



## DIAGNOSTIC SIGNIFICANCE OF LUNG ULTRASOUND EXAMINATION IN PULMONARY EDEMA AND ACUTE PNEUMONIA

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**Background:** Lung ultrasound (LUS) has become an essential bedside imaging technique for the evaluation of acute respiratory failure, providing rapid, radiation-free, and reliable assessment of pulmonary conditions. The BLUE (Bedside Lung Ultrasound in Emergency) protocol, introduced by Lichtenstein, offers a structured, evidence-based approach to differentiate the major causes of dyspnea, particularly pulmonary edema and acute pneumonia, through characteristic sonographic patterns.

**Clinical relevance:** In patients presenting with acute dyspnea, the ability to distinguish cardiogenic pulmonary edema from inflammatory or infectious consolidation is critical for early therapeutic decision-making. The BLUE protocol identifies reproducible ultrasound patterns, including the A-profile, B-profile, and C-profile, which correspond to different pathophysiologic mechanisms of lung involvement. Recognition of multiple bilateral B-lines with preserved lung sliding suggests interstitial alveolar edema, whereas focal, asymmetric B-lines with subpleural consolidations are typical of bacterial pneumonia.

**Technological integration:** The introduction of Mindray's Smart B-Lung, an automated AI-assisted application integrated into Mindray ultrasound platforms, enhances the precision and reproducibility of B-line detection and quantification. This innovation facilitates objective assessment of extravascular lung fluid and supports the standardization of the BLUE protocol across different clinical settings. Automated B-line counting and pleural-line tracking reduce inter-observer variability and accelerate decision-making in critical care and emergency environments.

**Conclusion:** Implementation of the BLUE protocol, complemented by automated quantification using Mindray Smart B-Lung, represents a modern paradigm in pulmonary ultrasound diagnostics. This integration of clinical methodology and intelligent technology enables accurate differentiation between pulmonary edema and acute pneumonia, improving diagnostic confidence and patient outcomes. Furthermore, the standardized workflow contributes to education, training, and consistency in ultrasound practice, reinforcing the role of lung ultrasound as a frontline tool in modern respiratory medicine.

**Keywords:** Lung ultrasound, BLUE protocol, pulmonary edema, pneumonia, Mindray Smart B-Lung.