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# BTS Pleural Disease Guideline 2010

## A Quick Reference Guide

**British Thoracic Society**

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## BTS PLEURAL DISEASE GUIDELINE 2010 – A QUICK REFERENCE GUIDE

British Thoracic Society Pleural Disease Guideline Group:  
a sub-group of the British Thoracic Society Standards of Care Committee

This quick reference guide should be read alongside the main guideline, and section numbers refer to the text of the main guideline.  
Note that the references made in this document relate to the references available in the full guideline only.

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The full BTS Guideline is published in Thorax Vol 65 Supplement 2

Available online at: <http://www.brit-thoracic.org.uk/clinical-information/pleural-disease.aspx>  
together with appendices and evidence tables.

The BTS Pleural Disease Guideline is endorsed by:

Royal College of Physicians, London  
Royal College of Surgeons of England  
Royal College of Physicians of Edinburgh  
Royal College of Surgeons of Edinburgh  
Royal College of Physicians and Surgeons of Glasgow  
Royal College of Radiologists  
Royal College of Anaesthetists  
Royal College of Pathologists  
College of Emergency Medicine  
Society for Acute Medicine  
Association for Clinical Biochemistry  
British Society of Clinical Cytology



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**INTRODUCTION AND METHODS**

**British Thoracic Society – Pleural Disease Guideline 2010**

Ingrid Du Rand, Nick Maskell

**Clinical context**

Pleural disease remains common, affecting over 3000 people per million population each year. It therefore presents a significant contribution to the workload of respiratory physicians. Pleural disease originates from a wide range of pathologies and a systematic approach to the investigation and management is therefore required. These guidelines attempt to summarise the available evidence to aid the healthcare professional in delivering good quality patient care.

**Need for guideline**

The Standards of Care Committee of the British Thoracic Society (BTS) established a Pleural Disease Guideline Group in December 2007. The objective was to produce an evidence-based update of the last pleural disease guidelines published in 2003. It was recognised that since the last guideline, a number of good quality primary research papers have been published and the guidelines needed to reflect these new data. In addition, there was a need to develop new sections on local anaesthetic thoracoscopy and thoracic ultrasound to reflect changes in clinical practice.

**Intended users and scope of the guideline**

This guideline is intended for use by all healthcare professionals who may be involved in pleural disease management. This will include doctors, nurses and other healthcare professionals.

**Areas covered by this guideline**

The guideline addresses the investigation and medical management of pleural disease in adults.

This is divided into the following sections:

1. Investigation of a unilateral pleural effusion in adults
2. Management of spontaneous pneumothorax
3. Management of a malignant pleural effusion
4. Management of pleural infection in adults
5. Local anaesthetic thoracoscopy
6. Chest drain insertion and thoracic ultrasound

The six sections can be downloaded individually from the website. Key points are repeated in the sections to enable users a review of the individual sections without the need to cross reference repeatedly. In addition, at the end of this section (Annex 1), there is a list of good areas for audit and future research.

**Areas not covered by this guideline**

The following areas fall out of the scope of this guideline:

- Paediatric pleural disease
- Detail on thoracic surgical techniques
- Management of bilateral pleural effusions

**Methodology**

*Establishment of guideline team*

A working party was established with representation from a range of professionals with an interest in pleural disease together with a lay representative (see full list of guideline group members in section 8).

*Scope for the guideline, PICOT questions and literature search*

The guidelines are based upon the best available evidence. The methodology followed the criteria as set out by the AGREE collaboration in the document, *The AGREE instrument*, available online at: <http://www.agreecollaboration.org/instrument/>

The scope and purpose of the guideline had been agreed and defined in consultation with all potential stakeholders representing the medical and nursing professions, patient groups, health management and industry (see full list of stakeholders in section 10).

Guideline members identified and formulated a set of key clinical questions in PICO(T) (Population, Intervention, Comparison, Outcome and Time) format to inform the search strategies for the literature search.

BTS commissioned the Centre for Reviews and Dissemination at the University of York to undertake a bespoke literature search using the search strategies shown in detail on the BTS website ([www.brit-thoracic.org.uk](http://www.brit-thoracic.org.uk)). The following databases were searched: Ovid MEDLINE (from 1960 onwards) (including MEDLINE In Process), Ovid EMBASE, Cochrane Database of Systematic Reviews (CDRS), the Database of Abstracts of Reviews of Effects (DARE) and the Cochrane Central Register of Controlled Trials. The initial searches were done in June 2008 and revised in September 2009. Searches were limited to English and adult literature. 19,425 potential papers were identified by the search. (See Web Appendix 1)

The guideline committee agreed on the following criteria to select relevant abstracts for the guideline:

1. Studies that addressed the clinical question.
2. Appropriate study types used to produce the best evidence to answer the clinical question.
3. Non-English abstracts were not evaluated.
4. Abstracts were not rejected on the basis of the Journal of publication, country research were done or published nor the date of publication.

A total of 17,393 abstracts were rejected through the criteria outlined above and 2,032 full papers were ordered for critical appraisal.

**Table 1: Revised Grading system for recommendations in evidence based guidelines**

Grade	Evidence
1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1	Meta-analyses, systematic reviews or RCTs, or RCTs with a high risk of bias
2++	High quality systematic reviews of case-control or cohort studies or High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal
2+	Well conducted case-control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal
2	Case-control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

*Critical appraisal of the literature*

A further 591 full papers were rejected because they fell outside the area of focus and scope of the guideline. Formal critical appraisal to assess clinical relevance and scientific rigor of 1,441 papers were done independently by at least two guideline reviewers using the SIGN critical appraisal checklists (see Web appendix 2). The guideline reviewers identified an additional 148 papers during the period of guideline development, which were added and critically appraised. The evidence in each study was graded using the SIGN formulated levels of evidence. (Table 1)

*Considered judgment and grading of the evidence*

Evidence tables were produced to review the body of evidence and inform the considered judgements and grading of recommendations. Where there were a lack of evidence, consensus statements were derived by incorporating a number of individual non-bias expert opinions from experts in the field.

The following were considered in grading of the recommendations:

1. The available volume of evidence.
2. The applicability of the obtained evidence for making recommendations for the defined target audience of this guideline.
3. How generalisable the obtained evidence was to the target population for the guideline.
4. A clear consistency in the evidence obtained to support recommendations.
5. The implications of recommendations on clinical practice in terms of recourses and skilled expertise.
6. In-depth cost effectiveness analysis falls outside the scope of this guideline.

Recommendations were graded from A+ to D as indicated by the strength of the evidence as listed in Table 2.

Table 2: Grades of recommendations

Grade	Type of evidence
A	At least one meta-analysis, systematic review, or RCT rated as 1++ and directly applicable to the target population or A systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++ directly applicable to the target population and demonstrating overall consistency of results or Extrapolated evidence from studies rated as 1++ or 1+
C	A body of evidence including studies rated as 2+ directly applicable to the target population and demonstrating overall consistency of results or Extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4 or
✓	Extrapolated evidence from studies rated as 2+

Important practical points for which there is no, nor is there likely to be, any research evidence. The guideline committee wishes to emphasize these as Good Practice Points (GPP).

*Drafting of the guideline*

The guideline group produced a draft guideline following regular email consultations and meetings held in December 2007, June 2008, November 2008, February 2009 and May 2009. The draft guideline was presented at the Summer BTS meeting in June 2009 and circulated to all the stakeholders identified (see section 11) for consultation and review.

The revised draft guideline was submitted to the BTS SOCC for review and published on-line for a month (in August 2009) to allow for BTS member and public consultation. All the feedback were reviewed and discussed by the guideline committee and incorporated into the revised draft guideline. The literature search was repeated by the Centre for Reviews and Dissemination at the University of York and additional evidence appraised and included into the final draft of the guideline.

**Planned review of the Guideline**

The guideline will be reviewed and updated in 4 years from publication.

**Guideline group membership**

*Guideline Group Members*

Dr Nick Maskell, Chair; Dr Nabeel Ali; Dr George Antunes; Dr Anthony Arnold; Professor Robert Davies; Dr Chris Davies; Dr Fergus Gleeson; Dr John Harvey; Dr Diane Laws; Professor YC Gary Lee; Dr Edmund Neville; Dr Gerrard Phillips; Dr Richard Teoh; Dr Naj Rahman; Dr Helen Davies; Dr Tom Havelock; Dr Clare Hooper; Dr Andrew MacDuff; Dr Mark Roberts.

Dr Edmund Neville represented the Royal College of Physicians, London.

Dr Fergus Gleeson represented the Royal College of Radiologists.

*Thoracic Surgical Representatives*

Mr Richard Berrisford; Mr Jim McGuigan (representing the Royal College of Surgeons); Mr Richard Page (representing the Royal College of Surgeons of Edinburgh).

Dr D L Evans (member of the BTS Standards of Care Committee) provided lay input during consultation phases of the production of the guideline.

**Stakeholder organisations**

The following organisations were identified as stakeholders and given the opportunity to comment on the draft documents during the consultation period:

Royal College of Physicians, London; Royal College of Surgeons of England; Royal College of Physicians of Edinburgh; Royal College of Surgeons of Edinburgh; Royal College of Radiologists; Royal College of Anaesthetists; Royal College of General Practitioners; Royal College of Nursing; Royal College of Obstetricians and Gynaecologists; Royal College of Pathologists; Joint Royal Colleges Ambulance Liaison Committee; College of Emergency Medicine; Society for Acute Medicine; Association for Palliative Medicine of GB and Ireland; British Geriatrics Society; Association for Clinical Biochemistry; Association of Medical Microbiologists; British Society for Immunology; British Society of Clinical Cytology; British Society for Rheumatology; Society for Cardiothoracic Surgery in Great Britain and Ireland.

**Web Appendices** (available online) include:

- Details of search methodology
- Critical appraisal checklists
- Evidence tables
- Local Anaesthetic thoracoscopy – practical guide to the procedure
- Chest drain insertion – patient information leaflet

## 1. INVESTIGATION OF A UNILATERAL PLEURAL EFFUSION IN ADULTS

Clare Hooper, YC Gary Lee, Nick Maskell

### Clinical assessment and history

- ▶ Aspiration should not be performed for bilateral effusions in a clinical setting strongly suggestive of a transudate unless there are atypical features or they fail to respond to therapy. [✓]
- ▶ An accurate drug history should be taken during clinical assessment. [✓]

### Initial Diagnostic Imaging

#### Plain radiography

- ▶ Posteroanterior (PA) chest x-rays should be performed in the assessment of suspected pleural effusion. [✓]

#### Ultrasound

- ▶ Bedside ultrasound guidance significantly increases the likelihood of successful pleural fluid aspiration and reduces the risk of organ puncture. [B]
- ▶ Ultrasound detects pleural fluid septations with greater sensitivity than CT. [C]

### Pleural aspiration

- ▶ A diagnostic pleural fluid sample should be aspirated with a fine bore (21G) needle and a 50ml syringe. [✓]
- ▶ Bedside ultrasound guidance improves success rate and reduces complications [including pneumothorax] and is therefore recommended for diagnostic aspirations [B].
- ▶ Pleural fluid should always be sent for protein, lactate dehydrogenase, Gram stain, cytology and microbiological culture. [C]

#### Appearance

- ▶ The appearance of the pleural fluid and any odour should be recorded. [✓]
- ▶ A pleural fluid haematocrit is helpful in the diagnosis of haemothorax. [✓]

#### Differentiating between a pleural fluid exudate and transudate

- ▶ Light's criteria should be used to distinguish between a pleural fluid exudate and transudate (Box 2). [B]
- ▶ In order to apply Light's criteria, the total protein and lactate dehydrogenase (LDH) should be measured in both blood and pleural fluid. [B]

#### Pleural fluid differential cell counts

- ▶ Pleural fluid cell proportions are helpful in narrowing the differential diagnosis but none are disease-specific [C].
- ▶ Any long standing pleural effusion tends to become populated by lymphocytes. Pleural malignancy, cardiac failure and tuberculosis are common specific causes of lymphocyte predominant effusions. [C]

#### pH

- ▶ In non-purulent effusions, when pleural infection is suspected, pleural fluid pH should be measured providing that appropriate collection technique can be observed and a blood gas analyser is available. [B]
- ▶ Inclusion of air or local anaesthetic in samples may significantly alter the pH results and should be avoided. [B]
- ▶ In a parapneumonic effusion, a pH <7.2 indicates the need for tube drainage. [B]

#### Amylase

- ▶ Routine measurements of pleural fluid amylase, or its isoenzymes, are not warranted. It can, however, be useful in

suspected cases of oesophageal rupture or effusions associated with pancreatic diseases. [C]

#### Cytology

- ▶ Malignant effusions can be diagnosed by pleural fluid cytology in about 60% of cases. [B]
- ▶ The yield from sending more than 2 specimens (taken on different occasions) is very low and should be avoided. [B]
- ▶ Immunocytochemistry should be used to differentiate between malignant cell types and can be very important in guiding oncological therapy. [C]

#### Tumour markers

- ▶ Pleural fluid and serum tumour markers do not currently have a role in the routine investigation of pleural effusions. [C]

### Further Diagnostic Imaging

#### Computed Tomography (CT)

- ▶ CT scans for pleural effusion should be performed with contrast enhancement of the pleura and before complete drainage of pleural fluid. [C]
- ▶ CT scans should be performed in the investigation of all undiagnosed exudative pleural effusions and can be useful in distinguishing malignant from benign pleural thickening. [C]
- ▶ A CT scan should be requested for complicated pleural infection when initial tube drainage has been unsuccessful and surgery is to be considered. [C]

### Invasive investigations

#### Percutaneous pleural biopsy

- ▶ When investigating an undiagnosed effusion where malignancy is suspected and areas of pleural nodularity are shown on contrast enhanced CT, an image-guided cutting needle is the percutaneous pleural biopsy method of choice. [A]
- ▶ Abrams needle biopsies are only diagnostically useful in areas with a high incidence of TB, although thoracoscopic and image-guided cutting needles have been shown to have higher diagnostic yield. [C]

#### Thoracoscopy

- ▶ Thoracoscopy is the investigation of choice in exudative pleural effusions where a diagnostic pleural aspiration is inconclusive and malignancy is suspected. [C]

#### Bronchoscopy

- ▶ Routine diagnostic bronchoscopy should not be performed for undiagnosed pleural effusion. [C]
- ▶ Bronchoscopy should be considered if there is haemoptysis, or clinical or radiographic features suggestive of bronchial obstruction. [C]

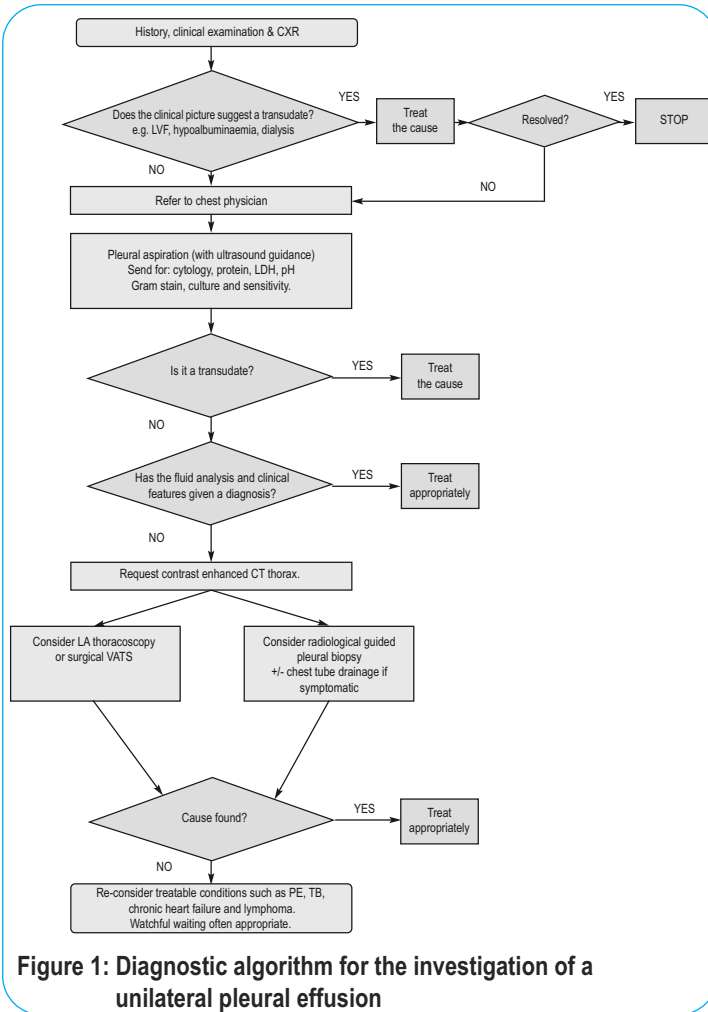
### Specific conditions and tests

#### Tuberculous pleurisy

- ▶ When pleural biopsies are taken, they should be sent for both histological examination and culture to improve the diagnostic sensitivity for tuberculosis. [B]
- ▶ Thoracoscopic pleural biopsies are the test most likely to yield positive mycobacterial culture (and therefore drug sensitivity) results. [B]
- ▶ Surrogate markers of pleural TB are useful 'rule out' tests in low incidence countries. Adenosine deaminase (ADA) is the most thoroughly validated to date. [B]

#### Rheumatoid arthritis associated pleural effusions

- ▶ Most chronic pleural effusions secondary to rheumatoid arthritis have a very low glucose level of less than 1.6 mmol/L (29mg/dL). [D]



**Figure 1: Diagnostic algorithm for the investigation of a unilateral pleural effusion**

**Systemic lupus erythematosus (SLE)**

- ▶ Pleural fluid ANA should not be measured routinely as it reflects the serum level and is therefore usually unhelpful. [C]

**Chylothorax and pseudochylothorax**

- ▶ If a chylothorax or pseudochylothorax is suspected, pleural fluid should be tested for cholesterol crystals and chylomicrons and the pleural fluid triglyceride and cholesterol levels measured. [C]

**2. MANAGEMENT OF SPONTANEOUS PNEUMOTHORAX**

Andrew MacDuff, Anthony Arnold, John Harvey

**Introduction**

- ▶ SSP is associated with a higher morbidity and mortality than PSP. [D]
- ▶ Strong emphasis should be placed on smoking cessation, to minimise the risk of recurrence. [D]
- ▶ Pneumothorax is not usually associated with physical exertion. [D]

**Clinical Evaluation**

- ▶ Symptoms in PSP may be minimal or absent. In contrast, symptoms are greater in SSP, even if the pneumothorax is relatively small in size. [D]
- ▶ The presence of breathlessness influences the management strategy. [D]
- ▶ Severe symptoms and signs of respiratory distress suggest the presence of tension pneumothorax. [D]

**Imaging**

**Initial Diagnosis**

- ▶ Standard erect chest radiographs in inspiration are recommended for the initial diagnosis of pneumothorax, rather than expiratory films. [A]
- ▶ The widespread adoption of digital imaging (PACS) requires diagnostic caution and further studies since the presence of a small pneumothorax may not be immediately apparent. [D]
- ▶ CT scanning is recommended for uncertain or complex cases. [D]

**Size of pneumothorax**

- ▶ In defining a management strategy, the size of a pneumothorax is less important than the degree of clinical compromise. [D]
- ▶ The differentiation of a “large” from a “small” pneumothorax continues to be the presence of a visible rim of more than 2cms between the lung margin and the chest wall (at the level of the hilum), and is easily measured with the PACS systems. [D]
- ▶ Accurate pneumothorax size calculations are best achieved by CT scanning. [C]

**Treatment options for pneumothorax**

- ▶ Patients with pre-existing lung disease tolerate a pneumothorax less well, and the distinction between PSP and SSP should be made at the time of diagnosis to guide appropriate management. [D]
- ▶ Breathlessness indicates the need for active intervention, as well as supportive treatment (including Oxygen). [D]
- ▶ The size of pneumothorax determines the rate of resolution, and is a relative indication for active intervention. [D]

**Management of PSP**

- ▶ Patients with PSP or SSP and significant breathlessness associated with any size of pneumothorax, should undergo active intervention. [A]
- ▶ Chest drains are usually required for patients with tension or bilateral pneumothorax, who should be admitted to hospital. [D]
- ▶ Observation is the treatment of choice for small PSP, without significant breathlessness. [B]
- ▶ Selected, asymptomatic patients with a large PSP may be managed by observation alone. [A]
- ▶ Patients with small PSP, without breathlessness, should be considered for discharge with early outpatient review. These patients should also receive clear written advice to return in the event of worsening breathlessness. [D]

**Needle aspiration or chest drain?**

- ▶ Needle (14–16G) aspiration (NA) is as effective as large bore (>20Fr) chest drains, and may be associated with reduced hospitalisation and length of stay. [A]
- ▶ NA should not be repeated, unless there were technical difficulties. [B]
- ▶ Following failed NA, small bore (<14Fr) chest drain insertion is recommended. [A]
- ▶ Large bore chest drains are not needed for pneumothorax. [D]

**Suction**

- ▶ Suction should not be routinely employed. [B]
- ▶ Caution is required because of the risk of RPO. [B].
- ▶ High volume low pressure suction systems are recommended. [C]

*Specialist Referral*

- ▶ Referral to a respiratory physician should be made within 24 hours of admission. [C]
- ▶ Complex drain management is best effected in areas where specialist medical and nursing expertise is available. [D]

**Management of SSP**

- ▶ All patients with SSP should be admitted to hospital for at least 24 hours, and receive supplemental oxygen in compliance with the BTS guidelines on the use of oxygen. [D]
- ▶ Most patients will require the insertion of a small-bore chest drain. [B]
- ▶ All patients will require early referral to a chest physician. [D]
- ▶ Those with a PAL should be discussed with a thoracic surgeon at 48 hours. [B]

*Patients with SSP but unfit for surgery*

- ▶ Medical pleurodesis may be appropriate for inoperable patients. [D]
- ▶ Patients with SSP can be considered for ambulatory management with a Heimlich valve. [D]

**Discharge and follow-up**

- ▶ Patients should be advised to return to hospital if increasing breathlessness develops. [D]
- ▶ All patients should be followed up by respiratory physicians until full resolution. [D]
- ▶ Air travel should be avoided until full resolution. [C]
- ▶ Diving should be permanently avoided unless the patient has undergone bilateral surgical pleurectomy and has normal lung function and chest CT scan postoperatively. [C]

**Medical chemical pleurodesis**

- ▶ Chemical pleurodesis can control difficult or recurrent pneumothoraces [A] but, since surgical options are more effective, it should only be used if a patient is either unwilling or unable to undergo surgery. [B]
- ▶ Chemical pleurodesis for pneumothorax should only be performed by a respiratory specialist. [C]

**Referral to thoracic surgeons**

- ▶ In cases of persistent air leak or failure of the lung to re-expand, an early (3-5 days) thoracic surgical opinion should be sought. [C]

*Surgical strategies: open thoracotomy or VATS?*

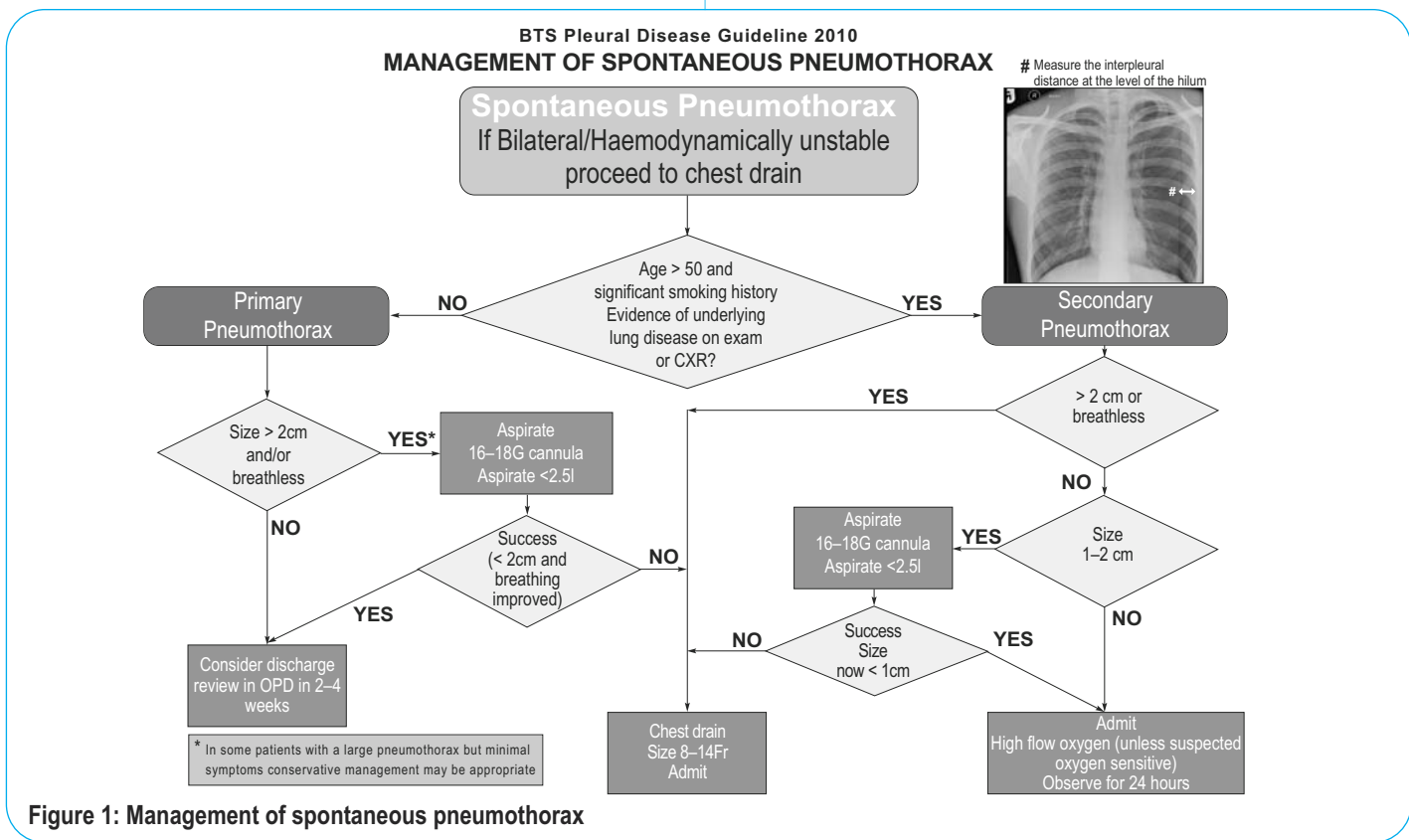
- ▶ Open thoracotomy and pleurectomy remain the procedure with the lowest recurrence rate (approximately 1%) for difficult or recurrent pneumothoraces. [A]
- ▶ Video-assisted thoracoscopic surgery (VATS) with pleurectomy and pleural abrasion is better tolerated, but has a higher recurrence rate of approximately 5%. [A]

*Surgical chemical pleurodesis*

- ▶ Surgical chemical pleurodesis is best achieved by using 5g sterile graded talc, with which the complications of adult respiratory distress syndrome and empyema are rare. [A]

**Tension pneumothorax**

- ▶ Tension pneumothorax is a medical emergency that requires heightened awareness in a specific range of clinical situations. [D]
- ▶ Treatment is with oxygen and emergency needle decompression. [D]
- ▶ A standard cannula may be insufficiently long if used in the second intercostal space. [D]



**Figure 1: Management of spontaneous pneumothorax**



### Pneumothorax and pregnancy

- ▶ Pneumothorax recurrence is more common in pregnancy, poses risks to the mother and fetus, and requires close co-operation between chest physicians, obstetricians and thoracic surgeons. [C]
- ▶ The modern and less-invasive strategies of simple observation and aspiration are usually effective during pregnancy, with elective assisted delivery and regional anaesthesia at or near term. [C]
- ▶ A corrective surgical procedure (VATS) should be considered after delivery. [D]

### Catamenial pneumothorax

- ▶ Catamenial pneumothorax is underdiagnosed in women with pneumothorax. [C]
- ▶ A combination of surgical intervention and hormonal manipulation requires cooperation with thoracic surgeons and gynaecologists. [D]

### Pneumothorax and AIDS

- ▶ The combination of pneumothorax and HIV infection requires early intercostal tube drainage and surgical referral, in addition to appropriate treatment for HIV and PJP infection. [C]

### Pneumothorax and Cystic Fibrosis

- ▶ The development of a pneumothorax in a patient with cystic fibrosis requires early and aggressive treatment with early surgical referral. [C]
- ▶ Pleural procedures, including pleurodesis, do not have a significant adverse effect on the outcome of subsequent lung transplantation. [D]

## 3. MANAGEMENT OF A MALIGNANT PLEURAL EFFUSION

Mark E Roberts, Edmund Neville, Richard G Berrisford, George Antunes, Nabeel J Ali

### Clinical presentation

- ▶ The majority of malignant effusions are symptomatic. [C]
- ▶ Massive pleural effusions are most commonly due to malignancy. [C]

### Management options

#### Observation

- ▶ Observation is recommended if the patient is asymptomatic and the tumour type is known. [C]
- ▶ Advice should be sought from the respiratory team and/or respiratory multidisciplinary team for symptomatic malignant effusions. [✓]

#### Therapeutic pleural aspiration

- ▶ Pleural effusions treated by aspiration alone are associated with a high rate of recurrence of effusion at one month, so aspiration is not recommended if life expectancy greater than a month. [A]
- ▶ Caution should be taken if removing more than 1.5 litres on a single occasion. [C]

#### Intercostal tube drainage and intrapleural instillation of sclerosant

- ▶ Other than in patients with a very short life expectancy, small-bore chest tubes followed by pleurodesis are preferable to recurrent aspiration. [✓]
- ▶ Intercostal drainage should be followed by pleurodesis to prevent recurrence unless lung significantly trapped. [A]

#### Size of intercostal tube

- ▶ Small bore (10–14 F) intercostal catheters should be the initial choice for effusion drainage and pleurodesis. [A]

#### Fluid drainage, pleurodesis and trapped lung

- ▶ Large pleural effusions should be drained in a controlled fashion to reduce the risk of re-expansion pulmonary oedema. [C]
- ▶ In patients where only partial pleural apposition can be achieved, chemical pleurodesis may still be attempted and may provide symptomatic relief. [B]
- ▶ In symptomatic cases where pleural apposition cannot be achieved (“trapped lung”), indwelling pleural catheters offer a more attractive therapeutic approach than recurrent aspiration. [✓]
- ▶ Once effusion drainage and lung re-expansion have been radiographically confirmed, pleurodesis should not be delayed. [B]
- ▶ Suction to aid pleural drainage before and after pleurodesis is usually unnecessary but, if applied, a high volume, low pressure system is recommended. [C]

#### Analgesia and premedication

- ▶ Lidocaine (3 mg/kg; maximum 250 mg) should be administered intrapleurally just prior to sclerosant administration. [B]
- ▶ Premedication should be considered to alleviate anxiety and pain associated with pleurodesis. [C]

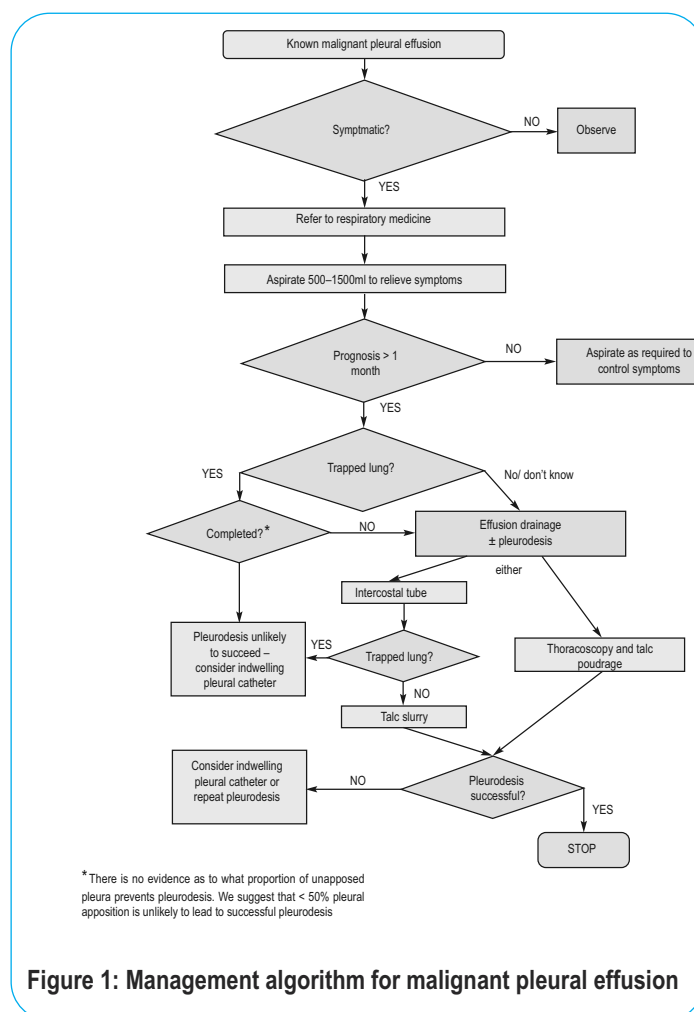


Figure 1: Management algorithm for malignant pleural effusion

### *Sclerosant and complications*

- ▶ Talc is the most effective sclerosant available for pleurodesis. [A]
- ▶ Graded talc should always be used in preference to ungraded talc as it reduces the risk of arterial hypoxaemia complicating talc pleurodesis. [B]
- ▶ Talc pleurodesis is equally effective when administered as a slurry or by insufflation. [B]
- ▶ Bleomycin is an alternative sclerosant with a modest efficacy rate. [B]
- ▶ Pleuritic chest pain and fever are the most common side effects of sclerosant administration. [B]

### *Rotation following pleurodesis*

- ▶ Patient rotation is not necessary after intrapleural instillation of sclerosant. [A]

### *Clamping and removal of intercostal tube*

- ▶ The intercostal tube should be clamped for 1 hour after sclerosant administration. [C]
- ▶ In the absence of excessive fluid drainage (>250 ml/ day) the intercostal tube should be removed within 24–48 hours of sclerosant administration. [C]

### *Malignant seeding at intercostal tube or port site*

- ▶ Patients with proven or suspected mesothelioma should receive prophylactic radiotherapy to the site of thoracoscopy, surgery or large-bore chest drain insertion, but there is little evidence to support this for pleural aspirations or pleural biopsy. [B]

### *Intrapleural fibrinolytics*

- ▶ Intrapleural instillation of fibrinolytic drugs is recommended for the relief of distressing dyspnoea due to multiloculated malignant effusion resistant to simple drainage. [C]

### *Thoracoscopy*

- ▶ In patients with good performance status, thoracoscopy is recommended for diagnosis of suspected malignant pleural effusion and for drainage and pleurodesis of a known malignant pleural effusion. [B]
- ▶ Thoracoscopic talc poudrage should be considered for the control of recurrent malignant pleural effusion. [B]
- ▶ Thoracoscopy is a safe procedure with low complication rates. [B]

### *Long term ambulatory indwelling pleural catheter drainage*

- ▶ Ambulatory indwelling pleural catheters are effective in controlling recurrent and symptomatic malignant effusions in selected patients. [B]

## 4. MANAGEMENT OF PLEURAL INFECTION

Helen E Davies, Robert J O Davies, Christopher W H Davies

### **Respiratory Specialist Care**

- ▶ A chest physician or thoracic surgeon should be involved in the care of all patients requiring chest tube drainage for pleural infection. [C]

### **Nutrition**

- ▶ Clinicians should ensure adequate nutrition in patients with pleural infection. [C]

### **Thrombosis prophylaxis in pleural infection**

- ▶ All patients with pleural infection are high risk for the development of venous thromboembolism and should receive adequate thrombosis prophylaxis with heparin unless contraindicated. [A]

### **Identification – Clinical**

- ▶ Features of ongoing sepsis and raised C reactive protein in patients with pneumonia, after 3 or more days, may indicate progression to pleural infection. [C]
- ▶ All patients with suspected pleural infection should have blood cultures for aerobic and anaerobic bacteria performed. [C]

### **Identification – Pleural fluid aspiration**

- ▶ All patients with a pleural effusion in association with sepsis or a pneumonic illness require diagnostic pleural fluid sampling. [C]
- ▶ Pleural fluid pH should be assessed in all non-purulent effusions when pleural infection is suspected. [B]
- ▶ If pleural fluid pH measurement is not available, pleural fluid glucose assessment should be performed where pleural infection is possible. [B]

### **Indications for pleural fluid drainage in pleural infection.**

- ▶ Patients with frankly purulent or turbid/cloudy pleural fluid on sampling should receive prompt pleural space chest tube drainage. [B]
- ▶ The presence of organisms identified by Gram stain and/or culture from a non-purulent pleural fluid sample indicates that pleural infection is established and should lead to prompt chest tube drainage. [B]
- ▶ Pleural fluid pH < 7.2 in patients with suspected pleural infection indicates a need for chest tube drainage. [B]
- ▶ Parapneumonic effusions that do not fulfil any of these criteria for chest tube drainage could be treated with antibiotics alone provided clinical progress is good. [B]
- ▶ Poor clinical progress during treatment with antibiotics alone should lead to prompt patient review, repeat pleural fluid sampling and probably chest tube drainage. [B]
- ▶ Patients with a loculated pleural collection should receive early chest tube drainage. [C]
- ▶ Large non-purulent effusions could be drained by aspiration and/or chest tube if required for symptomatic benefit. [C]

### **Chest tube drainage**

- ▶ A small bore catheter 10–14F will be adequate for most cases of pleural infection. However there is no consensus on the size of the optimal chest tube for drainage. [C]
- ▶ If a small bore flexible catheter is used, regular flushing is recommended to avoid catheter blockage. [C]
- ▶ Chest tube insertion should be performed under imaging guidance wherever possible. [D]

### **Antibiotics**

- ▶ All patients should receive antibiotics targeted to treat the bacterial profile of modern pleural infection, and based on local antibiotic policies and resistance patterns. [B]
- ▶ Antibiotics to cover anaerobic infection should be used in all patients, except those with culture proven pneumococcal infection. [B]
- ▶ Macrolide antibiotics are not indicated unless there is objective evidence for, or a high clinical index of suspicion of, 'atypical' pathogens. [B]
- ▶ Where possible antibiotic choice should be guided by bacterial culture results and advice from a microbiologist. [B]
- ▶ Penicillins, penicillins combined with  $\beta$ -lactamase inhibitors,

metronidazole and cephalosporins penetrate the pleural space well. Aminoglycosides should be avoided. [B]

- ▶ When bacterial cultures are negative, antibiotics should cover both common community-acquired bacterial pathogens and anaerobic organisms. [B]
- ▶ Empirical antibiotic treatment for hospital-acquired empyema should include treatment for MRSA and anaerobic bacteria. [B]
- ▶ Intravenous antibiotics should be changed to oral therapy once there is clinical and objective evidence of improvement in sepsis. [D]
- ▶ Intrapleural antibiotics are not recommended. [D]
- ▶ Prolonged courses of antibiotics may be necessary and can often be administered as an out-patient after discharge. [D]

#### Intrapleural fibrinolytics

- ▶ There is no indication for the routine use of intrapleural fibrinolytics in patients for pleural infection. [A]

#### Persistent sepsis and pleural collection

- ▶ Patients with persistent sepsis and a residual pleural collection should undergo further radiological imaging. [C]
- ▶ Patients with persistent sepsis and a residual pleural collection should be discussed with a thoracic surgeon to consider all possible surgical options available. [D]

#### Patients with persistent sepsis

- ▶ Patients should receive surgical treatment if they have persisting sepsis in association with a persistent pleural collection, despite chest tube drainage and antibiotics. [C]
- ▶ Failure of chest tube drainage and antibiotics should prompt early discussion with a thoracic surgeon. [C]
- ▶ The choice of antibiotic should be reviewed and a prolonged course administered where appropriate. [D]
- ▶ A thoracic surgeon should be involved in assessment of suitability for anaesthesia. Less radical surgical interventions including rib resection and placement of a large bore drain may be considered in frail patients depending on surgical expertise and access and can be performed in some cases under local anaesthetic or with epidural anaesthesia. [C]
- ▶ In patients with ineffective effusion drainage and persistent sepsis who are unable to tolerate general anaesthesia, re-imaging of the thorax and placement of a further image guided small bore catheters, a larger bore chest tube or intrapleural fibrinolytic could be considered after discussion with a thoracic surgeon. [D]
- ▶ For some patients, palliative treatment and active symptom control measures will be appropriate. [D]

#### Bronchoscopy

- ▶ Bronchoscopy should only be performed in patients where there is a high index of suspicion of bronchial obstruction. [C]

#### Follow - up

- ▶ All patients with empyema and pleural infection require out-patient follow-up. [D]

## 5. LOCAL ANAESTHETIC THORACOSCOPY

Najib M Rahman, Nabeel J Ali, Gail Brown, Stephen J Chapman, Robert J O Davies, Nicola J Downer, Fergus V Gleeson, Timothy Q Howes, Tom Treasure, Shivani Singh, Gerrard D Phillips

### The need for a local anaesthetic thoracoscopy service in the UK

#### The Increasing Burden of Pleural Disease

- ▶ Malignant pleural effusion represents an increasing burden of disease both to patients and to healthcare resources. [D]

#### The evidence for the use of local anaesthetic thoracoscopy

*The diagnostic yield of local anaesthetic thoracoscopy in the investigation of suspected pleural malignancy*

- ▶ The currently available data support local anaesthetic thoracoscopy as one of the techniques with the highest diagnostic yield in aspiration cytology negative exudative pleural effusion. [D]
- ▶ The efficacy of rigid local anaesthetic thoracoscopy in this regard appears to be as high as for video assisted thoracoscopic surgery (VATS). [D]

*Local anaesthetic thoracoscopy as a therapeutic procedure*

- ▶ Local anaesthetic thoracoscopy provides high diagnostic yield and effective therapeutic pleurodesis in a single procedure. [C]

*Safety of local anaesthetic thoracoscopy*

- ▶ Local anaesthetic thoracoscopy is a safe procedure. [D]
- ▶ Where talc poudrage is to be conducted, graded talc should be used. [C]

*Use in other conditions*

**Tuberculosis**

- ▶ Local anaesthetic thoracoscopy has a high yield for TB pleuritis, and a greater yield than blind pleural biopsy in high prevalence TB areas. [D]
- ▶ If blind pleural biopsy is non-diagnostic, local anaesthetic thoracoscopy is a reasonable next diagnostic step. [D]

**Pneumothorax**

- ▶ Talc poudrage pleurodesis may be an effective treatment for both primary and secondary pneumothorax. [D] However, the current definitive treatment strategy for these patients is thoracic surgery (video assisted thoracoscopic surgery (VATS) or mini-thoracotomy with pleural abrasion pleurodesis with or without lung resection).
- ▶ If surgery is deemed unsuitable because of the associated significant risks in some patients with secondary pneumothorax, local anaesthetic thoracoscopy may be considered if undertaken by experienced practitioners.

## 6. PLEURAL PROCEDURES AND THORACIC ULTRASOUND

Tom Havelock, Richard Teoh, Diane Laws, Fergus Gleeson

### Training

- ▶ 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. [✓]

### Pre-procedure preparation

#### Timing of procedures

- ▶ Pleural procedures should not take place out of hours except in an emergency. [✓]

#### Aseptic Technique

- ▶ Pleural aspirations and chest drains should be inserted in a clean area using full aseptic technique. [✓]

#### Clotting Disorders and Anticoagulation

- ▶ Non-urgent pleural aspirations and chest drain insertions should be avoided in anticoagulated patients until international normalised ratio (INR) <1.5. [C]

### Pleural Aspiration (Thoracocentesis)

#### Complications

- ▶ The commonest complications from pleural aspiration are pneumothorax, procedure failure, pain and haemorrhage. The most serious complication is visceral injury. These complications should be included in any consent process. [✓]

#### Image guidance

- ▶ A recent chest radiograph should be available prior to performing a pleural aspiration. [✓]
- ▶ Thoracic ultrasound guidance is strongly recommended for all pleural procedures for pleural fluid. [B]
- ▶ The marking of a site using thoracic ultrasound for subsequent remote aspiration or chest drain insertion is not recommended except for large pleural effusions. [C]

#### Patient position and site of insertion

- ▶ The preferred site for insertion of the needle for pleural aspiration should be the triangle of safety. [✓]

#### Aseptic Technique

- ▶ Pleural aspirations should take place in a clean area using full aseptic technique. [✓]

#### Size of needle

- ▶ Pleural aspiration with large bore needles should be avoided. [C]

#### Volume of removal, re-expansion pulmonary oedema and the use of pleural manometry

- ▶ The procedure should be stopped when no more fluid or air can be aspirated, the patient develops symptoms of cough or chest discomfort or 1.5l has been withdrawn. [C]

#### Follow-up

- ▶ A chest x-ray after a simple pleural aspiration is not required unless air is withdrawn, the procedure was difficult, multiple attempts were required or the patient becomes symptomatic. [C]

#### Consent

- ▶ Written consent should be obtained for chest drain insertions, except in emergency situations. [✓]

#### Complications

- ▶ Pain, intra-pleural infection, wound infection, drain dislodgement and drain blockage are the most frequent complications of a small bore chest drain insertion. Visceral Injury is the most serious complication. All of these possible sequelae should be detailed in the consent process. [✓]
- ▶ Pain, intra-pleural infection, wound infection, drain related visceral injury and drain blockage are the most frequent complications of a large bore chest drain insertion. All of these possible sequelae should be detailed in the consent process. [✓]

#### Antibiotic prophylaxis

- ▶ Antibiotic prophylaxis is not recommended for non-trauma patients requiring a chest drain. [✓]
- ▶ Antibiotic prophylaxis should be considered for trauma patients, especially after penetrating trauma, requiring chest drains. [A]

#### Size of Drain

- ▶ Small drains should be used first line for pneumothorax, free-flowing pleural effusions and pleural infection. [C]

#### Analgesia and Sedation

- ▶ To reduce pain associated with chest drains, analgesia should be considered as pre-medication and should be prescribed for all patients with a chest drain in place. [✓]
- ▶ If formal sedation is used during the procedure, this should be given in line with the Academy of Royal colleges recommendation for conscious sedation and include oximetry recording throughout the procedure. [✓]

#### Confirming site of insertion

- ▶ During chest drain insertion an attempt to aspirate the pleural contents with a small needle should be made. If this is not possible then the chest drain insertion should not continue. [✓]

#### Image Guidance

- ▶ It is strongly recommended that all chest drains for fluid should be inserted under image guidance. [B]

#### Aseptic Technique

- ▶ Chest drains should be inserted in a clean area using full aseptic technique including gowns, drapes, sterile gloves and skin cleansing. [C]

#### Local anaesthesia

- ▶ Lidocaine 1% should be infiltrated prior to the procedure paying particular attention to the skin, periostium and the pleura. [✓]

#### Insertion Technique

- ▶ Drains should never be inserted using substantial force. [✓]
- ▶ The dilator should not be inserted further than 1cm beyond the depth from the skin to pleural space. [✓]
- ▶ Blunt dissection should be employed in cases of trauma or insertion of large bore drains. [C]

**Large bore blunt dissection**

- ▶ Surgically inserted chest drains should be inserted by blunt dissection. Trocars should not be used. [C]

**Drain position**

- ▶ If a malposition of a chest drain is suspected a CT scan is the best method to exclude or confirm its presence [C]
- ▶ A chest drain may be withdrawn to correct a malposition, but should never be pushed further in due to the risk of infection. [✓]
- ▶ A further drain should never be inserted through the same hole as a previously dislodged drain as this can introduce infection. [✓]

**Drainage systems**

- ▶ A chest drain should be connected to a drainage system that contains a valve mechanism to prevent fluid or air from entering the pleural cavity. This may be an underwater seal, flutter valve or other recognised mechanism. [✓]

**Management of a chest drain**

- ▶ All patients with chest drains should be cared for by a medical or surgical team experienced with their management and nursed on a ward familiar with their care. [✓]

**Rate of fluid drainage and clamping the drain**

- ▶ A bubbling chest tube should never be clamped. [C]
- ▶ A maximum of 1.5l should be drained in the first hour after insertion of the drain. [C]
- ▶ Drainage of a large pleural effusion should be controlled to prevent the potential complication of re-expansion pulmonary oedema. [C]

**Nursing care of a chest drain**

- ▶ Chest Drains should be managed on wards familiar with chest drains and their management. [✓]
- ▶ Drains should be checked daily for wound infection, fluid drainage volumes and documentation for swinging and/or bubbling. [✓]

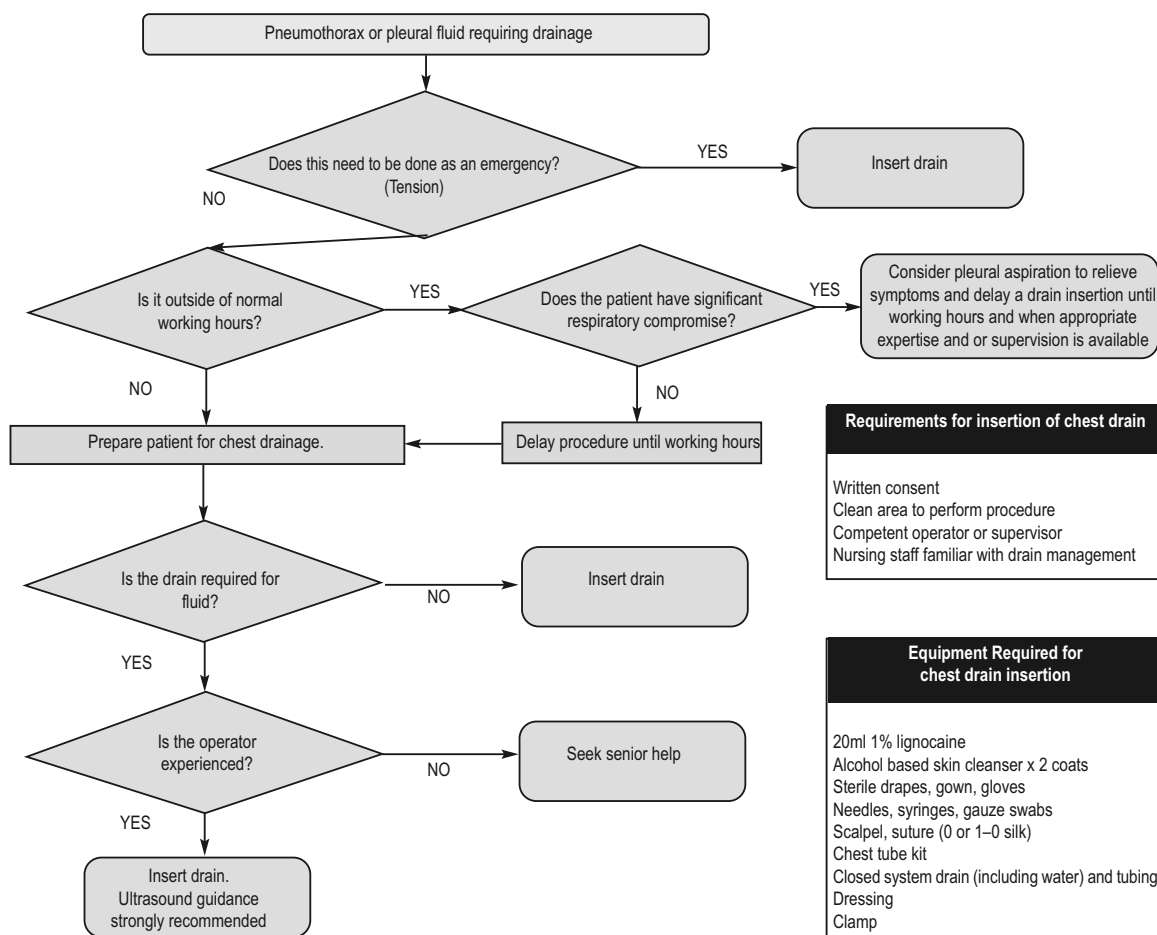
**Pleural procedures within the critical care setting**

- ▶ Ultrasound guidance reduces the complications associated with pleural procedures in the critical care setting and its routine use is recommended. [C]

**Thoracic ultrasound training**

- ▶ At least level 1 competency is required to safely perform independent thoracic ultrasound. [✓]

**Insertion of Chest Drain**



**Requirements for insertion of chest drain**

- Written consent
- Clean area to perform procedure
- Competent operator or supervisor
- Nursing staff familiar with drain management

**Equipment Required for chest drain insertion**

- 20ml 1% lignocaine
- Alcohol based skin cleanser x 2 coats
- Sterile drapes, gown, gloves
- Needles, syringes, gauze swabs
- Scalpel, suture (0 or 1-0 silk)
- Chest tube kit
- Closed system drain (including water) and tubing
- Dressing
- Clamp

Figure 1: Insertion of chest drain





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