Resuscitation
Hypoxia: Supporting Literature

Acute respiratory failure is encountered very frequently for any health care provider taking care of critically ill patients. The differential diagnosis of respiratory failure is broad, and one can use ultrasound to help rationalize diagnoses and treatment plans for patients. Lung ultrasound is becoming a valuable tool in critical care to help accurate bedside detection of thoracic disorders [1, 2]. We also know physical exam and chest radiography have limitations, resulting in need for more comprehensive exams that might delay diagnosis and treatment plans [3, 4]. Along with studies that shows high interobserver agreement and equivalency to computed tomography in detecting most disorders, using lung ultrasound has been shown to save time and decrease the need for computed tomography [5-7].

In a study by Lichtenstein, an algorithm approach to evaluation the patient with respiratory failure ("BLUE" protocol), lung ultrasound found a correct diagnosis in 90.5% of cases. Using the previous signs discussed in this chapter, the clinician can use this algorithmic approach to evaluation and help with diagnosis and treatment plans [Figure 1]. In this study it was useful to assign profiles to the different signs evaluated [8]:

A profile = anterior predominant bilateral A lines associated with lung sliding (with possible focal B lines)
A' profile = A profile with absent lung sliding
B profile = anterior predominant bilateral B lines associated with lung sliding (with possible focalized A lines)
B' profile = B profile without lung sliding
A/B profile = anterior predominant B lines on one side and predominant A lines on the other side
C profile = anterior alveolar consolidations
PLAPS profile = pleural effusion or consolidation in posterior exam

Pulmonary edema (cardiogenic): The B profile is seen. The transudate is pushed against gravity up to the anterior wall, with symmetrical patterns.
Chronic obstructive lung disease, asthma: The A profile is seen. These are bronchial disease and should give us a normal lung surface.
Pulmonary embolism: The A profile with lower extremity venous thrombosis is seen. This should not show us an interstitial change, and a normal anterior lung surface with addition of lower extremity ultrasound might help diagnose.
Pneumothorax: The A' profile is seen. Lung sliding is absent. No B lines, no lung pulse. A lung point should be searched for and if found can be sure pneumothorax is present (also can be mistaken with blebs).
Pneumonia: A/B profile, B' profile, and C profile are the main ones seen. Due to many different types of pneumonias, the signs seen on lung ultrasound are various. The loss of lung sliding is due to inflammatory adherences due to exudate. They usually present with asymmetric patterns.

Pleural effusion: PLAPS point is seen with anechoic space in the mid-axillary or posterior thorax regions.

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Figure 1 - Algorithm