ERS/ESTS PLEURAL INFECTION TASKFORCE – STATEMENT

SUPPLEMENTARY MATERIALS

S2. Brief overview of pleural infection bacteriology

Despite the aetiology of most cases being parapneumonic, the bacteriology of pleural infections has important differences to that of pneumonia [1–3]. The “milleri” group (more recently named ‘strep anginosus group’) are the most common pathogens in community acquired pleural infection, based on data from Europe, North America and Australia. Furthermore, ‘atypical’ pathogens, such as *Mycoplasma*, *Legionella* and *Chlamydophila*, that are commonly considered in pneumonia, do not have a significant role in pleural infection [4, 5]. Recently, in the largest exploratory metagenomics analysis, using Next Generation Sequencing (NGS), pleural infection was found to be polymicrobial in up to 80% of cases [6], previously significantly underestimated by standard culture techniques [1].

Pleural infection bacteriology also varies with age, geographical area, setting of infection (community- vs hospital-acquired), and comorbidities [1]. In the aforementioned systematic review, community-acquired pleural infections were more often due to Gram-positive aerobes (65.1%), followed by anaerobes (17.8%), and Gram-negative aerobes (17.1%). By contrast, the causes of hospital-acquired pleural infections included Gram-negative organisms (37.5%), followed by *Staphylococcus aureus* (35%; of which 58% were methicillin-resistant), and anaerobes (11%) (Fig. 1).

Optimising microbiological yield

Blood cultures are positive in approximately 17% of the cases and in 1 in 10 patients, may represent the only positive microbiology [7–9].

Bedside inoculation of pleural fluid in blood culture bottles in addition to standard cultures increases the proportion of patients with identifiable pathogens by roughly 20% (from 37.7% to 58.5%) [10] and has now become a common practice. Additionally, the AUDIO study demonstrated that culture of pleural tissue biopsies substantially increased the microbiological yield as compared with pleural fluid and blood specimens (45% vs 20% vs 10%, respectively) in 20 patients with clinically established pleural infection [11]. This suggests that bacteria may preferentially invade pleural tissues rather than the hypocellular, hypoxic environment of pleural fluid. Beyond demonstrating feasibility, a recommendation for including pleural biopsy in the routine work-up of suspected pleural infections is premature pending larger, prospective multicentre data.

Nucleic acid amplification testing (NAAT) on pleural fluid specimens has shown potential for a rapid (a few hours) and precise identification of microorganisms [12], particularly when patients have received antibiotics, or an anaerobic infection is suspected [13]. The standard method involves polymerase chain reaction (PCR) amplification of the 16S rRNA gene (conserved regions are common to all bacteria),

followed by sequencing and comparison to known databases for genus and species identification. In a series of 723 pleural fluid samples, of which 82 corresponded to infections, 16S PCR increased bacterial identification 1.5 times as compared to conventional cultures (from 54.9% to 81.7%) [14]. However, in addition to costs and the need for adequate laboratory equipment, the clinical impact of identifying multiple pathogens or interpreting culture-PCR discrepancies is uncertain [2, 14, 15]. One of the limitations of the NAAT is its inability to discriminate pathogens driving disease from bystander bacteria. Finally, the use of commercially available multiplex bacterial PCR assays is hampered by the lack of dedicated panels covering the common pathogens involved in pleural infection [16].

Until NAAT techniques become more widely available and there is greater evidence on their treatment implications, in their current practice TF members would ensure pleural fluid is cultured in aerobic and anaerobic media, including blood culture bottles as routine when infection is suspected as well as separately obtaining blood cultures.

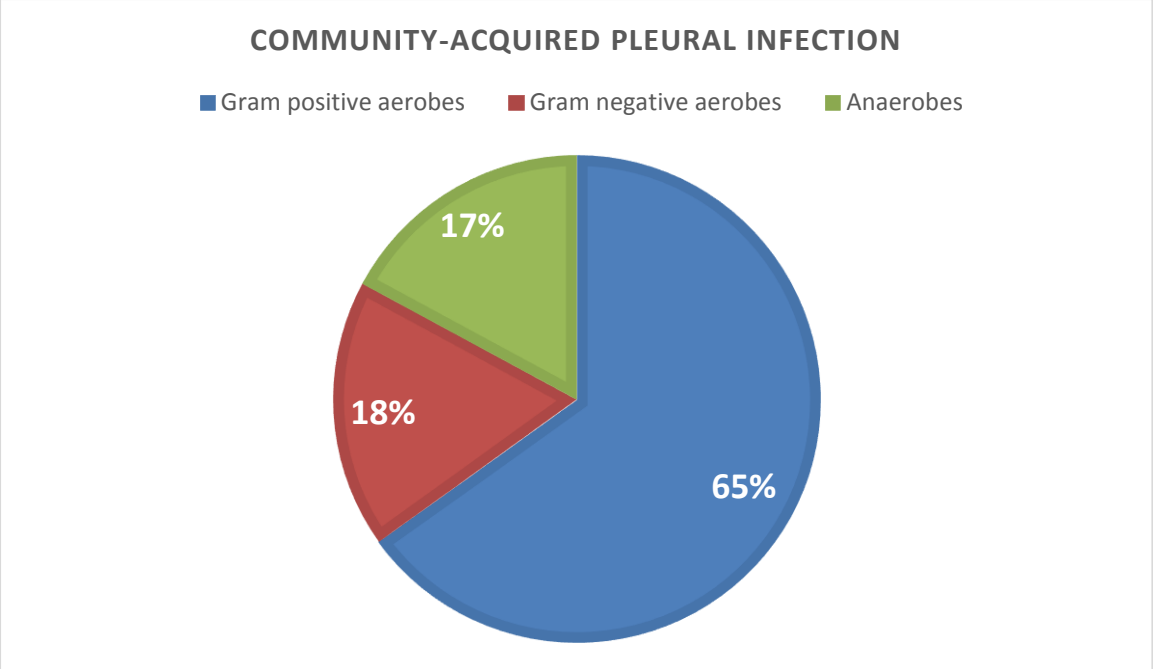


Figure S2.1a

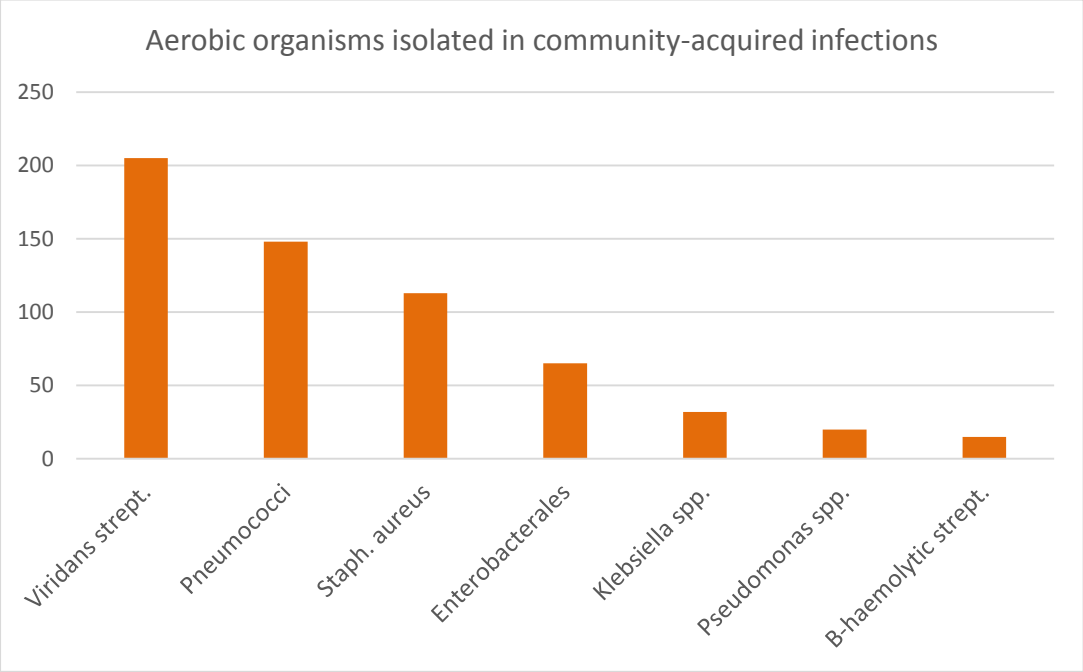


Figure S2.1b

Relative contribution of bacterial groups and organisms in the aetiology of community-acquired pleural infections. Klebsiella spp. are expressed separately from other Enterobacteriales to highlight the importance of this organism in the pathogenesis of pleural infection particularly in certain geographic areas.

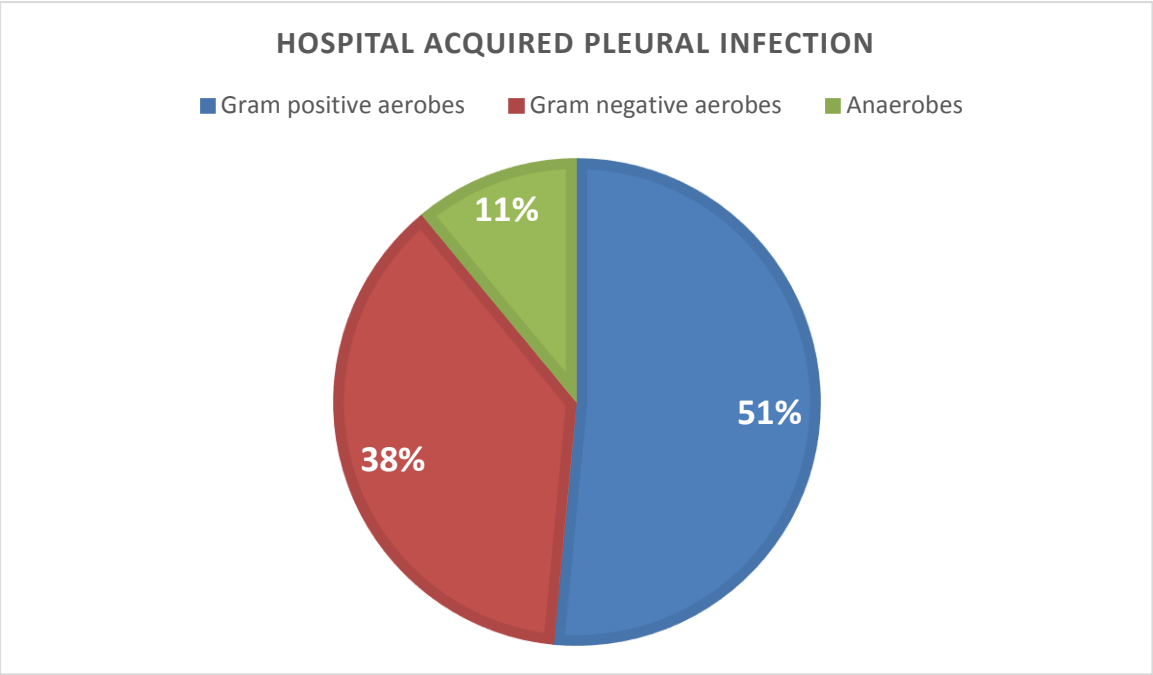


Figure S2.2a

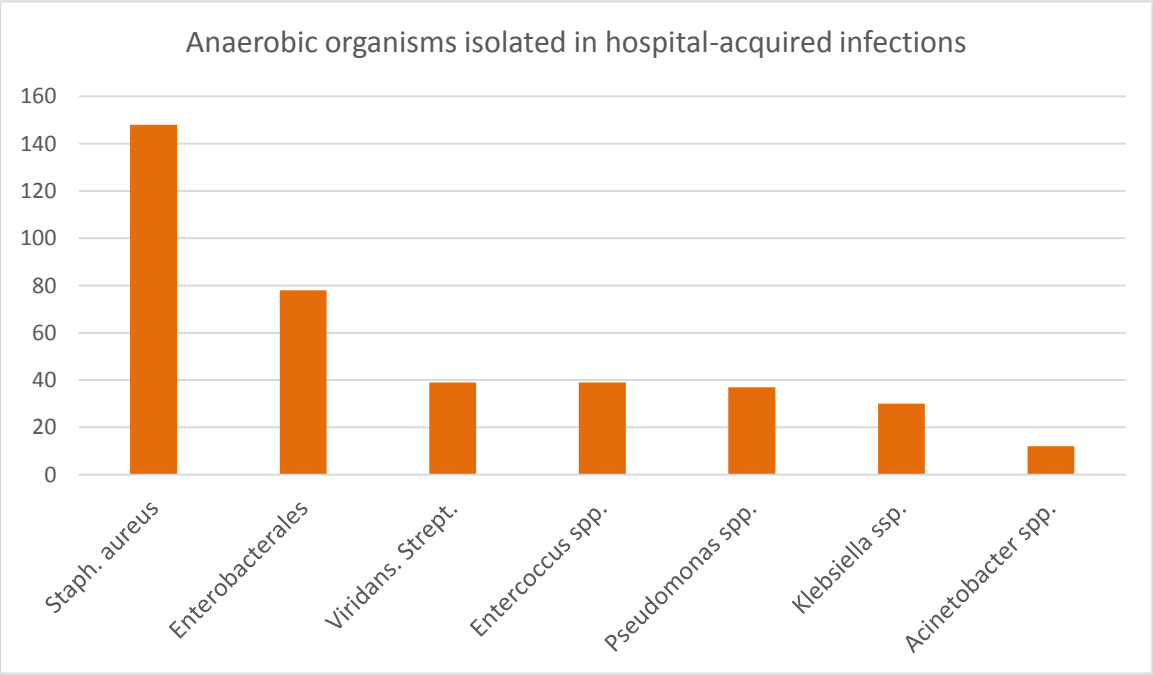


Figure S2.2b

Relative contribution of bacterial groups and organisms in the aetiology of hospital-acquired pleural infections. Klebsiella spp. are expressed separately from other Enterobacteriales to highlight the importance of this organism in the pathogenesis of pleural infection particularly in certain geographic areas.

Table S3: Example empiric antibiotic regimen for pleural infection*

Type of infection	Target groups/organisms	Suggested antibiotic	Alternatives (allergy, or local resistance patterns)
Community acquired	Gram positive and negative aerobes	Penicillin with β-lactamase inhibitor (e.g., ampicillin-sulbactam$ or amoxicillin-clavulanate$)	Quinolones, e.g. - Moxifloxacin$ - Levofloxacin Injectable 2nd or 3rd generation cephalosporin, e.g.: - Cefoxitin - Ceftriaxone
		+	+
	Anaerobes%	Metronidazole or clindamycin#	Metronidazole or clindamycin#
Hospital-acquired	Gram positive and negative aerobes (including Pseudomonas spp)	Antipseudomonal penicillin with β-lactamase inhibitor (e.g., piperacillin-tazobactam) *or* Carbapenem (e.g., meropenem)	Anti-pseudomonal cephalosporin (e.g., cefepime) or quinolone (moxifloxacin or levofloxacin).
		+	+
	MRSA	Linezolid	Vancomycin +
	Anaerobes*	(Covered by above antibiotics)	Metronidazole or clindamycin#

* This is a description of TF members' practice and is not intended as a clinical practice recommendation. Local microbiology guidelines where available should always take precedence.

% Even if an anaerobic organism is not identified on microbiological tests, most TF members would include anaerobic coverage in antibiotic regimens given the difficulty in culturing these organisms that commonly infect the pleural space.

Clindamycin and metronidazole have comparable anti-anaerobic spectrum, although the latter may have a lower incidence of bacterial resistance and better penetration into the pleura.

$ These agents possess anaerobic coverage and some TF members would consider for use as single agents in community-acquired infection (especially if needed to improve

tolerance/compliance) but higher-than-standard doses may be required for some agents. In most cases, TF members would prefer anaerobic cover with a specific agent.

S4.1 Example* protocol for IET preparation, administration and monitoring

***This protocol is intended to depict TF members' practice and is for information only. It is not intended as a clinical practice recommendation. The TF would always encourage clinicians to adapt IET protocol to local service and practice.**

Drug Preparation

1. Disconnect the chest drain from the tubing by either:
    - Closing 3-way tap; or
    - Clamping large bore chest tube and disconnecting drain from the tubing at connection site

2. Alteplase (Actilyse®) Preparation:
    - This drug should always be given first.
    - Add the contents of the provided vial of solvent (Water for injection) to the alteplase vial using the transfer cannula (if provided) to give a final concentration of 1mg/ml .
    - During reconstitution, agitate the vials gently until the contents are dissolved. Do NOT shake. If foaming occurs then allow solution to settle for several minutes
    - In a 50ml syringe, add the 10mg* of alteplase and make up to a total volume of 30ml with sodium chloride 0.9%.
    - After reconstitution, use immediately

3. Dornase alfa (Pulmozyme®):
    - **Note: This medication is stored in the refrigerator prior to use**.
    - Check the contents of the dornase alfa nebules prior to use. The solution must be clear and colourless, otherwise it must be disposed of in a sharps bin.
    - In a 50ml syringe, add 5mg of dornase alfa (two of the 2.5mg/2.5ml nebules) and make up to a total volume of 30ml with water for injections.
    - Dornase alfa is an unbuffered aqueous solution and should not be diluted or mixed with other drugs or solutions. Mixing of this solution could lead to adverse structural and/or functional changes in dornase alfa or the admixed compound. Therefore, after diluting the dornase alfa for administration intrapleurally, it should be used immediately

Administration:

• Inject the Alteplase intrapleurally, followed by a 10ml flush of sodium chloride 0.9% then

• Inject the Dornase alfa intrapleurally, followed by a 10ml flush of sodium chloride 0.9%

• Clamp for 1 hour then free drainage.

Repeat the process 12 hours later, e.g.

	8-10am	6-8pm
First drug	10mg Alteplase + 10ml sodium chloride 0.9% flush	10mg Alteplase + 10ml soidum chloride 0.9% flush
Followed by second drug	5mg Dornase alfa + 10ml sodium chloride 0.9% flush	5mg Dornase alfa + 10ml sodium chloride 0.9% flush
Followed by	Clamp for 1 hour then free drainage	Clamp for 1 hour then free drainage

Repeat the procedure twice daily for 3 days, until a total of 12 doses of drugs (6 doses of alteplase and 6 doses of dornase alfa) have been given.

Monitoring:

- Monitor chest drain site for erythema and rash
- If anaphylactic reactions occur, discontinue administration of medication, and treat appropriately
- Offer analgesia early (preferably premedicate) and monitor for pain
- Monitor for evidence of significant intrapleural bleeding – some blood staining of the pleural fluid is expected, however the drainage of significant amounts of heavily blood-stained fluid or complete cessation of drainage AND any evidence of haemodynamic instability (tachycardia, hypotension, reduction in serum Hb concentration) should be investigated with a thoracic ultrasound +/- CT scan and a specialist opinion sought.

S4.2 IET-related adverse events

A list of contraindications to IET is provided below (table S4.2). Use of fibrinolytics (including alteplase) and dornase alfa intrapleurally for pleural infection remains off-licence. These contraindications are based on manufacturer summary product characteristics (SPC), Safety Data Sheets and trial exclusion criteria.

Table S4.2a Side effects, complications, and mortality of IET

Author and country	Type of study	N	Agent(s)	Overall bleeding n (%)	Pleural bleeding	Pain with escalation of analgesia	Other adverse events/ complications	Mortality
Rahman *et al*, 2011. UK	RCT	52/210	10 mg tPA; 5 mg DNase	3 (6%)	2 (4.2%)	6 (11.5%)	<u>Serious adverse events:</u> Haemoptysis Gastrointestinal bleeding <u>Non-serious adverse events:</u> Nausea Transient confusion Erythema Rash	4 (8.3%) at three months
Piccolo *et al,* 2014. Australia, UK, and New Zealand	P Obs	107	10 mg tPA; 5 mg DNase	2 (1.8%)	2 (1.8%)	21 (19.6%)	ND	3 (2.8%) at 30 days
Popowicz *et al,* 2017. Australia, UK, and New Zealand	P Obs	61	5 mg tPA; 5 mg DNase	3 (4.9%)	3 (4.9%)	36.0% (none required cessation of therapy)	ND	1 (1.6%) at 30 days
Bédat *et al,* 2019. Switzerland	P Obs	93	tPA- DNase Urokinase	7/41 (17%) with tPA-DNase. None with urokinase	7/41 (17%) with tPA-DNase; none with urokinase (p=0.002)	ND	ND	2 (5%) with tPA- DNase. 4 (8%) with urokinase at 30 days
Kheir *et al,*	P	38	10 mg tPA; 5 mg	1 (5%) for	1 (5%) for	3 (15%) for	ND	4 due to

2018. US and Chile	Obs		DNase (concurrent vs sequential)	concurrent and 1 (5.5%) for sequential	concurrent and 1 (5.5%) for sequential	concurrent and 3 (16.6%) for sequential		pleural infection (2 in each arm) at 30 days
Jiang *et al*, 2020. US	R	56 (concurrent therapy)	10 mg tPA; 5 mg DNase	9 (16.1%)	9 (16.1%)	ND	ND	2 (3.6%) due to pleural infection at 30 days
Khemasuwan *et al,* 2018. US	R	84	10 mg tPA; 5 mg DNase (concurrent therapy)	4 (4.7%)	4 (4.7%)	13 (15.5%)	Increased oxygen requirement in 3. Minor complications in 20 patients	1 (1.2%) due to septic shock at 30 days
Majid *et al*, 2016. US, UK, and Chile	R	73	10 mg tPA; 5 mg DNase (concurrent therapy)	4 (5.4%)	4 (5.4%)	11 (15.1%)	ND	2 (2.7%) as a result of pleural infection at 30 days
McClune *et al,* 2016. US	R	101 (20 extended and 81 standard therapy)	10 mg tPA; 5 mg DNase. Six doses (> 6 days versus standard use*)	2 (10%) for extended and 2 (3%) for standard therapy	ND	16 (80%) for extended and 46 (57%) for standard therapy	Readmission (10% vs 16%). Outpatient pleural drainage (10% vs 12%). Tube dislodgement (15% vs 4%)	ND
Mehta *et al,* 2016. US	R	55	10 mg tPA; 5 mg DNase. Once daily (3 doses)	No major bleeding events	None	8 (15%)	4 erythema and swelling along the drainage site	3 (5.4%) at 30 days

tPA: tissue plasminogen activator. DNase: deoxyribonuclease. RCT: randomized controlled trial. P: prospective. Obs: observational. R: retrospective. ND: no data

Table S4.2b Suggested contraindications to IET

Absolute	Relative
Known sensitivity to the drug Coincidental stroke Major haemorrhage or trauma Major surgery in the previous five days Previous pneumonectomy on the infected side Known history of or suspected intracranial bleeding Pregnancy or lactation	Known haemorrhagic diathesis/ uncorrectable coagulopathy Broncho-pleural fistula Severe renal disease Anticoagulation therapy and/or antiplatelet agents[#] Neoplasm with increased bleeding risk Severe liver disease Recent obstetrical delivery Recent (less than 10 days) traumatic external heart massage Recent puncture of a non-compressible blood vessel (e.g., subclavian, or jugular vein puncture)

#In practice, and when appropriate to do so, most TF members hold anticoagulation therapy and/or antiplatelet agents (with the exception of low doses of aspirin and prophylactic doses of low molecular weight heparin) before and during administration of intrapleural fibrinolytics.

S5. ATS Stage definition of Pleural empyema

Exudative phase (stage I)	**Fibrinopurulent phase (stage II)**	**Organized phase (stage III)**
Inflammatory processes extend to the pleurae and result in immediate outpouring fluid	Frank pus accumulates especially laterally and dorsally	Thick and sedimented exudate
Low cell content	High cell content (PMN) and fibrin depositions over the pleural surfaces and fibrinous strands within the fluid	Fibroblast growth Fibrosis
	Tendency to loculations and formations of membranes	Inelastic membranes over the pleural surfaces
Re-expandable lung	Lung is less expandable	Trapped lung

S6. Brief overview of the RAPID score

The RAPID score was derived from data obtained from the MIST-1 study [17] and validated in the MIST-2 cohort [18]. Of 22 baseline characteristics recorded at initial presentation, using multivariate modelling, five parameters were strongly independently associated with poor outcome (figure 1), specifically 3-month mortality and a prolonged length of hospital stay.

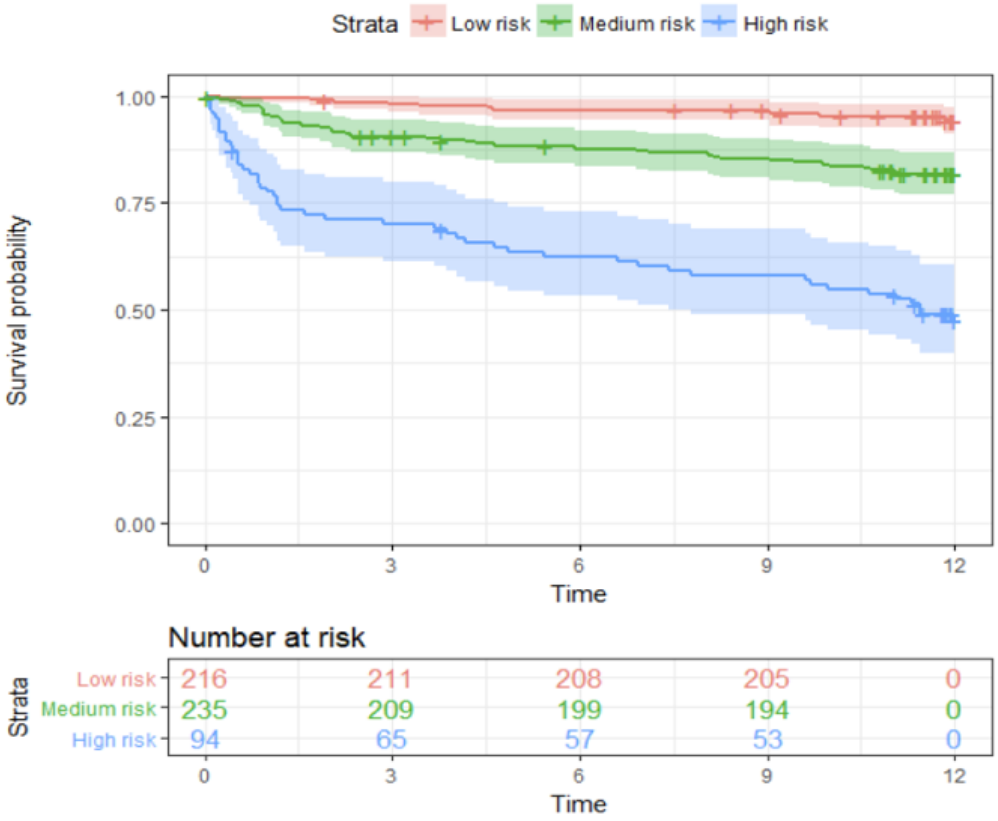
The RAPID score recently underwent prospective external validation in the international multicentre observational (PILOT) study (n=546) [19], where patients were treated according to standard guidelines and local practice. PILOT demonstrated robust clinical ability of the RAPID score to stratify patients into different categories according to increasing risk of three-month mortality (figure 2).

One interesting observation from the PILOT study was the higher rate of surgical referral in the low-risk group (19%) compared to the high-risk group (5.9%). No significant differences were observed in rates of intrapleural therapy between the 3 groups, but the overall rate of intrapleural fibrinolytic therapy in this study was low, making it difficult to draw conclusions.

Figure S6.1 – Parameters of the RAPID Score

Parameter	Measure		Score
Renal	Urea	<5mmol/L 5-8 mmol/L >8 mmol/L	0 1 2
Age	Age	<50 years 50-70 years >70 years	0 1 2
Purulence of fluid	Purulent Non-purulent		0 1
Infection Source	Community acquired Hospital acquired		0 1
Dietary Factors	Albumin	>27mmol/L <27mmol/L	0 1
Risk categories	**Score 0-2** **Score 2-4** **Score 5-7**		**Low risk** **Medium-Risk** **High Risk**

Figure S6.2 – Kaplan Meier survival plot based on RAPID stratification (taken from the PILOT study) (Corcoran et al ERJ 2020)



S7. Future research recommendations

1. Detailed characterisation of patients presenting with pleural infections to gain further understanding of the host factors contributing to the increased burden

   Further exploration of the role of viruses in adult pleural infection epidemiology

2. Additional benefit from a pleural-infection-specific multiplex PCR assay in improving pathogen identification and antimicrobial stewardship

   Strategy of de-escalation and duration of oral antimicrobial therapy after 'medical' and surgical' control of pleural infection

   Optimal biomarker to monitor treatment response in acute pleural infection

   Further studies on the added yield from microbiological testing of pleural biopsy in the setting of pleural infection.

3. Biomarkers targeting reliable diagnosis of pleural infection in complex clinical circumstances, such as post pleurodesis or pleural infection superimposed on MPE, with or without IPC in-situ.

   Ambulatory management of small volume pleural infection in lower risk patients with treatment modalities including antibiotic treatment only – failure rates, need for intervention and how outcomes differ in this setting compared to upfront intervention.

4. Comparative studies addressing the optimal dosing and schedule for IET

   Studies addressing the effect of fibrinolysis inhibitors (such as PAI-1) on IET outcomes

   Effects of chest tube dwell/clamp time impact on IET success

   Large observational studies addressing the significance of bronchopleural fistulas in the context of IET

   Studies addressing the most important radiological predictors of IET failure

5. The role and efficacy of medical thoracoscopy versus VATS drainage of empyema

   The role of intrapleural fibrinolytics in the setting of traumatic retained haemothorax and empyema prevention

6. Prospective data on long term pleural infection outcomes beyond 12 months

   The role of RAPID score together with surgical risk calculation (e.g. ASA-score) in evaluation of the risk-benefit from surgery more precisely

   The role of RAPID score in altering treatment paradigms at baseline

   The role of PAI-1 and other pleural fibrinolytic biomarkers in phenotyping patients, directing treatments and predicting outcome

S8. Search strategies

Results restricted to those involving only adult humans and those in the English language. The search was initially set from present to 2006 (15 years).

Inclusion criteria	**Exclusion criteria**
Systematic reviews	Opinion pieces
Meta-analysis	Editorials
RCTs	Informal reviews
Comparative studies (non randomised)	Case reports
Observational studies (retrospective or prospective)	Paediatric studies
Case series	Animal studies

Question 1 – What is the current burden of pleural infection?

Adult [Mesh] AND (("Pleural diseases" [MeSH Terms] OR "Pleural Effusion" [MeSH Terms] OR "Empyema, Pleural" [MeSH Terms] OR "pleural effusion" [tiab] OR parapneumon* [tiab] OR pleuritis [tiab] OR pleurisy [tiab] OR pyothorax [tiab]) AND ("Epidemiology" [MeSH Terms] OR "Incidence" [MeSH Terms] OR "Prevalence" [MeSH Terms]) AND "Comorbid*" AND "Gender" AND "Age" AND "Humans" [MeSH Terms]) NOT tuberculos*

((((coronavirus*[Title] OR coronovirus*[Title] OR coronoravirus*[Title] OR coronaravirus*[Title] OR corono-virus*[Title] OR corona-virus*[Title] OR "Coronavirus"[Mesh] OR "Coronavirus Infections"[Mesh] OR "COVID-19"[Mesh] OR "SARS-CoV-2"[Mesh] OR "COVID-19 Serological Testing"[Mesh] OR "COVID-19 Nucleic Acid Testing"[Mesh] OR "COVID-19 Testing"[Mesh] OR "COVID-19 Vaccines"[Mesh] OR "Wuhan coronavirus" [Supplementary Concept] OR COVID-19[Title] OR CORVID-19[Title] OR "2019nCoV"[Title] OR "2019-nCoV"[Title] OR WN-CoV[Title] OR nCoV[Title] OR "SARS-CoV-2"[Title] OR HCoV-19[Title] OR "novel coronavirus"[Title]) OR ((wuhan[Title/Abstract]) AND (pneumonia[Title/Abstract] OR outbreak*[Title/Abstract] OR "respiratory illness"[Title/Abstract]))) OR "Wuhan novel coronavirus"[Title/Abstract]) OR "Wuhan coronavirus"[Title/Abstract])) OR ((virus*[Title/Abstract] OR viral[Title/Abstract] OR influenza[Title/Abstract] OR "human flu*"[Title/Abstract] OR RSV[Title/Abstract]) OR ((("Viruses"[Mesh]) OR "Respiratory Syncytial Virus, Human"[Mesh]) OR "Influenza, Human"[Mesh]))) AND ((("Empyema, Pleural"[Mesh]) OR (empyema*[Title/Abstract] OR "pleural infect*"[Title/Abstract] OR "infections of the pleura*"[Title/Abstract] OR "infect* pleur*"[Title/Abstract] OR "parapneumonic effusion*"[Title/Abstract] OR CPPE[Title/Abstract] OR "infectious pleural effusion*"[Title/Abstract]))) NOT ((((pediatric[Title/Abstract] OR pediatrics[Title/Abstract] OR paediatric[Title/Abstract] OR paediatrics[Title/Abstract] OR children[Title/Abstract])))

Question 2 – In adults with pleural infection, what is the optimal antibiotic strategy?

((cavity, pleural[MeSH Terms]) OR (empyema, pleural[MeSH Terms])) AND ((antibiotics[MeSH Terms]) OR (6640, antibiotic[MeSH Terms]) OR (agents, antimicrobial[MeSH Terms]))(((cavity, pleural[MeSH Terms]) OR (empyema, pleural[MeSH Terms])) AND ((antibiotics[MeSH Terms]) OR (6640, antibiotic[MeSH Terms]) OR (agents, antimicrobial[MeSH Terms]))) AND (english[Language])

Question 3 – In adults with pleural infection, what are the optimal diagnostic parameters predicting need for chest tube drainage?

("empyema, pleural"[MeSH Terms] OR ("empyema"[All Fields] AND "pleural"[All Fields]) OR "pleural empyema"[All Fields] OR ("pleural"[All Fields] AND "empyema"[All Fields])) AND ("biomarker s"[All Fields] OR "biomarkers"[MeSH Terms] OR "biomarkers"[All Fields] OR "biomarker"[All Fields]) ("pleura"[MeSH Terms] OR "pleura"[All Fields] OR "pleural"[All Fields]) AND ("fluid"[All Fields] OR "fluid s"[All Fields] OR "fluids"[All Fields]) AND ("analysis"[MeSH Subheading] OR "analysis"[All Fields])
("empyema, pleural"[MeSH Terms] OR ("empyema"[All Fields] AND "pleural"[All Fields]) OR "pleural empyema"[All Fields] OR ("pleural"[All Fields] AND "empyema"[All Fields])) AND ("drainage"[MeSH Terms] OR "drainage"[All Fields] OR "drainaged"[All Fields] OR "drainages"[All Fields])] OR "chest tube"[All Fields]))("empyema, pleural"[MeSH Terms] OR ("empyema"[All Fields] AND "pleural"[All Fields]) OR "pleural empyema"[All Fields] OR ("pleural"[All Fields] AND "empyema"[All Fields])) AND ("predictor"[All Fields] OR "predictors"[All Fields])

Question 4 – In adults with pleural infection, what is the role of intrapleural therapy in pleural infection?

("Empyema, Pleural"[Mesh]) OR ("pleural infect*"[Title/Abstract] OR "parapneumonic effusion*"[Title/Abstract] OR empyema*[Title/Abstract])) AND ((((("Fibrinolytic Agents" [Pharmacological Action] OR "Fibrinolytic Agents"[Mesh])) OR (("Deoxyribonucleases"[Mesh]) OR "Tissue Plasminogen Activator"[Mesh])) OR ((intrapleural[Title/Abstract] OR fibrinolytic*[Title/Abstract] OR enzyme*[Title/Abstract] OR saline[Title/Abstract] OR thrombolytic*[Title/Abstract] OR alteplase[Title/Abstract] OR "Tissue plasminogen activator"[Title/Abstract] OR "t plasminogen activator"[Title/Abstract] OR DNase[Title/Abstract] OR Deoxyribonuclease*[Title/Abstract] OR DNase[Title/Abstract]) OR (t-PA[Title/Abstract]))) OR ("Saline Solution"[Mesh]))) AND ((((("Retrospective Studies"[Mesh]) OR "Prospective Studies"[Mesh]) OR (prospective*[Text Word] OR retrospective*[Text Word] OR "case series"[Text Word])) OR ((randomized controlled trial[pt] OR controlled clinical trial[pt] OR randomized[tiab] OR placebo[tiab] OR drug therapy[sh] OR randomly[tiab] OR trial[tiab] OR groups[tiab] NOT (animals [mh] NOT humans [mh])))) NOT ("TB pleuritis"[Title] OR "tuberculous"[Title] OR "TB"[Title] OR "tuberculous pleural effusion"[Title]) AND ((english[Filter]) AND (2011:2021[pdat]))) NOT (("pediatric OR pediatrics OR paediatric OR paediatrics"[Journal]) OR (pediatric[Title/Abstract] OR pediatrics[Title/Abstract] OR paediatric[Title/Abstract] OR paediatrics[Title/Abstract] OR children[Title/Abstract]))

Question 5 – In adults with pleural infection, what is the role of surgery in pleural infection?

P	Patients with pleural infection
I	Surgical drainage and debridement
C	Video-assisted Thoracoscopic Surgery (VATS), thoracotomy. decortication, open window thoracostomy, thoracoplasty, vacuum devices, medical thoracoscopy
O	Resolution of symptoms, conversion rates, pain, air leak, length of stay , mortality, reintervention

Mesh descriptor

- Empyema pleural / surgery
- Thoracic Surgery, Video-Assisted
- Thoracotomy / methods
- Debridement
- Pneumonectomy / adverse effects
- Bronchial fistula / surgery
- Surgical Flaps
- Thoracoplasty/ adverse effects
- Hemothorax / surgery

Methods

A MEDLINE search of the MeSH database was performed based on PICO elements ‘empyema, pleura’, ‘empyema, pleural, surgery’, ‘empyema, pleural, decortication’, ‘empyema, pleural, VATS’, ‘empyema pleural, thoracoplasty’, ‘empyema pleural, medical thoracoscopy’

Question 6 – what is the role of outcome prediction in pleural infection?

(("Empyema, Pleural"[Mesh]) OR ("pleural infect*"[Title/Abstract] OR parapneumonic*[Title/Abstract] OR para-pneumonic*[Title/Abstract] OR empyema*[Title/Abstract]))) AND ((prognos*[Title/Abstract] OR model*[Title/Abstract] OR "risk factor*"[Title/Abstract] OR prediction*[Title/Abstract] OR score*[Title/Abstract] OR outcome*[Title/Abstract]) OR ((("Prognosis"[Mesh]) OR "Risk Factors"[Mesh]) OR "Treatment Outcome"[Mesh]))

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