The Parapneumonic Effusion/Empyema Algorithm

Overview:
The management of children with pneumonia and pleural effusion (parapneumonic effusion/empyema) is not straightforward. In order to provide some consistency of care, a group of Children’s Hospital clinicians interested in this area convened to establish an evidenced-based approach to the management of children with parapneumonic effusion. The following specialties were represented: Pediatric Surgery, Pulmonary, Radiology, Infectious Diseases, General Pediatrics, and Pediatric Residents. The medical literature was reviewed, and in a series of meetings held in 2004 the group decided on a general approach. An algorithm was developed and went through several drafts. Once the group completed the final draft, this draft was presented to each of the representatives' Divisions for approval.

As with all algorithms/clinical guidelines, this one is intended as a template for care, and it is not absolute. There are many ways to treat children with parapneumonic effusions, and clinical judgment always is important. However, the group of Children's Hospital clinicians who developed this algorithm decided that this represents a “best management strategy” for children admitted to this hospital.

Key Points on Parapneumonic Effusions:
1. Parapneumonic effusion is defined as a pleural effusion associated with pneumonia (primarily bacterial). An empyema is normally defined as purulent pleural fluid or pleural fluid containing bacteria (identified by gram stain or culture). The distinction between a non-empyema parapneumonic effusion and an empyema is becoming less important, and the terms are occasionally used interchangeably.
2. Most children with parapneumonic effusions get well and have no long-term sequellae, independent of how their illness is treated. However, appropriate treatment and early intervention with pleural drainage can shorten the course of illness. One key to treatment is deciding if and when a child should undergo pleural fluid drainage.
3. The clinical condition of the child is key to deciding how aggressively to intervene. The sicker the child, the more likely that child will benefit from some form of pleural fluid drainage.
4. The most common bacterial cause of parapneumonic effusion is strep pneumoniae, though MRSA is emerging as an important pathogen.

Key points on the Parapneumonic Effusion/Empyema algorithm:
1. Thoracentesis upon initial presentation has low yield for a positive bacterial culture, and pleural fluid analysis is not particularly helpful in determining how to manage these patients. Therefore, in this algorithm early thoracentesis is not recommended.
2. This algorithm is based on the Parapneumonic Effusion Working Group’s interpretation of the literature and experience with managing this disease. The data supporting one treatment over another, e.g. fibrinolytics vs. surgical
drainage with video-assisted thoracoscopy (VATS) is not particularly strong. We opted to not include treatment with fibrinolytics instilled via a chest tube in this algorithm. Fibrinolytics can be effective but have not been shown to be more effective than VATS. Fibrinolytics require a chest tube, and their instillation can cause pain. As there is no proven benefit of fibrinolytics over early surgical drainage we opted avoid them in favor of VATS.

3. When managing children with parapneumonic effusions, there is often debate over when to treat with antibiotics alone vs. when to intervene with a chest tube or VATS. The pulmonary and surgical services are often involved with these decisions. To improve communication and to facilitate presenting a united plan to the family, we recommend a joint pulmonary/surgical consultation early in the algorithm.

4. Parapneumonic effusions start free-flowing and then develop fibrin strands eventually leading to loculation. Loculated fluid cannot be drained via a simple chest tube. Therefore, if patients require pleural fluid drainage then they should first undergo imaging to assess for loculations. The ultrasound is sufficient for this purpose. Thus, the imaging treatment of choice is an ultrasound and not a CT scan. However, a CT scan can be done if clinically indicated.

5. There are few data on the appropriate length of antibiotic treatment. The course proposed on the algorithm is safe, standard, but necessarily arbitrary.

6. Repeat CXRs in the hospital lend little to the management decisions and should be ordered judiciously.

7. Patients will clinically improve long before their CXR returns to normal. Thus, we recommend repeat imaging 4-6 months after resolution of the infection unless clinically indicated earlier.

**The Parapneumonic Effusion Working Group:**
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