Module: Advanced Lung (Credit Hours: 20)

This module builds on the basic Lung module, so if you have not completed that module, it is recommended you go back and complete basic Lung module first. In this module you will learn how to identify pneumonia, and together with what you learned in the basic lung module how to put it all together to evaluate the respiratory failure patient in an algorithm format.

Questionnaire. These are the questions that should be answered by the Trainee:

1. **Level of Trainee:** Medical Student, Resident, Fellow, Advanced Practice Provider, Faculty, or Other
2. **Previous Ultrasound Knowledge (as estimated by trainee):** none, some experience, moderate experience, very comfortable
3. **Approximate Number of Hands on Scans performed (as estimated by trainee):** less than 10, 10-100, greater than 100

**Step 1 (1 hour):** Self Learning Pre-Tests: No minimum score needed to move on to next section, 5 questions per section

COPD Asthma
Pneumonia
Lung Profiles

**Reading:** UF Local Material: Pneumonia Supporting Literature (with figures)

**Step 2: Review Competency Goals for this module:**

- Identification of a relatively hypoechoic or echo-free space surrounded by typical anatomic boundaries: diaphragm, chest wall, ribs, visceral pleura, normal/consolidated/atelectatic lung
- Identification of liver and ascites, spleen, kidney, heart, pericardium and pericardial effusion, spinal column, aorta, inferior vena cava
- Identification of characteristic dynamic findings of pleural fluid, such as diaphragmatic motion, floating lung, dynamic fluid motion, respirophasic shape change
- Characterization of fluid: anechoic; echogenicity (using liver/spleen as reference); homogeneous or heterogeneous; presence of strands/debris/septations
- Performance of semi quantitative assessment of fluid volume
- Identification of miscellaneous findings, such as pleural based masses or thickening
Recognition of specific limitations of ultrasonography to identify pleural fluid, such as inadequate image quality due to technical limitations, subcutaneous emphysema, hemothorax, echo-dense purulent fluid, mimics of effusion such as mesothelioma or pleural fibrosis

**Step 3 (1 hours):** Watch the Didactic lectures and Bedside Videos listed below:

**Didactic Lecture:** Rohit Patel, MD: Pneumonia: [https://youtu.be/31suD8WNLO4](https://youtu.be/31suD8WNLO4)

**Didactic Lecture:** Rohit Patel, MD: DVT (for use in evaluation of Pulmonary Embolism): [https://youtu.be/14-9BgzUcFg](https://youtu.be/14-9BgzUcFg)

**Bedside Video:** COPD-Asthma: COPD/Asthma - Ali Dabaja, CCM, Emergency Medicine [https://youtu.be/pEY-O5zGo9A](https://youtu.be/pEY-O5zGo9A)

**Bedside Video:** Pneumonia: Pneumonia - Shalu Patel, Emergency Medicine ([https://youtu.be/GSO_IfpihZw](https://youtu.be/GSO_IfpihZw))


**Step 4 (4 hours):** Reading:


Before moving onto the next section, please complete the following:

1. (From Lichtenstein Article): The lung point may be explained by a slight increase in pulmonary volume during ________. (answer: inspiration)
2. (From Reissig Article): The most important parenchymal criterion is the positive air________ within an echopoor area to diagnose pneumonia. (answer: bronchogram)
3. (From Chavez Article): This meta-analysis found lung ultrasound had a high sensitivity (___%) and specificity (___%) for the diagnosis of pneumonia in adults. (answer: 94%, 96%)
4. (From Koenig Article): This preliminary report indicates that combining thoracic ultrasonography, limited _____, and lower extremity DVT study might ahve use in reducing unnecessary CTPA ordered to rule out PE. (answer: ECG, or EKG, or electrocardiogram)
Step 5: Review the Tip Sheet Review: Review the Lung TIP SHEET.

Step 6 (1 hour): Active Learning: If you are part of a UF Health training program (advanced practice provider, resident, fellow, or faculty), go to your intensive care unit or emergency department setting and obtain 3 views of the right lung. Be sure to demonstrate proper location by saving images of the hepatorenal space, then the diaphragm location, then the lung. Take the Lung TIP SHEET with you as you are working through this procedure. If you are a student and do not have access to a machine, please place “student” in name of unit, and appropriate date.

In order to move on to next section, please document the following:

1. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)
2. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)
3. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)

Step 7 (1 hour): Watch the Didactic lecture and Bedside Videos as listed below

**Didactic Lecture:** Respiratory Failure: [https://youtu.be/qsFmZl pecA](https://youtu.be/qsFmZl pecA)

**Bedside Video:** Respiratory Failure: Acute Respiratory Failure - Joel Rowe, Emergency Medicine [https://youtu.be/cvO2KUBz6Ds](https://youtu.be/cvO2KUBz6Ds)

**Bedside Video:** Lung Profiles: Lung Profiles - Ali Dabaja, Medicine ICU [https://youtu.be/YqW2UqI LAEG](https://youtu.be/YqW2UqI LAEG)

**Reading:** UF Local Material: Hypoxia Supporting Literature (with figures)

Step 8 (3 hours): Reading:


Before moving on to the next section, please complete the following:

1. (From Volpicelli Article): Level __ recommendation is given for in the detection of effusion, lung ultrasound is more accurate than supine radiography and is as accurate as CT. (answer: A)
2. (From Lichtenstein Article): A patient with lung sliding present with B profile is suggestive of ________. (answer: pulmonary edema)
3. (From Bataille Article): The study demonstrated a significant better performance of _____ ultrasound versus lung ultrasound in the diagnosis of acute respiratory failure. (answer: thoracic)

**Step 9 (1 hour): Review the following Sample Video Clip Review (Part 1):**
Review Lung18 to Lung26

Lung18:
This video depicts lung sliding of the right lung. This is a normal finding.

Lung19:
This video depicts lung sliding of the left lung. This is a normal finding.

Lung20:
This video depicts no lung sliding and should be correlated for pneumonia or pneumothorax.

Lung21:
This image depicts a still image of a guidewire in the pleural space during drainage of a pleural effusion. This would depict good positioning for placement of an ultrasound guided chest tube via seldinger technique.

Lung22:
This video depicts a large pleural effusion that should be considered for drainage via chest tube.

Lung23:
This video depicts a large pleural effusion that should be considered via drainage via chest tube. Fluid-filled air bronchograms can be seen in the lung.

Lung24:
This image depicts ultrasound evidence of a significant lung contusion.

Lung25:
This image is a still image of the left lung which depicts B lines.
Lung26:

This video depicts a complex pleural effusion of the left lung that is loculated. A single chest tube would not be helpful for drainage in this circumstance and evaluation by interventional radiology should be considered.

**Step 10: Review Tip Sheet Review:** Review the **Lung TIP SHEET**.

![Step 11 (2 hours): Active Learning](image)

**Step 11 (2 hours): Active Learning:** If you are part of a UF Health training program (advanced practice provider, resident, fellow, or faculty), go to your intensive care unit or emergency department setting and obtain 3 scans of a patient that is hypoxic. Find patients that is a difficult wean or acute endotracheal intubation due to respiratory failure. Be sure to note the profile of the patient, A, B, or A/B and not presence of lung sliding or absence. Take the Lung TIP SHEET with you for review while you are doing this procedure. If you are a student and do not have access to a machine, please place “student” in name of unit, and appropriate date.

In order to move on to next section, please document the following:

1. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)
2. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)
3. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)

**Step 12 (1 hour): Review Sample Video Clip Review (Part 2):**

Review Lung27 to Lung35

Lung27:

This image depicts a large lung abscess of the right lung. This fluid collection should be drained.

Lung28:

This image depicts a moderately sized pleural effusion of the right lung. Very little respiratory variation is seen in this video which could be indicative of a breath hold or apnea.

Lung29:

This image depicts a still image of the lung in M mode of PLAPS point. This image depicts a sinusoid sign. Sinusoid sign is seen only in M mode and has a high sensitivity and specificity for pleural effusion.
This image depicts a still image of the lung in M mode of PLAPS point. This image depicts a sinusoid sign. Sinusoid sign is seen only in M mode and has a high sensitivity and specificity for pleural effusion.

This image is a still image of the right lung at PLAPS point which depicts shred sign, which is consistent with lung consolidation.

This image is an M-mode image of a right pneumothorax.

This video depicts shred sign which is consistent with lung consolidation.

This video revels shred sign (consolidated lung) with a large pleural effusion.

This video shows a large pleural effusion with fibrin stranding.

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**Step 13 (1 hour): Observed Learning:** Print out the Advanced Lung Observed Learning form and have the appropriate ultrasound trained supervisor (preferably faculty who has Ultrasound Privileges at UF Health) complete the bedside form on a patient you are taking care of. Save these in your portfolio for any future documentation requirements. If you are a student and do not have access to a machine, please place the type of student you are in the Faculty Advisor section, and appropriate date.

Before moving onto the next section please complete the following:

1. Faculty Advisor and Date of observation.

**Step 14 (2 hours): Review the following Case Scenarios:** The following are case scenarios, see if you can answer the questions related to specific cases with corresponding ultrasound information.
Step 15: Read the following: Quality Assurance: For UF Health advanced practice providers, ICU fellows, and ICU faculty, quality assurance is performed in individual units and follows the criteria listed below. The QA process will be done through Qpath (see Qpath instruction sheet) and will be required as a continuing process for fellows and attending physicians performing ultrasound in the intensive care units. Qpath allows individuals to submit cases for review. ICU fellows will be required to submit 2 QA's per application per month (limited cardiac, thoracic, vascular/procedural, abdomen). This should result in approximately 80 reviewed scans per year (~25% of all scans done). In addition, faculty who are identified as “Reviewers” are able to review scans on an intermittent basis. The following is the scale we will be using:

5: Excellent images, adequate for evaluation and decision making - No intervention required

4: Good images, adequate for evaluation and decision making - PDF sent to fellow/attending physician on what could have been done better

3: Poor to Good images, not adequate for evaluation and decision making - PDF sent to fellow/attending physician on what could have been done better

2: Inadequate images; not adequate for any interpretation to perform, unable to identify system studied; PDF sent to fellow/attending physician on what could have been done better

1: Poor to good images; patient care decision with possible risk (chest tube placed for no pleural effusion causing pneumothorax, chest tube placed in abdomen, poor heart function evaluated as hyperdynamic and inappropriately given IV fluids); intervention required is meeting with all attending physicians and fellow involved with action plan.

Step 16 (1 hour): Speed Skills: If you are part of a UF Health training program (advanced practice provider, resident, fellow, or faculty), go to your intensive care unit or emergency department setting and obtain 3 left lung in mid-axillary spaces of 3 different patients in 15 minutes or less. Be sure to place appropriate patient information data, operator information, and labels for body parts examined. If you are a student and do not have access to a machine, please place “student” in name of unit, and appropriate date.

In order to move on to next section, please document the following:

1. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)
2. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)
3. Name of Unit images obtained (ED, 4WEST, MICU, etc) and Date (no identifying information necessary)

**Step 17 (1 hour): Final Self Learning Tests: Must obtain 80% to complete module**

COPD Asthma  
Pneumonia  
Lung Profiles

**Questionnaire (must complete this part of module to receive final credit):**

-Please identify up to three concrete, measurable changes you plan to apply as a result of participating in this program. Your responses will help us better evaluate specific areas of impact and future conferences. As a result of this program, I commit to change the following:

1.  
2.  
3.  

-Will Information gained from this module result in enhancing patient care (yes or no)  
-Please rate your confidence in implementing these changes (high, moderate, low, no)  
-Please identify any barriers you perceive in implementing these changes (select all that apply) (cost, lack of time, lack of administrative support, insurance/reimbursement issues, patient compliance issues, lack of consensus of professional)  
-The material was presented at an appropriate level (1,2,3,4,5)  
-I have gained knowledge that will improve patient care (1,2,3,4,5)  
-The program met my expectations in accomplishing the educational objectives (1,2,3,4,5)  
-The program content was objective, balanced, and free from commercial bias or influence (1,2,3,4,5)  
Your overall rating of the quality of the education offered at this program (1,2,3,4,5)  
Additional Comments (How can this program be improved?, etc): FREE TEXT

**Final:** Thank You for taking this module!