

Appendix 1. Standardised data collection tool used to assess documentation of chest drain insertion.

Case number:			
Pre-procedure			
Date recorded:	Yes	No	
Time recorded:	Yes	No	
Indication for drain recorded:	Yes	No	
Specific indication for drain:			
Documented who made decision for drain insertion	Yes	N	
Specialty of decision maker:	ACU	Respiratory	Other
Level of decision maker:	Consultant	SpR	SHO
Record of clotting checked:	Yes	No	
Record of platelets checked:	Yes	No	
Record of up to date / recent CXR:	Yes	No	
Pre-medication recorded:	Yes	No	
Nature of pre-medication:			
If no pre-medication, reason documented:	Yes	No	
Nature of reason:			
Patient consent recorded:	Yes	No	
Nature of consent:	Written	Verbal	
Information leaflet given recorded:	Yes	No	
Procedure			
Location of drain insertion:	Bedside Procedure room	Theatre Other	
Bedside ultrasonography:	Yes	No	
Ultrasonography + marked in radiology:	Yes	No	
CT guided	Yes	No	
Site of drain insertion recorded:	Yes	No	
Site of drain insertion:			
2% chlorhexidine / antiseptic use recorded:	Yes	No	
Mask use recorded:	Yes	No	
Gown use recorded:	Yes	No	
Sterile drapes use recorded:	Yes	No	
Local anaesthetic use recorded:	Yes	No	
Volume of local anaesthetic used recorded:	Yes	No	Volume:
Drain size recorded:	Yes	No	Size:
Length drain inserted to recorded:	Yes	No	Length:
Method drain secured recorded:	Yes	No	Method:
Post-procedure			
What drained recorded:	Yes	No	
What drained:	Serous Blood stained Other	Turbid Purulent	
Initial volume drained recorded:	Yes	No	Volume:
Complications recorded:	Yes	No	
Nature of complications:			
Post-procedure advice recorded:	Yes	No	
Nature of advice:			
Chest drain observation sheet:	Yes	No	
Pain score during insertion recorded:	Yes	No	Pain:
Record of post-drain CXR request:	Yes	No	
Record of post-drain CXR interpretation:	Yes	No	
Results of post-drain CXR:			
Investigations any aspirated samples sent for recorded:	Yes	No	
Investigations requested:	Microbiology Cytology	Biochemistry Other	
Grade of practitioner recorded:	Yes	No	
Grade of practitioner:	F1/F2 SpR	SHO Consultant	

Appendix 2. Final Chest Drain Care Bundle

Name:
Date of Birth: DD / MM / YYYY
MRN Number:
NHS Number:
(OR AFFIX HOSPITAL LABEL HERE)

Adult Chest Drain Insertion Record

Date DD / MM / YYYY	Time 00 : 00
Hospital	Location
PRE-PROCEDURE	
Indication	Coagulopathy or anticoagulation use - check clotting and platelets <input type="checkbox"/> Up to date CXR <input type="checkbox"/>
	Radiological Guidance Bedside USS <input type="checkbox"/> (Ultrasonography results should be recorded in the patient's health record)
Consent verbal <input type="checkbox"/> non-verbal <input type="checkbox"/> written <input type="checkbox"/>	
Pre-medication (suggest opioid or midazolam)	
WHO CHECKLIST (PERFORM ALOUD WITH PATIENT AND ASSISTANTS)	
Ask patient to confirm their identity <input type="checkbox"/>	Procedure site marked <input type="checkbox"/>
Proposed procedure confirmed <input type="checkbox"/>	Consent for procedure given <input type="checkbox"/>
Confirm site of procedure (double-check with imaging) <input type="checkbox"/>	Specimens taken correctly labelled <input type="checkbox"/>
PROCEDURE	
Site	
Asepsis 2% chlorhexidine <input type="checkbox"/> mask <input type="checkbox"/> gown <input type="checkbox"/> drapes <input type="checkbox"/> sterile gloves <input type="checkbox"/>	
Local anaesthetic + volume	
Drain size (French)	
Length drain inserted to	Drain secured non-absorbable suture (required) <input type="checkbox"/> drain-fix dressing <input type="checkbox"/>
Notes on procedure / complications	
.....	
POST-PROCEDURE	
Drained Serous <input type="checkbox"/> Turbid <input type="checkbox"/> Blood stained <input type="checkbox"/> Purulent <input type="checkbox"/> Frank blood <input type="checkbox"/> Other (specify) <input type="checkbox"/>	
Initial volume drained (if calculable)	
POST-PROCEDURE ONGOING CARE	
Request bed on respiratory or other designated ward trained in caring for chest drain and start chest drain nursing observation sheet <input type="checkbox"/>	
Pain score during insertion None <input type="checkbox"/> Mild <input type="checkbox"/> Moderate <input type="checkbox"/> Severe <input type="checkbox"/>	Additional analgesia given
Instructions for rate of drain and clamping	
Post-Drain CXR Requested	Results
Samples sent	Biochemistry <input type="checkbox"/> Microbiology <input type="checkbox"/> Cytology <input type="checkbox"/> Other (specify)
Inserted by	Grade F1/F2 SHO SpR Consultant
Assisted by	Grade F1/F2 SHO SpR Consultant
Signed	

Pleural Procedures Guidelines

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Guidance Overview

1. Introduction

Safe and appropriate use of pleural procedures by skilled and experienced operators remains a key recommendation of the British Thoracic Society (BTS)¹ following national work on significant concerns raised by the National Patient Safety Agency (NPSA)².

This guidance is primarily based British Thoracic Society for management of pleural diseases¹, which can be found at <https://www.brit-thoracic.org.uk/guidelines-and-quality-standards/pleural-disease-guideline/>.

2. Policy Scope

This policy applies to all medical staff who perform pleural aspirations and chest drain insertion, and to all nursing staff who manage patients with chest drains.

3. Policy Aims

The aim of this policy is to ensure safe and effective pleural aspiration, chest drain insertion and appropriate management of patients who undergo these procedures.

4. Roles and Responsibilities

Consultants and senior members of the nursing staff team are responsible for ensuring this guidance is implanted within their individual departments. It is the duty and responsibility of all medical and nursing personnel to ensure they work within this guidance.

Training in Pleural Procedures

1. Achieving Competence for Trainees

For trainees who have not yet achieved the relevant competencies, pleural aspiration and chest drain insertion should be performed under the direct guidance of a doctor who has adequate training and experience with the relevant procedure and available equipment.

2. Competencies for Independent Pleural Aspiration or Drain Insertion

The number of procedures required to achieve competency will vary between individuals. However it is anticipated that most trainees would need to have performed at least 5-10 procedures to develop the skills needed to be signed off as independent practitioners. Competence in pleural procedures must be evidenced by DOPS stating independence.

Those who are already fully competent in pleural aspiration and chest drain insertion should be able to demonstrate that competence is being actively maintained.

The difficulty of pleural procedures depends on many factors such as effusion size or location and body habitus. It is paramount that all clinicians, whatever their level of experience, seek senior help whenever they are uncertain whether a pleural procedure is indicated or whether it can be performed safely.

3. Further Training

The respiratory team can be contacted by those who wish to obtain these competencies in pleural aspiration and / or chest drain insertion (GRH: henry.steer@glos.nhs.uk; CGH: Mark.Slade@glos.nhs.uk).

For trainees within the Emergency Department, the primary point of contact for those wishing to achieve these competencies should be an Emergency Department Consultant with adequate training and experience with the relevant procedure (helen.mansfield@glos.nhs.uk).

Indications for Pleural Procedures

1. Pleural Effusions

1a. Diagnostic Aspirations

Pleural aspiration of up to 50ml of fluid is utilised for diagnostic evaluation of unilateral pleural effusions.

1b. Therapeutic Aspirations

Therapeutic aspiration of up to 1.5L of fluid is usually sufficient to relieve acute breathlessness in patients with pleural effusions. It should be considered first line in patients who do not have suspected pleural infection and do not need a drain for other reasons – see below. Therapeutic pleural aspiration is also preferable out of hours when chest drain insertion is best avoided unless necessary.

1c. Chest Drain Insertion

Chest drain should be inserted in the following instances:

- Empyema and complicated parapneumonic effusions
- Traumatic haemo/pneumothorax
- During surgery in certain instances (VATS, thoracotomy, oesophagectomy, cardiac surgery)
- Malignant effusions for the purpose of talc pleurodesis

2. Pneumothorax

2a. Pleural Aspiration

Minimally symptomatic patients with small (<2cm at level of hilum) primary pneumothoraces can be initially managed with observation alone.

Aspiration should be considered first line in symptomatic patients with spontaneous primary pneumothorax of any size¹. No more than 2.5L of air should be aspirated before reassessment with CXR.

2b. Chest Drain Insertion

Chest drains should be inserted for patients with pneumothorax in the following situations:

- In any ventilated patient

- In tension pneumothorax after initial needle decompression
- Persistent or recurrent pneumothorax after initial aspiration
- Secondary pneumothorax
- Traumatic pneumothorax
- Bilateral pneumothoraces

Some clinicians favour initial small bore ($\geq 12\text{F}$) chest drain insertion over aspiration in patients with a large/complete spontaneous primary pneumothorax.

A pneumothorax in a patient over 50 with a significant smoking history should be treated as a secondary pneumothorax.

Use of Ultrasonography

1. Bedside Ultrasonography

BTS guidelines strongly recommend that all chest drains and pleural aspirations for the purposes of draining fluid be carried out under bedside ultrasound guidance by a suitably trained practitioner. This has been demonstrated to give greater likelihood of success as well as minimising the risk of adverse events and complications¹.

Ultrasound is recommended especially in the case of “white out” to ensure that the opacified lung field is truly fluid and not consolidated/collapsed lung.

If no suitably trained US operator is immediately available pleural procedures should be delayed until an ultrasound can be performed. The occasions when pleural drainage cannot be deferred for a few hours to obtain an ultrasound are rare (eg trauma), and in all other circumstances ultrasound guidance should be considered mandatory.

Ultrasound is of no practical use in guiding pleural procedures for pneumothorax.

2. “X-marks-the-spot” Departmental Ultrasonography

If “X-marks-the-spot” ultrasound guidance is to be used, the person who is to perform the procedure should accompany the patient to the radiology department and perform the procedure there under the ultrasound guidance.

Reliance on a previously marked spot is not recommended as the technique has poor accuracy. The complication rate for “X-marks-the-spot” with later, separate insertion is equivalent to that of using no ultrasound guidance¹.

Location and Timing of Procedure

1. Location

1a. Generalities

Both pleural aspiration and chest drain insertion should be performed in a clean area using full aseptic technique¹. Equipment for monitoring should be available. This includes pulse oximetry, blood pressure measurement and access to ECG.

1b. Designated Procedure Room

A designated clean procedure room is preferable for aspiration or drain insertion. This should be used whenever possible unless the clinical situation demands otherwise, or a suitable alternative area exists, eg ED resus.

1c. Patient Bedside

Bedside aspiration or drain insertion should only be performed where no procedure room is available. Adequate care must be taken to ensure there is sufficient space for both the procedure and appropriately sterile field.

2. Timing

Pleural aspiration and chest drain insertion should be avoided outside of normal working hours unless absolutely necessary¹. This is because the complication rate has been demonstrated to be higher at these times, especially at night¹. There may be occasions where the clinical situation requires an out-of-hours pleural procedure to be performed. Out of hours pleural aspiration is preferable to chest drain. The circumstances where this may be appropriate are detailed in [Section 3: Indications for Pleural Procedures](#).

Patient Consent

1. Nature of Consent

Patients should be fully consented as to the risks and benefits of their pleural procedure. For pleural aspiration, documented verbal consent is adequate. For chest drain insertion, consent should be written consent except in a clinical emergency.

2. Risks of Pleural Procedures

2a. Risks of Pleural Aspirations

- Pain
- Failure of procedure
- Pneumothorax (about 3% with ultrasound guidance, 5-15% without ultrasound guidance)
- Visceral injury, haemothorax, pleural infection (rare)

2b. Risks of Chest Drain Insertion

- Pain
- Pneumothorax (5%)
- Bleeding / haemothorax (2%)
- Intrapleural infection (2%)
- Drain dislodgement or blockage (15%)
- Organ puncture (rare)
- Failure of procedure

Pre-medication and Anaesthesia

1. Pre-medication

1a. Pre-medication for Pleural Aspiration

Pre-medication is not routinely indicated for pleural aspiration.

1b. Pre-medication for Chest Drain Insertion

Chest drain insertion is a painful procedure^{1,3}. As such, pre-medication with an opioid or anxiolytic agent should be strongly considered.

If sedation is given, this should be in line with current guidance for conscious sedation⁴ with appropriate monitoring.

2. Use of Local Anaesthesia

1% lidocaine should be infiltrated into the skin, periosteum and pleura prior to carrying out therapeutic pleural aspiration or chest drain insertion. For diagnostic pleural aspiration the needle size used to infiltrate lignocaine to the pleura is the same size as the aspiration needle and therefore the use of lignocaine may not reduce discomfort.

It is thought that the volume of lidocaine given rather than the total dose is more important in achieving adequate analgesia as this helps achieve adequate spread of anaesthesia¹. For this reason 1% lidocaine is preferred to stronger formulations.

Both lidocaine strength and volume given should be documented post-procedure.

Aseptic Technique

1. Aseptic Technique for Pleural Aspirations

Pleural aspiration should be carried out in a clean area using full aseptic technique. For full aseptic technique, this requires¹:

- Sterile gloves/gown
- Sterile field
- Sterile dressing
- Skin sterilising preparations such as iodine or chlorhexidine in alcohol

2. Aseptic Technique for Chest Drain Insertion

Chest drains should likewise be inserted in a clean area using full aseptic technique. This clean area should ideally be separate from the main ward area. To achieve adequate aseptic technique, this requires¹:

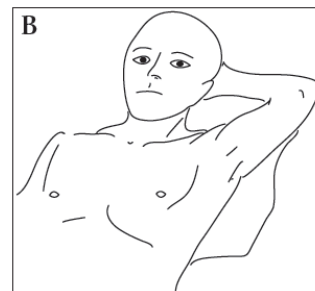
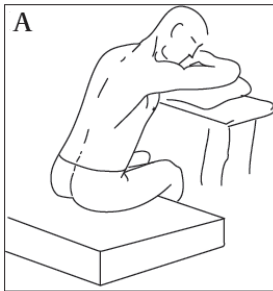
- Sterile gloves
- Sterile gown
- Sterile field
- Sterile drapes
- Mask
- Skin sterilising preparations such as chlorhexidine in alcohol
- Additional sterile equipment required: sterile gauze swabs, selection of syringes and needles, scalpel and blade, suture (0 or 1-0 silk), guide wire and dilators for Seldinger technique, chest tube, connecting tubing, closed drainage system including sterile water for underwater seal

Patient Position

1. Patient Position

There are two usual positions for a patient to be sat for a pleural procedure.

- Upright position whilst leaning forwards with arms resting on a table or bed (image A)¹
- Lying on the bed whilst slightly rotated with the arm on the side of the lesion behind the patient's head (image B)¹



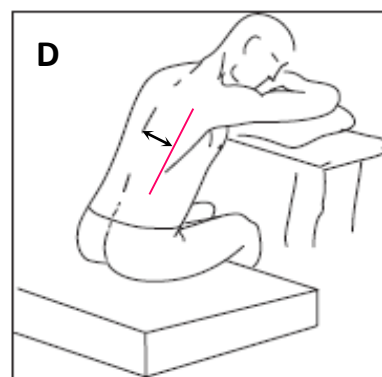
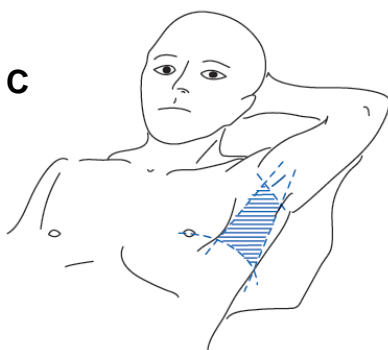
Providing there is sufficient depth of fluid visible on ultrasound, an alternative is with the patient lying flat in the lateral position with arms up in front of the face

2. Site of Needle Insertion

The site of needle insertion should ideally be within the triangle of safety (image C)¹ to minimise the risk to underlying structures and reduce the risk of visible scarring. Alternatively, the 2nd intercostal space in the mid-clavicular line may be used in the case of pneumothorax.

The triangle of safety is bordered by the lateral edge of latissimus dorsi, the lateral border of pectoralis major and superior to the 5th intercostal space.

A posterior approach may be used for drainage of fluid under ultrasound guidance. However, inserting the needle more posteriorly gives greater risk of damage to the intercostal artery. For this reason it is important that the site is located lateral to the angle of the rib posteriorly (at least 10cm from spine) (figure D).



Pleural Aspiration

It is not the aim of this guidance to provide a step-by-step walkthrough guide to performing pleural aspiration but rather to cover the important safety points for the procedure. Therefore:

- Ultrasound guidance for all fluid aspirates is strongly advised
- Ensure adequate patient position
- Use small-bore needle to reduce risk of complications
- Insert needle above superior border of rib to avoid neurovascular bundle
- For diagnostic aspirations, 20-50ml of fluid is sufficient
- For therapeutic aspirations:
 - After confirming depth of the pleural space using initial needle aspiration the cannula should be advanced into the chest whilst aspirating continuously until the pleura is breached and air or fluid is withdrawn
 - Attach the cannula to a three-way tap to enable easy expulsion of fluid or air
 - Stop when no more air / fluid can be withdrawn or 1.5L has been withdrawn or until the patient develops symptoms of cough / chest discomfort

Post-procedure Care

After aspiration has been carried out, there are several steps to consider.

- A simple clean dressing should be immediately applied to the site of aspiration
- Follow-up chest radiograph is not indicated if the patient has had a simple, uncomplicated diagnostic tap.
- For diagnostic aspirates, the samples should be sent for:
 - Biochemistry (protein, lactate dehydrogenase, glucose)
 - Microbiology (M,C&S +/- acid-fast bacilli) in blood culture bottles
 - Cytology
 - pH if suspected pleural infection (into heparinised blood gas syringe. Must not be put through a gas machine if purulent)
 - Other tests may be indicated as discussed with respiratory team

Chest Drain Insertion

1. Size of Chest Drain

Small-bore chest drains (12-18 French) inserted with the Seldinger technique should be used as first line therapy for¹:

- Pneumothoraces
- Pleural effusions
- Pleural infection / empyema

Large-bore chest drains inserted with blunt dissection require a different set of competencies. These should be considered for:

- Haemothorax / Trauma
- Where risk of lung perforation exists with Seldinger needle technique (e.g. lung edge close/tethered to chest wall)
- Where there is worsening surgical emphysema despite small bore drain.

2. Important Points from Procedure

It is not the aim of this guidance to provide a step-by-step walkthrough for inserting chest drains. Instead, it aims to cover the important safety points for the procedure. Therefore when inserting chest drains:

- Written consent for all chest drains should be obtained
- Direct ultrasound guidance is strongly recommended for pleural effusions
- Ensure adequate patient position and analgesia
- Should be carried out with full aseptic technique (including gown, sterile drapes, mask, sterile field, sterile gloves)
- Insert drain above superior border of rib to avoid neurovascular bundle
- Before fully inserting the drain, fluid (or air in the case of pneumothorax) from the site of drain insertion should be obtained. If no fluid can be drained, the procedure should be abandoned
- Drains should be inserted with the Seldinger technique
- It is imperative that the wire is not left inside the chest cavity

- Drains should never be inserted with substantial force
- The dilator should not be inserted further than 1cm beyond the depth from skin to pleural space. The marker on the dilator should be set to the correct depth needed to access the pleural space, as determined by the introducer needle.

3. Securing Chest Drains

A common complication of drain insertion is accidental removal due to insufficient securing methods. Chest drains should be secured with a combination of¹:

- Stout non-absorbable (0 – 1.0 silk) suture that gathers adequate skin and subcutaneous tissue. A stitch under the skin 0.5cm from the drain exit site should be secured then the threads should be tied around the drain multiple times next to the skin to ensure that the drain can neither move forwards nor backwards.
- A clear dressing over the drain site
- It is good practice to secure the drainage tubing to the abdomen at a second point to take the direct weight off the chest drain fixing.

4. Post-procedure Care

After a chest-drain has been inserted, there are several aspects to post-procedure care that must be carried out, documented and communicated to the nursing staff and/or patient. These include:

- Keep the bucket below hip level
- Complete record for chest drain insertion (utilising Trust chest drain proforma)
- Post-procedure radiograph for all successful or failed chest drain attempts
- Rate of drainage for pleural effusions / empyema / haemothorax:
 - A maximum of 1.5L should be drained in the first hour after chest drain insertion to reduce the risk of re-expansion pulmonary oedema. Drainage should be ceased immediately if the patient begins to cough. It can be cautiously restarted 1 hour later if the coughing ceases with cessation of drainage.
 - A suitable regime for rate of drainage should be provided by the doctor inserting the drain – a recommended regime would be drain 1-1.5L, clamp for 4 hour, drain 1L, clamp for 4 hour then repeat

- Prophylactic Fragmin can be given after drain insertion, providing there are no bleeding complications or haemothorax.
- Clamping chest drains:
 - A bubbling chest drain should NEVER be clamped
 - Clamping drains in the case of pneumothorax, once bubbling has ceased and the lung is fully re-inflated on CXR, should be done under the direct guidance of respiratory registrar or consultant only.
- In the case of empyema, regular flushes (2-4 times per day) with 10-20ml of normal saline should be prescribed on the drug chart to reduce the likelihood of drain blockage.
- Suction may occasionally be used. This should be under the guidance of a respiratory registrar or consultant. This should be high volume low pressure thoracic suction
- Nursed on a ward familiar with the management and monitoring of chest drains (generally respiratory ward except in exceptional circumstances)
- Chest drains should be checked daily for signs of wound infection, drainage volumes, swinging & bubbling, and for loose connections which can allow air into the drain and produce bubbling even when the air leak from the lung has ceased.

Recognition and Management of Drain Complications

1. Bleeding

1a. Recognition

- It is not uncommon for a small amount of bleeding during drain insertion however this should quickly stop.
- Bruising/swelling around drain insertion site.
- Frank blood draining from the drain which quickly clots (unless known haemothorax). This can be difficult at times to distinguish from heavily blood stained effusion however these should not clot.
- Signs and symptoms of shock. This may develop several hours after the procedure.
- Increasing dyspnoea post drain insertion and CXR showing no change or increasing effusion size.
- Bleeding can rarely be a complication of drain removal. This occurs when a vessel is penetrated during drain insertion but is then tamponaded by the drain until it is removed.

1b. Management

- Check urgent haemoglobin, coagulation, cross match
- Obtain good intravenous access.
- Apply continuous pressure to the intercostal space at the site of pleural intervention. This can be very effective in compressing the bleeding vessel and slowing the rate of blood loss.
- Significant bleeds will require resuscitation of the patient and urgent discussion with the thoracic surgeons.

2. Surgical Emphysema

2a. Recognition

- Occurs when air is trapped under the skin, is usually associated with pneumothorax.
- Subcutaneous swelling, which in extreme circumstances can extend up to involve the face and neck. In this circumstance it has the potential to cause airway compromise and restrict drainage from the jugular veins.
- Crepitus on palpation
- CXR showing radiolucent streaks throughout the subcutaneous tissue and muscle.

2b. Management

- Ensure that any pneumothorax present is being appropriately managed with a functioning chest drain and the drain is not kinked. Check that proximal drainage holes are not in subcutaneous tissue.
- Management is usually conservative and the air should reabsorb on its own over time, however patients should be closely monitored especially if the emphysema is extending.
- If airway compromise is suspected urgent senior anaesthetic assistance is required.
- A blunt dissection, wide bore drain may be required if progressive surgical emphysema despite narrow bore drain or if pneumothorax is not large enough to insert Seldinger drain safely.
- In rare cases skin incision +/- subcutaneous drain to allow the release of air can be considered – only after discussion with a respiratory or ITU consultant.

3. Pneumothorax

3a. Recognition

- Small pneumothoraces are relatively common complication of chest drain insertion and will be noted on CXR.
- Consider if the patient is at risk of trapped lung, which is due to the lung being fixed and unable to expand once pleural fluid is drained. This is especially common in mesothelioma but can also occur in other malignant effusions and in empyema.

3b. Management

- Ensure that the drain is correctly positioned and swinging (fluid in drainage tubing moves with respiration) – a swinging drain means that it is functioning.
- Check the connections and underwater seal
- Discuss with respiratory team

4. Secondary Infection

4a. Recognition

- Risk of infection increases the longer the drain is in situ.
- Cloudy pleural fluid, pain, infection round drain exit site.
- Clinical signs of sepsis

4b. Management

- Aspirate some pleural fluid and send for MC&S and culture.
- Discuss with microbiology and respiratory.

5. Pain

5a. Recognition

- Pain is common post drain insertion and is managed with regular analgesia, including opiates if necessary.

- Chest pain and discomfort can also result from negative intrapleural pressure during fluid removal. This can indicate an underlying trapped lung and can be accompanied by vasovagal responses.

5b. Management

- Check for other complications, including haemorrhage.
- If pain due to rapid fluid drainage is suspected, turn the drain off and leave it off for 2 hours or until the pain has completely settled.
- Analgesia

6. Drain Blockage

- If the drain is no longer swinging or draining any fluid this can be an indication that it is blocked.
- Flushing the drain with 20mls of normal saline is usually sufficient to relieve any blockage.

7. Drain Dislodgement

- This occurs when a drain has not been adequately sutured in place.
- The drain should never be advanced again due to risk of infection but can be pulled back slightly and resutured if drain is in too far.
- Consider removing the drain.

References

- (1) Pleural procedures and thoracic ultrasound; British Thoracic Society pleural disease guideline 2010. BTS Guidance. *Thorax* 2010; **65** (suppl 2); ii61-ii76.
- (2) NPSA Alert. <http://www.npsa.nhs.uk/nrls/alerts-and-directives/rapidrr/risks-of-chest-drain-insertion/>
- (3) Chest tube insertion: a prospective evaluation of pain management. Luketich JD, Kiss M, Hershey J, et al. *Clinical Journal of Pain* 1998(14): 152e4.
- (4) Implementing and ensuring safe sedation practice for healthcare procedures in adults. *Academy of Medical Royal Colleges*. London: Academy of Medical Royal Colleges, 2001.