Cook Children's Medical Center
Clinical Excellence Committee

Summary Recommendations for the diagnosis and management of empyema

Inclusion Criteria:

-Children and adolescents with empyema

Exclusion Criteria:

-Concern for non-infectious etiology
-Patients with immunodeficiency

1. **Diagnosis**
    a. **Chest ultrasound should be the primary imaging modality to evaluate concerns for possible pleural space disease on chest x-ray. US can accurately identify loculations and solid components of the disease process. Chest CT should be reserved for more complicated cases where further information may direct surgical decision-making or if US would not provide adequate imaging, for example due to a patient's body habitus [1].**

    b. **Repeat chest x-ray should be obtained in patients with pneumonia who fail to show adequate improvement after 48-72 hours from initiation of antibiotics. It should also be obtained in patients with pneumonia who demonstrate clinical deterioration [2].**

2. **Indications for drainage of pleural fluid**
    a. **Size**

        A retrospective study found that a significant amount of children with small or medium effusions could be treated with antibiotics alone, while the presence of a large effusion was a strong indicator for the need for drainage [3].

    b. **Symptoms**

        Worsening symptoms, such as fever, tachypnea or increasing oxygen requirement, may result in the need for drainage of pleural fluid [3, 4].

    c. **Loculations**

        While at least one study showed an association with the presence of loculations and the need for drainage [4], another study did not find an association between the two [3].

3. **Draining of pleural fluid**
    a. **Chest tube placement with instillation of fibrinolytics should be considered first line therapy for drainage of parapneumonic fluid collections over VATS [1].**

b. **The timing of drainage, regardless of the intervention chosen, is an important consideration.**

One study that looked at VATS done within 48 hours of admission versus VATS done after 48 hours found that those patients who underwent early VATS had a 4 day shorter length of stay [5]. Another study found that those patients who had surgery more than 4 days after their initial diagnosis had a significantly more complicated disease course [6].

c. **Currently, tPA (tissue plasminogen activator) is the preferred debridement agent in the US [1].**

d. **Small-bore drains are recommended for routine use over large-bore drains [7-11].**

e. **Fibrinolytic Frequency**

There have been no studies to compare different fibrinolytic instillation protocols. It is our organization's practice to use tPA instilled every 24 hours, with a 1 hour dwell time, for 3 total doses.

f. **Drain Removal**

Two previous study's protocols removed the chest tube when drainage was less than 40-60 ml in 24 hours [12, 13]. The other study protocol removed the chest tube when drainage was less than 1 ml/kg/day, calculated over the previous 12 hours [14]. Since these studies achieved similar results, either criteria for chest tube removal is considered reasonable.

g. **Laboratory Evaluation of Pleural Fluid**

Pleural fluid should be sent for culture and sensitivities to optimally guide antibiotic therapy. [15, 16].

4. **When to consider VATS**

No studies have clearly established whether there is a difference between repeat attempts of fibrinolysis with tPA or proceeding to VATS when fibrinolytic failure has occurred, so additional courses of fibrinolysis with tPA may be appropriate, depending on the clinical scenario.

5. **Antibiotic Treatment**

a. **Initial Empiric Therapy**

Empiric therapy for the treatment of pneumonia with empyema should be with Ceftriaxone. Clindamycin or Vancomycin can be added if there is concern for MRSA. If cultures are positive, they should be used to tailor antibiotic therapy.

b. Length of Therapy

The length of antibiotic therapy in children with empyema after successfully undergoing fluid drainage has not been well studied and has been recommended to be anywhere from 1-4 weeks after discharge.

6. Discharge Criteria

a. Patients who have undergone treatment for empyema may be discharged home if they are well appearing, tolerating good oral intake, are no longer requiring oxygen and have been afebrile for 24 hours [1, 12-14].

7. Follow-up

a. Follow-up imaging

Local expert consensus recommends that these children have follow-up imaging at approximately 6-8 weeks post-discharge and that these children be followed until their chest x-ray findings normalize. One study of pediatric patients with empyema demonstrated chest x-ray normalization within 3-6 months of discharge [17].

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This summary statement was created using the Evidence-Based Guidelines for the diagnosis and management of empyema. For supporting rationale about each recommendation and for a further list of used references, please refer to the Evidence-Based Guideline. This document is intended to assist providers in decision making by providing the current state of evidence and recommendations for the management of empyema. This document is not meant to replace clinical judgement and will not be appropriate for all cases of empyema.

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A special thanks to the Schwarz Library for their assistance with literature searches and to our finance department for their assistance with pulling financial data.

Approved by Clinical Excellence Committee: April 17, 2019

Reviewed and Renewed by Clinical Excellence Committee: October 2022

Due for review by Clinical Excellence Committee on or before: October 2025