

Brighton and Sussex University Hospitals

Policy for the Insertion and Management of Non-Trauma Chest Drains in Adults

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1. Introduction

1.1 In May 2008, the National Patient Safety Agency (NPSA) released an alert highlighting the risks associated with the insertion of chest drains. They identified that most of the incidences reported to the agency that had resulted in death or serious harm to patients following insertion of chest drains had occurred because of inadequate staff experience and supervision, poor positioning of chest drains and a lack of knowledge of existing clinical guidelines.

1.2 As a result, the NPSA made several recommendations:

- that chest drains are only inserted by adequately supervised and competent staff
- that ultrasound is strongly advised when inserting a drain for fluid
- that clinical guidelines are followed and staff made aware of the risks
- that patients give written consent before the procedure, wherever possible
- that local incident data relating to chest drains is reviewed and staff encouraged to report further incidences

1.3 In 2010, the British Thoracic Society (BTS) issued updated guidelines for the insertion and management of chest drains. The BSUH policy will be following the BTS guidance throughout the following policy.

2 Purpose

The purpose of this policy is to ensure that only clinically competent staff with the right training and experience will be responsible for the insertion and ongoing management and monitoring of chest drains.

3 Definitions

Chest drains are inserted into the pleural space to drain air, or other substances such as blood or pus, to allow lung re-expansion.

4 Responsibilities, Accountabilities and Duties

4.1 **Chief Executive and the Senior Management team** have overall responsibility for ensuring that the trust has the necessary management systems in place to enable the effective implementation of this policy

4.2 **The Patient Safety Committee** is responsible for ensuring that the actions identified in the NPSA alert (2008) are implemented. The committee will be informed about any incidents that may occur, about the investigations that follow and about the lessons learned. The committee reports to the Quality and Performance Committee.

- 4.3 **The Directorates**– are responsible for ensuring that all clinical staff working within their departments are made aware of the policy; that any training and competency programme is completed by all clinical staff who are responsible for the insertion and management of chest drains; that clinical staff involved in the insertion of chest drains adhere to the principles of the Mental Capacity Act Policy; that incidents are reported using Datix and results of the investigation are drawn to the attention of the Directorate Leads; that audits required to check compliance are completed and the findings fed back to the directorate Governance Committees for action if required.
- 4.4 **Medical Consultants** - must ensure that their junior staff receive appropriate training and that there is documentary evidence that they can demonstrate competence in the insertion of chest drains as identified in this policy. They must ensure that their junior staff have fulfilled the requirements of the Mental Capacity Act Policy in terms of “best interest” of the patient before any decision is made to insert a chest drain. They must ensure that this decision, and how it was reached, is clearly documented in the patient’s record using the chest drain insertion checklist (appendix 5).
- 4.5 **Ward Managers** or Department Lead Nurse – should ensure that patients who have chest tubes and drainage systems are nursed in highly visible bed spaces; that all nurses who care for and manage chest drains have been trained in the required procedures and have been assessed as competent to perform the skills. The ward manager is responsible for maintaining evidence of that training and competence. The Ward Manager should ensure datix are completed when identified complications of chest drainage occur. The Ward Manager should be prepared to complete Datix in the case of an adverse event, to participate in any investigation relating to the incident and to ensure that lessons learned are shared across the organisation.
- 4.6 **Registered clinical staff** – are responsible for ensuring that they comply with the standards set out in this policy; that they undertake the relevant training, including in the particular technique used to insert the drain (either Seldinger or large bore), only work within their own competence and identify where they may require further education. They must report adverse events using datix. They are also responsible for assisting in the completion of any audit required to monitor compliance with the policy.

Following insertion of radiologically guided drains – ward nursing staff should be given a drainage after care sheet (appendix 7). If any problems occur the respiratory team should be contacted.

- 4.7 **Clinical Site Team** – all patients with chest drains should be placed and cared for by a medical or surgical team experienced with their management and by nurses on a ward familiar with their care.

In BSUH, the clinical areas most familiar with the care of chest drains are:

- Critical Care
- Respiratory wards

- Cardiothoracic unit and ward (see appendix 1)
- Acute Medical Unit (AMU)
- Emergency department
- Trauma Unit
- A general surgical ward(post procedure)

5 Policy (following BTS guidelines, 2010)

In a healthy individual, the pleural membranes (visceral and parietal) are closely associated, with only a potential space separating them. The pressure within the pleural space is negative and has an important role in maintaining lung expansion. If air or other substances enter the pleural space, negative pressure is lost and the lung collapses. Chest drains are inserted into the pleural space to drain air, or other substances such as blood or pus, to allow lung re-expansion.

There are two types of chest drain:

- Small bore (for eg. Seldinger or pig tail drains). The BTS recommends that these drains are to be used as first line therapy for pneumothorax, free flowing pleural effusions and pleural infection. It is also recommended that all chest drains for fluid are inserted under ultrasound guidance
- Large bore Argyle chest drains which are typically inserted by blunt dissection without a trocar

5.1 The following are indications for chest (pleural) drain insertion:

- pneumothorax
- tension pneumothorax after initial needle relief
- persistent or recurrent pneumothorax after simple aspiration
- large secondary pneumothorax in patients aged > 50 years
- malignant pleural effusions ± pleurodesis
- empyema and complicated parapneumonic pleural effusion
- traumatic haemopneumothorax
- post surgical (thoracotomy, oesophagectomy, cardiac surgery)

5.1.1 Chest drain insertion checklist should be used (see Appendix 5 or Appendix 1 (cardiothoracics only))

5.2 Pleural procedures should not take place out of hours except in an emergency.

5.2.1 Most pleural aspiration and chest drain insertions do not need to be performed as an emergency and therefore should not be carried out overnight except in the case of significant respiratory or cardiovascular compromise. It may be considered in some circumstances that pleural aspiration is safer than chest drainage.

5.3 Non-urgent chest drain insertion should be avoided in anticoagulated patients until the INR < 1.5 (International Normalised Ratio). It must be noted that INR is not the only measure of coagulation and the clinician must take into account the use of Low Molecular Weight Heparin or antiplatelet therapies

5.3.1 In an emergency, when it is felt that it is necessary to insert a chest drain despite the INR being >1.5, the rationale for undertaking the procedure at that time and all risks associated with the procedure must be clearly identified in the patient record. The decision to go ahead when the INR is >1.5 should have been made in consultation with the consultant responsible for that patient's care and following discussion with Haematology. The outcome of these discussions must be clearly documented in the patient record. Patients and relatives should be warned about the increased and potentially fatal bleeding risks and these discussions need to be explicitly documented. The patient's consent to the procedure must demonstrate they have understood the risks.

5.3.2 Where a patient is anticoagulated because they are at high risk of thrombotic complications if anticoagulation is stopped, for example, in venous thromboembolism, arterial embolism, atrial fibrillation, mechanical heart valves or thrombophilias, please see the Trust 'bridging' guideline for the management of adult patients who require elective surgery or an invasive procedure whilst they are anticoagulated with warfarin or on antiplatelet therapy (MM0021). This guideline states that for the majority of chronically anticoagulated patients the haemorrhagic risk will exceed any thrombotic risk posed by interruption of anticoagulation. For patients who are deemed at high thrombotic risk, bridging therapy with therapeutic heparin should be discussed on an individual basis with a consultant in the appropriate speciality if there is time to do so. The Trust guideline recommends "withholding 5 doses of warfarin pre-operatively. If the INR is >1.4 at the time of surgery the balance of haemorrhage vs. urgency of surgery must be considered and the decision to proceed should be at the discretion of the operating surgeon. Vitamin K may be appropriate to reverse anticoagulation. It needs to be given at least 12 hours prior to the procedure to take effect. Haematology advice should be sought in the first instance".

5.3.3 Where it is deemed an emergency and that the insertion of a chest drain cannot be delayed despite an INR >1.5, then Haematology advice must be sought. Section 9.2.6 of the Blood and Nutrition Prescribing Guidelines for the Trust (<http://rxhws001/DepartmentSites/PrescribingGuidelines/>) has advice about Reduction of Anticoagulant Effect – Emergency surgery

requiring reduction of warfarin within 1 hour which recommends the use of prothrombin complex concentrate (Octaplex), the protocol for which can be found in Section 9.2.6 of the Blood and Nutrition guidelines, and the use of Vitamin K 5mg IV over at least 30 seconds, usually administered by slow IV injection over 3-5 minutes.

5.4 Written consent should be obtained for chest drain insertion except in emergency situations.

- 5.4.1 Before performing chest drain insertion, the competent medical practitioner should have obtained a valid consent to the procedure. The consent procedure should include the indications for the procedure, alternatives to the procedure and identify common and serious complications (see Trust Policy Consent to Examination or Treatment). The commonest complications resulting from chest drain insertion (with both small bore and large bore drains) are pain, haemothorax, pneumothorax, 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.
- 5.4.2 Valid consent means that the patient is a properly informed person who has the capacity to consent, free of undue influence (see Section 6.3 of Trust Consent policy).
- 5.4.3 The Trust Consent Policy and Mental Capacity Act Policy states that if an adult patient does not have the capacity to give or withhold consent to a significant intervention for which written consent would normally be sought, this fact should be documented on the Assessment of Capacity form (for adults who are unable to consent to investigation or treatment, see Appendix A of Consent Policy), which includes the assessment of the patient's capacity, why the health professional believes the treatment to be in the patient's best interests, consideration of any Advance Decision, involvement of people close to the patient and assessment of alternative decision-makers. For more minor interventions, this information should be entered in the patient's notes. Other consent forms should never be used for adult patients unable to give or withhold consent for themselves.
- 5.4.4 The Trust Consent policy goes on to say that an apparent lack of capacity to give or withhold consent may arise from communication difficulties rather than genuine incapacity. Trust staff should involve appropriate colleagues in making such assessments of capacity, such as specialist learning disability teams and speech & language therapists, unless the urgency of the patient's situation prevents this. If at all possible, the patient should be assisted to make and communicate their own decision, for example by providing information in non-verbal ways where appropriate and/or providing an appropriate interpreter. (See also Section 5.4.5 below). In certain circumstances, it is a statutory obligation to consult an independent Mental Capacity Advocate (IMCA).
- 5.4.5 **Provision for patients whose first language is not English** This Trust is committed to ensuring that patients whose first language is not English

receive the information they need and are able to communicate appropriately with healthcare staff. It is not appropriate to use children to interpret for family members who do not speak English.

5.5 To reduce pain associated with chest drains, analgesia should be considered both for a premedication and be prescribed post-procedure for all patients who have a chest drain in place.

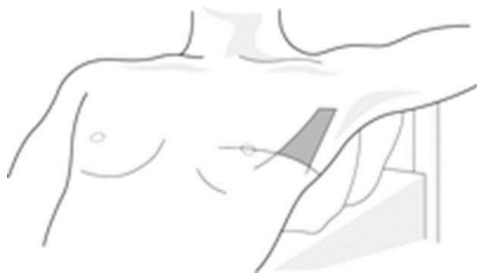
5.5.1 The BTS recommendation for premedication is either an intravenous anxiolytic or an analgesic. If an oral dose is preferred, the use of Oramorph in a suitable dose is recommended.

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

5.6.1 Infection following chest drain insertion, both cutaneously and within the pleural space, is an avoidable complication of the procedure.

5.7 Site for chest drain insertion

The BTS guidance recommends using the “triangle of safety” (see diagram below) to identify the site for insertion of chest drains.



5.7.1 This is the area bordered by the lateral edge of the latissimus dorsi, the lateral border of the pectoralis major muscle and superior to the horizontal level of the fifth intercostals space. This position minimises the risk to underlying structures (eg, internal mammary artery and intercostal vessels) and avoids damage to muscle and breast tissue resulting in unsightly scarring.

5.7.2 The preferred position for standard drain insertion is for the patient to be on the bed, slightly rotated, with the arm on the side of the lesion behind the patient’s head.

5.8 Local anaesthesia: (Lidocaine 1%) should be infiltrated prior to the procedure, paying particular attention to the skin, periosteum and the pleura.

5.8.1 Chest drain insertion is a very painful procedure and can be improved by the liberal use of local anaesthesia.

5.9 Confirming the site for insertion: prior to insertion of chest drain, an attempt should be made to aspirate the pleural contents with a small needle. If this is

not possible, the drain insertion should **not** continue as further imaging is required.

5.10 The BTS strongly recommends that all chest drains for fluid are inserted under image guidance.

5.10.1 The use of thoracic ultrasound should reduce the risk of drain malposition and complications.

5.11 Drains should never be inserted using substantial force.

5.12 Insertion of the drain

5.12.1 The dilator should not be inserted further than one centimeter beyond the depth from the skin to the pleural space.

5.12.2 A needle is introduced into the pleural space and the pleural contents should be aspirated at this stage to confirm position of the needle tip in the pleural space. The depth of the needle tip in the space should be noted. A guide wire is passed through the needle which can be used to gently guide the wire to the apex or base of the pleural cavity as required. The needle is withdrawn leaving the guide wire in place.

5.12.3 A small skin incision is then made. The dilator is passed over the guide wire using a slight twisting action. Force is unnecessary and the dilator only needs to be passed one centimeter beyond the depth to the pleura as measured by the introducer needle.

5.12.4 The tract is further widened by using a series of enlarging dilators up to the size of the drain.

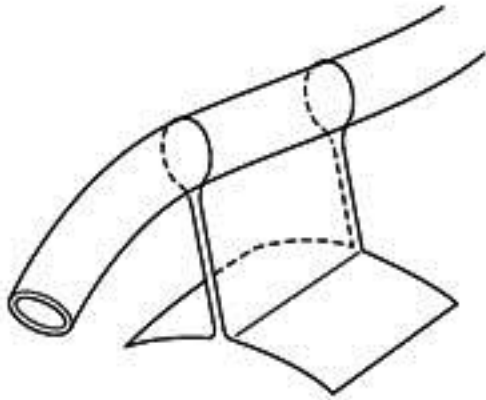
5.12.5 The drain is then inserted gently over the wire aiming upwards for pneumothorax or as appropriate for fluid to be drained. The depth should be enough to ensure the last drainage hole is well within the pleural space (approximately 5 – 10 centimeters). The guide wire is then removed leaving the drain in place.

5.12.6 The drain should be stoppered until secured and then connected to a drainage system.

5.12.7 The drain itself should be secured after insertion to prevent it falling out. For the small bore drain, the chosen suture should be stout and non-absorbable to prevent breaking and it should include adequate skin and subcutaneous tissue to ensure it is secure. For the large bore drain (inserted during surgery), a mattress suture, or suture across the incision, is usually employed. The suture should be suitable for a linear incision. Complicated sutures such as 'Purse-string' sutures should not be used.

5.12.8 The drain site should be dressed with an appropriate wound drain dressing that allows close inspection of the wound site for leakage / infection and secures the drain to prevent dislodgement. Wound dressings should help to ensure that the tube lies a little way away from the skin to avoid kinking of the tube and to prevent tension at the insertion site.

- 5.12.9 A suitable method of securing the chest tube to the patient is shown below. NB The drain connection itself should never be covered over. This is to prevent direct pull on the chest drain tube and potential disconnection.



- 5.13 Post procedure, a chest X-ray is not required unless there is doubt over its position.** Exception cardiothoracic patients See appendix 1

- 5.13.1 If malposition of a chest drain is suspected, a CT scan is the best method to exclude or confirm its presence. A chest drain may be withdrawn to correct a malposition but it should never be pushed in further due to the risk of infection.

- 5.14 The chest drain should be connected to a drainage system that contains a valve mechanism to prevent fluid or air from entering the pleural cavity.**

- 5.14.1 BSUH currently uses underwaterseal drainage bottles manufactured by Rocket. (Appendix 2). Before the device is attached to the patient's chest drain tube it is important to ensure that the tube in the bottle is placed under sterile water at a depth of approximately three centimeters. If the tube is not below the surface of the water, the device will not work and air will enter the pleural space. The bottle also has a automatic pressure relieve valve (see Appendix 2)

- 5.15 A bubbling drain must NEVER be clamped.**

- 5.15.1 If there has been bubbling and assessment has determined there is an air leak from the lung, the chest tube must NOT be clamped. Doing so will cause air to accumulate in the pleural cavity since it has no means of escape. This can rapidly lead to a life threatening tension pneumothorax.

If a chest drain has to be briefly clamped to change an underwater seal bottle – chest drain clamps must be used as these do not have “teeth” which can damage the tubing.

- 5.16 Initial drainage**

Large pleural effusions should not be allowed to drain all at once. The rapid shift in pleural pressures and re-expansion of the previously collapsed lung

can cause re-expansion pulmonary oedema which is a potentially fatal complication.

After insertion of the drain for pleural effusion, a maximum of 1000 mls should be drained in the first hour. The patient should be carefully monitored during this time for signs of discomfort or increased breathlessness. If any problems occur the drain should be clamped until symptoms settle and advice sought from the respiratory team.

The amount that can be drained off after the initial 1000mls will vary with each individual but should not exceed a further 1000mls (**maximum 2000mls total drainage in 24 hours**). Exact details of how much fluid may be drained safely over what time frame should be documented in the post procedure checklist / health records.(appendix 5) and continue to be monitored on the chest drain observation chart (appendix 4).

5.17 Underwater seal drains

If an underwater seal drain is used, the bottle must be kept below the insertion site at all times. It must be kept upright with 500mls of sterile water to ensure that the end of the drainage tube in the bottle is kept underwater.

5.17.1 The drain should be kept on the ground using a chest drain bottle stand at the bedside and below waist level when the patient is mobilising.

5.17.2 If the patient needs to be transferred outside the ward to other departments, they must be accompanied by a registered nurse who is competent in the care of a patient who has a chest drain. This registered nurse is responsible for ensuring that they take the necessary safety equipment with them (for eg. chest drain clamps and gauze/tape)

5.18 Patient Information: Patients should be encouraged to take responsibility for their chest tube and drainage system. They should be taught about the importance of correct positioning of the tube and drainage system; this would include how to avoid kinking and coiling of the tube system which might cause loss of patency. They should be told that it is very important to call a nurse and to report immediately should they experience any difficulty breathing, worsening pain or if they notice a sudden change in their condition.

5.18.1 Educational material should be available on the ward for patients and nursing staff, for eg. the Patient Information Leaflet available from the Respiratory Medicine webpage on the infonet and the BTS information leaflet obtainable from: <https://www.brit-thoracic.org.uk/document-library/clinical-information/pleural-disease/pleural-disease-guidelines-2010/appendix-6-patient-information-leaflet-on-chest-drain-insertion/>

And BSUH Imaging Pleural drainage information – see appendix 7

5.18.2 When patients have a visual impairment, it is possible to obtain written information in larger print. Clinical staff wanting to access this type of communication aid for a patient should contact the Equality and Human Rights team for further details.

- 5.18.3 Staff must be aware of how to contact Deaf Blind interpreters for people with visual and/or hearing impairment. Information can be found on the Equality and Human Rights webpages (on Working Here) via this hyperlink. <http://nww.bsuh.nhs.uk/working-here/equality-and-human-rights/interpretation-services/>
- 5.18.4 Further information about available communication tools can be found in the Equality and Human Rights pages on the infonet on <http://nww.bsuh.nhs.uk/working-here/equality-and-human-rights/communication-toolkit/>

5.19 Nursing Management

- 5.19.1 That a patient has a chest tube and drainage system must be reflected in either the Care Plan or Care Pathway for that individual and the following key points must be assessed and evaluated on a regular basis. The assessment and evaluation should be documented in the nursing record and on the Chest Drain observation chart (appendix 4).
- 5.19.2 All clinical observations of the patient who has a chest tube and drainage system should be made by a registered nurse who has been assessed and identified as competent to care for such patients (see Section 6 and appendix 3). This task must not be delegated.
- 5.19.3 **Physiological Observations** - Trust policy on patient observations states that the patient must have their physiological observations (including respiration and oxygen saturation) performed at least 12 hourly. However, a patient with a chest drain will require more frequent observations.

Initial observations post insertion : every 15 minutes for first hour, every hour for next 3 hours then 4 hourly.

The frequency may be increased by the nurse responsible for the patient's care, dependent on the patient's condition. The frequency required for these observations should be documented on the patient's observation chart, the care plan and be discussed with the responsible medical team on a daily basis. All patients should have their NEWS score (National Early Warning Score) calculated with every set of observations. This should be documented on the bottom of the BSUH observation chart in the appropriate area.

- 5.19.4 The patient should be observed for signs of chest pain, breathlessness, desaturation, bleeding and signs of surgical emphysema. Any of these symptoms are indications that the patient requires urgent medical review.
- 5.19.5 **Observation of the drainage system and bottle itself** – Checking of the drainage system should be done at the same time as physiological observations are recorded. This would include ensuring that the tubing is patent and not kinked or coiled under the patient and that the tube system is intact. Since there are two main reasons for insertion of a chest drain (to re-inflate a lung or to drain fluid from it) there are also two differing signs which require observation when checking for effectiveness of the system. These

findings must be recorded on the Chest Drain observation chart (see appendix 4). Also see troubleshooting guide appendix 6.

- 5.19.6 **Bubbling** – bubbling in the drainage bottle occurs on respiration and on coughing when there is still air in the pleural space. If the patient has had a drain inserted for pneumothorax, for example, air bubbles will be visible in the underwaterseal bottle as air is drained from the pleural space and the lung re-expands. The bubbling will occur intermittently as the patient breathes out or coughs, and reduces in frequency as the pneumothorax resolves (Briggs, 2010).
- 5.19.7 Sudden continuous or excessive bubbling throughout both inspiration and expiration may indicate a broncho-pleural air leak or a breach in the tube's system (Briggs, 2010). This requires an immediate check of the chest tube and its connections to ensure it has not become detached.
- 5.19.8 **Swinging** – a respiratory swing can be seen in fluid in the tube of the underwaterseal drain. This means that fluid in the connecting tube will Up and down as the patient breathes. With respiration, the fluid should rise on inspiration and fall on expiration. This “swing” confirms the correct placement of the tube in the pleural space and that the tube itself is patent. If there is no visible swing but the patient appears comfortable, they should be asked to cough as this will also achieve a swing in the fluid.
- 5.19.9 Absence of swinging would indicate that the drain has become occluded or that it is no longer in the pleural space. It is likely, however, that this would cause respiratory distress and would be an indicator for an urgent medical review.
- 5.19.10 **Observation and Measurement of fluid drainage** – Under waterseal drainage bottles usually have a measuring scale, where zero is the water seal level (the level to which sterile water is poured into the bottle to cover the bottom of the tube sufficiently in order to establish the seal) and anything in excess of this would represent actual drainage. As with the need for physiological observations, how frequently the drainage must be measured and recorded should be dictated by the patient's condition and the amount and nature of the drainage itself. If the drain has been inserted recently and the drainage volume is large, it is not unusual for it to be measured frequently, for example every 15-30 minutes (Briggs, 2010). Drainage must be recorded on the chest drain chart and cumulative drainage. The colour of the drainage fluid also needs to be recorded. For example, as blood drainage diminishes, the fluid may begin to become rose-pink; if the drainage fluid becomes cloudy in nature, infection might be suspected.
- 5.19.11 **Observations of the chest drain site** – following initial insertion observations chest drains should be checked at least every 4 hours for signs of wound infection (pain, swelling and redness). Observe for leakage around the insertion site or connection point. If the dressing is soiled, change the dressing, taking care to ensure that the drain connection is maintained. Adhere to the Trust's control and prevention of infection policies including aseptic non touch technique when handling the chest drain using appropriate personal protective equipment.

5.19.12 **Changing the drainage bottle** – the underwaterseal drainage bottle should be changed when the bottle is no more than three quarter's full to ensure it works at maximum efficiency (ie once the level reaches approximately 1500 ml, the bottle should be changed). If the drain has been inserted for re-inflation of the lung and there is no fluid drainage, then the bottle need only be changed at 7 day intervals. The used drainage bottle and its contaminated contents should be disposed of according to the Trust's control and prevention of infection policies.

5.19.13 **Pain Management** – insertion of a chest drain and its continued presence is painful. The patient's ongoing pain must be assessed at least 2 – 4 hourly in order to ensure an optimum analgesic effect. The patient is the only person who can identify whether their pain is managed adequately, but it should allow them to be compliant with physiotherapy, for example, and to perform the activities of daily living which would include deep breathing and coughing.

5.19.14 Patients who have difficulty communicating their needs must be offered alternative methods to help in the management of their pain. This can be by use of an interpreter (see Section 5.4.5 above) or for patients who have a learning disability or for older patients with communication difficulties please see the Acute Pain Team's infonet pages where they have a variety of available resources, for example, the British Pain Society and the Royal College of Physicians have a useful leaflet "Assessment of Pain in Older People" available online <http://nww.bsuh.nhs.uk/clinical/teams-and-departments/division-of-surgery/acute-pain/training-and-resources/best-practice-documents-and-resources/?p=2>

5.20 Suction

Should the patient require suction with their drainage system, please refer to the BTS Guidelines page ii22

<https://www.brit-thoracic.org.uk/document-library/clinical-information/pleural-disease/pleural-disease-guidelines-2010/pleural-disease-guideline/>

5.20.1 If any underwaterseal chest drain is required to be attached to suction, it must be to only a Low Vacuum Thoracic Suction Unit. If in doubt, contact the Critical Care Outreach team or Clinical Site Management Team or seek advice from the on-call Respiratory Medicine Team.

5.21 **Flushing of small bore chest drains ie Seldinger or pigtail.** Flushing of small bore chest drains is covered by a separate policy: Policy for the Flushing of Seldinger Small Bore Chest Drains by Nurses on the Respiratory Wards which is available on the infonet under Clinical policies.

5.22 **Removal of the chest drain – The chest tube should be removed on medical advice either once the fluid drainage has decreased to less than 200 mls per day, or there is resolution of a pneumothorax (see specific guidance below) or when the drain is no longer functioning.**

5.22.1 In the case of pneumothorax, the drain should not usually be removed until bubbling has ceased (provided tube is clearly patent) and there is chest x-ray demonstration of lung re-inflation.

5.22.2 The removal of a chest drain may require two skilful practitioners. The patient should be given analgesia prior to the procedure to ensure adequate pain control. The patient should be asked to hold their breath whilst the drain is removed in a brisk firm movement. The assistant should tie a previously placed mattress suture and apply an occlusive dressing to the drain site.

6 Training Implications

6.1 All doctors expected to be able to insert a chest drain should be trained using a combination of didactic lecture or e.learning, simulated practice and a period of supervised practice until they are considered competent. There should be documented evidence of competency achievement.

6.2 The table below identifies the level of competency required for insertion of chest drains by medical staff

<p>Stage 1 competency</p>	<p>All doctors: F2 and above</p> <p>(F1s can observe/assist, but must be supervised by a consultant/ ST3 or above)</p>	<p>Can perform chest drain insertion with supervision by an operator (who is Stage 2 or 3 competent) who has recent experience of chest drain insertion. If ultrasound guidance is required (ie all chest drains, except in the case of pneumothorax or trauma) the supervisor should also be Royal College of Radiologists (RCR) Level 1 competent in chest ultrasound or equivalent</p>
<p>Stage 2 competency</p>	<p>Any doctor who has completed the appropriate training for chest drain insertion as per Section 6.1</p>	<p>It is expected that doctors looking to gain Stage 2 competency will have undertaken a number of chest drain insertions, for example, witnessed during successfully carried out Directly Observed Procedures (DOP), 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>However, if Ultrasound is required (in all cases, except in the case of pneumothorax or trauma) then they must have at least Royal College of Radiologists Level 1 competency or equivalent in chest ultrasound or be supervised by an operator who has.</p> <p>See Royal College of Radiologists Ultrasound Training Recommendations for Medical and Surgical Specialties http://www.rcr.ac.uk/docs/radiology/pdf/ultrasound.pdf</p>

<p>Stage 3 Competency</p>	<p>Senior medical personnel experienced at performing these procedures, who must have RCR Level 1 competency in ultrasound</p>	<p>These doctors are experienced and independent operators who may undertake the observation and assessment of other operators carrying out the procedure.</p> <p>They must have RCR Level 1 competency or equivalent.</p>
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6.3 Training for thoracic ultrasound should follow the principles set out by the Royal College of Radiologists.

6.4 Nurses working in areas identified as suitable to care for such patients, should have in-house coaching related to the care and management of chest drains. They must be supervised in practice until they are able to complete a competency-based assessment (see appendix 3) and are assessed by suitably experienced senior clinicians. Ward managers are responsible for holding training records.

7 Monitoring Arrangements

<p>Measurable Policy Objective</p>	<p>Monitoring / Audit Method</p>	<p>Frequency</p>	<p>Responsibility for performing monitoring</p>	<p>Where is monitoring reported and which groups / committees will be responsible for progressing and reviewing action plans</p>
<p>To ensure that BTS guidelines are being followed in practice</p>	<p>National Audit Analysis of pleural procedures led by BTS. This assesses the Trust against best practice guidelines and gives local vs national performance</p>	<p>1 – 2 yearly</p>	<p>Designated lead from Respiratory Medicine</p>	<p>Discussed in Respiratory Clinical Governance meeting</p>

8 Due Regard Assessment Screening

As an NHS organisation, BSUH is under a statutory duty to set out arrangements to assess and consult on whether this policy and function impacts on race equality and human rights.

This policy does not discriminate against any groups on the basis of age, disability (including carers), gender, gender identity, marriage and civil partnership, pregnancy and maternity status, religion or belief, race / ethnicity, sexual orientation or social inclusion / health inequalities (See Appendix 8).

9 Links to other Trust Policies/Guidelines

Trust 'bridging' guideline for the management of adult patients who require elective surgery or an invasive procedure whilst they are anticoagulated with warfarin or on antiplatelet therapy

<http://rxhws001/DepartmentSites/PrescribingGuidelines/> for Blood and Nutrition (Section 9.2.6 Reduction of Anticoagulant Effect – Emergency surgery requiring reduction of warfarin within 1 hour)

Policy for Consent to Examination or Treatment

Mental Capacity Act Policy incorporating DOLs

Translating and Interpreting Medical Information in a Foreign Language

Patient observation

Transfer (clinical handover)

Policy for the flushing of Seldinger small bore chest drains

Infection prevention

<https://nww.bsuh.nhs.uk/clinical/teams-and-departments/infection-prevention/policies-and-guidelines/>

10 Associated documentation

<http://www.brit-thoracic.org.uk/Portals/0/Guidelines/PleuralDiseaseGuidelines/Pleural%20Guideline%202010/Chest%20Drain%20Patient%20Information%20Leaflet.pdf>

11 References

Briggs, D. (2010) Nursing care and management of patients with intrapleural drains *Nursing Standard* 24, 21, 47-55

Havelock, T. et al, Pleural procedures and thoracic ultrasound: British Thoracic Society pleural disease guideline 2010 *Thorax* 2010; **65** (suppl2):ii61-ii76 Available online at: <http://www.brit-thoracic.org.uk/Portals/0/Guidelines/PleuralDiseaseGuidelines/Pleural%20Guideline%202010/Pleural%20disease%202010%20pleural%20procedures.pdf>

Marsden manual 9th Edition (2015) Chapter 9, Respiratory care, Chest Drains
<http://www.rmmonline.co.uk/manual/c09-sec-0145#c09-fea-0056>

National Patient safety Agency (2008) Rapid response Report 15th May Risks of Chest Drain Insertion. NPSA /2008/ RRR003

Appendix 1 : Cardiothoracic chest drain insertion checklist- (For use in cardiothoracic dept only)- please see Appendix 5 for Chest drain checklist

Chest Drain Insertion Checklist

Patient details (or affix patient label)

Name: _____

Date of birth: _____

Hospital number: _____

Time and date: _____

1) Preparation

1. Patient given information leaflet and management instructions? Interpreter offered?

Yes Emergency

All drains to be inserted before 3pm unless an emergency.

2. Time of insertion? _____

Drains to be inserted on Level 7 Millennium Wing unless an emergency.

3. Patient location on insertion?

4. Procedure type?

Elective Emergency

5. Indication?

6. Procedure discussed with the surgeon responsible for patient including type of drain to be used?

Yes

The commonest complications of pleural drains are pneumothorax, procedure failure and haemorrhage. The most serious is visceral injury.

7. Has a written consent form been completed stating the procedural risks?

Yes Emergency

INR should be <1.5 unless an emergency.

8. Patient INR? _____

If taking novel oral anticoagulant or non-aspirin antiplatelet, please discuss with surgeon.

2) Procedure

9. Parenteral analgesia administered?

Yes

10. Patient position during insertion?

11. Imaging reviewed?

Yes

12. Real-time ultrasound image guidance used?

Yes No (state reason): _____

13. Side of insertion?

Left Right

14. Drain inserted within triangle of safety?

Yes No (state reason): _____

15. Type of drain?

Large bore Seldinger

16. Pleural aspirate confirmed position prior to insertion?

Yes

17. Drain secured and drainage system in place?

Yes

18. Post-insertion chest X-ray?

Yes

19. Procedure documented on Metavision?

Yes

20. Post-insertion monitoring initiated using ICD specific form?

Yes

Clinician details

Name & grade: _____

Signed: _____



IN THE EVENT OF MALPOSITION: Please arrange an urgent CT scan and immediately inform the consultant surgeon responsible for the patient.

Appendix 2: Rocket Chest Drain

Rocket® Single Bottle System

Traditionally the simplest way to accomplish chest drainage is to set up a single bottle containing a prescribed amount of water, one short tube leading to the outside atmosphere functions as a vent; another leads from the patient and is submerged approximately 2cm below the surface of the water.

This creates an underwater seal, the most important element in pleural drainage. The water seal provides a low resistance one way valve that allows air and fluid to be pushed out of the pleural space by means of positive expiratory pressure and prevents atmospheric air from being drawn back in.

The Rocket® Single Bottle and tube set combine to provide the UK's biggest selling chest drainage system.

It is comprised of a traditional underwater seal and is used almost universally as the product of choice after cardiac and thoracic surgery, in A&E departments and medical wards.

The simple functionality of the system in use and ease of set-up mean that it is well suited for any condition requiring chest drainage.

The system features: **UNDERWATER SEAL CHEST DRAINAGE BOTTLE** for either single collection (R54500) or double collection (R54509)

- **UPRIGHT, INHERENTLY STABLE DESIGN**
which does not require tiresome stands or carriers
- **1800ml CAPACITY:**
available in two graduations 25ml: R54500 or 5ml: R54509
- **AVAILABLE WITH A WIDE RANGE OF TUBING SETS:**
including, single cone connector for connection to large bore catheters: (R54502)
and also for use with Rocket® Seldinger Chest Drainage Sets: (R54539).
- **SIMPLE ORDERING:**
all products are available direct, many



CUSTOMER INFORMATION BULLETIN

Rocket® R54500 & R54509 Single Chest Drainage Bottle

Dear Customer,

As part of our programme of continuous improvement we are pleased to introduce an update for the R54500 & R54509 Chest Drainage bottles.

- There is now an automatic positive pressure relief valve.
- If the flow of escaping air is blocked, the positive pressure relief valve will allow the air to escape and protect the patient from potential harm.



Positive Pressure Blow Off Valve

through NHS Logistics. NHS Codes listed below.

Appendix 3 : Competency framework

Nursing Competence in the Care and Management of Chest Drains

Name of candidate

Ward

Name of Assessor

	Criteria for Achievement	Competence achieved. Nurse and Assessor Signature and date achieved
1	a. Draws a labelled diagram of the respiratory tract.	
2	Using at least 2 different patients, demonstrates how to perform respiratory assessment, checking: a. Airway patency b. Respiratory rate and pattern c. Respiratory sounds d. Chest movement e. Respiratory volume	
3	a. Outlines the indications for chest drain insertion and underwaterseal drainage b. Discusses the advantages and disadvantages of the different types of chest drain tubes c. Describes potential hazards and complications associated with chest drains and underwaterseal drainage and how these should be managed d. Describes optimal circumstances for insertion of all chest drains including baseline observations, time, location for procedure to take place, site and personnel who should be involved	
4	a. Describes the safety equipment that must always be available at the bedside when patient has underwaterseal chest drain. Ensures equipment is always made available b. Demonstrates how to set up an underwater seal drainage system for use c. Describes how to identify when it is necessary to change an underwater seal drainage bottle. Demonstrates how to accomplish this safely. Demonstrates how to dispose of used drain and its contents according to Trust policy d. Describes (demonstrates) how to manage safety issues like accidental disconnection or damage to the drainage system.	

5	<ul style="list-style-type: none"> a. Describes how to ensure that a patient’s pain is managed effectively both during and following the insertion of a chest drain. b. Describes safe positioning of patient for insertion of drain. c. Describes how to identify air leaks from the insertion site. d. Demonstrates how to ensure that the chest tube and drainage connections are made secure e. Demonstrates safe positioning of the underwater seal drainage bottle. f. Describes potential hazards of uncontrolled fluid drainage. Records drainage on appropriate chart g. Describes how to maintain tube patency and discusses importance of monitoring of “respiratory swing” h. Discusses routine observations and documentation of care to be completed for patient following insertion of chest drain i. Describes how to check for surgical emphysema and the possible causes and the actions to taken if identified j. Discusses the importance of breathing exercise and mobility in the care of the patient with a chest drain k. Describes the methods for safe transfer of the patient with a chest drain l. Describes some clinical indications that the chest drain may no longer be required m. Demonstrates safe removal of chest drain n. Demonstrates safe management of site of drain following removal 	
6	Discusses how to give psychological support to the patient.	

Appendix 4 Chest Drain observation chart



Chest drain observation chart

Name.....
 Hospital No.....
 DoB.....

Date and time of insertion:

Type of drain

Ward:.....

Seldinger chest drain: 12F 18F

Consultant :.....

Wide bore chest drain: 20F 22 F 24F 26F 28F

Indication : pleural effusion pneumothorax

Empyema other :.....

Observations post insertion

- Every 15 mins for 1st hour
- Every hour for the next 3 hours and every 4 hours until removal
- Observe site for signs of infection / disconnection / air leak and or displacement
- Ensure drain bottle positioned below level of chest
- Maximum 1000mls first hour
- Record amount and type of drainage
- Ensure patient is comfortable and has adequate analgesia
- Refer to trust policy for more information

Frequency	Date	Time	Swinging	Bubbling	Drainage type	Underwater seal intact	Tubing & connection intact	Chest drain site checked	Bottle changed	Hourly chest drain drainage	Chest drain drainage running	Suction prescrip ⁿ if applicable	Bubbling	Suction setting at wall	Signature
			y/n	y/n	*C/P/B/SS	y/n	y/n	y/n	y/n	mls	mls	... KPa	y/n	... KPa	
Every 15 mins first hour															
Every hour for next 3 hours															
4 hourly															

From Salisbury observation chart 2016 *Drainage type C=clear P= purulent B=blood SS= serosanguineous

Appendix 5 - Chest drain insertion checklist

Chest drain insertion safety checklist

BEFORE THE PROCEDURE	
Indication	
Pneumothorax	
Pleural effusion	
Other:	
If out of hours does the drain need to be inserted now? Yes <input type="checkbox"/>	
Are you competent to insert the drain? Yes <input type="checkbox"/>	
Patient identity checked as correct	Yes <input type="checkbox"/>
Patient information leaflet provided	Yes <input type="checkbox"/>
Appropriate consent completed	Yes <input type="checkbox"/>
Is suitable drain and equipment available including ultrasound guidance?	Yes <input type="checkbox"/>
Confirm site of clinical abnormality	Yes <input type="checkbox"/>
Imaging reviewed	Yes <input type="checkbox"/>
Medicines and coagulation checked	Yes <input type="checkbox"/>
Any known drug allergies	Yes <input type="checkbox"/>
Safe site of drain insertion identified	
Consider premedication	Yes <input type="checkbox"/>
Observations recorded	Yes <input type="checkbox"/>
Are you ready to proceed?	Yes <input type="checkbox"/>
Names / GMC numbers of clinicians responsible for chest drain insertion	
1.	
2.	
3.	

TIME OUT	
Verbal confirmation between team members before the start of the procedure	
Is the patient position optimal?	Yes <input type="checkbox"/>
All members identified and roles assigned	Yes <input type="checkbox"/>
Team all agreed ready to proceed	Yes <input type="checkbox"/>

Procedure Date:	Time:.....
Operator:	
Observer:	
Assistant:	
Level of supervision: SpR <input type="checkbox"/> Consultant <input type="checkbox"/>	
Equipment and trolley prepared	Yes <input type="checkbox"/>
Location of patient:	
Ward / AMU / Other state :	

Name.....
Hospital No.....
DoB.....

SIGN OUT	
Sutures and dressing secured	Yes <input type="checkbox"/>
Patient advised about care and not elevating drain above the chest	Yes <input type="checkbox"/>
Analgesia prescribed	Yes <input type="checkbox"/>
In effusion, confirm no more than maximum of 1000mls is drained in the first hour	Yes <input type="checkbox"/>
Clear instruction of further drainage rate	Yes <input type="checkbox"/>
Document if bubbling or swinging	Yes <input type="checkbox"/>
Post procedure observations completed	Yes <input type="checkbox"/>
Procedure documented overleaf	Yes <input type="checkbox"/>

Signature of responsible clinician completing the form:
.....

Adapted from Intensive care society procedure checklist 2016

Reverse of checklist

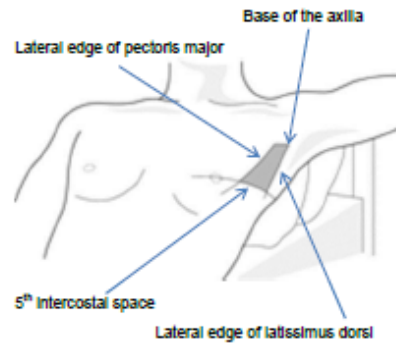
Chest drain insertion safety checklist

DURING PROCEDURE

Sterile scrub / gown and gloves?	Yes	<input type="checkbox"/>
Chloraprep 2% to skin?	Yes	<input type="checkbox"/>
Local anaesthetic?	Yes	<input type="checkbox"/>
Large fenestrated drape used?	Yes	<input type="checkbox"/>
STOP if unable to aspirate air or fluid while infiltrating LA with green needle	Yes	<input type="checkbox"/>
Side: Left Right Site		
LA used:		
Appearance of fluid:		
Chest drain type:		
Method of insertion : surgical / seldinger		
Samples sent for:		
<input type="checkbox"/> Protein / LDH / Glucose (gold top bottle)		
<input type="checkbox"/> MC & S (universal bottle)		
<input type="checkbox"/> Cytology (brown cytology bottle)		
Additional comments / adverse events noted:		

Adapted from Intensive care society procedure checklist 2016

Guide of anatomical landmarks of "safe triangle" for chest drain insertion



Any specific instructions to nursing staff :

Name.....

Hospital No.....

DoB.....

Appendix 6 Chest drain Troubleshooting guide

Problem	Cause	Outcome	Action
Drain not swinging or bubbling	The absence of a swing may indicate that the tube is blocked	If the drainage in tube is impeded there is potential risk for a tension pneumothorax or surgical emphysema to occur	<ul style="list-style-type: none"> Assess the patient Check for links in the tubing If a clot is seen in the tubing gently squeeze or pinch the tubing between the fingers in the direction of the drainage device. If no improvement change the tubing GET SENIOR HELP
Lack of drainage	The lack of drainage may indicate that the drain is blocked or kinked	Tension pneumothorax	<ul style="list-style-type: none"> Asses the patient Check the entire system for any kinks or obstructions Straighten the tube If unresolved GET SENIOR HELP
Tube becomes disconnected	Connection not adequately secured	Air will enter the pleural space causing a worsening pneumothorax and / or tension pneumothorax	<ul style="list-style-type: none"> Clamp tubing to prevent air entering pleural space Ask another member of staff to assess the patient Replace with ne tubing Ask the patient to cough gently to remove air GET SENIOR HELP
Leakage from drain site	<p>a. Incomplete closure of sutures</p> <p>b. Bleeding</p> <p>c. Infection</p>	Surgical emphysema, sepsis and empyema	<ul style="list-style-type: none"> Remove dressing, check wound send swab for M C & S Check integrity of sutures Assess the patient Inform medical team and consider blood cultures / antibiotics
Continuous bubbling	<p>a. Leak from chest connections</p> <p>b. Persistent air leak within the lung</p>	Unresolved pneumothorax	<ul style="list-style-type: none"> Assess the patient Check drain , connections and tubing GET SENIOR HELP

Sudden increased blood or fluid losses in drain	<p>a. Drain previously blocked</p> <p>b. Thoracic bleeding</p>	Hypovolaemic shock	<ul style="list-style-type: none"> • IMMEDIATELY GET SENIOR HELP • Assess the patient • >1500 mls loss of blood or 200 mls / hour may indicate need for a thoracotomy
Tube eyelets are exposed	The chest drain has moved	Air will enter pleural space causing a worsening pneumothorax and / or tension pneumothorax	<ul style="list-style-type: none"> • GET SENIOR HELP • Cover tubing with occlusive dressing • Assess patient
Chest drain falls out	Drain not secured	Respiratory distress due to pneumothorax	<ul style="list-style-type: none"> • GET SENIOR HELP • If mattress suture present close the wound and apply occlusive dressing • Assess patient • Prepare for a chest drain insertion
Pain	<p>a. Drain pulling at site</p> <p>b. Immobility</p> <p>c. Pneumothorax</p>	Hospital acquired pneumonia Stiff shoulder Respiratory distress	<ul style="list-style-type: none"> • Assess patient • Review and adjust analgesia • Refer to physiotherapist

From Salisbury Interpleural Chest drain insertion and management

<http://www.icid.salisbury.nhs.uk/ClinicalManagement/Respiratory/Pages/IntrapleuralChestDrains-InsertionandManagement.aspx>

Accessed 15/12/16

Appendix 7 Imaging pleural aftercare sheet



Imaging

Brighton and Sussex 
University Hospitals
NHS Trust

Drainage Aftercare Sheet

ACS-Imag-BSUH-001

PLEURAL AND ASCITIC DRAINAGE AFTERCARE SHEET

1. Samples

If samples are to be sent they should be as follows:

Biochemistry – Protein & LDH – gold top blood bottle

+/- pH (pH sticks)

+/- Triglycerides and cholesterol (if chylous) - gold top blood bottle

+/- Glucose – grey top bottle

Microbiology – MC&S

+/- TB – clear sterile container

+/- Blood culture bottles if infection suspected

Cytology – Brown cytology container up to 500mls

2. The patient can be transferred to the ward connected to a bag, but the tap must be closed. Ensure the connections are tight.
3. Indicate in the hospital notes the volume of fluid removed for samples and what time drainage can be restarted (Maximum of 1 litre in the first hour).
4. On arrival to the ward the bag should be replaced with an underwater seal by a nurse or doctor who is familiar with this process. Please contact Respiratory team if unsure.
5. Please observe BP, Pulse and O₂ saturation ¼ hourly for 1 hour, ½ hourly until drainage complete.
6. A maximum volume of 1L can be drained in the first hour and thereafter no more than 1.5L every 2 hours if complete drainage is necessary.
7. If the patient gets more short of breath call a member of the team.
8. To remove a pigtail drain please ensure the locking mechanism is released before pulling. If the drain does not slide out easily contact a member of the team to decide if it is appropriate to cut the drain just skin side of the hub, pinch the tube to avoid air entering the pleural space and gently pull.

If there are any concerns regarding the drain please contact either the doctor who placed it or the on call respiratory team.

Ascitic

1. If samples are to be sent they should be as follows:

Biochemistry – Protein & LDH – gold top blood bottle

+/- pH (pH sticks)

+/- Triglycerides and cholesterol (if chylous) - gold top blood bottle

+/- Glucose – grey top bottle

Microbiology – MC&S

+/- TB – clear sterile container

+/- Blood culture bottles if infection suspected

Cytology – Brown cytology container up to 500mls

2. The tube will be connected to a bag, but the tap must be closed for transfer.
3. Indicate in the hospital notes the volume of fluid removed for samples and what time drainage can be restarted.
4. Please observe BP & P ¼ hourly for 1 hour then ½ hourly until drainage is complete.
5. A maximum rate of 1 litre/hour can be drained; up to a maximum volume of 6 litres.
6. To remove a pigtail drain ensure the locking mechanism is released before pulling. If the drain does not slide out easily phone a member of the team to decide if the drain should be cut just skin side of the hub and gently pulled.

Author: Guy Burkill, Consultant Radiologist; Jenny Messenger, Chest Physician
Issue Date: Mar 2016
Location: Imaging Shared Drive, Nursing Folder

Issue number: 1
Review Date: Mar 2017
Page 1 of 1

Appendix 8 Due regard assessment

		Yes/No	Comments
1.	Does the document/guidance affect one group less or more favourably than another on the basis of:		
	• Age	No	
	• Disability	No	Where there is an overseas language or additional communication need, staff will meet them in line with the relevant policy listed in section 9.
	• Gender	No	
	• Gender identity	No	
	• Marriage and civil partnership	No	
	• Pregnancy and maternity	No	
	• Race	No	Where there is an overseas language or additional communication need, staff will meet them in line with the relevant policy listed in section 9.
	• Religion	No	
	• Religion or belief	No	
	• Sexual orientation, including lesbian, gay and bisexual people	No	
2.	Is there any evidence that some groups are affected differently and what is/are the evidence source(s)?	No	
3.	If you have identified potential discrimination, are there any exceptions valid, legal and/or justifiable?	N/A	
4.	Is the impact of the document/guidance likely to be negative?	No	
5.	If so, can the impact be avoided?	N/A	
6.	What alternative is there to achieving the document/guidance without the impact?	N/A	
7.	Can we reduce the impact by taking different action and, if not, what, if any, are the reasons why the policy should continue in its current form?	N/A	
8.	Has the policy / guidance been assessed in terms of Human Rights to ensure service users, carers and staff are treated in line with the FREDA principles (fairness,	Yes	

	respect, equality, dignity and autonomy)		
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For advice in respect of answering the above questions, please contact Consultant in Respiratory Medicine. For advice in respect of answering the above questions, please contact Equality@bsuh.nhs.uk (01273 664685).