

ANMC Pediatric (1 month to 17 years) Parapneumonic Effusion/Empyema Management Guideline

Initial evaluation

- Chest x-rays including PA and lateral views.
- Decubitus films may help further characterize effusion if accepting a child from a rural area.
- Formal chest ultrasound.
- CBC with differential, blood culture, CRP, CMP.
- TB evaluation if indicated based on history/exam/imaging.

Criteria for chest tube or pigtail catheter drainage

- Fluid volume is >1/3 of hemithorax (regardless of fluid complexity).
- Loculated or particulate effusion regardless of size (unless too small to safely drain).

Consultation with pediatric hospitalist or pediatric surgeon advised for any questions regarding whether an effusion requires drainage.

Antibiotics selection

Most common pathogens: *Streptococcus pneumoniae*, *Haemophilus influenzae*. Less common pathogen: *Staphylococcus aureus*.

Pediatric ID consultation as needed to guide choice of antibiotics and length of therapy

Non-critically ill child

1. **Ceftriaxone** 50 mg/kg IV q24h, maximum dose 2000 mg
2. If history of MRSA or poor dentition, add **clindamycin** 10 mg/kg IV q8h, maximum dose 900 mg
3. If polymicrobial infection (such as bronchopleural fistula), consider **ampicillin-sulbactam** 75 mg/kg IV q6h, maximum dose 3000 mg (delivers 50 mg/kg of the ampicillin component) (this is chosen in lieu of ceftriaxone ± clindamycin)

Critically ill child

1. **Ampicillin-sulbactam** 75 mg/kg IV q6h, maximum dose 3000 mg (delivers 50 mg/kg of the ampicillin component)
2. **Vancomycin** 15 mg/kg IV q6h

Surgical management

Drainage not indicated

1. Chest ultrasounds daily for assessments to ensure that effusion is not worsening. Continue until clinically improving.
2. Consider using the ANMC Pediatric (>3mo) Inpatient Community Acquired Pneumonia (CAP) Treatment Guideline.
3. Consider upright chest x-ray, CBC and CRP when nearing discharge.

Drainage indicated

1. Multidisciplinary case review with the pediatric hospitalist, the pediatric intensivist, and the pediatric surgeon.
2. Options for chest tube placement include the pediatric intensivist, the pediatric surgeon, and the interventional radiologist.
3. Send pleural fluid for Gram stain, culture, and cell count with differential.
4. Most children will benefit from three days of empiric fibrinolytics*, and may need more depending on response.
5. If simple effusion not likely to benefit from fibrinolysis, the multidisciplinary team may decide against fibrinolytics.
6. If no improvement after three days of fibrinolysis, consider chest CT for further evaluation.
7. After chest tube removed, observe at least one more night in the hospital, obtain a true upright chest x-ray the morning after chest tube removal, prior to discharge.

*Bronchopleural fistula is a contraindication to using intrapleural fibrinolytics.

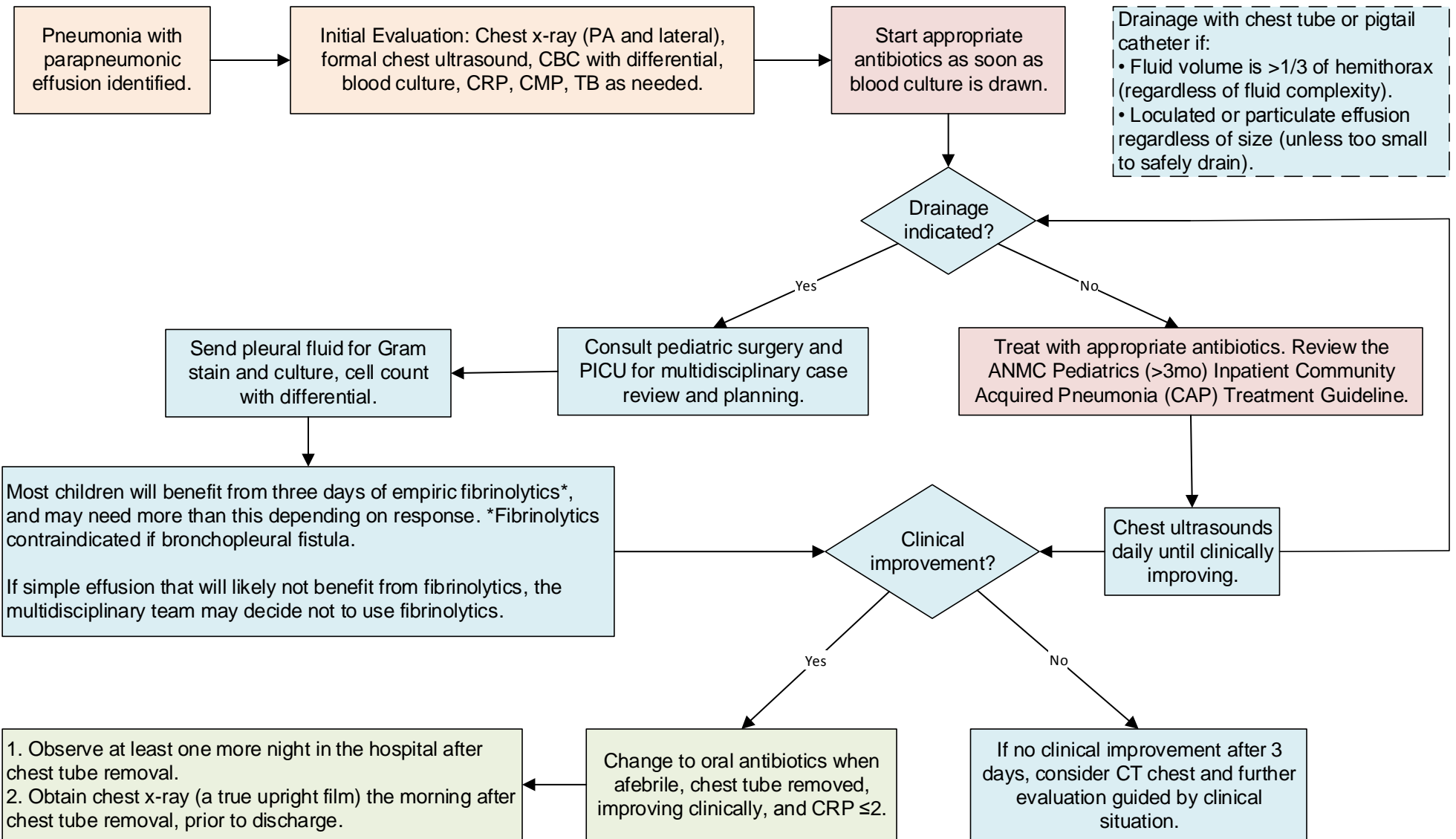
Transition to outpatient care

- Change to oral antibiotics when: Afebrile for ≥ 24 hours, chest tube is removed, child is improving clinically, and CRP is ≤ 2.
- Typical duration of antibiotics is 2 to 4 weeks, depending on course and clinical response.

Follow up care

- Follow up with PCP, other involved services as needed.
- If any intrathoracic air is present at discharge, considerations for air travel should be discussed.
- At discharge, if from out of town, push (send electronically) all imaging to referring hospital.
- Repeat chest x-ray in 2 months. Refer to pediatric pulmonology if abnormal.

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ALASKA NATIVE MEDICAL CENTER PEDIATRICS PARAPNEUMONIC EFFUSION/EMPYEMA MANAGEMENT

OBJECTIVE: The inpatient multidisciplinary hospital team provides consistent and evidence-based care to children with parapneumonic effusions.

References:

- St. Peter S.D., et al. Thoracoscopic decortication vs tube thoracostomy with fibrinolysis for empyema in children : a prospective, randomized trial. Journal of Pediatric Surgery, 2009; 44:106-111.
- Hawkins J.A., et al. Current Treatment of Pediatric Empyema. Thoracic and Cardiovascular Surgery, 2004; 16:196-200.
- Gasior A.C., et al. Experience with an evidence-based protocol using fibrinolysis as first line treatment for empyema in children. Journal of Pediatric Surgery, 2013; 48:1312-1315.
- Islam S., et al. The diagnosis and management of empyema in children: a comprehensive review from the APSA Outcomes and Clinical Trials Committee, 2012; 47:2101-2110.

General information regarding fibrinolysis and alteplase:

1. Intrapleural alteplase instillation is indicated for fibrinolysis of empyema associated with pneumonia.
2. Fibrinolytic therapy has been shown to be equivalent to video-assisted thoracoscopic surgery (VATS) in treating empyema.
3. Alteplase dosing:
 - a. Dose:
 - For children < 10 kg, use 2 mg alteplase in 20 mL normal saline.
 - For children ≥ 10 kg, use 4 mg alteplase in 40 mL normal saline.
 - b. Frequency: Instill every 24 hours for three days, may need an extended course.
 - c. Dwell time is 1 hour. (Can increase to 4 hours as needed, per physician order).
4. A stopcock connector system is preferred when giving alteplase, with a needleless connector as the third position.

Alteplase instillation protocol:

1. Turn off suction to chest tube.
2. If using a stopcock connector system, turn the stopcock off toward the suction connector.
3. Cleanse injection cap with sterile alcohol swab for 15 seconds and let dry completely for 15 seconds.
4. Inject the alteplase solution into the tube and turn the stopcock off toward the patient. If no stopcock connector system is used, clamp the tube.
5. Allow alteplase to dwell for one hour. During this hour and as is tolerated, position patient in four different positions for 15 minutes each:
 - a. Trendelenberg (15 degrees)
 - b. Left side down
 - c. Sitting up
 - d. Right side down
6. After one hour, unclamp tube or open the stopcock.
7. Return the chest tube to suction and document output from the tube.