Chapter 86
Approach to Pleural Effusion in the ICU

86.1 Introduction

Pleural effusion, an abnormal accumulation of fluid in the pleural space, is a common and potentially serious condition in ICU settings. Studies indicate a prevalence of up to 60% among critically ill patients, with significant associations with mortality. It arises from diverse causes such as infection, malignancy, or systemic illnesses, often presenting with dyspnea, hypoxia, and reduced breath sounds. Management involves prompt identification, accurate diagnosis, and tailored interventions to mitigate adverse outcomes [1, 2] [Ref: Algorithm 86.1].

86.2 Initial Assessment

- Clinical Presentation: Symptoms include dyspnea and hypoxia. Signs include diminished breath sounds, or dullness to percussion, signaling pleural effusion.
- Early recognition is essential to prevent complications such as respiratory failure, empyema, or tension hydrothorax [3].

86.3 Confirmation of Pleural Effusion

- Imaging:
- Thoracic Ultrasound (TUS): Preferred modality in the ICU due to its bedside applicability and superior sensitivity over chest X-rays. Detection rates exceed those of chest radiography and rival CT scans, making it indispensable. Real-time

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visualization facilitates rapid diagnosis and guided interventions, especially in mechanically ventilated patients [4].
- Significant Effusion: Defined by a pleural fluid depth ≥2 cm on TUS with adverse respiratory effects.

86.4 Evaluation of Effusion Type

- Classification: Use Light's Criteria to differentiate transudative and exudative effusions:
- Pleural protein/serum protein ratio >0.5.
- Pleural LDH/serum LDH ratio >0.6.
- Pleural LDH > 2/3 the upper limit of normal serum LDH.
- Advanced Diagnostics:
- Pleural fluid elastance and Starling's equation help in understanding pleural fluid dynamics.
- Mechanical ventilation complicates effusion diagnosis; strategies include dynamic TUS and pleural pressure monitoring.

86.5 Management Based on Effusion Type

- Transudative Effusions: Commonly linked to systemic conditions like heart failure or cirrhosis.
- Management: Address the underlying condition rather than direct drainage.
- Exudative Effusions: Associated with infections, malignancy, or inflammation.
- Actions: Diagnostic thoracentesis for further analysis; therapeutic drainage if indicated [5].

86.6 Therapeutic Interventions

- Indications: Symptomatic relief or unclear etiology.
- Guidelines:
- pH < 7.2 or Glucose <60 mg/dL: Suggests infection, requiring immediate drainage.
- Empyema: Purulent fluid mandates chest tube placement.
- Advanced Techniques:
- Intrapleural Fibrinolytics: Effective for complex parapneumonic effusions and empyemas, reducing surgical referrals.
- Early Drainage: Improves oxygenation and PaO_2/FiO_2 ratios [6].

86.7 Special Situations and Complications

- Hemothorax:
- Large-bore drainage for significant blood loss (>1500 mL initially or >200 mL/h).
- Prevents complications like fibrothorax and hemodynamic instability.
- Chylothorax:
- Milky fluid appearance with elevated triglycerides confirms the diagnosis.
- Managed with drainage and nutritional modifications, including low-fat diets or parenteral nutrition.
- Malignant Effusions:
- Recurrent effusions may require pleurodesis, indwelling catheters, or repeated thoracentesis.
- Focus on palliative measures to enhance quality of life.
- Complications of Drainage:
- Includes infection or visceral injury. Strategies to mitigate risks involve ultrasound-guided procedures and aseptic techniques [7].

86.8 Pathophysiology Insights

- Fluid Turnover:
- Governed by hydrostatic and oncotic pressures across the pleural membrane.
- Imbalances lead to effusion formation, with critical contributions from systemic and localized factors.

86.9 Multidisciplinary Collaboration

- Complex cases (e.g., empyema or malignancy) may require input from thoracic surgeons, interventional radiologists, or pulmonologists to ensure optimal outcomes.

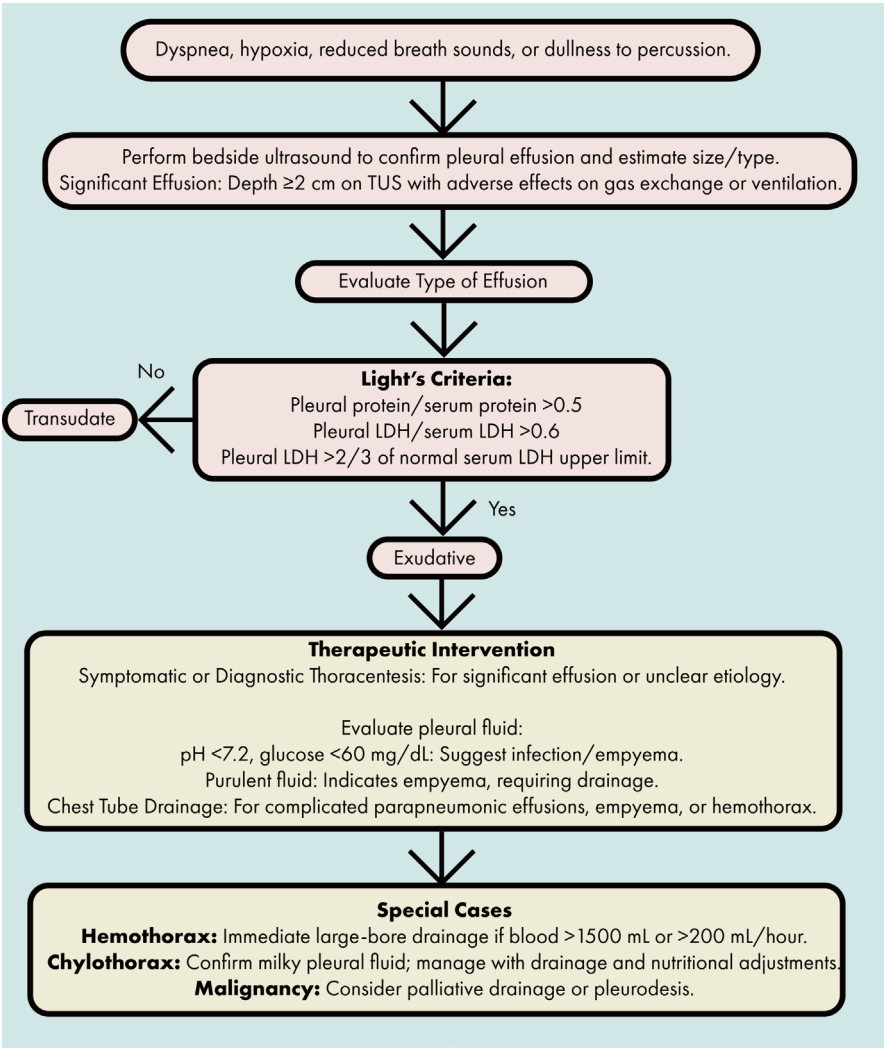
86.10 Prognostic Implications

- Pleural effusion complicates ICU prognostication by increasing mortality risk and impeding mechanical ventilation weaning. Its presence underscores the need for vigilant monitoring and timely management.

86.11 Conclusion

Effective management of pleural effusion in the ICU demands a structured approach encompassing early recognition, precise diagnosis, and evidence-based interventions. Incorporating advanced imaging modalities, multidisciplinary collaboration, and updated management strategies ensures optimal patient outcomes while minimizing complications.

Algorithm 86.1: Approach to pleural effusion in the ICU



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