 Musgrove Park Hospital	Trust Guidelines
<b>Title: Guidelines for chest drain insertion</b>	
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<b>Ratified by:</b> Planned Care and Emergency & Urgent Care Divisional Governance Committees	<b>Active date:</b> 29/10/2009
<b>Ratification date:</b> 27/10/09	<b>Review date:</b> 27/10/2012
<b>Applies to:</b> Adults and children	<b>Exclusions:</b> Nil
<b>Purpose:</b> To rationalise the use of chest drains throughout the organisation and improve the safety of patients during insertion	

### Key points

- **Insertion of a chest drain carries a potential significant risk to the patient and should only be performed by a trained and competent practitioner. Do not attempt chest drain insertion unless you are competent – seek senior help**
- Separate guidelines exist for the management of patients with pleural effusion; for pleural tap/thoracocentesis; and pneumothorax/traumatic pneumothorax. This guideline details the technique to be used to insert a chest drain, which is often an integral part of the management of these conditions.
- The responsibility for ensuring staff are trained in chest drain insertion technique lies with each Division
- There are few indications for an emergency chest drain for pleural effusions. The use of an intravenous cannula and 3-way tap is just as effective at relieving immediate symptoms
- The site of chest drain insertion should generally be in the safe triangle, in the mid axillary line
- Imaging should be used to select appropriate site; ultrasonography can help ensure placement is safe
- A chest radiogram must be available at the time of insertion, except in the case of tension pneumothorax
- Chest drain insertion should be performed without substantial force
- Small bore drains should be inserted under image guidance with a guidewire (dissection not required)
- Blunt dissection must be performed if a large bore chest drain is inserted

## **1.0 Background**

- 1.1 Insertion of an intercostal drain, and other invasive manoeuvres employed in the diagnosis and treatment of suspected pleural effusion and pneumothorax, carries a potential significant risk to the patient and should only be performed by a competent practitioner.
- 1.2 When this procedure is undertaken as part of training there must be appropriate education beforehand and close supervision of the trainee by a competent practitioner during the procedure.
- 1.3 Separate guidelines exist for the management of patients with pleural effusion; for pleural tap/thoracocentesis; and pneumothorax/traumatic pneumothorax. This guideline details the technique to be used to insert a chest drain, which is often an integral part of the management of these conditions.
- 1.4 Any patient in whom a chest drain has been inserted should be cared for on a ward with nursing staff trained in the care of chest drains and under the care (which may be joint) of a chest physician. This includes patients under orthopaedics or surgical care for trauma.
- 1.5 It is recognised that despite adherence there will always be the possibility of problems associated with these interventions; though with strict adherence to these guidelines this risk will be reduced to a minimum.

## **2.0 Training and Responsibilities**

- 2.1 Chest drains should not be inserted unless the operator has been trained and deemed competent in the procedure. Each Division will make their own arrangements for training. Trainees may have been trained through previous jobs or via an ATLS course but regardless of this must be formally assessed and deemed competent by the supervising Consultant before being allowed to practice independently.
- 2.2 It is the responsibility of each member of staff involved in the insertion and management of chest drains to comply with the standards set out in this guideline and work within their own competence

### **3 Indications for chest drain insertion**

- Pneumothorax (see pneumothorax guidelines for further information)
- Pneumothorax in any ventilated patient
- Tension pneumothorax after initial needle relief
- Persistent or recurrent pneumothorax after simple aspiration
- Large secondary spontaneous pneumothorax in patients over 50 years
- Iatrogenic
- Pleural fluid
  - Malignant pleural effusion
  - Empyema and complicated parapneumonic pleural effusion
  - Small effusion in any ventilated patient
- Traumatic pneumothorax / haemopneumothorax (see pneumothorax guidelines for further information)
- Postoperative e.g. thoracotomy or oesophagectomy

#### **4.0 Paediatric patients (excludes neonates)**

- 4.1 Children requiring chest drains are most likely to come in via A&E with trauma
- 4.2 When a chest drain is required as a live saving treatment, insertion must be performed in the presence of both an A&E Consultant and a Paediatric Registrar
- 4.3 Insertion in less critical circumstances must wait until both a Paediatric Consultant and an A&E Consultant are present
- 4.4 Patients with empyema or effusion requiring elective insertion of chest drain will be discussed with the paediatric surgical registrar and paediatric respiratory registrar at Bristol Royal Hospital for Children to arrange transfer for the procedure to take place there.
- 4.5 The majority of children with chest drains are transferred to Bristol. In the event of an admitted paediatric patient requiring chest drain insertion, assistance will be provided by A&E staff
- 4.6 Paediatric spinal patients with chest drains in situ will be cared for on the high dependency unit and in accordance with Royal Marsden Manual of Clinical Nursing Procedures

## **5.0 Pre-drainage risk assessment**

- 5.1 Risk of haemorrhage: where possible, any coagulopathy or platelet defect should be corrected prior to chest drain insertion but routine measurement of the platelet count and prothrombin time are only recommended in patients with known risk factors.
- 5.2 The differential diagnosis between a pneumothorax and bullous disease requires careful radiological assessment. Similarly it is important to differentiate between the presence of collapse and a pleural effusion when the chest radiograph shows a unilateral “whiteout”.
- 5.3 Lung adherent to the chest wall throughout the hemithorax or underlying the proposed insertion point on the chest x-ray is an absolute contraindication to chest drain insertion. Further imaging (CT) should be requested and discussed with Radiology.
- 5.4 The drainage of a post pneumonectomy space should only be carried out by or after consultation with the respiratory registrar

## **6.0 EQUIPMENT**

All the equipment required to insert a chest tube should be available before commencing the procedure. Insertion kits (12f seldinger) are available. Separately, the equipment required is:

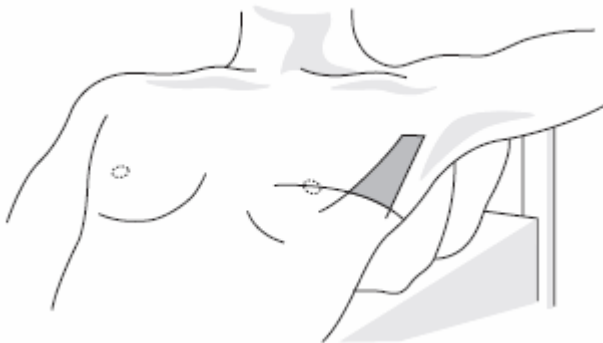
- Sterile gloves and gown
- Skin antiseptic solution, e.g. iodine or chlorhexidine in alcohol
- Sterile drapes
- Gauze swabs
- A selection of syringes and needles (21–25 gauge)
- Local anaesthetic, e.g. lignocaine (lidocaine) 1% or 2%
- Scalpel and blade
- Suture (e.g. “1” silk)
- Instrument for blunt dissection (e.g. curved clamp / finger)
- Guidewire with dilators (if small tube being used)
- Chest tube
- Connecting tubing
- Closed drainage system (including sterile water if underwater seal being used)
- Dressing

## **7 Consent and Pre-medication**

- 7.1 Prior to commencing chest tube insertion the procedure should be explained fully to the patient and consent recorded in accordance with Trust guidelines.
- 7.2 Unless there are contraindications to its use, pre-medication (benzodiazepine or opioid) should be given to reduce patient distress

## **8 Patient Position**

- 8.1 The preferred position for drain insertion is on the bed, slightly rotated, with the arm on the side of the lesion behind the patient's head to expose the axillary area. An alternative is for the patient to sit upright leaning over an adjacent table with a pillow or in the lateral decubitus position.
- 8.2 Insertion should be in the "safe triangle" illustrated. This is the triangle bordered by the anterior border of the latissimus dorsi, the lateral border of the pectoralis major muscle, a line superior to the horizontal level of the nipple, and an apex below the axilla



## **9 Confirming site for chest drain insertion**

- 9.1 A chest tube should not be inserted without further image guidance if free air or fluid cannot be aspirated with a needle at the time of anaesthesia.
- 9.2 Imaging should be used to select the appropriate site for chest tube placement.
- 9.3 Chest radiograph must be available at the time of drain insertion except in the case of tension pneumothorax
- 9.4 The ultrasound department should be contacted if the effusion needs marking

## **10 Drain size**

- 10.1 Small bore drains are recommended as they are more comfortable than larger bore tubes but there is no evidence that either is therapeutically superior.
- 10.2 Large bore drains are recommended for drainage of acute haemothorax to monitor further blood loss.

## **11 Aseptic Technique**

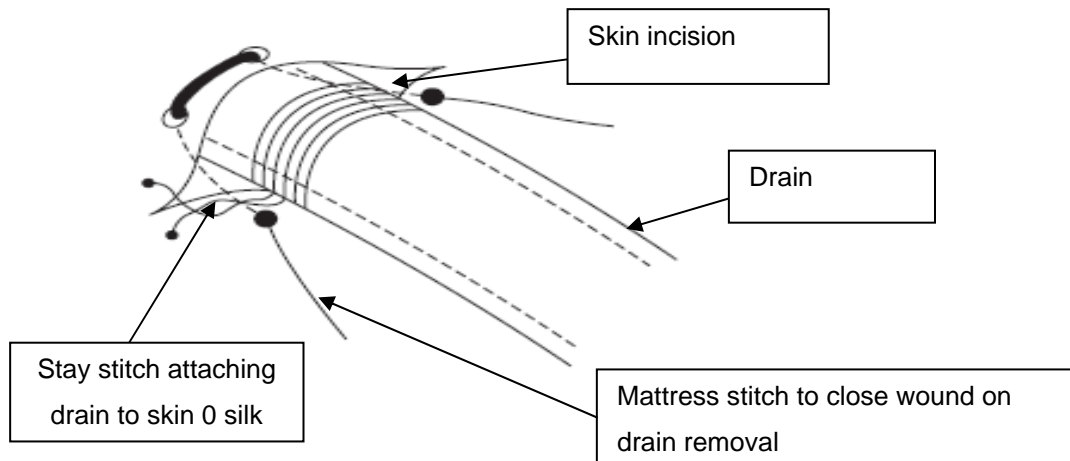
- 11.1 Aseptic technique should be employed during insertion.
- 11.2 Prophylactic antibiotics should be given in trauma cases.

## **12 Insertion of chest tube**

- 12.1 Skin should be cleaned with 2 applications of an alcohol based preparation
- 12.2 Local anaesthetic e.g. lignocaine (lidocaine) 1% or 2% should be infiltrated prior to insertion of the drain
- 12.3 Chest drain insertion should be performed without substantial force.
- 12.4 Insertion of a small bore drain under image guidance with a guidewire does not require blunt dissection.
- 12.5 Blunt dissection into the pleural space must be performed before insertion of a large bore chest drain.
- 12.6 The incision for insertion of the chest drain should be similar to the diameter of the tube being inserted.
- 12.7 The position of the tip of the chest tube should ideally be aimed apically for a pneumothorax or basally for fluid. However, any tube position can be effective at draining air or fluid and an effectively functioning drain should not be repositioned solely because of its radiographic position.
- 12.8 Pre-medication / anaesthetic used; gauge; position; complications; drainage (chest drain chart) and suction should be documented in the patient's notes.

### 13 Securing the drain

- 13.1 Large and medium bore chest drain incisions should have a stitch (0 silk preferably) for wound closure after drain removal
- 13.2 "Purse string" sutures must not be used.
- 13.3 All drains should have a stay stitch placed through the skin and wrapped around the drain to prevent misplacement / the drain falling out



### 14 Post-drain insertion management

- 14.1 A chest radiograph should be performed after insertion of a chest drain.
- 14.2 All chest tubes should be connected to a single flow drainage system e.g. underwater seal bottle or flutter valve.
- 14.3 Drainage of a large pleural effusion should be controlled to prevent the potential complication of re-expansion pulmonary oedema.
- 14.4 Clamping a pleural drain in the presence of a continuing air leak may result in a tension pneumothorax or possibly worsening surgical emphysema. A bubbling chest tube should therefore never be clamped.
- 14.5 In cases of pneumothorax, clamping of the chest tube should usually be avoided.
- 14.6 If a chest tube for pneumothorax is clamped, this should be under the supervision of a respiratory physician only. The patient should be managed in a specialist ward with experienced nursing staff, and the patient should not leave the ward environment.

- 14.7 If a patient with a clamped drain becomes breathless or develops subcutaneous emphysema, the drain must be immediately unclamped and medical advice sought.
- 14.8 When chest drain suction is required, a high volume/ low pressure system should be used. When suction is required, the patient must be nursed by appropriately trained staff
- 14.10 Patients with chest tubes should be managed on Coleridge ward or on HDU by staff who are trained in chest drain management. Blunt trauma patients will be managed on an Orthopaedic ward.

The following link can be copied and pasted into an internet search engine to access the current full BTS guideline for Patients having a chest drain inserted <http://www.brit-thoracic.org.uk/Portals/0/Clinical%20Information/Pleural%20Disease/Guidelines/PleuralDiseaseChestDrain.pdf>

## **15. Removal of chest drain**

- 15.1 The timing of removal of the chest drain will be dependent of the original reason for insertion and clinical progress.
- 15.2 If the drain is bubbling it should stay in.
- 15.3 If it is swinging and has stopped bubbling then it is in the pleural space and should be draining any persistent air leak. It should be removed when and chest x-ray does not show a persistent air leak and the patient is spontaneously ventilating.
- 15.4 If the drain is not swinging, it is blocked. It should be flushed with 20mls of saline or be removed and replaced as required.
- 15.5 Removal of the drain should be performed using aseptic technique. When the drain is ready to be removed, patients should be asked to breath in and hold their breath (to increase the pleural pressure and prevent air entering the pleural cavity) whilst it is removed and the hole sealed.
- 15.6 For large bore drains, the hole should be sealed using the previously place mattress suture, airtight dressing and gauze padding. If required, glue can be used in addition to the mattress suture.
- 15.7 For small bore drains, glue should be used and the wound covered with an airtight dressing and gauze padding.



## Appendix A - Trouble shooting for chest drains

Problem	Possible Cause	Suggested Action
1. No drainage	<p>Kink in catheter tubing (in particular, close to the entry site)</p> <p>Blocked tube</p> <p><b><i>Effusion resolved</i></b></p> <p>Tubing connections faulty</p>	<p>Check all tubing and reposition to prevent recurrence of problem. If necessary tape to secure.</p> <p>Try flushing with 20mls normal saline.</p> <p>Remove drain on medical advice. Usually a CXR is needed to ensure the effusion has resolved.</p> <p>Check all connections are properly secured and check wound site if patient is on suction.</p>
2. New bubbling of air in drainage bottle	<p>Chest drain may have partially fallen out (check no sign of holes in drain outside pt.)</p> <p>Patient has developed a pneumothorax</p>	<p>CXR may be required to check the position of the drain in the pleural space. Do not attempt to push drain back into the pleural space - this can introduce infection.</p> <p>Inform medical staff; follow management plan in Pneumothorax guidelines</p>
3 Disconnection of drainage tubing from drain	<p>Breakdown of connections (Patient may have moved without the drainage bottle in tow!)</p>	<p>If system has not been contaminated, reconnect immediately. If 3 way-tap still connected, turn off immediately. If not;</p> <ul style="list-style-type: none"> <li>• Apply chest drain clamp to the drain in order to prevent air from entering pleural space. Connect a new sterile system as soon as possible and remove clamp.</li> <li>• N.B. The patient with a pneumothorax and existing large air leak is better off with a temporary open pneumothorax than with a tension pneumothorax that could develop behind a clamped chest drain.</li> </ul> <p>Check all parts of the drain and system. Straighten tubing as required and reposition to prevent a recurrence.</p>
4. No movement (swinging) of fluid in the drainage tube with respirations	<p>Tubing is obstructed, kinked or disconnected</p> <p>Patient is on suction</p>	<p>See action for Problem 1 &amp; 3.</p> <p>Disconnect suction whilst carrying out chest drain observations unless instructed otherwise by medical staff.</p>
5. Chest drain falls out	<p>Tubing is blocked</p> <p>Tubing is displaced from pleural cavity</p> <p>The connections may not be fully secure</p>	<p>Try flushing with 20mls normal saline.</p> <p>Inform medical staff; a CXR will be required to check its position.</p> <ul style="list-style-type: none"> <li>• Re-assure patient.</li> <li>• If large bore drain; immediately tighten mattress suture to close the hole. Cover with gauze and occlusive sterile dressing.</li> <li>• If fine bore drain, cover site with gauze and occlusive sterile dressing.</li> <li>• Check patient's O<sub>2</sub> saturations and respirations.</li> <li>• Inform the medical staff.</li> </ul> <p>A CXR will probably be necessary to check possible air entry and assess need for new drain insertion.</p>

