Chapter 89
Approach to Interstitial Lung Disease in the ICU

89.1 Introduction

Interstitial lung disease (ILD) comprises a diverse group of disorders characterized by varying degrees of fibrosis and inflammation within the lung parenchyma. Patients with ILD are at increased risk for acute respiratory decompensation, particularly in the intensive care unit (ICU) setting. Managing these patients is challenging due to the complexities of their chronic condition and the potential for life-threatening complications such as pneumothorax. Clinicians must balance the need for prompt diagnosis and treatment with the risks associated with invasive procedures [1, 2] [Ref: Algorithm 89.1].

89.2 Initial Assessment: Is the Patient a Known Case of ILD?

- Yes: For patients with a known ILD diagnosis, management begins by assessing potential causes of acute decompensation while considering the underlying disease trajectory, subtype of ILD, and previous functional status.
- No: In undiagnosed patients, a thorough clinical history and targeted diagnostics are essential to identify or rule out ILD, considering the limitations and risks of invasive procedures in critically ill patients.

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89.3 Clinical History and Workup for Undiagnosed Patients

89.3.1 Key History Points

- Exposure History: Investigate occupational exposures (e.g., asbestos, silica), environmental factors (e.g., bird proteins, mold), and drug-related triggers (e.g., amiodarone, methotrexate).
- Autoimmune Screening: Assess for symptoms suggestive of connective tissue diseases. Laboratory tests may include antinuclear antibodies (ANA), extractable nuclear antigens (ENA) panel, and rheumatoid factor [3].

89.3.2 Laboratory Investigations

- Complete blood count.
- A comprehensive metabolic panel, including liver and kidney function tests and serum electrolytes.
- Electrocardiogram.
- Arterial blood gases.
- Transthoracic echocardiogram, cardiac enzymes—to rule out cardiac causes of hypoxia and breathlessness.
- CT pulmonary angiography: If acute worsening of conditions and development of shock. Patients with idiopathic pulmonary fibrosis (IPF) are more prone to deep vein thrombosis and pulmonary embolism(PE).

89.3.3 Imaging and Diagnostics

- High-Resolution Computed Tomography (HRCT):
- Fibrotic ILDs: Idiopathic pulmonary fibrosis(IPF)/usual interstitial pneumonia.
- Usual Interstitial Pneumonia (UIP): Characterized by subpleural, basal-predominant reticulation with honeycombing and traction bronchiectasis.
- Inflammatory ILDs: Nonspecific interstitial pneumonia, hypersensitivity pneumonitis.
- Nonspecific Interstitial Pneumonia (NSIP): Presents with ground-glass opacities and a more uniform distribution, minimal honeycombing (typically bilateral and symmetrically distributed in the lower zones).
  - Hypersensitivity Pneumonitis:

    Subacute: Diffuse ground-glass opacification, ill-defined centrilobular nodules, and lobular areas of decreased attenuation on images performed at end-expiration.

    Chronic: Reticular abnormalities and traction bronchiectasis, with a predominance in the upper and middle lung fields, and frequently shows a peribron-

chovascular accentuation with subpleural sparing. Honeycombing is observed in up to 69% of the cases. Centrilobular nodules, air trapping, and/or a mosaic pattern in a patient with a fibrosing lung disease are good clues to the diagnosis of CHP.

89.3.4 Challenges in Diagnosing ILD in Critically Ill Patients:

- Risks of Invasive Diagnostics: Procedures like bronchoalveolar lavage (BAL) and lung biopsy carry increased risks, including bleeding, pneumothorax, and worsening respiratory failure.
- Alternative Strategies: Utilize noninvasive imaging and postpone invasive diagnostics until the patient stabilizes, if possible [4].

89.4 Identifying Acute Decompensation Causes in Known ILD Patients

Common Causes

1. Pneumothorax: May require urgent intervention based on severity.
2. Pulmonary embolism.
3. Infection: Bacterial, viral, or opportunistic pathogens.
4. Cardiac Dysfunction: Pulmonary edema or heart failure.
5. Acute exacerbation of ILD (AE-ILD).
6. Aspiration.
7. Drug toxicity [5].

89.5 Ruling Out Reversible Causes of Decompensation

89.5.1 Diagnostic Workup

- CT Chest: High-resolution imaging to assess for new infiltrates, pneumothorax size, PE, or other abnormalities.
- Laboratory Tests:
- Cardiac Markers: B-type natriuretic peptide (BNP), troponin levels.
- Infection Markers: C-reactive protein (CRP), procalcitonin, complete blood count.
- Blood Cultures: If sepsis is suspected.
- Echocardiography: Evaluate for left ventricular dysfunction, valvular abnormalities, or pulmonary hypertension.

89.5.2 Management of Reversible Causes

- Pulmonary Edema:
- Management: Administer diuretics, optimize fluid balance, and address underlying cardiac issues.
- Infection:
- Management: Initiate empiric broad-spectrum antibiotics tailored to likely pathogens and local resistance patterns.
- Aspiration:
- Management: Supportive care; consider antibiotics if secondary infection is suspected, and implement measures to prevent further aspiration.
- Drug Toxicity:
- Management: Discontinue offending agents and provide supportive care.
- Pulmonary Embolism:
- Management: Initiate anticoagulation therapy promptly [4].

89.6 Management of AE-ILD

89.6.1 Definition

An acute, clinically significant respiratory deterioration characterized by new, widespread alveolar abnormality on imaging, not fully explained by cardiac failure or fluid overload.

89.6.2 Treatment Approach

- High-Dose Corticosteroids:
- Regimen: Methylprednisolone 500–1000 mg daily for 3 days, followed by a gradual taper.
- Immunosuppressants:
- Cyclophosphamide: Consider in non-IPF ILDs with severe inflammation.
  Dose: 500–1000 mg every 4 weeks or 1–2 mg/kg/day orally.
- Antifibrotic Agents:
- Nintedanib and Pirfenidone:
  - Dose: Nintedanib—150 mg twice a day.

    Pirfenidone—1800–2400 mg/day in divided doses, 200 mg three tablets thrice a day
- Role: Shown to slow disease progression in fibrotic ILDs like IPF.
- Potential Benefits During Acute Exacerbations: May reduce the rate of decline in lung function, though evidence during acute exacerbations is limited [6].

89.6.3 Supportive Care

- Oxygen Therapy: Aim to maintain adequate oxygenation using the least invasive methods.
- Advanced Respiratory Support:
- High-Flow Nasal Cannula (HFNC): Preferred for its ability to deliver humidified oxygen at high flow rates with precise FiO_2 control. Benefits: Better tolerated, reduces dead space, and provides consistent oxygen delivery.
- Indications: Hypoxemic respiratory failure without significant hypercapnia.
- Noninvasive Ventilation (NIV): Benefits: Provides positive pressure ventilation, which may be beneficial in select patients.
- Limitations: Poor tolerance due to discomfort, risk of air leaks, and may delay necessary intubation.
- Invasive Mechanical Ventilation (IMV):
- Limited Utility: High risk of mortality; reserved for cases where it serves as a bridge to lung transplantation or when acute reversible factors are identified.
- Ventilation Strategies: Employ low tidal volumes (4–6 mL/kg of predicted body weight) and limit plateau pressures to reduce ventilator-induced lung injury.

89.7 Risk Stratification and Prognosis

Prognostic Factors

- HRCT Features:
- Honeycombing: Suggests advanced fibrosis and is associated with higher mortality.
- Extent of Fibrosis: Greater extent correlates with increased risk of acute exacerbations and death.

Mortality Rates and Outcomes

- IPF Patients:
- Higher Mortality: Acute exacerbations have in-hospital mortality rates exceeding 50%.
- Non-IPF ILDs:
- Variable Outcomes: Some subtypes respond better to immunosuppressive therapy, improving survival rates [7].

89.8 Reversible Triggers

- Pulmonary Edema: Optimize cardiac function, use diuretics.
- Infection: Early identification and targeted antimicrobial therapy.
- Aspiration: Preventive strategies and supportive care.

- Drug Toxicity: Identify and discontinue the offending agent.

  Flowchart for Diagnosing and Managing Acute Exacerbations

- Consider Including: A visual aid to guide clinicians through the assessment and management process, emphasizing the identification of reversible causes and appropriate interventions.

89.9 Special Considerations

- Decision-Making: Shared decision-making with patients and families regarding treatment options and goals of care.
  Palliative Care Integration
- Symptom Management: Address dyspnea, anxiety, and other distressing symptoms.
- Advance Care Planning: Discuss prognosis and end-of-life preferences early in the care continuum.

89.10 Emerging Therapies and Research

Experimental Therapies and Biomarkers

- KL-6: A serum biomarker elevated in ILD; under investigation for early disease activity detection and monitoring.
- Telomere Biology: Short telomeres are associated with familial ILD and worse outcomes; research is ongoing into targeted therapies.

  Genetics in ILD

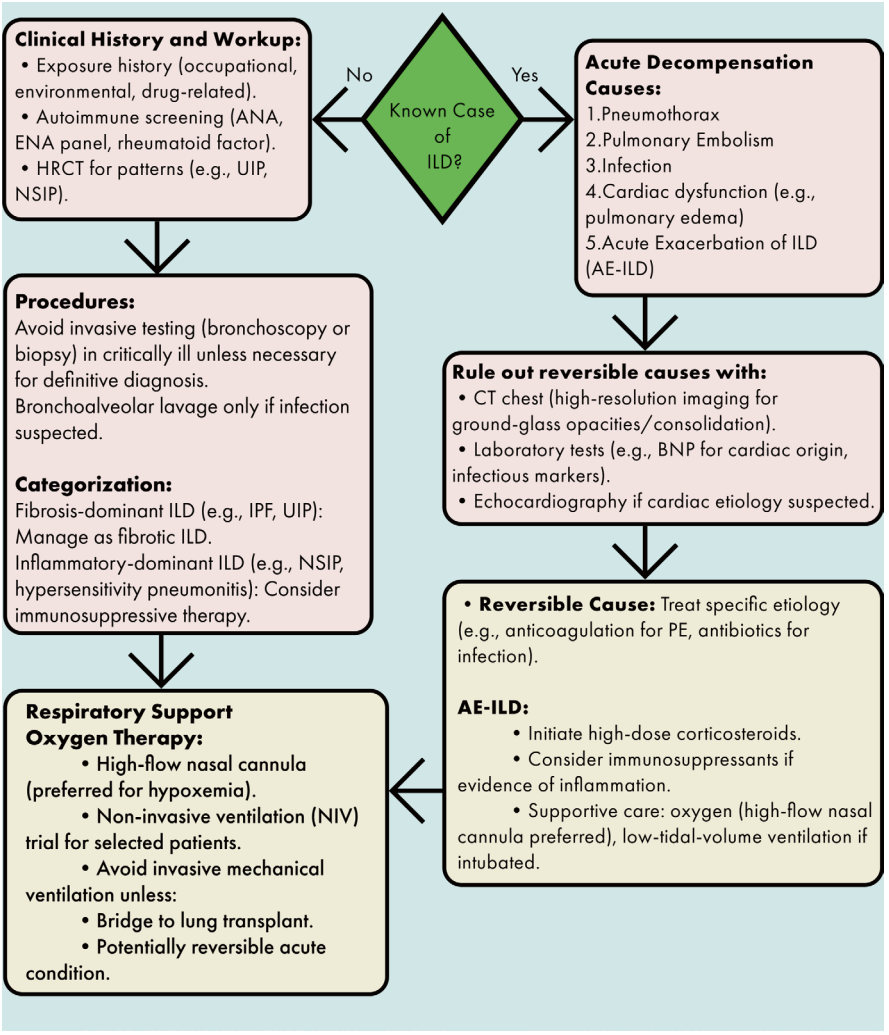
- Familial Cases: Genetic mutations (e.g., in surfactant proteins, telomerase) contribute to disease pathogenesis.
- Syndromic ILD: Understanding genetic factors may lead to personalized treatment strategies [3].

89.11 Conclusion

Managing acute decompensation in ILD patients within the ICU is complex and requires a comprehensive, patient-centered approach. Differentiating between fibrotic and inflammatory ILDs is crucial for guiding therapy, and HRCT imaging plays a vital role in this distinction. Managing acute exacerbations involves ruling out reversible causes, employing immunosuppressive or antifibrotic therapies as

appropriate, and carefully selecting respiratory support strategies to minimize further lung injury. A multidisciplinary team is essential for addressing the multifaceted needs of these patients, including consideration for lung transplantation and integration of palliative care. Ongoing research into emerging therapies and genetic underpinnings holds promise for improving outcomes in this challenging patient population.

Algorithm 89.1: Approach to interstitial lung disease in the ICU



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