Complicated Pneumonia, ED/IP/PICU

Last Updated: 01/20/26

INCLUSION CRITERIA

- Patient admitted for and/or being managed for chest x-ray confirmed complicated pneumonia (moderate to large effusion, multilobe pneumonia, empyema, necrotizing pneumonia, or lung abscess)

EXCLUSION CRITERIA

- NICU
- CICU/CCCU
- Hematology & Oncology Service
- <90 days old
- Ventilated (intubated or tracheostomy)
- Cystic Fibrosis
- Immunodeficiency

PATHWAY MEASURES

- Order set use
- 48 hour ED Return Rate
- Readmission Rate
- Hospital Length of Stay

[1]Consults for Chest Tube Based on Location

- DV Acute Care – Surgery
- DV PICU (per PICU attending) – May consider IR consult
- FL Acute Care – IR (Surgery if IR unavailable)
- FL PICU (per PICU attending) – May consider IR consult

Guidance on Estimating Effusion Size on Chest X-Ray

- Small: <10 mm OR ¼ thorax
- Moderate: >10 mm AND > ¼ thorax by < ½ thorax
- Large: >10 mm AND > ½ thorax

*OR per Radiology interpretation

Clinical Suspicion

- Suspicion of complicated pneumonia through a chest x-ray

Concern for sepsis or shock? — Yes → **Sepsis & Septic Shock Pathway**

Initial Evaluation and Management

- Obtain 2 view chest x-ray if not already obtained
- Insert IV
- Obtain labs CBC with diff, BMP/CMP, (+/-) ESR, blood culture, Resp PCR Panel
- MRSA Nares Screen if ill appearing or high suspicion for MRSA infection based on risk factors
- Provide respiratory support as needed
- Initiate Antibiotics (See antibiotic guidance box)
- Admit to Acute Care vs PICU
- Timing of imaging to be coordinated between ED and inpatient teams and should not delay disposition

Determine Next Steps

- Based on Chest X-ray findings, determine next steps accordingly

Option A

- Effusion- Small
- Effusion – Moderate - without symptoms of respiratory distress, hypoxia, escalating respiratory support, persistent fever
- Bilateral or multilobe without effusion

Option B

- Effusion – Moderate – with symptoms of respiratory distress, hypoxia, escalating respiratory support, persistent fever
- Effusion – Large
- White out

Option C

- Concern for necrotizing pneumonia or lung abscess

Obtain Ultrasound

Option 1

- Shows trace or small effusion

Option 2

- Confirms Symptomatic effusion, complex/loculated effusion or empyema

Option 3

- Necrotizing pneumonia, abscess, or non-diagnostic

- No additional imaging
- No routine consults needed at this time

- Recommend ID Consult
- Consider Pulmonology Consult[3]
- Consult appropriate service for consideration of chest tube placement[1]
- **Complicated Pneumonia Chest Tube Algorithm to be utilized by appropriate service**

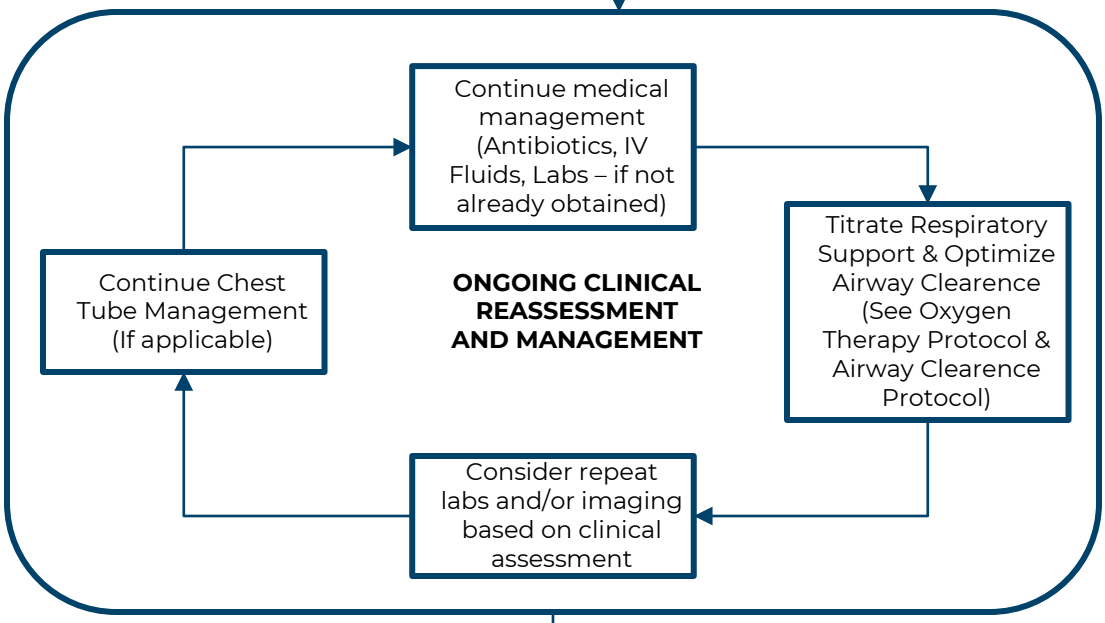
- Obtain Chest CT with IV Contrast
- Consult ID
- Consult Surgery/ IR
- Consider Pulmonology Consult[3]

[3]Considerations for Pulmonology Consult

- Patients who require chest tube or have concern for necrotizing pneumonia or lung abscess
- Refractory or worsening respiratory symptoms and/or prolonged need for respiratory support, longer than expected
- Concern for suspected airway malformation
- Evaluation for possible bronchoscopy

DISCHARGE CRITERIA

- Off Supplemental oxygen
- Improved work of breathing
- Improving fever trend
- Adequate nutrition/ hydration
- Tolerating oral medications
- Down trending CRP (if applicable)



Signs of Clinical Improvement/Criteria for Transition to Oral Antibiotics

- Improving Fever Curve
- Tolerating PO
- Improving respiratory status (hypoxia, work of breathing)
- Chest Tube removed if applicable

Discharge Patient

- When patient meets discharge criteria
- Consider outpatient follow-up with ID for clinical reevaluation and final duration of therapy
- Consider follow up with outpatient Pulmonology in 1-2 months

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[4]Indications for Fibrinolytics (Alteplase)

- Prescence of complex/ loculated effusion or empyema

OR

- Prescence of purulent fluid at time of chest tube placement

OR

- WBC > 10,000 cell/uL on pleural fluid

DO NOT administer Alteplase if there is significant air leak after chest tube placement or if patient has a known bleeding disorder

Chest Tube Insertion & Management

Insert Chest Tube

- IR, General Surgery, or PICU to place based on patient's location

Obtain Pleural Fluid for Diagnostics

- Send pleural fluid cultures (aerobic and anerobic), LDH, Glucose, Cell Count, Protein
- Send additional studies based on risk factors and ID recommendations

Administer Fibrinolytics if indicated (see indications box[4])

- Alteplase x3 days (Day 1 should occur at the time of chest tube placement)
- Repeat imaging as needed for clinical change/deterioration. Routine repeat Chest X-Rays not needed during days of alteplase administration if patient is stable

Is clinical improvement Noted after alteplase x3 days (if indicated)?

For example: improving hypoxia, decreased WOB and improved fever trend

No

Repeat Imaging

- As recommended by General Surgery/IR (Likely Chest X-Ray followed by possible chest US or CT)

Persistent pleural space disease?

Yes

OFF PATHWAY Management of Chest Tube per Surgery/IR Team

No

Yes

Monitor Drainage

- Less than 1mL/kg for the previous 12 hours of drainage (can consider longer period of monitoring for more severe disease)

Repeat Imaging

- Chest X-Ray to confirm improved pleural space disease

Transition to Water Seal

- When improved pleural space disease

Remove Chest Tube when Criteria Met:

- No air leak
- Improved pleural space disease on repeat imaging
- Tolerating chest tube to water seal

Resume Care per the Complicated Pneumonia algorithm.

Return to **"Ongoing Reassessment and Management"**

Antibiotic Guidance

Complicated Pneumonia First Line:

- **Ampicillin/Sulbactam IV**
- **PCN allergy**[2]: CefTRIAXone IV
- **Cephalosporin allergy**[2]: LevoFLOXacin IV/PO

Transition to Oral Antibiotics: (once above criteria met)

- Ampicillin/Sulbactam: transition to Augmentin
- Ceftriaxone: transition to Augmentin if no penicillin allergy. If penicillin or cephalosporin allergy: LevoFLOXacin.

MRSA History/Considerations:

- **NCHDE: Add Clindamycin IV/PO**
- **NCHFL: Add Vancomycin IV OR Linezolid IV/PO**
- If concern for clindamycin-resistant MRSA (ie, known colonization or clinical failure on clindamycin) regardless of location: Add Linezolid instead of clindamycin

Transition to Oral Antibiotics: (once above criteria met)

- Vancomycin: transition to Linezolid

Atypical Pneumonia (*Mycoplasma pneumoniae* or *Chlamydophila pneumoniae: PCR positive*):

- **Acute Care: Azithromycin PO (preferred)**
- **PICU or critically ill: Doxycycline PO/IV (preferred)**

- If enteral therapy is not tolerated, consider IV Doxycycline instead of IV azithromycin, regardless of age. Empiric antibiotic coverage for both typical and atypical pathogens is not indicated for most patients. Concomitant typical and atypical bacterial pneumonias generally do not occur. Molecular testing can readily diagnose atypical bacterial infections.

Recommend ID Consult if Not Already Involved

a. Clinical and testing guidance if concerned for less common pneumonia pathogens, including but not limited to Legionella, *Chlamydia psittaci*, Fungal (i.e. Histoplasma, Blastomyces, Coccidioides, etc), Pneumocystis, Mycobacteria, etc
b. Penicillin AND cephalosporin allergy
c. Concern for clindamycin resistant MRSA

Medications			
Medication	Route	Dose	Max per dose
Alteplase	Intrapleural	<2 years 1 mg in 10 mL 0.9% sodium chloride Daily preferred for Acute Care BID may be considered for PICU	1 mg
		2 years to 8 years 2 mg in 20 mL 0.9% sodium chloride Daily preferred for Acute Care BID may be considered for PICU	2 mg
		>8 years 4 mg in 40 mL 0.9% sodium chloride Daily preferred for Acute Care BID may be considered for PICU	4 mg
Ampicillin/Sulbactam	IV	50 mg/kg/dose Q6H	2000 mg
Amoxicillin/Clavulanate	PO	**ES Suspension** (amoxicillin 600 mg/clavulanate 42.9 mg/5 mL) 30 mg/kg/dose of amoxicillin TID	960 mg
	PO	**Tablet** (amoxicillin 875 mg/clavulanate 125 mg per tablet) for weight ≥40 kg 875 mg of amoxicillin BID	875 mg
	PO	**Chewable Tablet** (amoxicillin 400 mg/clavulanate 57 mg per tablet) for weight ≥40 kg 800 mg of amoxicillin TID	800 mg
Azithromycin	PO/IV	**<6 months** 10 mg/kg/dose daily x 5 days	Day 1: 500 mg Days 2-5: 250 mg
		≥ 6 months and < 40 kg Day 1: 10 mg/kg/dose Days 2-5: 5mg/kg/dose	
		≥ 40 kg Day 1: 500 mg Days 2-5: 250 mg	
CefTRIAXone	IV	75 mg/kg Q24H	2000 mg
Clindamycin	PO	10 mg/kg/dose TID	600 mg
	IV	13.3 mg/kg/dose Q8H	900 mg
Doxycycline	IV/PO	**<40 kg** 2.2 mg/kg/dose Q12H	100 mg
		≥ 40 kg 100 mg dose Q12H	
LevoFLOXacin	IV/PO	**≥6 months to <5 years** 10 mg/kg/dose BID	375 mg
	IV/PO	**≥5 years** 10 mg/kg/dose Q24H	750 mg
Linezolid	IV/PO	**<12 years** 10 mg/kg/dose Q8H	600 mg
	IV/PO	**≥12 years** 600mg Q12H	
Vancomycin	IV	Dosing varies by age and renal function.	

Disclaimer: The clinical pathways are based upon publicly available medical evidence and/or a consensus of medical practitioners at Nemours Children's Health ("Nemours") and are current at the time of publication. These clinical pathways are intended to be a guide for practitioners and may need to be adapted for each specific patient based on the practitioner's professional judgment, consideration of any unique circumstances, the needs of each patient and their family, and/or the availability of various resources at the health care institution where the patient is located.

VERSION MANAGEMENT

- Version 1.0 (1/20/2026): Go Live.

Questions about this pathway should be directed to **clinicalpathways@nemours.org**.

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