous or iatrogenic (following CT guided lung biopsy) pneumothorax, where a small bore Seldinger drain is usually most appropriate (Section 3), and specific BTS guidelines exist for management of pneumothorax[1]. Thirdly there are times when a chest drain is required in the management of an exudative pleural effusion, including parapneumonic effusion/ empyema (Section 4). Within the BTS pleural guidelines there are sections on the general investigation of pleural effusion and on the management of pleural infection and malignant pleural effusion[1]. Chest drains inserted under radiological (CT) guidance are also out with the scope of this guideline.

1.4 Choice of Technique

The historic technique for chest drain insertion is that of blunt dissection, sometimes referred to as insertion of an Argyle or 'Surgical' chest drain. This technique involves dissection down to the pleural space through the chest wall and direct placement of a chest drain through this tract, usually with a large bore tube.

Subsequently the Seldinger technique was developed for chest drain insertion. This technique involves reaching the pleural space using a specifically designed seeker needle, passing a guidewire through the seeker needle and dilating a tract around the guidewire, allowing the chest drain to be passed smoothly over this wire into the pleural space.

In theory either technique could be used in most circumstances, and the experience of the operator may influence the choice of technique. However, in certain situations one technique will be more appropriate than another. For example, in traumatic pneumothorax or haemothorax a blunt-dissection technique should be used, but when required for spontaneous pneumothorax or pleural effusion a smaller bore Seldinger drain is usually recommended.

1.5 Common Principles

The BTS Guidelines on pleural procedures contain a number of recommendations aimed at improving patient safety (Box 1). Some of these are discussed in more detail here.

TRAINING AND SUPERVISION

- All doctors expected to be able to insert a chest drain should be trained using a combination of didactic lecture, simulated practice and supervised practice until considered competent.
- Pleural procedures should not take place out of hours except in an emergency.

EQUIPMENT AND INSERTION TECHNIQUE

- Written consent should be obtained for chest drain insertions, except in emergency situations. Pain, intrapleural infection, wound infection, drain dislodgement and drain blockage are the most frequent complications of small-bore chest drain insertion. Visceral injury is the most serious complication. All of these possible sequelae should be detailed in the consent process.
- Small drains (usually inserted by the Seldinger technique) should be used as first-line therapy for pneumothorax, free flowing pleural effusions and pleural infection.
- During chest drain insertion an attempt to aspirate the pleural contents with a small needle should be made. If this is not possible, chest drain insertion should not continue.
- The dilator should not be inserted further than 1 cm beyond the depth from the skin to the pleural space (just enough to allow the tapered end of the dilator to enter the pleural space)

INSERTION SITE AND IMAGING

- The preferred site for insertion of the needle for pleural aspiration should be the triangle of safety, unless ultrasound suggests an alternative site is more appropriate.
- Thoracic ultrasound guidance is mandatory for all pleural procedures for pleural fluid.
- The marking of a site using thoracic ultrasound for subsequent remote aspiration or chest drain insertion is not recommended except for large pleural effusions.

OTHER SAFETY ISSUES

- Pleural aspirations and chest drains should be inserted in a clean area using full aseptic technique.
- Non-urgent pleural aspirations and chest drain insertions should be avoided in anticoagulated patients until international normalised ratio (INR) ≤1.5
- All patients with chest drains should be cared for by a medical or surgical team experienced with their management and nursed on a ward familiar with their care.

Box 1 - BTS recommendations to improve the safety of chest drain insertion and management

Training and Supervision

For the insertion of any chest drain it is recommended that doctors and pleural nurse specialists are trained using a combination of didactic lecture, simulated practice and supervised practice until considered competent.

For the insertion of chest drains using the blunt dissection technique, the Advanced Trauma Life Support (ATLS) programme is recommended for initial training. Progression to competence to practise independently will follow further supervised practice and will depend on standards set within individual specialities such as Emergency Medicine, General Surgery and Cardiothoracic Surgery. Trainees in general medicine would not routinely be expected to insert chest drains by the blunt dissection technique, with the exception of respiratory medicine, where training and supervised procedures may be provided as part of their specialty training programme.

Before being allowed to insert Seldinger ICDs in unsupervised situations in NHSGGC hospitals, doctors and pleural nurse specialist should undergo training as specified by the BTS guidelines i.e. a combination of didactic lectures, manikin/simulation practice and directly observed procedures (DOPs). Several pathways already exist to achieve this training, such as the IMT training programme via NES or the IMPACT and ATLS courses. In particular, all IMT doctors in Scotland are now routinely trained by experienced operators with SIM training as part of a clinical skills education day. This is part of the NES Mastery Training programme.

Before being considered fully competent to insert a chest drain by Seldinger technique independently it is recommended that trainees should have inserted a minimum of four chest drains under supervision with satisfactory DOPs completed for at least two, the latter of which should have the '*Level of independent practice*' recorded as '*Competent to perform the procedure unsupervised and deal with complications*'.

Pleural procedures for effusions out of hours should be avoided where possible, and should usually be restricted to therapeutic aspiration for symptomatic relief rather than chest drain insertion. If possible, definitive management should be performed by or at least discussed with the local Respiratory team.

Consent

Unless in an emergency, ICDs should not be inserted without written informed consent. To facilitate the consent process, a Patient Information Leaflet has been produced for use in NHSGGC (see Appendix B). If the patient does not have capacity to consent, a procedure-specific AWI form should be completed.

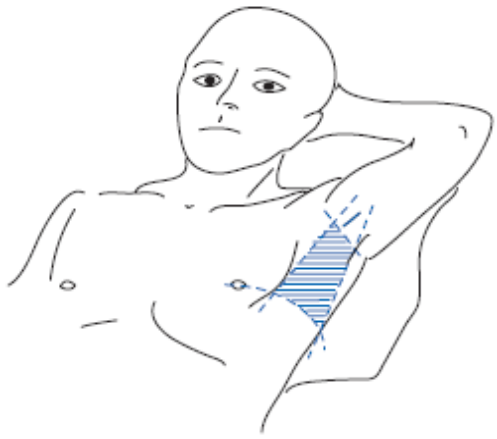


Figure 1 The 'triangle of safety'. The triangle is bordered anteriorly by the lateral edge of pectoralis major, laterally by the lateral edge of latissimus dorsi, inferiorly by the line of the fifth intercostal space and superiorly by the base of the axilla.

Triangle of Safety

This is the conventional site for insertion of ICDs and is detailed in Figure 1. For the insertion of drains by blunt dissection the ATLS manual advises that a site is selected anterior to the mid-axillary line, in order to avoid the long thoracic nerve and its vascular bundle.

Good Practice

Where available, chest drains should be inserted in a clean procedure room rather than at the bedside. Sterile gowns and drapes are mandatory.

All ICDs inserted for medical indications should be managed in collaboration with respiratory units and, where appropriate, transfer to the respiratory ward should be considered.

ICD packs for medical indications have been standardised. After a review of the Seldinger ICD packs available, those produced by Rocket Medical Ltd were the preferred choice and are now stocked as standard on respiratory wards. These come in a flexible range of sizes (12, 14, 16, 18 and 20F) and the dilators are short and hence less prone to causing solid organ injury. The packs usually contain gowns and drapes to allow aseptic technique, though some packs do not contain these items, which need to be sourced locally. Different adaptors allow connection to different types of chest drain bottle, though the Rocket drain bottles or Thopaz suction units are most commonly used in GG&C. Chest drain equipment has largely been standardised across respiratory, ED and medical units across GG&C, though ED occasionally used different equipment and it is worth carefully assessing any patient transferred from ED to a medical ward with a chest drain in-situ.

To improve adherence to guidelines and manufacturer's instructions for ICD insertion, an SOP (see Appendix A) has been produced covering the procedure based upon the BTS guidelines and instructions accompanying the Rocket Medical chest drains.

Rocket Medical also provides larger sizes of ICDs (24, 26, 28F) which are blunt dissection technique chest drains- these come with a plastic "stiffener" in lieu of a trocar, and the insertion technique is described in the appendix.

1.6 Ultrasound Imaging

Ward-based ultrasound imaging is mandatory for pleural procedures involving fluid in all but immediately life threatening emergencies (e.g., chest trauma). This is now available in all respiratory departments in NHS GGC.

The marking of a site using thoracic ultrasound for subsequent remote aspiration or chest drain insertion is not recommended.

2 Blunt dissection chest drains

a. **Trauma.** Blunt dissection chest drains are generally recommended in the setting of trauma when drainage of air or fluid, such as blood, is required. Chest drain insertion in the context of trauma is outwith the scope of this guideline, and is covered as part of ATLS training.

b. **Medical indications.** A Seldinger approach is generally recommended for the management of 'medical' pleural disease, namely pleural fluid or spontaneous pneumothorax. However there are certain circumstances when a blunt dissection approach may be preferred. These indications might include patients with extensive surgical (subcutaneous) emphysema, persistent pneumothorax with large air leak or management of complex pleural infection. Outwith critical care/ ED settings, specialist respiratory advice should be sought before inserting a large bore chest drain for these indications. An SOP for the insertion of blunt dissection chest drains can be found in Appendix A.

3 Spontaneous Pneumothorax

Pneumothorax is a significant health problem. Primary spontaneous pneumothorax (PSP) is a pneumothorax occurring in a previously healthy individual and secondary spontaneous pneumothorax (SSP) is pneumothorax occurring in those with pre-existing lung disease. Combined hospital admission rates for PSP and SSP in the UK have been rising and are estimated at 14.1 per 100,000 population.

Symptoms in PSP may be minimal or absent. In contrast, symptoms are greater in SSP, even if the pneumothorax is relatively small in size. In reality, however, this is a false dichotomy since patients with apparent PSP commonly have parenchymal abnormalities. It is also often difficult to reliably distinguish between PSP and SSP prior to a first pleural intervention in the emergency setting. The updated BTS guidelines therefore advise treatment planning based on a number of high-risk features, including but not limited to likely underlying lung disease, in addition to an early assessment of breathlessness alongside the risks involved in performing any pleural intervention and the patient's immediate priorities (see Figure 2).

In low-risk patients, conservative management (no intervention) or ambulatory care (involving placement of ambulatory device) can be considered in areas with established downstream pathways for early outpatient clinical review. The former will be most suitable for selected patients keen to avoid intervention. Needle aspiration should always be considered in low-risk patients seeking rapid relief of breathlessness. Chest pain is a weak indication for any pleural intervention.

High-risk symptomatic patients require admission and usually require insertion of an ICD. It should be noted that ICD insertion in patients with SSP can be challenging and CT scanning is sometimes required to assist with drain positioning.

Severe symptoms and signs of respiratory distress or haemodynamic instability suggest the presence of tension pneumothorax, which requires immediate management. This should be managed with oxygen therapy and needle decompression with a wide bore cannula inserted into the 2nd intercostal space, mid clavicular line (It should be noted that a standard cannula may not be long enough to

reach the pleural space in some patients and a longer needle may be required if the ‘hiss’ is not heard). Tension is a clinical rather than a radiological diagnosis and the patient is usually unwell with a history of chronic lung disease or recent trauma.

The recommended size of chest drain for spontaneous pneumothorax is 12F, inserted using a Seldinger technique and sited within the triangle of safety. There may occasionally be circumstances under which an alternative site, drain size or insertion technique is preferable, but this should only occur with involvement of the Respiratory team or another senior clinician.

The BTS 2023 pleural disease guideline[1] includes a useful algorithm for the management of pneumothorax which should be followed.

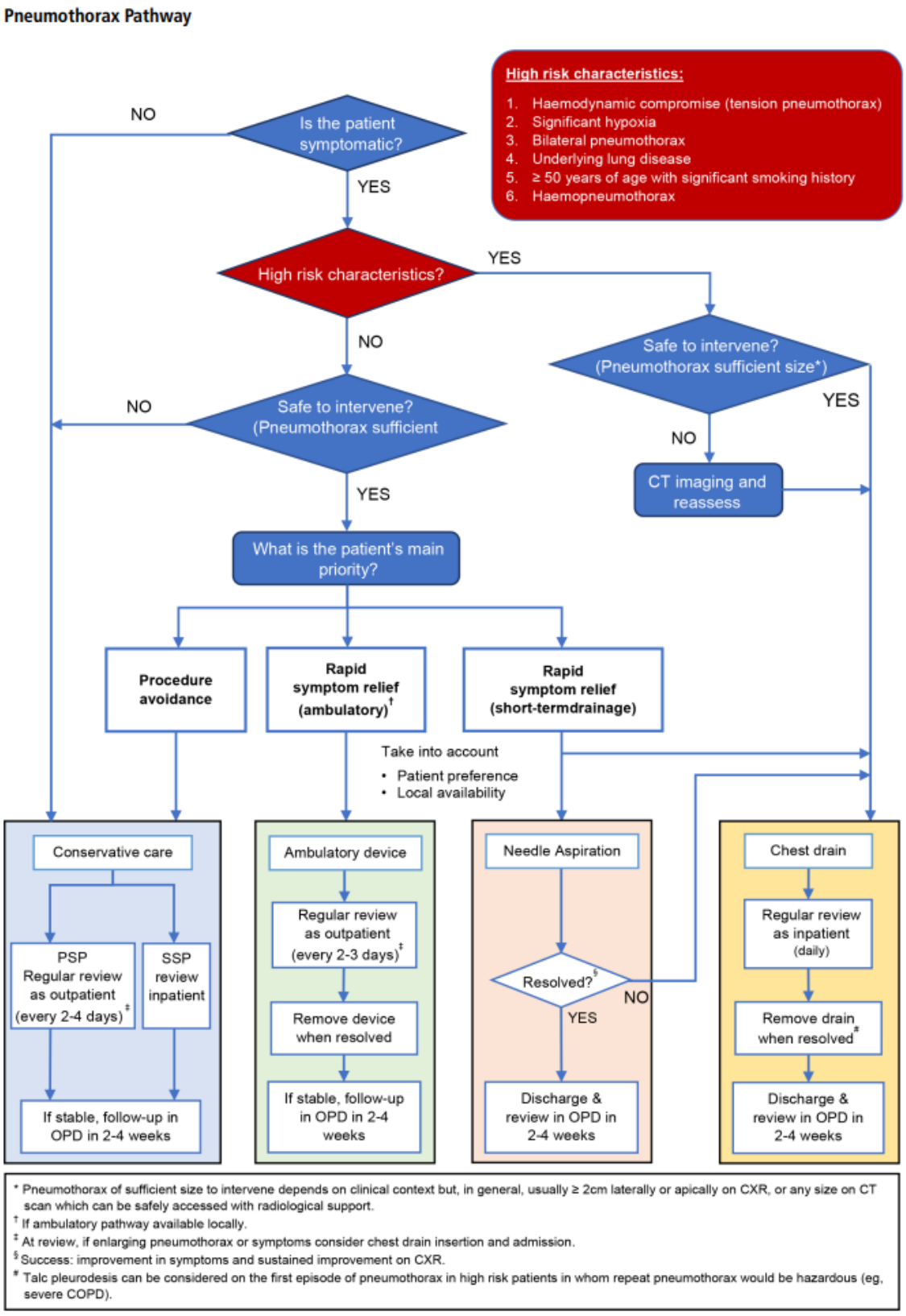


Figure 2 BTS algorithm for management of pneumothorax

4 Pleural effusion

Pleural effusion is a common medical problem with over 50 recognised causes. The aim is to establish a diagnosis swiftly and minimise the need for repeated invasive procedures.

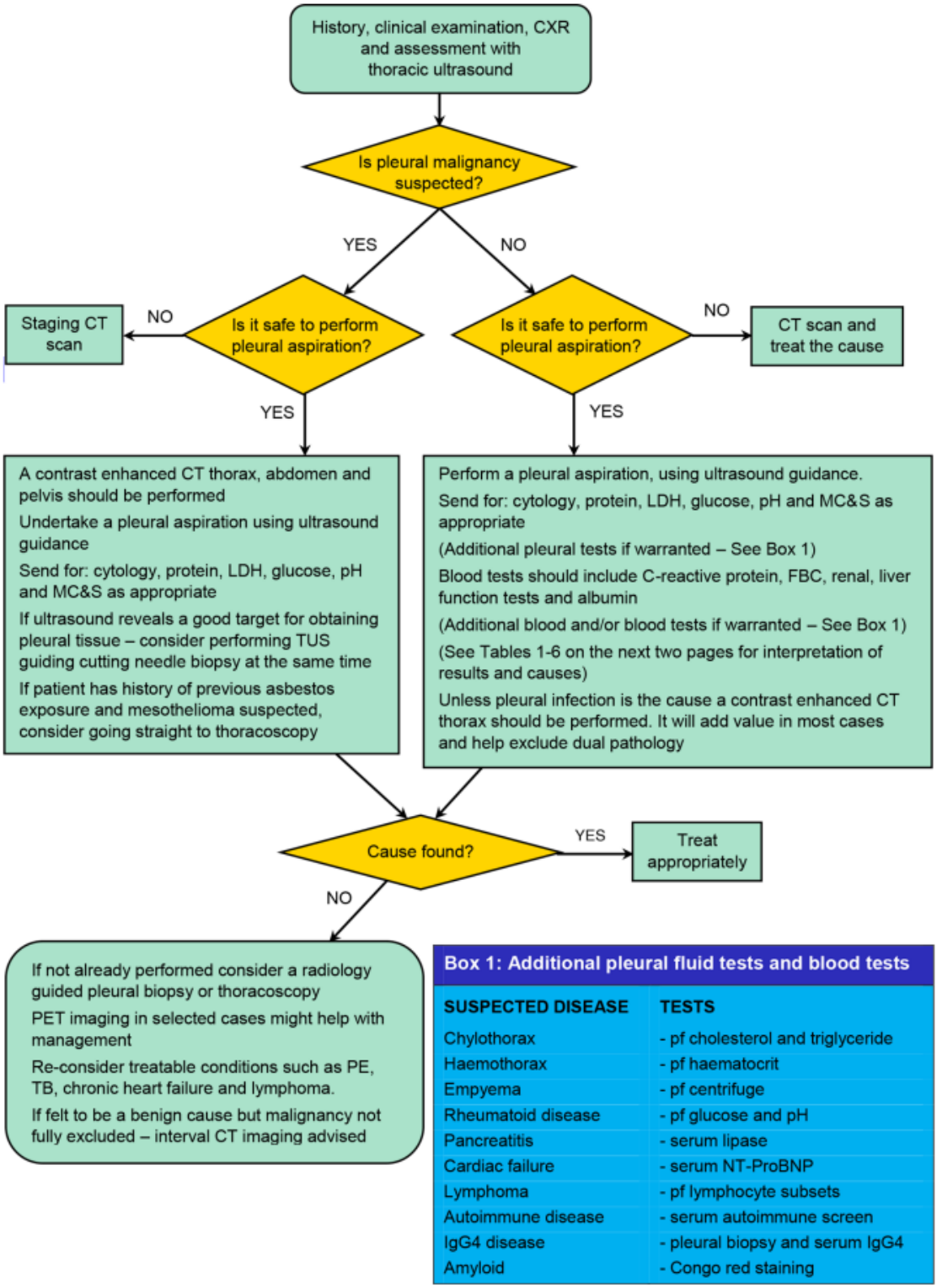
Not all pleural effusions require insertion of an ICD. A diagnostic tap is usually the appropriate first step, and additional fluid can be removed if required for symptomatic relief. If mesothelioma is suspected (as indicated by a history of asbestos exposure/pleural plaques and pleural thickening on CT scan), pleural cytology is of little diagnostic value and patients can be referred directly for thoracoscopy. Occasionally a chest drain is inserted before a diagnosis has been established (for example patients who are critically unwell or very poor performance status), but this should be discussed with the local respiratory team where possible. Ideally ICD insertion should be done during daytime hours. If a patient presents 'out of hours' with respiratory distress associated with a pleural effusion it is reasonable to carry out a 'therapeutic aspiration' of 500ml of fluid to provide symptomatic relief and fluid for diagnostic purposes, deferring the insertion of an ICD until it has been decided this is the appropriate management strategy.

If the diagnostic tap reveals very turbid fluid or pus, this is diagnostic of empyema and requires early liaison with the Respiratory team and early insertion of an ICD.

The recommended size of chest drain for pleural fluid is 10-14F inserted using a Seldinger technique under ultrasound guidance. The ultrasound should always be performed at the bedside immediately before the procedure. There is no evidence that larger drains lead to better outcomes in the management of pleural infection, and larger bore drains may be associated with greater pain. There may occasionally be circumstances under which an atypical site, drain size or insertion technique is preferable (pleural infection being a notable example), but this should only occur with involvement of the Respiratory team.

The BTS 2023 guideline[1] includes a useful diagnostic algorithm which should be used in the investigation and management of unilateral pleural effusion. It also gives a useful decision guide when dealing with suspected pleural infection (figure 4).

Unilateral pleural effusion diagnostic pathway



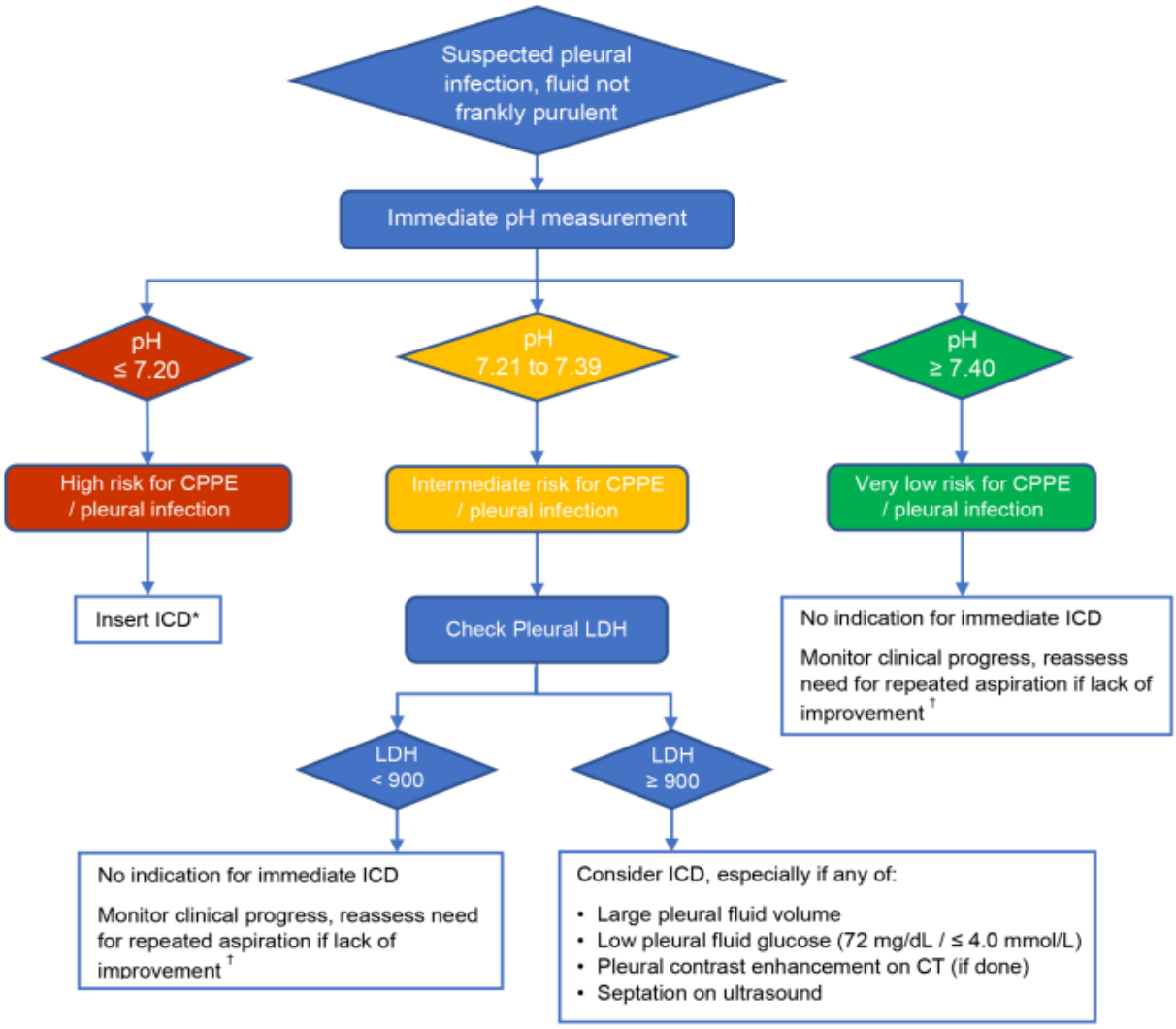
Box 1: Additional pleural fluid tests and blood tests

SUSPECTED DISEASE	TESTS
Chylothorax	- pf cholesterol and triglyceride
Haemothorax	- pf haematocrit
Empyema	- pf centrifuge
Rheumatoid disease	- pf glucose and pH
Pancreatitis	- serum lipase
Cardiac failure	- serum NT-ProBNP
Lymphoma	- pf lymphocyte subsets
Autoimmune disease	- serum autoimmune screen
IgG4 disease	- pleural biopsy and serum IgG4
Amyloid	- Congo red staining

CXR, chest X-ray; FBC, full blood count; LDH, lactate dehydrogenase; NT-proBNP, N-terminal prohormone brain natriuretic peptide; PE, pulmonary embolism; TB, tuberculosis; TUS, thoracic ultrasound.

Figure 3 BTS algorithm for management of unilateral pleural effusion

Suspected pleural infection, non-purulent fluid – initial decision tree



* Assuming ultrasound demonstrates safe volume of accessible pleural fluid.
† As evidenced by ongoing temperature, persisting elevation of inflammatory markers. Those with septations and pleural pH >7.4 should also be considered for drainage.

Initial pH	Level of risk for CPPE / pleural infection	Initial action regarding drainage
≤ 7.2	High risk	Insert ICD, assuming ultrasound demonstrates safe volume of accessible pleural fluid
> 7.2 to < 7.4	Intermediate risk	Check LDH and review other parameters which may support CPPE / pleural infection. Consider ICD insertion if LDH > 900, especially if any of the following: • Large pleural fluid volume • Low pleural fluid glucose (72 mg/dL / ≤ 4.0 mmol/L) • Pleural contrast enhancement on CT • Septation on ultrasound
≥ 7.4	Very low risk	No indication for immediate ICD

CPPE, complex parapneumonic effusion; LDH, lactate dehydrogenase; ICD, intercostal drain.

Figure 4 BTS algorithm for managing suspected pleural infection.

Anticoagulation in patients undergoing pleural procedures

Many patients are on blood thinning treatments, including anticoagulants and anti-platelet agents, for a variety of reasons. This needs to be considered when carrying out pleural procedures, and medications should be stopped or suspended where possible. The risks and benefits of interrupting treatment should be discussed with the patient where possible. If there are felt to be risks associated with suspending anticoagulant or anti-platelet medication, discussions may need to involve other specialty teams eg cardiology and haematology. "Bridging" LMWH is sometimes an option if anticoagulants need to be stopped for a period of time and the patient is at high thrombotic risk.[6]

Warfarin should be stopped, and it is safe to proceed when INR is ≤ 1.5

DOACs should be stopped 24-48 hours pre procedure (depends on agent and renal function)

Clopidogrel and prasugrel should be stopped 5 days pre procedure

Ticagrelor should be stopped 7 days pre procedure

Aspirin and prophylactic LMWH can be continued[6]

Appendix A – Standard Operating Procedures

PURPOSE

This SOP outlines the procedure to be used for insertion of a chest drain by the blunt dissection technique. This SOP is designed to be used in medical patients (eg severe surgical emphysema in the context of pneumothorax). For guidance regarding trauma/ surgical settings, refer to the ATLS manual

EMERGENCY SITUATIONS

In an emergency setting, decisions need to be made on the urgency with which action should be taken. Under certain circumstances it may not be possible to carry out all the steps outlined below, for example written consent or full imaging.

DECISION

- Is a drain required in line with relevant guidelines – e.g. Advanced Trauma Life Support, British Thoracic Society
- Is it required urgently? (Avoid 'out of hours' where possible)
- Is there sufficient information to make a confident diagnosis? If not consider further imaging such as ultrasound or CT
- Is there a sufficiently skilled operator to insert the drain?
- Are there relative or absolute contraindications to be aware of?
    - *Clotting, platelets, allergies, body habitus*

Discuss with senior Respiratory or Cardiothoracic team where possible. There may be variance in what local expertise is available, and assistance may be required from anyone on site with relevant experience e.g. General Surgery or the local Emergency Department.

PREPARATION

- Confirm patient ID corresponds with name band and chest imaging
- Provide patient information sheet and chance to read it
- Obtain written informed consent or complete Adults with Incapacity Act form. Inform relative if appropriate
- Review imaging to confirm site for drain and consider further imaging such as CT if diagnostic uncertainty
- For pleural fluid/ pleural infection, bedside ultrasound by a trained operator is mandatory

- Use triangle of safety wherever possible (see Figure 1)
- Two assistants is optimal – one of whom is experienced in assisting chest drain insertion
- Select a suitable clinical area for drain insertion. If patient is in a general ward it is strongly recommended that a suitably equipped dedicated procedure room is used
- Oxygen saturation monitoring available, oxygen available
- Record baseline observations
- IV access secured and working
- Ensure the patient is comfortable with analgesia if required
- If premedication needed, reversal available
- Check all drugs/doses/expiry dates with assistant
- Check for allergies (local anaesthetic, chlorhexidine, iodine, dressings)

- Obtain equipment *(see checklist)*
- Position the patient appropriately (Figure 2)
    - o For pneumothorax semi-reclined position is preferred to access the triangle of safety
    - o For pleural fluid position for patient comfort and depending on ultrasound findings

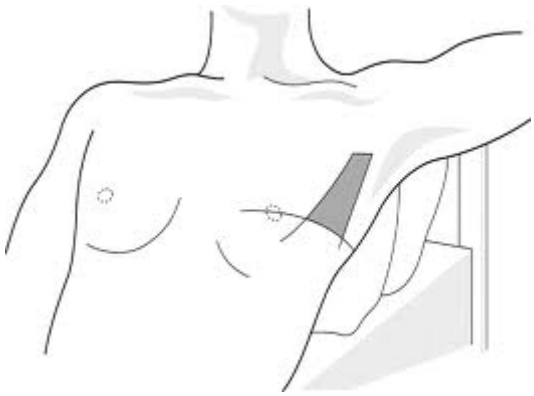


Figure 1 The 'triangle of safety'. The triangle is bordered anteriorly by the lateral edge of pectoralis major, posteriorly by the mid-axillary line, inferiorly by the line of the fifth intercostal space and superiorly by the base of the axilla.

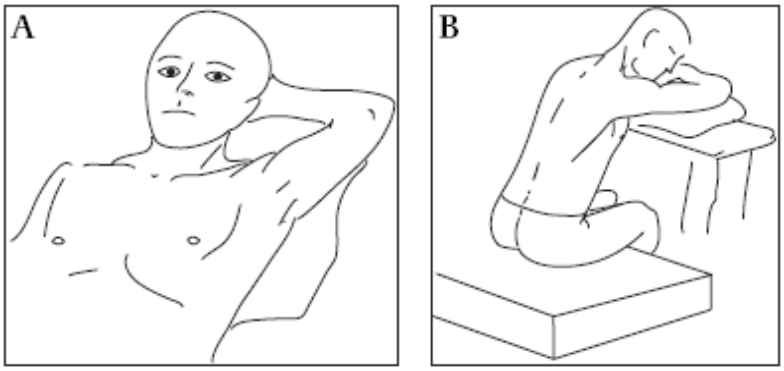


Figure 2 Common patient positions for chest drain insertion. (A) Semi-reclined with hand behind head. (B) Sitting up leaning over a table with padding.

EQUIPMENT

Clean trolley
Clinical waste bag
Large sharps container
Trolley drape

Hernia drape
Gallipot
Swabs
5ml syringe
21g needle (green)
23g or 25g needle (blue or orange)
11 scalpel blade with handle
Suture
Dry dressing
Iodine or Chlorohexidine 2% and 70% alcohol solution.
Sterile surgical gown and gloves
Visor mask / goggles
Medium blunt tipped forceps x 2
Lidocaine 1% or 2%
Chest drain
Chest drain bottle and tubing
Bottle of sterile water
Clear tape
Chest drain clamp
[Portable ultrasound for pleural fluid]

PROCEDURE

Carry out a Procedural Pause [5]

The procedural pause is an opportunity for all those involved in the procedure, including the patient, to acknowledge that they are content and happy to proceed.

1. Ensure that the patient is comfortable and that they are happy to proceed
2. Your assistant should have the opportunity now to voice any concerns, identify any problems or anything else that needs addressed
3. The operator should ensure that the equipment is all present, checked and laid out in the order of use.

Once this is completed the insertion can begin.

Cleansing and anaesthesia

- Full aseptic technique
- Position patient, trolley, room furniture, assistants
- Consider premedication
- Double-check equipment
- Scrub up, gown on, gloves on
- Clean skin and apply sterile drapes
- Infiltrate skin with local anaesthetic (LA)
- Infiltrate tissue, down to ribs and pleura with LA
    - *Confirm aspiration of fluid/air - if not possible further imaging required*
    - *Note depth of insertion of LA needle to pleural space*
    - *Note direction of needle insertion to pleural space*

Blunt dissection and drain insertion (Trocar/ Argyle drain- see below for Rocket drain insertion)

- Ensure that assistant has prepared chest drain bottle with underwater seal and has tubing ready

- Make a transverse (horizontal) incision through the skin and superficial soft tissues, large enough to accommodate the drain selected. Use blunt dissection with artery forceps through the subcutaneous tissue in the horizontal plane over the upper border of the rib
- Puncture the pleura with the tip of the forceps and put a gloved finger into the incision and the pleural cavity.
- Trocars should **never** be inserted into the pleural space due to the risk of visceral injury/ bleeding
- Take the chest drain and insert it into the pleural cavity for the desired length. The tube should be directed posteriorly along the inside of the chest wall
- Check for fogging of the tube with expiration or listen for air movement.
- Connect the end of the tube to a suitable underwater seal apparatus
- Check for bubbling or oscillation to ensure the drain is functioning.
- Secure the tube in place with sutures and dressing
- Remove drapes and help patient back into comfortable position in bed
- Obtain a chest x-ray at the end of the procedure to confirm a satisfactory position of the tube. If the position is suboptimal, the tube may adjusted by pulling it back, but it must never be pushed further in because of the risk of pleural infection.
- Note depth of drain to skin (by markings on drain) for future reference
- Remove drapes and help patient back into comfortable position in bed

Drain insertion (Rocket drain)- refer to manufacturer's instructions

- Many respiratory units also stock "Rocket" chest drains designed for insertion by blunt dissection. Any Rocket drain greater than size 20F does not come with an introducer needle, a guidewire or dilators- instead, a scalpel and disposable blunt dissection forceps are contained within the insertion pack
- The principles of blunt dissection chest drain insertion are identical to those detailed above
- The key difference is that there is no metal trocar in the pack- instead, there is a stiff plastic rod about 8 inches long
- Before inserting the chest drain, the plastic stiffener should be inserted into the proximal drainage hole and worked distally until it reaches the distal end of the tube. This should be done before the incision is made
- This stiffens the distal end of the drain and makes it easier to insert down the formed tract.
- **The plastic stiffener should be withdrawn completely** as the drain in inserted into the thoracic cavity, keeping hold of it at all times- it should then be discarded.

AFTERCARE

- Unclamp drain, if clamped
  - *Traumatic haemothorax - manage in line with ATLS guidelines*
  - *Pneumothorax - should never be clamped*
  - *Pleural effusion - follow local policy for drainage, generally 500ml fluid drainage then clamp for an hour, then repeat. Certainly, no more than 1.5 litre initial drainage before clamping.*

For pneumothorax or any bubbling chest drain there should be absolutely no clamping

- Document procedure in medical case notes.
  The use of the Chest Drain Bundle documentation (in sticker or electronic format) is recommended. See Appendix B.
  Record -

    - *Indication*
    - *Operator, assistant(s)*
    - *Consent, premedication*
    - *Insertion technique, site, anaesthetic*
    - *Drain size, depth, complications*
    - *Sutures inserted and fixation device used*
    - *Samples sent*
    - *Post-procedure instructions*
- Insert Product Batch Number sticker into casenotes if available
- Prescribe analgesia
- Sign for any premedication that you have administered
- Send any samples taken
- Handover to Nursing Staff and on-call medical staff if necessary
- Request chest x-ray (timing at discretion of clinical team)
- Other SOPs provide guidance on further drain care

PURPOSE

This SOP outlines the procedure to be used for the insertion of a chest drain by the Seldinger technique for either pleural fluid or pneumothorax.

DECISION

- Would aspiration be sufficient?
- Is pleural biopsy needed? *(Respiratory team required)*
- Is it required urgently? (Avoid 'out of hours' where possible)
- Is there sufficient information to make a confident diagnosis? If not consider further imaging such as CT
- Is there a sufficiently skilled operator to insert the drain?
- Are there relative or absolute contraindications to be aware of?
    - *Clotting, platelets, allergies, body habitus*

Discuss with Respiratory team where possible and whenever diagnosis in doubt, relative contraindications exist, atypical insertion site proposed or difficult insertion anticipated

PREPARATION

- Confirm patient ID corresponds with name band and chest imaging
- Provide patient information sheet and chance to read it
- Obtain written informed consent or complete Adults with Incapacity Act form. Inform relative if appropriate
- Review imaging to confirm site for drain and consider further imaging such as CT if diagnostic uncertainty

  For Pleural Fluid

  Image-guidance (bedside ultrasound) wherever possible
    - *Must be performed by someone trained in ultrasound*
    - *Note depth from skin to pleural space*

  Triangle of safety wherever possible (see Figure 1) and if ultrasound not available
- Two assistants is optimal – one of whom is experienced in assisting chest drain insertion
- Select a suitable clinical area for drain insertion. If patient is in a general ward it is strongly recommended that a suitably equipped dedicated procedure room is used
- Oxygen saturation monitoring available, oxygen available
- Record baseline observations
- IV access secured and working
- Ensure the patient is comfortable with analgesia if required
- If premedication needed, reversal available
- Check all drugs/doses/expiry dates with assistant
- Check for allergies (local anaesthetic, chlorhexidine, iodine, dressings)
- Obtain equipment *(see checklist)*
- Position the patient appropriately (Figure 2)
    - For pneumothorax semi-reclined position is preferred to access the triangle of safety
    - For pleural fluid position for patient comfort and depending on ultrasound findings

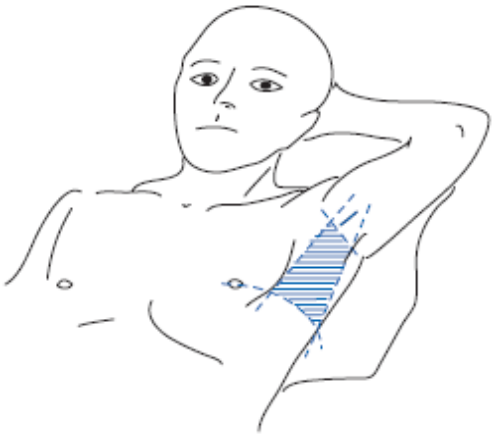


Figure 1 The 'triangle of safety'. The triangle is bordered anteriorly by the lateral edge of pectoralis major, laterally by the lateral edge of latissimus dorsi, inferiorly by the line of the fifth intercostal space and superiorly by the base of the axilla.

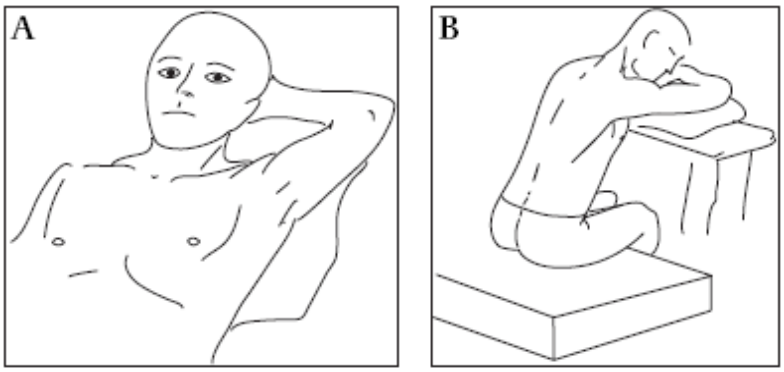


Figure 2 Common patient positions for chest drain insertion. (A) Semi-reclined with hand behind head. (B) Sitting up leaning over a table with padding.

EQUIPMENT

NB In many clinical areas drain packs manufactured by Rocket are being used which contain much of the necessary equipment. These items are indicated by * in the list below

Sterile gown*
Sterile drapes*
Gauze swabs*
Syringes and needles*
Scalpel*
Suture
Guidewire*
Chest drain*
Sterile gloves

Skin antiseptic solution
Local anaesthetic
Chest drain tubing
Drain bottle + sterile water
Dressing
Chest drain clamp
Clinical waste bag
[Specimen containers]

PROCEDURE

Carry out a Procedural Pause [5]

The procedural pause is an opportunity for all those involved in the procedure, including the patient, to acknowledge that they are content and happy to proceed.

1. Ensure that the patient is comfortable and that they are happy to proceed
2. Your assistant should have the opportunity now to voice any concerns, identify any problems or anything else that needs addressed
3. The operator should ensure that the equipment is all present, checked and laid out in the order of use.

Once this is completed the insertion can begin.

Cleansing and anaesthesia

- Full aseptic technique
- Position patient, trolley, room furniture, assistants
- Consider premedication
- Double-check equipment
- Scrub up, gown on, gloves on
- Clean skin and apply sterile drapes
- Infiltrate skin with local anaesthetic (LA)
- Infiltrate tissue, down to ribs and pleura with LA
  - *Confirm aspiration of fluid/air air - if not possible further imaging required*
  - *Note depth of insertion of LA needle to pleural space*
  - *Note direction of needle insertion to pleural space*

Guidewire insertion and dilatation

- Ensure that assistant has prepared chest drain bottle with underwater seal and has tubing ready
- Assemble and check introducer needle and syringe
- Check guidewire/feeder, dilators, drain
- Nick skin with scalpel
- Insert introducer needle until fluid/air obtained +5mm
- Secure needle position with hand, remove syringe
- Insert guidewire sufficient length to reach pleural space
  - *NB The guidewire has markings in 10cm intervals; 20-30cm length of wire should be adequate in most patients*
  - ***There should be little or no resistance***
- Secure guidewire then remove introducer needle
- Use scalpel to increase size of skin incision over guidewire, if necessary

- Insert sequential dilators over guidewire
  - *Rotating motion to ease through skin*
  - *Do not remove depth guards unless absolutely necessary*

Chest Drain Insertion

- Insert chest drain over guidewire to a depth adequate to have all side ports within pleural space +5cm
  - *On Rocket drains, markers measure depth to proximal port (**not** to the end of the drain)*
  - *A typical depth would be 10cm (= 5cm chest wall thickness + 5cm 'extra')*
  - *Ensure guidewire feeds down the central 'stiffener' within the chest drain*
- **Remove guidewire and central core 'stiffener' of chest drain, while holding drain secure with other hand**
- Attach three-way tap, if using, and male/female tubing adaptor if needed
- Take any pleural fluid samples needed with a 50ml syringe

Securing and dressing

- At this point ensure that the guidewire has been removed from the chest drain/pleural space
- Attach sterile end of chest drain tubing (other end already connected to underwater seal)
  - *Confirm drainage of fluid/air and oscillation of water level in tube*
  - *You may need to get the patient to cough to start fluid flowing*
  - *If large effusion, apply clamp (or use the 3-way tap to close) at this stage to maintain control while completing the procedure*
- Assistant supports non-sterile portion of chest drain tubing while you suture the drain
  - *1-2x anchoring suture is usually sufficient*
  - *Smaller drains do not need a mattress suture*
- Apply sterile chest drain dressing
- Note depth of drain to skin (by markings on drain) for future reference
- Remove drapes and help patient back into comfortable position in bed

AFTERCARE

- Unclamp drain, if clamped
  - *Follow local policy for drainage, generally 500ml fluid drainage then clamp for an hour, then repeat*
  - *Certainly no more than 1-1.5 litre initial drainage before clamping*

For pneumothorax or any bubbling chest drain there should be absolutely no clamping

- Document procedure in medical casenotes.
  The use of the Chest Drain Bundle documentation (in sticker or electronic format) is recommended. See Appendix B.
  Record -
  - *Indication*
  - *Operator, assistant(s)*
  - *Consent, premedication*
  - *Insertion technique, site, anaesthetic*
  - *Drain size, depth, complications*
  - *Confirm removal of guidewire*
  - *Sutures inserted and fixation device used*

    - *Samples sent*
    - *Post-procedure instructions*
- Insert Product Batch Number sticker into casenotes if available
- Prescribe analgesia
- Sign for any premedication that you have administered
- Send any samples taken
- Handover to Nursing Staff and on-call medical staff if necessary
- Request chest x-ray (timing at discretion of clinical team)
- Others SOPs provide guidance on further drain care

More details available from the British Thoracic Society Pleural Disease Guideline 2023 available at: http://www.brit-thoracic.org.uk
Diagrams taken from above document.

PURPOSE

This SOP provides guidance on the care of a patient with an intercostal chest drain.

GENERAL

- Patients should be managed in a clinical environment where nursing staff are competent in the holistic care of a patient with a chest drain in situ with resuscitation equipment available.
- Close attention should be paid to patient comfort and adequate analgesia provided
- Chest drain bottle should;
  - Be kept below the drain insertion site at all times
  - Be kept upright at all times
  - Never be filled below the 'zero' level
  - Be replaced with a new bottle if almost full

IMMEDIATE POST INSERTION CARE

- Ensure drain is secured with sutures and appropriate dressing
- Confirm drain is swinging and note whether there is active fluid drainage or bubbling
- A chest X-ray should be obtained after insertion, the timing of this is at the discretion of the clinical team.
- **A patient with a clamped chest drain for any reason should not leave the ward and therefore should have a portable chest X-ray**.
- Ensure the nursing staff and any relevant medical staff are aware that the drain has been inserted
- Drainage;

  For pneumothorax or any bubbling chest drain there should be absolutely no clamping
  - *Traumatic haemothorax - manage in line with ATLS guidelines*
  - *Pleural effusion - follow local policy for drainage, generally 500ml fluid drainage then clamp for an hour, then repeat. Certainly no more than 1.5 litre initial drainage before clamping.*
- When unclamping a drain for the drainage of pleural fluid the rate of drainage should be directly observed. If the rate is rapid it may be necessary to wait by bedside so it can be clamped again as soon as the maximum allowed volume has drained
- **When draining a pleural effusion, if a patient becomes unwell or their observations change adversely clamp the drain and seek medical review as re-expansion pulmonary oedema may be a possibility**

MONITORING AND DOCUMENTATION

- Observations should be obtained immediately after drain insertion
- The frequency of subsequent observations should be adjusted according to the patient's clinical condition and guided by the early warning score
- Observations should include; respiratory rate, SpO_2 and flow of oxygen prescribed, heart rate, blood pressure, temperature and early warning score
- Drain observations should also be documented on the Chest Drain Chart (Appendix B). These observations include

  Suction?
  Underwater seal intact?
  Bubbling?
  Oscillating/Swinging?

Dressing site satisfactory?
Drain tubing satisfactory?
Current drainage level
Total volume drained (including drainage from previous bottles)
Pain control adequate?

DRAIN PROBLEMS & TROUBLESHOOTING

- Drain has stopped swinging
  - Check patient including observations
  - Look for any obvious problem with chest drain, tubing and drain bottle; patient lying on tubing, tubing twisted, drain bottle full, drain fallen out
  - If the problem is not easily remedied inform medical staff
  - Medical staff should perform similar investigations for drain problems including taking the drain dressing down and if none are evident consider whether an updated chest X-ray and/or flushing of the drain is appropriate.
- Drain appears to have slipped partially out
  - Check patient including observations
  - Inform medical staff immediately
  - Medical staff will need to determine whether the drain is still functioning and make a plan for further action if it is not (i.e. drain removal or replacement)
- Drain has fallen out completely
  - Check patient including observations
  - Inform medical staff immediately
  - Place an occlusive dressing over the drain site
  - Obtain a chest X-ray
  - Medical staff will need to determine whether further intervention is required, for example is a new chest drain needed, and if so whether it is required urgently
- Drain tubing disconnected
  - Reattach drain tubing
  - Check patient including observations
  - Inform medical staff immediately
  - If patient is well and drain functioning further action may not be necessary
  - Chest X-ray may be indicated
- Chest drain bottle knocked over
  - Return bottle to upright position
  - Ensure the fluid level is not below the ‘zero’ mark, if there is insufficient water replace the drain bottle
  - Check patient including observations
  - Inform medical staff
  - If patient is well and drain functioning further action may not be necessary
- Dressing no longer securely attached
  - Replace dressing
- Sutures no longer in place
  - Medical staff should ensure the drain remains in a satisfactory position and if so should re-suture the drain

Standard Operating Procedure	June 2012
A.4 Changing a Chest Drain Bottle	v1.1

PURPOSE

This SOP provides guidance on the replacement of an existing chest drain bottle with a new drain bottle.

EQUIPMENT

- Sterile gloves and apron
- Small sterile sheet or drape
- Replacement chest drain bottle
- 500 ml sterile water
- [Chest drain tubing: may be packed with bottle or separately]
- [Clamp – if no 3 way tap in place]

PROCEDURE

- Wash hands and don gloves and apron
- Throughout the procedure care must be taken to avoid contaminating any drain openings by contact with the environment such as bedclothes or patient clothing
- Fill the new drain bottle to the 'zero' mark with sterile water
- Place drain connection on top of a sterile sheet or drape
- 'Clamp' drain, either by closing 3 way tap to patient or by application of a clamp to the chest drain
- Change old drain bottle for new one. The drain bottle tubing may be retained or replaced, depending on the drain system used and condition of the tubing.
- Unclamp drain
- Document final volume in old bottle on drain chart and new (zero) volume for replacement bottle

PURPOSE

This SOP provides guidance on the care of a patient with an intercostal chest drain.

INDICATIONS

There are generally two indications for a chest drain to be flushed

- As part of routine care to maintain patency. This is usually in the case of an empyema when there may be benefit from flushing the drain at regular intervals, for example twice daily. It is recommended the flush is prescribed on the medical kardex or online prescription and documented on the chest drain observation chart.
- As an attempt to unblock a drain which has stopped working. If a drain has stopped swinging and there is no drainage further assessment is required. One possibility is that the lung has completely re-expanded, but drain faults should also be considered, such as malposition, twisting, disconnection or blockage. Blockage may be evident within the visible drain tubing, or occult within the chest. If there is a blockage in the distal tubing attached to the drain bottle this should be replaced. If there is a suspicion of a blockage within the actual drain, flushing should be considered

If there is any uncertainty regarding the flushing of a drain advice should be sought from the Respiratory team.

EQUIPMENT

- Sterile dressing pack
- Sterile gloves and clean apron
- 50-100 ml bag of sterile normal saline
- 1 or 2 x 50 ml syringe - catheter tip or Luer tip depending on drain
- Needle
- Clamp [unless 3 way tap already attached to drain]

PROCEDURE

- Wash hands and don gloves
- Fill 1 or 2 syringe(s) with 50 ml of saline using aseptic technique
- Throughout the procedure care must be taken to avoid contaminating any drain openings by contact with the environment such as bedclothes or patient clothing
- If drain has 3 way tap
  - Close tap to patient
  - Place side port covering cap in sterile area
  - Clean port with alcohol wipe
  - Attach syringe to side port
  - Close tap to distal chest drain tubing
  - Flush 50 ml of saline into chest drain, repeat if necessary
  - Attempt to aspirate fluid back
  - Close tap to patient and remove syringe
  - Replace side port cap
  - Close tap to side port
- If drain does not have 3 way tap
  - Clamp drain proximally (usually easier performed by an assistant)
  - Disconnect drain tubing
  - Attach syringe to drain

  - Flush 50 ml of saline into chest drain
  - Attempt to aspirate fluid back
  - Remove syringe and reattach drain
  - Unclamp
- Record flush on drain chart and electronic prescribing system including volume
- If flushing due to blockage record procedure and outcome in case notes

When it is possible to flush fluid into a drain but not aspirate back the drain may still be functioning normally and further management will depend on the clinical scenario.

If it is not possible to either flush into or aspirate back from a drain, and it is not actively swinging, draining or bubbling, it can be considered to be a non-functioning drain and consideration should be given to drain removal.

Chest drains on suction using this method should be looked after on a Respiratory unit / by a Respiratory team.

PURPOSE

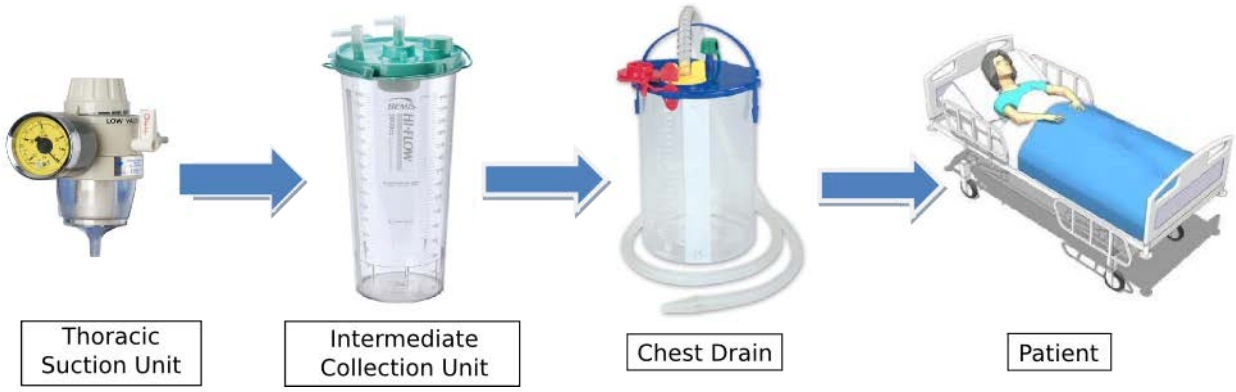
This SOP provides guidance on the application of suction to a chest drain by the use of Low pressure thoracic wall suction via Rocket Medical blue bottle chest drain for pneumothorax with persisting air leak. In many cases Thopaz suction may be more appropriate – discuss with senior respiratory medical staff.

EQUIPMENT

- Thoracic high volume/**LOW PRESSURE** suction regulator
- Intermediate collection unit (trap)
- Rocket Medical Blue bottle already *in situ*
- Suction tubing
- Scissors
- [Clamp – if no 3 way tap in place]

PROCEDURE

- Wash hands and don gloves and apron
- Throughout the procedure care must be taken to avoid contaminating any drain openings by contact with the environment such as bedclothes or patient clothing
- Ensure Rocket Blue Bottle (already attached to patient) is adequately filled with water
- Attach the high volume/**LOW PRESSURE** Thoracic suction unit to the wall suction port, replacing the standard high volume/high pressure unit
- Connect Thoracic suction unit and intermediate collection unit (such as wall mounted suction trap) with suction tubing
- Cut suction tubing to an appropriate length and attach from the port on the drain bottle directly to the inlet of the intermediate collection unit
- Turn wall suction on to desired level of suction. A common initial setting will be 5-10 cm H_2O (may be titrated up to 20 cm as tolerated).
- Confirm chest drain bubbles initially. Bubbling may be sustained, if not there should be evidence of negative pressure being exerted on the column of water within the chest drain bottle



Standard Operating Procedure	June 2012
A.7 Chest Drain Suction - Altitude Bottle	v1.1

Chest drains on suction should be looked after on unit experienced in their management (such as Respiratory, Cardiothoracic or Intensive Care Units).

PURPOSE

This SOP provides guidance on the application of suction to a chest drain by the use of a Kendall Argyle Altitude bottle attached to wall suction

EQUIPMENT

- Altitude chest drain bottle
- Suction tubing
- Scissors
- Wall mounted suction and trap
- [Clamp – if no 3 way tap in place]

PROCEDURE

- Wash hands and don gloves and apron
- Throughout the procedure care must be taken to avoid contaminating any drain openings by contact with the environment such as bedclothes or patient clothing
- Fill the new Altitude drain bottle to the 'zero' mark with sterile water by opening the blue spout on the back of the drain bottle.
- 'Clamp' drain, either by closing 3 way tap to patient or by application of a clamp to the chest drain.
- Change old drain bottle for new one. The drain tubing from the Altitude drain will connect to the existing drain directly or via 3 way tap.
- Unclamp drain
- Document final volume in old bottle on drain chart and new (zero) volume for replacement bottle
- Cut suction tubing to appropriate length and attach to wall suction with suction trap in circuit, between drain bottle and wall suction
- Turn wall suction on to -160mmHG
- Confirm that "Source Suction" indicator on top of bottle is now in the "on" position – see illustration on side of drain bottle
- Adjust altitude regulator knob on top of bottle to desired level of suction. A common initial setting will be 10 cm H_2O

Standard Operating Procedure	Sept 2024
***A.8* Thopaz Suction Device**	v1.1

PURPOSE
This SOP provides guidance on the initiation of a patient on a Thopaz suction device.

EQUIPMENT
- Thopaz suction device
- Thopaz docking station and charge pack
- Thopaz sterile tubing
- Thopaz sterile canister
- Sterile gloves and clean apron

PROCEDURE
- Confirm that senior team have made decision to commence on Thopaz device and what pressure settings are required. **The pressure reading should set to cmH_2O – if the units are set to kPa dangerous levels of suction may be applied by mistake.** Units can be changed by pressing the two buttons at the bottom of the device, followed by the bottom left button. If you are unsure, ask a senior for advice.
- Open sterile tubing pack, leaving distal end inside the pack
- Insert proximal end of Thopaz tubing into the Thopaz device ensuring that it is firmly in place and there are no kinks in the tubing
- Remove Thopaz canister from pack and attach it to Thopaz device. Start by placing the bottom pins of the canister into the tracks at the bottom of the device before clicking the top of the canister in place. Ensure that the canister is firmly in place before proceeding
- Turn on the Thopaz device BEFORE connecting to the patient's drain
- Adjust to desired settings using the up and down buttons on the Thopaz device (normally starting at $-8cmH_2O$). Note $-8cmH_2O$ on the Thopaz device is the equivalent of an underwater seal (also commonly referred to as 'Gravity Mode').
- Wash hands and don gloves
- Occlude the distal end of the Thopaz tubing with your thumb until the air leak reading on the Thopaz device falls to 0
- Turn device on standby while your thumb is still occluding the distal end of the tubing
- Attach tubing to patient's chest drain
- Once firmly attached, turn device back on
- Click Thopaz device into Thopaz docking station to charge
- Note when removing a Thopaz device from a patient, the canister and the tubing are the only parts that should be disposed of in the bin. The Thopaz device and docking station should be retained for future use and NOT disposed of.

TROUBLESHOOTING

Additional information on device operation can be found on the Medela Healthcare website

PURPOSE

This SOP provides guidance on the removal of an intercostal chest drain of either the Seldinger or blunt dissection type

EQUIPMENT

- Sterile dressing pack
- Sterile gloves and clean apron
- Biological waste disposal bag
- Stitch cutter
- Occlusive dressing
- [steristrips or suture]

PROCEDURE

- Confirm that team have made decision to remove drain
- Wash hands and don gloves
- Strip down dressing
- Cut sutures
- There is no evidence that removal of the drain in end inspiration or expiration affects the risk of pneumothorax. It is however suggested that removal be avoided during active inspiration.
- Remove the drain with a brisk firm movement
- Wound closure
  - Small bore drains – usually do not require specific wound closure, although one may consider the use of steristrips
  - Large bore drains – may require closure by suturing depending on wound size. In some cases this will be by tying of a previously placed mattress suture, in others suturing is carried out after drain removal
- Place a sterile occlusive dressing over the drain site
- Dispose of drain and fluid in accordance with ward policy
- Inform nursing staff of drain removal and any sutures in place
- The requirement for post removal chest X-ray will depend on clinical circumstances
- In some patients with large volume effusions there will be leakage post drain removal. This can be easily managed with the application on a Stoma bag over the drain site for 24-48 hours until the leakage subsides

PURPOSE

This SOP outlines the procedure to be used for the intrapleural administration of tPA and DNase for non-resolving pleural infection.

DECISION

- Consultant Respiratory Physician decision to initiate (unlicensed)
- Appropriate antibiotic therapy should continue
- Intercostal drain should be adequately sited, clearly patent and ideally have 3-way tap (suggest flush drain with saline first to ensure patency)
- Usually await initial drainage 24-48 hr post drain insertion, before decide to initiate
- Consider relative contraindications (including anticoagulation, underlying lung/pleural disease, recent stroke, recent trauma, recent surgery)
- Never give single agent therapy if one drug is unavailable
- If lytics are being considered, early referral to cardiothoracic surgery is encouraged where appropriate, as insertion of lytics may influence when they intervene

EQUIPMENT

For Full Treatment

3x 10mg vials of Actilyse® (alteplase / tPA)
12x 2.5mg (2.5ml) vials of Pulmozyme® (dornase alfa / DNase)

Each Administration

Half a 10mg vial of Actilyse® (alteplase / tPA)
2x 2.5mg (2.5ml) vials of Pulmozyme® (dornase alfa / DNase)
Syringes and needles
Saline
Sterile gloves
Clinical waste bag

PROCEDURE

- Prescribe on electronic prescribing system tPA (Alteplase) 5mg + DNAse (Dornase alfa) 5mg intrapleural twice daily, for 3 days - six doses in total. Record as note “Medical Staff to Administer”
- Full aseptic technique throughout

Drug Preparation

5mg of tPA

- Use 10mg vial of Actilyse® *****
- Mix drug bottle with provided 20mls of diluent
- Draw up 5ml syringe containing 5mg tPA
- Label remaining 5ml and store in fridge for use 12 hours later

5mg (5000 Units) DNase

- Draw up 5ml from two 2.5mg (2.5ml) vials of Pulmozyme®

Administration

- Confirm drain is functioning, consider flush first if not swinging
- Instil prepared 5mg tPA and 5mg DNase via 3 way tap
- Flush into pleural space with further 10-20ml sterile saline
- Clamp for 1 hour after each dose and document release of clamp after this time

- ***if using 10mg vials store the remaining drug in the fridge for use later**

Reference – Rahman et al N Engl J Med. 2011 Aug 11;365(6):518-26

Occasionally due to drug availability issues it will be necessary to use alternative lytic agents eg. Urokinase. This should be discussed locally with respiratory team and pharmacy as needed.

PURPOSE

This SOP provides guidance on performing a talc pleurodesis via an intercostal chest drain. The decision to perform pleurodesis should be taken by a senior member of the Respiratory team. Patient preference, fitness and prognosis are crucial factors and consideration should be given to alternatives such as therapeutic aspirate, thoracoscopic management and indwelling pleural catheter. The indications for talc pleurodesis are;

- Malignant pleural effusion (after consideration of other options)
- Recurrent pneumothorax (if not fit for surgical treatment)

PREPARATION

- Ideally lung should be fully re-expanded on CXR with no residual fluid and output should be less than 150ml fluid in 24 hours
- At Consultant's discretion, pleurodesis may be performed even if the above conditions are not met, although the chances of success will be reduced. Consider suction if trapped lung
- Ensure drain position is satisfactory and drain is swinging
- Obtain consent

EQUIPMENT

- Sterile dressing pack
- Sterile gloves and clean apron
- 4g vial of sterile graded talc (ordered from Pharmacy)
- Bag of 0.9% sodium chloride solution
- Lidocaine 1% (10mg/ml) or 2% (20mg/ml)
  3mg/kg total to maximum 250mg
- 50 ml syringe - catheter tip or Luer tip depending on drain
- Needles
- Clamp [unless 3 way tap already attached to drain]

PROCEDURE

- Consider premedication (e.g. 10mg oral morphine) and prescribe regular analgesia (e.g. co-codamol 30/500 x2 QDS)
- Wash hands and don gloves and apron
- Throughout the procedure care must be taken to avoid contaminating any drain openings by contact with the environment such as bedclothes or patient clothing
- Confirm drain patency with 10ml flush 0.9% saline
- Cleanse top of talc vial with alcohol wipe
- Draw up 10ml sterile 0.9% saline and inject into talc vial
- Agitate to mix
- Make up to 40mls with normal saline
- Add calculated lidocaine dose to syringe **
- Immediately instil into chest drain
- [Optionally flush in with further 10-50ml 0.9% saline]

- Close 3 way tap / clamp drain immediately
- Leave clamped for 2 hours and then allow free drainage

AFTERCARE

- [Optionally attach to -10 to -20cmH_2O suction]
- Document procedure in casenotes, including time
- Prescribe and sign for talc and any lidocaine/premedication in the electronic prescribing system
- Observations should be performed every 15 minutes for the first hour post-talc, then hourly for the next 3 hours, before reverting to standard frequency if there are no significant complications
- Continue to record drainage output and other monitoring on chest drain chart
- Continue with standard drain care as in other SOPs
- Remove drain after 24-48h

**An alternative approach is to instill the lidocaine into the chest drain prior to adding the talc slurry solution. This is an entirely reasonable option and you should be guided by usual practice in your unit.

PURPOSE

This SOP outlines how to carry out a blood Pleurodesis ('Autologous Blood Patch Pleurodesis'). This decision should have been made by a Respiratory Consultant. This procedure requires two doctors to carry out. The patient should give written informed consent to a senior clinician with risk of infection, tube occlusion with tension pneumothorax, failure of procedure and death explained.

EQUIPMENT

Trolley one

Dressing pack
Sterile gown
Sterile gloves x2 for operator1 and x1 for operator 2
500ml bag saline still in packaging
Sterile scissors
Sterile foil bowl
Sterile swabs
Rocket wide bore adaptor
Rocket 3-way tap for chest drain
4x 50ml syringe (Luer lock)
Chlorhexidine skin cleanser
Hibiscrub
Drip stand
2x square 'inco' pads
1 x suction tubing set
Chest drain bottle and tubing
Sterile water for chest drain bottle
Green 'butterfly' needle
Chest drain clamp

Trolley two

16F Chest drain pack
Lidocaine 2% 5ml x2
Sterile gloves
Suture

PROCEDURE

- Patient in bed and toileted (will need to remain in bed for 4 hours)
- Inco pad under patient at chest drain and at venepuncture site
- Doctor 1 washes hands for clean procedure, dons gown and gloves
- Open sterile saline in aseptic manner with help from assistant
- Cut open corner of saline, pour into sterile foil bowl
- Draw up 2x50ml sterile saline.
- New chest drain bottle, tubing prepared, extra tubing attached in aseptic manner.
- End of extra tubing attached to 3-way tap in aseptic manner – tubing hung over drip stand ready to use.
- Doctor 2 dons sterile gloves and cleanses patient skin for venepuncture
- 50ml blood withdrawn with butterfly
- While venepuncture is taking place, Doctor 1 cleans 3-way tap and connections with chlorhexidine and places sterile drape underneath
- Doctor 1 changes to clean pair of gloves
- Consider flush of drain if not oscillating/bubbling
- Doctor 1 takes 50ml syringe of blood, attaches to side port of 3-way tap, turns tap and injects blood through chest drain into pleural space
- 3-way tap closed to patient while syringe changed for sterile saline

- Drain flushed with enough saline to clear chest drain
- Assistant clamps chest drain
- Doctor 1 changes 3-way tap for previously prepared new 3-way tap/extended tubing
- Tubing hung over drip stand (this allows air to drain but keeps the blood in the chest)
- Drain unclamped
- Patient left on bed rest for 4 hours then extended tubing removed to leave standard chest drain assembly
- Trolley 2 remains in room for 24 hours due to risk of blood clotting in chest drain resulting in tension pneumothorax

Reference: Rinaldi *et al.,* Thorax 2009;**64**:258–260

PURPOSE

This SOP outlines how to drain and flush an Indwelling Pleural Catheter (IPC) in addition to connecting an IPC to a Rocket chest drain bottle if free drainage is required. Always seek advice of someone experienced in IPC use (medical or nursing). Please also refer to *SOP A.5 Flushing a Chest Drain.* If using an IPC for pleural fluid sampling, a drainage line MUST be used, with appropriate Rocket connectors

EQUIPMENT

For IPC drainage:
Rocket IPC drain bottle pack
Sterile gloves x 2 and an apron
Sterile dressing pack

For IPC flushing:
Equipment as per *SOP A.5 Flushing a Chest Drain* plus
Rocket IPC drainage line

For connecting an IPC to a Rocket chest drain bottle:
Rocket chest drain bottle
Rocket chest drain tubing
Sterile water
Rocket IPC drainage line

PROCEDURE

For IPC drainage:

- Wash hands and don gloves
- Open sterile dressing pack and place sterile drape below IPC
- Remove IPC dressing, placing IPC on to sterile drape
- Remove cap from end of IPC
- Wipe tubing with alcohol wipes provided in the IPC drain bottle pack
- Change gloves
- Take drainage bottle and unclip at top
- Manipulate the tubing at the top of the bottle to clear any kinks that remain from the clip
- Attach drain bottle to IPC
- Press drainage button. NB. Many patients are used to pressing the drainage button themselves to control their own drainage. If the patient does this at home allow them to do it as an in-patient.
- Stop draining at any point the patient feels uncomfortable or a ‘dragging’ sensation
- Detach drainage bottle
- Wipe tip of IPC with provided alcohol wipe
- Attach new IPC cap to end of IPC
- Place square foam dressing against the patient’s chest wall at the IPC exit site
- Place 2 x gauze swabs on the IPC sticky dressing
- Coil IPC round on top of square sponge
- Place gauze swabs/IPC dressing on top of drain
- Ensure good adherence of dressing to the patient’s chest wall all around the

dressing
- Dispose of drainage bottle into disposal bag provided

For IPC flushing:
- Prepare flush as per *SOP A.5 Flushing a chest drain*
- Wash hands and don gloves
- Open sterile dressing pack and place sterile drape below IPC
- Remove IPC dressing, placing IPC on to sterile drape
- Remove cap from end of IPC
- Wipe tubing with alcohol wipes provided in the IPC drain bottle pack
- Change gloves
- Ensure Rocket IPC drainage line is occluded with the attached clip
- Attach IPC drainage line to IPC
- Attach syringe with flush
- Undo clip attached to drainage line once syringe attached
- Flush IPC
- Re-do clip attached to drainage line so that it is once again occluded
- Remove drainage line
- Re-dress IPC as above

For connecting an IPC to a Rocket chest drain bottle:
- Fill Rocket chest drain bottle to line with sterile water
- Wash hands and don gloves
- Open sterile dressing pack and place sterile drape below IPC
- Remove IPC dressing, placing IPC on to sterile drape
- Remove cap from end of IPC
- Wipe tubing with alcohol wipes provided in the IPC drain bottle pack
- Change gloves
- Ensure Rocket IPC drainage line is occluded with the attached clip
- Attach IPC drainage line to IPC
- Attach Rocket chest drain tubing to IPC drainage line
- Connect other end of Rocket chest drain tubing to Rocket chest drain bottle
- Undo clip attached to drainage line
- Place square foam dressing against the patient's chest wall at the IPC exit site
- Place 2 x gauze swabs on the IPC sticky dressing
- Coil IPC and place swabs/dressing over IPC, leaving the drainage line free at the bottom connected to the chest drain tubing/bottle
- Tape connections



PURPOSE

This SOP outlines the procedure to be used for irrigation with 0.9% saline of pleural infection via intercostal chest drain, where access to both fibrinolytic agents become restricted or patient not suitable for intrapleural enzyme therapy.

DECISION

- Appropriate antibiotic therapy should continue

- Intercostal drain should be adequately sited, clearly patent and ideally have 3-way tap

- Usually await initial drainage 24-48 hr post drain insertion, before deciding to initiate

- Cautionary use in patients with suspected non-expansible lung where negative pressure stops free-drainage of irrigation

- Daily review of patient, CXR/US should be performed if resolution of collection treatment can be discontinued.

EQUIPMENT

9x 250ml bags of sterile 0.9% Sodium chloride
9X sterile IV giving sets
Drip stand
3 way tap
Sterile alcohol wipes.
Sterile gloves Clinical waste bag

PROCEDURE

- Prescribe (in HEPMA) 250ml 0.9% sodium chloride giving via ICD 3 times daily for 3 days.

- Full aseptic technique throughout

Drug Preparation

- Run saline through giving set and hang from drip stand.

Administration

- Confirm drain is functioning, consider flush first if not swinging

- clamp drain and remove port cap

- clean port with sterile alcohol wipe and attach giving set to three way tap.

- open drain to port and patient (close to drain bottle).

- allow for administration of saline by gravity over maximum one hour

- once complete clamp drain and remove giving set replace cap.

- allow for free drainage.

AFTERCARE

- Document procedure in casenotes, including time

- Prescribe and sign for administration on Kardex

- Observations should be performed every hour.

- Continue to record drainage output and other monitoring on chest drain chart

- Continue with standard drain care as in other SOPs

Request medical review if no drainage from drain after administration.

Appendix B – Additional Material

B.1 Appendix 1. Patient Information Leaflet

Please now read the consent form overleaf. If you have any questions please ask your doctor.

If you are happy to proceed with the chest drain, please sign the consent form.

Acute Services Division

NHS Greater Glasgow and Clyde

Information about

Having a Chest Drain Inserted

Greater Glasgow and Clyde Acute Hospitals

What is a Chest Drain?

A chest drain is a plastic tube about the thickness of your little finger. It is used to drain air or fluid which can collect in the space between your lung and ribcage (known as the pleural space). A chest drain can usually be inserted at your bedside, and the procedure will only be performed by a doctor with the specific training and necessary skills. We would like to insert a chest drain for the following reason:

_____

Having a Chest Drain inserted

Most drains are inserted into the side of the chest, just below the armpit. The specific site chosen will, however, depend on your own particular problem. The area will first be cleaned with antiseptic fluid and surrounded by sterile sheets. The site will then be numbed using a local anaesthetic injection, and a small cut will be made in the skin (about 1 inch in length). The chest drain can then be passed through this hole, using a thin wire to guide it into the correct position inside the chest.

Once in place, the chest drain tubing will be connected to a drainage bottle and secured into place with a dressing; a stitch may be used in some cases.

It is important that you keep the drainage bottle BELOW THE LEVEL OF YOUR CHEST at all times. This prevents fluid/air moving backwards into your chest.

An x-ray will be taken once the procedure is complete, to check that the tube is in the correct position.

Risks

As with most medical procedures there are risks associated with the insertion of a chest drain and rare cases of death following chest drain insertion have been reported. However, this risk is extremely small and the risk of any serious problem occurring is low. Importantly, your medical team feels the risk of not inserting a chest drain outweighs these small risks. More common potential complications that you should be aware of include:

1. Pain. Your doctor will do their best to minimize any discomfort by using local anaesthetic. Some patients are uncomfortable despite this; therefore extra painkillers can be given, if necessary.

2. Bleeding. Minor bleeding is common but this will usually stop on its own. Very rarely, more significant bleeding can occur into or around the lung and specific treatment, including surgery may be required.

3. Problems with the drain. Occasionally, the drain may become kinked or blocked after it has been inserted. This can usually be fixed but sometimes the drain may need to be removed and replaced.

4. Infection. Skin or lung infections can develop if bacteria get into the chest through the drain site. This risk is reduced by cleaning the skin beforehand, using sterile equipment to insert the drain and dressing the site afterwards. The less time the drain is kept in, the lower the risk of an infection. Therefore, it will be removed as soon as possible.

Removal of the Chest Drain

Your doctor will decide when the drain can be removed. This can usually be done at your bedside and it is not usually painful. Once the drain has been removed, the area will be dressed. Occasionally, a stitch may be inserted but this is often not required. A chest x-ray may then be taken to check for any remaining fluid or air. You will only have a small scar and this will gradually fade over

time.

B.2 Appendix 2. Seldinger Chest Drain Bundle Sticker

This can be printed as a sticker to be inserted and completed in casenotes to aid the recording of chest drain insertions.

Date:	Time:	Inserted by:	Grade:
Ward:	Procedure room YES ☐ NO ☐	Supervised by:	Grade:
Site: R ☐ L ☐	Patient info leaflet YES ☐ NO ☐	Written consent YES ☐ NO ☐	Gown used YES ☐ NO ☐
Drain Type: Seldinger ☐ Blunt ☐	Drain size: _____	Premed: _____	Inserted to (cm):_____
Lidocaine 1% ☐ 2% ☐ Volume _____		USS: Bedside ☐ X Ray dept ☐ None ☐	
Specimens: Biochem ☐ Micro ☐ Cytology ☐		Guidewire removed: Y ☐ N ☐	
Describe fluid: _____			
Complications / Instructions:		Affix batch sticker here:	

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