Whittington Health NHS

Unilateral Pleural Effusion and Pleural Infection

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Key Words:	Pleural Effusion, Pleural Infection, Empyema, Ultrasound, Aspiration, Chest Drain

Version Control Sheet

Version	Date	Author	Status	Comment
1.0	Feb 2015	Dr R Kaiser		New guideline

Abbreviations contained within this document:

LDH	Lactate Dehdrogenase
MCS	Microscopy, Culture And Sensitivity
TB	Tuberculosis
AFB	Acid Fast Bacilli
CT	Computed tomography
FBC	Full blood count
U&E	Urea & Electrolytes
LFT	Liver function test
CRP	C-reaction protein
MDT	Multidisciplinary Team
US	Ultrasound
PPE	Parapneumonic Effusion
MRSA	Methicillin Resistant Staph Aureus
tPA	Tissue Plasminogen Activator
VATS	Video Assisted Thoracoscopic Surgery

➢ Criteria for use

This guideline only covers the **initial** investigations and management approach for a unilateral pleural effusion. It is anticipated that all cases of a new undiagnosed unilateral effusion (not thought to be due to transudative causes) will be referred to the Respiratory Pleural Team for optimal investigations and management.
This guideline should be read in conjunction with the 'Pleural Procedures' trust guideline

➢ Introduction

Pleural effusions are a common medical problem with more than 50 recognised causes including diseases local to the pleura or underlying lung, systemic conditions, organ dysfunction and drugs

Causes

Pleural Transudates

- Left ventricular failure
- Liver cirrhosis
- Hypoalbuminaemia

- Nephrotic syndrome
- Hypothyroidism
- Constrictive pericarditis
- Urinothorax
- Meigs syndrome

Pleural Exudates

- Malignancy (commonly mesothelioma, metastatic from primary lung, breast, ovarian, Gastric, lymphoma)

- Parapneumonic effusions
- Tuberculosis

- Pulmonary embolism
- Connective tissue diseases
- Benign asbestos effusion
- Pancreatitis
- Post myocardial infarction
- Post Cardiac Bypass
- Drugs (e.g methotrexate, amiodarone, phenytoin, nitrofurantoin)

➢ Clinical assessment and history

Clinical assessment alone is often capable of identifying likely transudative effusions, and treatment should be directed to the underlying cause. Aspiration should not be performed for bilateral effusions in a clinical setting strongly suggestive of a transudate (for e.g. heart failure, fluid overload), unless there are atypical features or they fail to respond to therapy (48 hours of effective diuresis often adequate).

An accurate drug history should be taken ; although uncommon, drugs can cause exudative effusions. Refer to website : www.pneumotox.com

An occupational history including details about known or suspected asbestos exposure should be documented.

Pleural effusions can occur with pulmonary emboli. 75% of these patients will have a history of pleuritic pain, the effusions tend to be small (occupying less than 1/3 of the hemithorax), and the dyspnoea is often out of proportion to the size of the effusion.

➢ Pleural aspiration and diagnostic tests performed

All cases of an undiagnosed unilateral pleural effusion should be referred to and discussed with the Respiratory Pleural Team for optimal management. **See Management Pathway for unilateral pleural effusion (page 6)**
Ultrasound guidance should be used for all cases of diagnostic pleural aspiration. Refer to Pleural Procedures guideline for further details on indications, risk assessment, and technique.

Samples to be sent for :

- Biochemistry - LDH and protein (with paired serum sample)
- Microbiology - MC and S, AFB (if TB pleuritis suspected)
  If pleural infection suspected, send a further 10 ml in blood culture bottles (this increases diagnostic yield by 20%)
- Cytology and differential cell count : at least 20-30 ml
- pH : only if pleural infection suspected. Draw 0.5-1ml in heparinised gas syringe immediately after aspiration, and test immediately in ABG machine located in ED. No need to test pH if pus aspirated.
- Amylase : May be useful in suspected cases of oesophageal rupture or effusions associated with pancreatitis.
- Haematocrit: In diagnosis of haemothorax (pleural fluid haematocrit >50% of peripheral blood haematocrit).

Apply Lights criteria to distinguish between a pleural fluid transudate and exudate.

Exudate if one or more of the following criteria are met:

- Pleural fluid protein divided by serum protein is > 0.5
- Pleural fluid LDH divided by serum LDH is >0.6
- Pleural fluid LDH is >2/3 upper limits of laboratory normal value for serum LDH

Further Investigations

CT scan is indicated in the investigation of undiagnosed exudative pleural effusions and can be useful in distinguishing malignant from benign pleural thickening.

CT should be performed with contrast enhancement of pleura. Seek guidance from Respiratory team and radiologist re timing of CT, ideally after drainage of a large effusion but with some fluid still present.

CT scan should be requested for complicated pleural infection when initial tube drainage has been unsuccessfull and surgery is to be considered.

Details of further investigations in the work up of exudative effusions are beyond the scope of this guideline. These investigations may include percutaneous pleural biopsy, video assisted thoracoscopic surgery, PET scanning. Refer to the BTS Guideline for further information [1]

See Diagnostic Algorithm below (page 7).

➢ Management pathway for undiagnosed unilateral pleural effusion

Respiratory Pleural Team Contacts :
Respiratory SpRs – bleep 3049/3359
Respiratory Consultant (via switchboard)

Patient presents within working hours as:

- ➢ Self referral to ED
- ➢ Radiology reporting on GP XRay
- ➢ GP referral to chest clinic

Yes

Contact Resp SpR on bleep 3049/3359
Or Respiratory Consultant

If clinically stable, patient will be seen in Ambulatory Clinic

- ➢ Pulse <100, SBP >100
- ➢ RR <24, Sats >93% air

- History, Exam, Bloods (FBC, U&E, LFT, LDH, CRP, Clotting)
- US guided Diagnostic +/- Therapeutic Aspiration (upto 1.5L depending on effusion size and symptoms)
- Send fluid for pH, protein, LDH, MCS, AFB, Cytology (20-30ml)

If malignancy suspected :

- Arrange staging CT with contrast – same day in level 2 scanner or next available urgent target slot
- List for Lung MDT discussion 1 week
- Arrange Resp Clinic f/u post MDT discussion

If pleural infection suspected, follow algorithm for pleural infection

No

Does the patient have significant cardiac/ respiratory compromise:

- ➢ Breathless/ tachypnoic at rest
- ➢ Hypoxia not ameliorated by modest oxygen therapy
- ➢ Haemodynamic compromise felt to be caused or worsened by large effusion

Yes

2 treatment strategies :

I. Urgent large volume (1-1.5 L) therapeutic pleural aspiration with cannula or aspiration kit.
Use US guidance in every case wherever possible.

OR

II. Chest drain insertion (under US guidance) ONLY performed by a fully trained competent operator.

Non US guided intervention may be appropriate for very large pleural effusions if US expertise is not available in an urgent situation.
Caution if 'whiteout' (consider other potential causes eg lung collapse).

For undiagnosed effusions, large volume aspiration to relieve symptoms is the preferred treatment option out of hours, with referral the next day to Respiratory Pleural Team.

The clinician should ensure that the appropriate diagnostic tests are requested on samples.

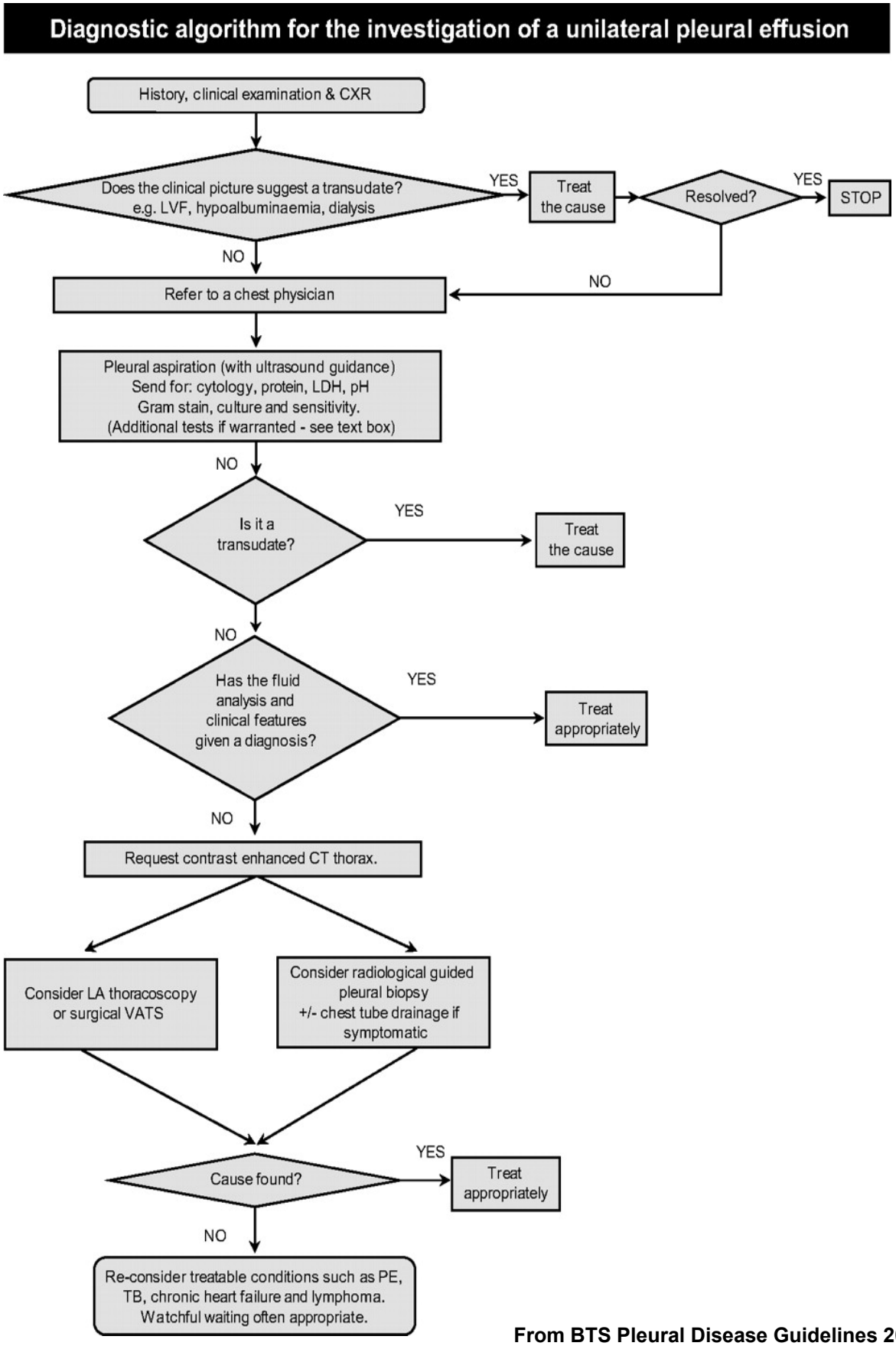
No

Unilateral pleural effusion - known or suspected malignancy:

- If patient clinically stable and not breathless at rest and no other reason for admission consider discharge home, and refer to rapid access Ambulatory Pleural Service.
- If patient is admitted, refer to Resp Team the next day

If suspected pleural infection :

- Admit all cases out of hours
- Manage as per Pleural infection algorithm, and refer to Resp Team the next working day.
- If admitted over weekend, will need US guided diagnostic tap +/- drain by on call radiologist



From BTS Pleural Disease Guidelines 2010[2]

➢ PLEURAL INFECTION

Pleural Infection should be considered as a possible cause of unilateral pleural effusion if associated with a pneumonia, or evidence of infection (fever, raised inflammatory markers).

The associated morbidity and mortality is high, in the UK 20% patients with empyema die and approximately 20% require surgery to recover within 12 months of their infection. Prompt evaluation and therapeutic intervention reduces mortality, morbidity and healthcare costs.

Table 1 – Classification and characteristics of Parapneumonic Effusion (PPE)

Stages	Aspirated fluid appearance	Pleural fluid characteristics	Management
Simple PPE	Clear	pH > 7.2 LDH < 1000 IU/L Glucose > 2.2 mmol/l No organisms on staining/cultures	Usually clears spontaneously with antibiotic therapy alone. Chest tube drainage only for symptomatic relief
Complicated PPE	Clear or cloudy	pH < 7.2 LDH > 1000 IU/L Glucose < 2.2 mmol/l Maybe organisms on staining/culture	Requires chest tube drainage in addition to IV antibiotics
Empyema	Frank pus	No additional biochemical tests required. Maybe organisms on staining/culture	Requires chest drainage +/- surgery

➢ Indications for pleural fluid drainage in pleural infection

Patients with frankly purulent or turbid pleural fluid on initial sampling should receive prompt pleural space chest tube drainage. Frank pus confirms a diagnosis of empyema and pH testing is not required.

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.

Pleural fluid pH should be tested in ALL non purulent samples, in a blood gas analyser. The syringe should be immediately capped as presence of air can falsely elevate pH. Lidocaine can depress measured pH so different syringe from local anaesthetic infiltration should be used for pleural fluid sampling.

Pleural fluid pH < 7.2 implies bacterial invasion in suspected pleural infection cases, and indicates a need for chest tube drainage.

Parapneumonic effusions that do not fulfil any of these criteria for chest tube drainage ('a simple parapneumonic effusion') could be treated with antibiotics alone provided clinical progress is good. Poor clinical progress should lead to repeat pleural fluid sampling.

Large non purulent effusions could be drained by therapeutic aspiration and/or chest drain if required for symptomatic relief of breathlessness.

There is no role for routine use of intrapleural fibrinolytics in pleural infection.

➢ Antibiotics

All patients should receive antibiotics targeted to treat the bacterial profile of pleural infection. Antibiotics to cover anaerobic infection should be used in all patients except those with culture proven pneumococcal infection.

First choice should be intravenous Co-amoxiclav 1.2 g tds, and then guided by bacterial culture results and advice by microbiologists.
If penicillin allergic, treat with IV Clindamycin 600 mg qds, discuss with Micro.

Macrolide antibiotics (Clarithromycin) are not indicated unless there is culture evidence for or a high clinical index of suspicion of 'atypical' organisms.

Empirical antibiotic treatment for hospital-acquired empyema should include treatment for MRSA and anaerobic bacteria. Discuss with microbiologists.

Intravenous antibiotics should be changed to oral therapy once there is clinical and objective evidence of improvement in sepsis, usually after 1-2 weeks. Total antibiotic therapy duration will vary depending on clinical response and severity of infection; should be at least 3 weeks in total, and up to 6 weeks in total if confirmed empyema.

➢ Persistent sepsis and pleural collection

Patients with persistent sepsis and residual pleural collection on CXR should undergo further radiological imaging – usually a contrast enhanced CT chest.

Failure of chest tube drainage and antibiotics should prompt early discussion with a thoracic surgeon for consideration of thoracic surgery – VATS (Video assisted thoracoscopic surgery).

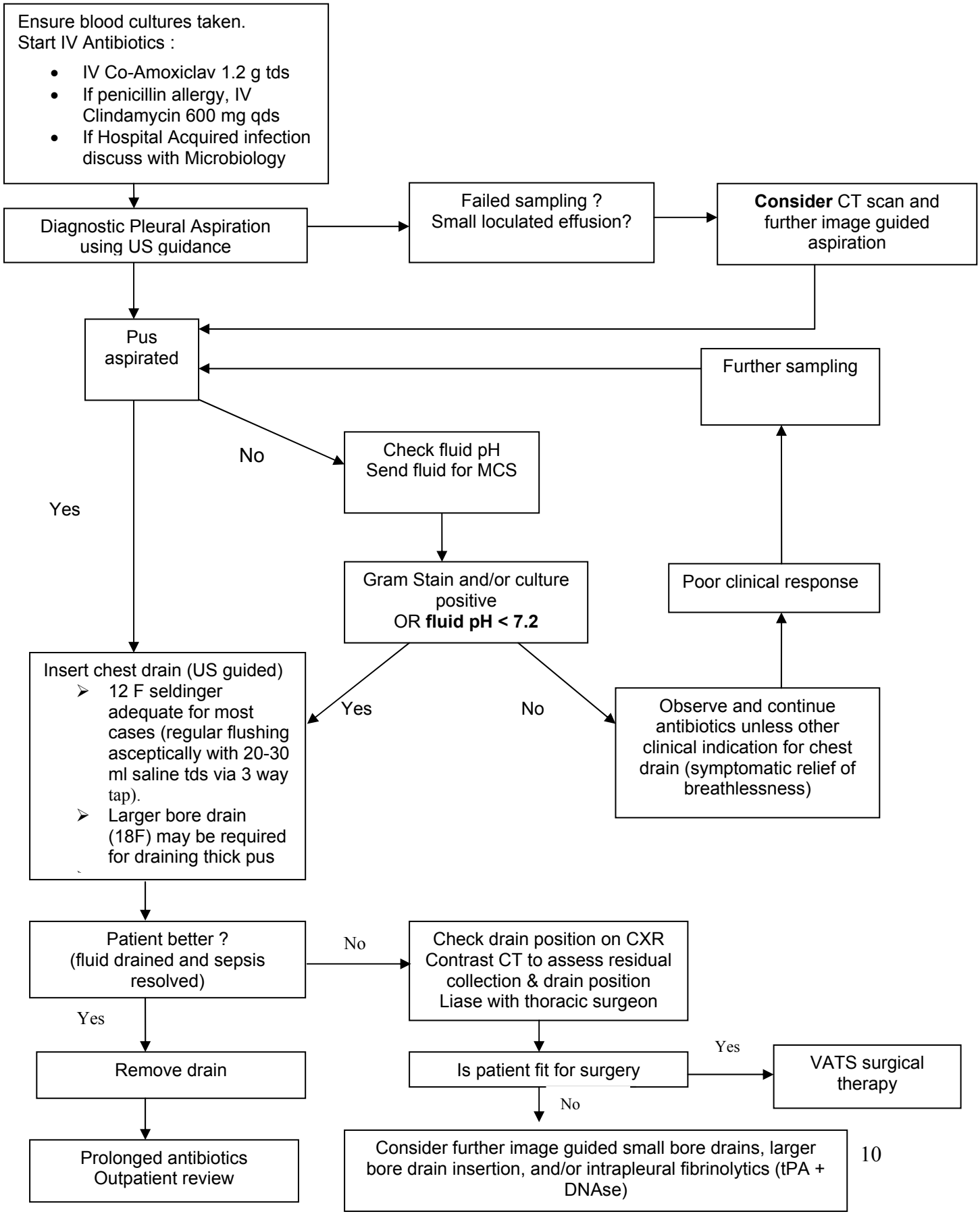
In frail unfit patients unable to tolerate general anaesthesia, therapeutic options may include the following

- re-imaging of the thorax and placement of further image guided small bore drains
- larger bore chest drain insertion
- and/or intrapleural fibrinolytic (intravenous tPA in combination with DNAase) could be considered in carefully selected cases.

Algorithm for management of patients with suspected pleural infection

➢ Pleural Effusion with evidence of infection or pneumonia

Within working hours refer all cases to Respiratory Pleural Team



➢ Contacts

- Respiratory Consultants (via switchboard)
- Respiratory SpR (bleeps 3359/3049)
- Nightingale ward (Ext 5521, 4275, or 3117)

➢ References

[1]. Investigation of a unilateral pleural effusion in adults: British Thoracic Society pleural disease guideline 2010.
Hooper C, Lee YCG, Maskell N, on behalf of the BTS Pleural Disease Guideline Group.
Thorax 2010;65 (Suppl 2): ii4-ii18

[2]. Management of pleural infection in adults: British Thoracic Society pleural disease guideline 2010.
Davies HE, Davies RJO, Davies CWH, on behalf of the BTS Pleural Disease Guideline Group.
Thorax 2010;65 (Suppl 2): ii41-ii53

3 British Thoracic Society Pleural Disease Guidelines 2010
https://www.brit-thoracic.org.uk/guidelines-and-quality-standards/pleural-disease-guideline/

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval

		Yes/No	Comments
1.	**Does the procedural document affect one group less or more favourably than another on the basis of:**		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
	• Disability - learning disabilities, physical disability, sensory impairment and mental health problems	No	
2.	**Is there any evidence that some groups are affected differently?**	No	
3.	**If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?**	No	
4.	**Is the impact of the procedural document likely to be negative?**	No	
5.	**If so can the impact be avoided?**	N/A	
6.	**What alternatives are there to achieving the procedural document without the impact?**	N/A	
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For advice in respect of answering the above questions, please contact the Director of Human Resources.

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	Title of document being reviewed:	Yes/No	Comments
1.	**Title**		
	Is the title clear and unambiguous?	Yes	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Yes	
2.	**Rationale**		
	Are reasons for development of the document stated?	Yes	
3.	**Development Process**		
	Is it clear that the relevant people/groups have been involved in the development of the document?	Yes	
	Are people involved in the development?	Yes	
	Is there evidence of consultation with stakeholders and users?	Yes	
4.	**Content**		
	Is the objective of the document clear?	Yes	
	Is the target population clear and unambiguous?	Yes	
	Are the intended outcomes described?	Yes	
5.	**Evidence Base**		
	Are key references cited in full?	Yes	
	Are supporting documents referenced?	Yes	
6.	**Approval**		
	Does the document identify which committee/ group will approve it?	Yes	
7.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	Yes	
8.	**Document Control**		
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	Is there a plan to review or audit compliance with the document?	Yes	
10.	**Review Date**		
	Is the review date identified?	Yes	
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11.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Yes	

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If you approve the document, please sign and date it and forward to the author. Procedural documents will not be forwarded for ratification without Executive Sponsor Approval			
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Signature			
Relevant Committee Approval			
The Director of Nursing and Patient Experience's signature below confirms that this procedural document was ratified by the appropriate Governance Committee.			
Name		Date	
Signature			
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The Committee Chair's signature below confirms that this procedural document was ratified by the responsible Committee			
Name		Date	
Name of Committee		Name & role of Committee Chair	
Signature			

Tool to Develop Monitoring Arrangements for Policies and guidelines

What key element(s) need(s) monitoring as per local approved policy or guidance?	Who will lead on this aspect of monitoring? Name the lead and what is the role of the multidisciplinary team or others if any.	What tool will be used to monitor/check/observe/Assess/inspect/ authenticate that everything is working according to this key element from the approved policy?	How often is the need to monitor each element? How often is the need complete a report ? How often is the need to share the report?	What committee will the completed report go to?
Element to be monitored	**Lead**	**Tool**	**Frequency**	**Reporting arrangements**
Appropriate management of patients presenting with unilateral pleural effusion and pleural infection according to guideline	Respiratory Lead for Pleural disease	Compliance with guideline	Annual	Respiratory Team and Audit Committee