

The Newcastle upon Tyne Hospitals NHS Foundation Trust

Policy for the Insertion and Management of Chest Drains (Adults)

Effective from: September 2010

Review date: December 2011

1. Introduction

This policy and its principles of matching skilled and experienced operators to clinical need for patient safety applies to the non-operative insertion and management of elective and semi-elective chest drains in any area of the Trust. In May 2008 the National Patient Safety Agency (NPSA) released an alert¹ highlighting risks associated with the insertion of chest drains. This followed a national review of all reported serious injuries and fatalities resulting from the insertion of chest drains for pleural effusions. Each Trust was given the responsibility of introducing policy locally in response to this alert. While this policy is mostly concerned with the safe and appropriate management of chest drainage for pleural effusions, it also covers chest drainage for pneumothoraces. It is expected that chest radiographs will be used to identify pneumothoraces; if assistance is required with the identification of pneumothoraces or placement of drains for them, after full evaluation of available imaging, then CT may be of some value.

The British Thoracic Society (BTS) guidelines on the insertion of chest drains were updated and published in August 2010². These guidelines provide comprehensive guidance and recommendations that should be reviewed by all clinical staff involved in the insertion and management of chest drains. This policy contains recommendations from the BTS guidelines which have been included in bold to highlight good practice points.

2. Policy Scope

This policy is for all medical personnel who have competencies in the insertion of chest drains and for medical and nursing personnel who manage patients with chest drains.

3. Policy Aims

The aim of this policy is to ensure the safe insertion of chest drains and subsequent management of the patient.

4. Roles and Responsibilities

Consultants and senior nursing staff are responsible for ensuring that the policy is implemented in their individual departments.

It is the individual responsibility of all medical and nursing personnel to ensure that they work in line with this policy.

The Working party will convene every six months to review all reported critical incidents involving chest drains. This is in addition to the existing Trust process for the investigation of individually reported critical incidents. The working party will meet annually to review and update this policy.

5. Insertion of chest drains

- 5.1** Chest drains should only be inserted by competent and qualified individuals who have assessed the patient, reviewed any available radiology and assessed the timing and the suitability of clinical area for performing the procedure. **Pleural procedures should not take place out of hours except in an emergency.**
- 5.2** **Written consent should be obtained for chest drain insertion except in emergency situations. The commonest complications resulting from chest drain insertion (with both small bore and large bore drains) are pain, intrapleural infection, wound infection, drain dislodgement and drain blockage. Visceral injury is the most serious complication. All of these possible sequelae should be detailed in the consent process.**
- 5.3** Chest drains should not be inserted for a pleural effusion out of hours unless there is clear evidence that the patient's condition is compromised by the effusion. Oxygen should be administered to hypoxic patients until competent personnel are available for drain insertion.
- 5.4** **Chest drains should be inserted in a clean area, using full aseptic technique including gowns, drapes, sterile gloves and skin cleansing.**
- 5.5** Small or loculated pleural effusions should have ultrasound guidance for diagnostic thoracocentesis or chest drain insertion.
- 5.6** **Ultrasound guidance reduces the risk of complications of pleural procedures in the critical care setting and its routine use is recommended.**
See Appendix 2 and 3.

6. Types of drain for insertion

There are two categories of chest drains available, Seldinger (small bore) and non-Seldinger (large bore) chest drains which are usually inserted surgically. It is recognised that in certain situations other devices may be used for chest drainage e.g. drains inserted under radiological control.

- 6.1** **Seldinger (small bore) drains should be used as first line therapy for pneumothorax, free flowing pleural effusions and pleural infection.**

6.2 During Seldinger (small bore) chest drain insertion, an attempt should be made to aspirate the pleural contents with a small needle. If this is not possible chest drain insertion should not continue.

6.3 Surgically inserted chest drains (large bore) should be inserted by blunt dissection. Trocars should not be used.

6.4 Seldinger drains should be used in preference to large bore drains in the majority of settings, with notable exceptions such as cardiothoracic surgery, complicated empyema, post surgery, trauma, or where an emergency drain is required to be inserted and a Seldinger drain is not possible.

7. Image Guidance for insertion of chest drains

7.1 A recent chest radiograph should be available prior to chest drain insertion.

7.2 It is strongly recommended that all chest drains intended to drain fluid should be inserted under ultrasound guidance.

7.3 Near point of care ultrasound NPoCUS³ guided or assisted drain placement involves real time bedside or procedure room assessment of the effusion. The use of NPoCUS should be encouraged where it is available and where skills exist.

7.4 Where NPoCUS is not available, the competent individual who is to perform the drainage procedure should accompany the patient to the radiology department, and insert the drain under image guidance or assistance in the department. **The marking of a site using thoracic ultrasound for subsequent remote aspiration or chest drain insertion is not recommended except for large pleural effusions.**

8. Competencies to insert chest drains

8.1 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.

8.2 Chest drain insertion is a core competency expected of doctors doing core accident and emergency, anaesthetic, intensive care, medical, radiology, respiratory and surgical training.

8.3 There is a hierarchy of competencies; see Appendix 1.

9. Chest drain fixation

All personnel inserting drains should use a method for drain fixation that minimises the risk of a drain falling out. This will be reviewed in future audit to be carried out across the Trust.

10. Chest drain documentation and patient management

10.1 Patients with chest drains should be managed on wards familiar with chest drains and their management.

10.2 Written consent should be taken by the competent medical personnel wherever possible before the insertion of the chest drain. [Link to Consent Policy](#)

10.3 **Drains should be checked daily for signs of wound infection, fluid drainage volumes and documentation for swinging and/or bubbling.** Accurate daily recordings of the drain and bottle readings, any changes instituted to the drain and any microbiological swabs taken should be documented appropriately on a dedicated chest drain chart. See Appendix 4.

11. Monitoring and Review

All incidents, accidents or near misses related to the insertion and management of chest drains should be reported through the Trust Incident reporting system. These incidents will be reviewed by the working party.

12. Patient information leaflet

The patient information leaflet relating to chest drain insertion produced by the British Thoracic Society (BTS)⁴ should be available to patients undergoing chest drain insertion.

13. References

1. NPSA alert
<http://www.npsa.nhs.uk/nrls/alerts-and-directives/rapidrr/risks-of-chest-drain-insertion/>
2. BTS guideline
Thorax 2010; **65** (suppl 2); ii61-ii76. Pleural procedures and thoracic ultrasound; British Thoracic Society pleural disease guideline 2010.
3. NPoCUS
www.npocus2008.com
4. BTS Patient information leaflet for chest drain insertion
<http://www.brit-thoracic.org.uk/Portals/0/Clinical%20Information/Pleural%20Disease/Pleural%20Guideline%202010/Chest%20Drain%20Patient%20Information%20Leaflet.pdf>

Chest drain insertion competencies

<p>Stage 1 competency</p>	<p>CT1, CT2, or equivalent in core accident and emergency, anaesthetic, intensive care, medical, radiology, respiratory, and surgical training</p>	<p>Can perform chest drain insertion with supervision by an operator (level 2 or greater) who has recent experience of chest drain insertion.</p>
<p>Stage 2 competency</p>	<p>Accident and emergency, anaesthetic, intensive care, medical, radiology, respiratory, and surgical trainees ST3/equivalent and above</p>	<p>It is expected that doctors within this grade will have undertaken a number of chest drain insertions and have been directly supervised undertaking the procedure on at least 2 occasions in each year. Following such assessment they may carry out the procedure independently.</p>
<p>Stage 3 Competency</p>	<p>Any senior medical personnel experienced at performing these procedures, preferably with experience in ultrasound assisted drain insertion.</p>	<p>These doctors are experienced and independent operators and may undertake the observation and assessment of other operators carrying out the procedure.</p>

Insertion of Seldinger (small bore) chest drains

1. Explain the procedure to the patient before taking written consent.
2. A treatment or procedures room should be sought and aseptic technique followed.
3. Make sure that the trolley is stocked appropriately: alcoholic Betadine or Chlorhexidine, chest drain insertion tray, needles and syringes, Seldinger kit, local anaesthetic fixation needle, drain swab and dressing. Check that the drain bottle is primed with sterile water and connecting tubing prepared.
Position the patient comfortably and safely to ensure optimisation of rib space and review the Chest X-Ray (CXR). Consider the point of insertion. **It is strongly recommended that all chest drains for fluid should be inserted under ultrasound guidance.**
4. **Local anaesthetic (lidocaine 1%) should be infiltrated prior to the procedure paying particular attention to the skin, periosteum and the pleura.**
5. **During chest drain insertion an attempt should be made to aspirate the pleural contents with a small needle. If this is not possible chest drain insertion should not continue.**
6. Once fluid or air is found make a small incision with scalpel. Insert the Tuohy needle (supplied within the Seldinger kit) into the rib space. Direct the bevel appropriately; the bevel allows the drain to be directed basally for effusions or apically for pneumothorax.
7. Ensure the tip of the Tuohy needle fully through the pleura. Air or pleural fluid should be aspirated via the Tuohy needle.
8. Remove the syringe and pass the wire through the needle; there should be no resistance and the wire should pass freely.
9. Remove the needle over the wire.
10. Pass the dilator over the wire until into the thorax. **The dilator should not be inserted further than 1cm beyond the depth from the skin to the pleural space.**
11. Remove the dilator over the wire, preventing the wire from being pulled out of, or pushed into, the thorax.
12. Insert the drain over the wire, to approximately 12–16cm.
13. Remove the wire and inner tube from the drain.
14. Attach the 3 way tap, leaving it **closed** until the drain is secured and attached to the drainage system.
15. Secure the drain to the skin with a suture. It is recommended that the knot around the drain is tightened so that the drain tubing is slightly indented.
16. Apply an appropriate dressing.
17. Connect the drain to the drainage tubing. The end of this may need to be cut off. Open the 3 way tap.
18. The operator can assume that the drain is in the pleural cavity if
 - i. the chest drain fogs up
 - ii. the fluid level in the chest drain internal pipe swings
 - iii. the prime level fluid bubbles when the patient coughs
 - iv. pleural fluid drains from the chest.
19. **A maximum of 1.5 litres of fluid should be drained in the first hour after insertion of the drain.**
20. **The rate of drainage of a large pleural effusion should be controlled to prevent the potential complication of re-expansion pulmonary oedema.**
21. **A bubbling chest drain should never be clamped**
22. A CXR should be obtained and reviewed.

Insertion of Large bore Chest Drains

It should be recognised that chest drains are used for three media: air, fluid and pus. The insertion and management of chest drains can vary.

Surgically inserted chest drains (large bore) should be inserted by blunt dissection. Trocars should not be used.

1. Explain the procedure before taking written consent.
2. A treatment or procedures room should be sought and aseptic technique followed.
3. Make sure that the trolley is stocked appropriately: alcoholic Betadine or Chlorhexidine, chest drain insertion tray, needles and syringes, Seldinger kit, local anaesthetic fixation needle, drain swab and dressing. Check that the drain bottle is primed with sterile water and connecting tubing prepared.

Position the patient comfortably and safely to ensure optimisation of rib space and review the Chest X-Ray (CXR). Consider the point of insertion.

For pneumothorax

- a) 4th intercostal space anterior to mid-axillary line (triangle of safety) in most cases
- b) if there is subcutaneous emphysema, alternative sites should be considered
- c) if a previous drain is in position as in a) above, the second drain should be placed away from the previous surgical field. Make the incision over the rib, tunnelling through the intercostal space above (diagram 1).

For effusion or empyema

For a drain to be sited basally make the incision in the appropriate intercostal space, after first aspirating fluid.

4. **Local anaesthetic (lidocaine 1%) should be infiltrated prior to the procedure, paying particular attention to the skin, periosteum and the pleura.** Test for anaesthesia with a sterile needle.
5. Make the incision sufficiently long to allow an index finger to push through into the pleural cavity.
6. Blunt dissect using artery forceps to the pleura.
7. Administer further local anaesthetic to the periosteum and pleura if required.
8. Place drain sutures before breaching the pleura (diagram 2).
9. Breach the pleura and use an index finger to sweep round to ensure the finger is in the pleural cavity and all adhesions are cleared.
10. Place the drain into the pleural cavity with artery forceps (diagram 3), and clamp it to the drapes.
11. Secure the drain to the skin with a suture. It is recommended that the knot around the drain is tightened so that the drain tubing is slightly indented.
12. Cut off the tapered connection from the end of the tube and connect it to the drain tubing with the blue connector. Label the drains accurately.

13. The operator can assume that the drain is in the pleural cavity if:
- i) they have swept the pleural cavity with an index finger
 - ii) the chest drain fogs up
 - iii) the fluid level in the internal pipe of the chest drain bottle swings
 - iv) the prime level fluid bubbles when the patient coughs.

14. A maximum of 1.5 litres should be drained in the first hour after insertion of the drain.

15. Drainage of a large pleural effusion should be controlled to prevent the potential complication of re-expansion pulmonary oedema.

16. A bubbling chest drain should never be clamped.

17. A Chest x ray should be obtained and reviewed.

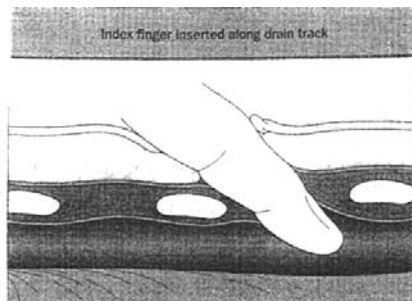


Diagram 1

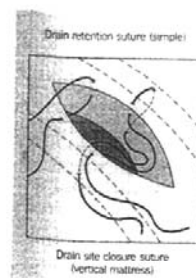


Diagram 2

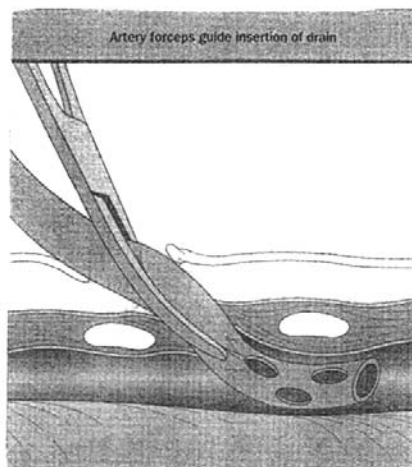


Diagram 3

Management of chest drains

1. All medical and nursing staff working in any area where patients may have a chest drain inserted should be trained in the management of chest drains.
2. **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 the care of such patients.**
3. The drain should be kept on the ground at the bedside and below waist level when mobilising.
4. The drainage system should be assessed for integrity, volume, bubbling and swinging (both amplitude and height) regularly. The fluid level should be marked regularly and documented on the chest drain chart.
5. If excessive frothing occurs due to an air leak, staff must ensure that the bottom of the internal pipe is below the fluid level.
6. Low vacuum suction may be used with a suction pressure of 2kPa or greater, titrated to the patient's pain level.
7. Patients should be assessed regularly for pain, breathlessness, drop in O₂ saturations (SpO₂) and subcutaneous emphysema.
8. Chest x rays should be reviewed in comparison to previous x rays.
9. **If malposition of a chest drain is suspected a CT scan is the best method to exclude or confirm this.**
10. **A chest drain may be withdrawn to correct a malposition but should never be pushed further in, due to the risk of infection.**
11. **A second drain should never be inserted through the same hole as a previously dislodged drain as this can introduce infection.**
12. A Chest x ray should be taken and reviewed after any change instituted to drain.
13. Pleurodesis and fibrinolysis should only be considered following specialist review and under specialist guidance.
14. Clamping of drains should only occur following senior review (SpR or Consultant). **A bubbling chest drain should never be clamped.**
15. Communication with senior nursing staff and thorough documentation is essential.
16. The drainage bottle should be changed as necessary in order to avoid the need for patient to breath against a high fluid level (approx 700ml will create increased resistance), and at least every 3 days in order to minimise the risk of infection. If the drain is bubbling, it should be clamped for the briefest time possible during the bottle change to avoid any possible tension effect.
17. Gloves should be worn when handling chest drains.
18. Removal of drains should occur after consultation with medical staff and should be carried out by 2 individuals, at least one of whom has been assessed as competent.
19. Apply an air tight dressing over the drain site. Remove this after 24 hours and assess the site.
20. Dispose of the drain and bottle as per the [Trust Infection Control Policy](#).