



Lung POCUS Learning Modules Curriculum Outline

Domains	Description	Module Content %	Summative Assessment %	Resources and References
Introduction to Lung POCUS	<p>Define Lung POCUS:</p> <ol style="list-style-type: none"> 1. Define lung POCUS and its significance in clinical practice. 2. Recognize when lung POCUS should be used in patient assessment 	16%	17%	<p>Kok B, Wolthuis D, Bosch F, van der Hoeven H, Blans M. POCUS in dyspnea, nontraumatic hypotension, and shock; a systematic review of existing evidence. <i>European Journal of Internal Medicine</i>. 2022;106:9-38.</p>
Anatomy of the Lungs	<p>Identify and Interpret Lung Anatomy:</p> <ol style="list-style-type: none"> 1. Review the basic anatomical structure of the lungs 2. Recognize the anatomical relationship between the lungs and adjacent structures or organs within the thoracic and the upper abdominal cavity. 	6%	6%	<p>Chaudhry R, Bordoni B. <i>Anatomy, Thorax, Lungs</i>. National Library of Medicine. Published January 13, 2019. https://www.ncbi.nlm.nih.gov/books/NBK470197/</p> <p>Gordan Betts J, Desaix P, Johnson E, et al. <i>Anatomy and Physiology 2e</i>. Rice University; 2022. https://openstax.org/details/books/anatomy-and-physiology-2e</p> <p>Gray, Henry. <i>Anatomy of the Human Body</i>. Philadelphia: Lea & Febiger, 1918; Bartleby.com, 2000. www.bartleby.com/107/.</p> <p>Sapin MR, Kolesnikov LL, Nikitjuk DB. <i>Textbook of Human Anatomy: For Medical Students. Vol Volume 1</i>. New Wave Publishing Agency; 2019. https://archive.org/details/006240629</p>
Principles of Ultrasound Imaging	<p>Explain the fundamental principles of ultrasound imaging in lung POCUS:</p> <ol style="list-style-type: none"> 1. Describe the systematic approach to conducting a lung ultrasound, detailing patient positioning, probe/preset selection, imaging windows and scanning zones. 2. Develop a standardized protocol for image acquisition to ensure consistency and reproducibility in lung ultrasound exams. 3. Analyze ultrasound findings in relation to the patient's history, symptoms, and clinical examination. 4. Critically appraise how lung ultrasound results can inform clinical decision-making and management strategies for respiratory conditions. 	16%	18%	<p>Staub LJ, Mazzali Biscaro RR, Kaszubowski E, Maurici R. Lung ultrasound for the emergency diagnosis of pneumonia, acute heart failure, and exacerbations of chronic obstructive pulmonary disease/asthma in adults: a systematic review and meta-analysis. <i>The Journal of Emergency Medicine</i>. 2019;56(1):53-69.</p> <p>Kharasch S, Duggan NM, Cohen AR, Shokoohi H. Lung Ultrasound in Children with Respiratory Tract Infections: Viral, Bacterial or COVID-19? A Narrative Review. <i>Open Access Emergency Medicine</i>. 2020;Volume 12:275-285. doi:https://doi.org/10.2147/oaem.s238702</p> <p>See Page 4 for additional resources and references.</p>



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Ultrasound Findings and Correlation with Anatomy	<p>Identify and interpret sonographic findings related to the lungs:</p> <ol style="list-style-type: none"> 1. Identify key anatomical features and structures within the lung fields that can be visualized with ultrasound. 2. Review normal and abnormal sonographic imaging findings. 3. Identify the lung scanning zone commonly used 	9%	10%	<p>Bhoil R, Ahluwalia A, Chopra R, Surya M, Bhoil S. Signs and lines in lung ultrasound. <i>J Ultrason</i>. 2021;21(86):e225-e233. doi:10.15557/JoU.2021.0036</p> <p>Sapin MR, Kolesnikov LL, Nikitjuk DB. <i>Textbook of Human Anatomy: For Medical Students</i>. Vol Volume 1. New Wave Publishing Agency; 2019. https://archive.org/details/006240629</p> <p>Soni NJ, Arntfield R, Kory P. <i>Point-of-Care Ultrasound</i>.; 2020.</p> <p>Sharma A, Subramani S. <i>Point-of-Care Ultrasound of the Lungs</i>. Published online January 1, 2022;81-101. doi:https://doi.org/10.1007/978-981-16-7687-1_</p>
Thoracic Ultrasound Artifacts and Sonographic Findings	<p>Analyze and interpret various sonographic findings encountered in lung POCUS:</p> <ol style="list-style-type: none"> 1. Recognize the typical sonographic patterns observed in healthy lung tissue and relevant non-pathological artifacts that may occur. 2. Recognize sonographic patterns and artifacts that indicate pathology (such as the presence of irregular pleural lines, increased B-lines, and the absence of normal lung sliding) and ultimately associate these findings with specific clinical conditions. 	19%	20%	<p>Soni NJ, Arntfield R, Kory P. <i>Point-of-Care Ultrasound</i>.; 2020.</p> <p>Bhoil R, Ahluwalia A, Chopra R, Surya M, Bhoil S. Signs and lines in lung ultrasound. <i>J Ultrason</i>. 2021;21(86):e225-e233. doi:10.15557/JoU.2021.0036</p> <p>Bell D, Carroll D. A-line (ultrasound). <i>Radiopaedia</i>org. Published online September 30, 2018. doi:https://doi.org/10.53347/rid-63388</p> <p>Francisco MJ Neto, Rahal A Junior, Vieira FA, Silva PS, Funari MB. <i>Advances in lung ultrasound</i>. <i>Einstein (Sao Paulo)</i>. 2016;14(3):443-448. doi:10.1590/S1679-45082016MD3557</p> <p>Sharma R, Sajid R. Thoracic spine sign (ultrasound). <i>Radiopaedia</i>org. Published online January 30, 2017. doi:https://doi.org/10.53347/rid-50946</p> <p>Copetti R. Lung Pulse with Pneumothorax: Examine the Thoracic Artery and Veins. <i>Anesthesiology</i>. 2019;131(3):666. doi:10.1097/ALN.0000000000002756</p> <p>T. D, D. B. Lung Ultrasound Comet Tails — Technique and Clinical Significance. <i>Hot Topics in Echocardiography</i>. Published online November 6, 2013. doi:https://doi.org/10.5772/56198</p>



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Integration of Ultrasound into Management: Clinical Examples	<p>Evaluate and integrate sonographic findings with clinical information for diagnostic purposes:</p> <ol style="list-style-type: none"> 1. Engage in the review of clinical cases that highlight common lung pathologies diagnosed with ultrasound. 2. Integrate clinical and sonographic findings to formulate a preliminary diagnosis. 3. Recognize when to use ultrasound in conjunction with other imaging methods for optimal patient outcomes. 	27%	29%	<p>Lichtenstein DA, Mezière GA. Relevance of lung ultrasound in the diagnosis of acute respiratory failure: the BLUE protocol [published correction appears in Chest. 2013 Aug;144(2):721]. Chest. 2008;134(1):117-125. doi:10.1378/chest.07-2800</p> <p>Javaudin F, Marjanovic N, de Carvalho H, et al. Contribution of lung ultrasound in diagnosis of community-acquired pneumonia in the emergency department: a prospective multicentre study. BMJ Open. 2021;11(9):e046849. Published 2021 Sep 24. doi:10.1136/bmjopen-2020-046849</p> <p>Soni NJ, Arntfield R, Kory P. Point-of-Care Ultrasound.; 2020.</p> <p>Sharma R, Sajid R. Thoracic spine sign (ultrasound). Radiopaedia.org. Published online January 30, 2017. doi:https://doi.org/10.53347/rid-50946</p> <p>Zhu R, Ma XC. Clinical Value of Ultrasonography in Diagnosis of Pulmonary Embolism in Critically Ill Patients. J Transl Int Med. 2017;5(4):200-204. Published 2017 Dec 29. doi:10.1515/jtim-2017-0034</p> <p>Falcetta, Andrea, Stefano Leccardi, Elisa Testa, Francesca Papaleo, Luigi Fenoglio, & Remo Melchio. "The role of lung ultrasound in the diagnosis of interstitial lung disease." Shanghai Chest [Online], 2.5 (2018): n. pag. Web. 25 Sep. 2023</p> <p>Yan JH, Pan L, Gao YB, Cui GH, Wang YH. Utility of lung ultrasound to identify interstitial lung disease: An observational study based on the STROBE guidelines. Medicine (Baltimore). 2021;100(12):e25217. doi:10.1097/MD.00000000000025217</p> <p>Hafez MR, Sobh ES, Elsayy SB, Abo-Elkheir OI. The usefulness of thoracic ultrasonography in diagnosis and staging of bronchogenic carcinoma. Ultrasound. 2017;25(4):200-212. doi:10.1177/1742271X17721264</p>
Conclusion	Summarize key concepts and skills related to lung POCUS	7%	—	-----



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Domains	Additional Resources and References
Principles of Ultrasound Imaging	<p>Conlon TW, Nishisaki A, Singh Y, et al. Moving Beyond the Stethoscope: Diagnostic Point-of-Care Ultrasound in Pediatric Practice. <i>Pediatrics</i>. 2019;144(4):e20191402. doi:https://doi.org/10.1542/peds.2019-1402</p> <p>Scheier E, Levick N, Peled J, Balla U. Could It Be Pneumonia? Lung Ultrasound in Children With Low Clinical Suspicion for Pneumonia. <i>Pediatric Quality & Safety</i>. 2020;5(4):e326. doi:https://doi.org/10.1097/pq9.0000000000000326</p> <p>Yilmaz HL, Özkaya AK, Sarı Gökay S, Tolu Kendir Ö, Şenol H. Point-of-care lung ultrasound in children with community acquired pneumonia. <i>The American Journal of Emergency Medicine</i>. 2017;35(7):964-969. doi:https://doi.org/10.1016/j.ajem.2017.01.065</p> <p>Gravel CA, Monuteaux MC, Levy JA, Miller AF, Vieira RL, Bachur RG. Interrater reliability of pediatric point-of-care lung ultrasound findings. <i>The American Journal of Emergency Medicine</i>. 2020;38(1):1-6. doi:https://doi.org/10.1016/j.ajem.2019.01.047</p> <p>Soni NJ, Arntfield R, Kory P. <i>Point-of-Care Ultrasound</i>.; 2020.</p> <p>Sharma A, Subramani S. Point-of-Care Ultrasound of the Lungs. Published online January 1, 2022:81-101. doi:https://doi.org/10.1007/978-981-16-7687-1_4</p> <p>Baribeau Y, Sharkey A, Chaudhary O, et al. Handheld Point-of-Care Ultrasound Probes: The New Generation of POCUS. <i>Journal of Cardiothoracic and Vascular Anesthesia</i>. 2020;34(11):3139-3145. doi:https://doi.org/10.1053/j.jvca.2020.07.004</p> <p>Lichtenstein DA, Mezière GA. Relevance of lung ultrasound in the diagnosis of acute respiratory failure: the BLUE protocol [published correction appears in <i>Chest</i>. 2013 Aug;144(2):721]. <i>Chest</i>. 2008;134(1):117-125. doi:10.1378/chest.07-2800</p> <p>Millington SJ, Koenig S, Mayo P, Volpicelli G. Lung Ultrasound for Patients With Coronavirus Disease 2019 Pulmonary Disease. <i>Chest</i>. 2021;159(1):205-211. doi:10.1016/j.chest.2020.08.2054</p> <p>Rouby JJ, Arbelot C, Gao Y, et al. Training for Lung Ultrasound Score Measurement in Critically Ill Patients. <i>Am J Respir Crit Care Med</i>. 2018;198(3):398-401. doi:10.1164/rccm.201802-0227LE</p> <p>Hendin A, Koenig S, Millington SJ. Better With Ultrasound: Thoracic Ultrasound. <i>Chest</i>. 2020;158(5):2082-2089. doi:10.1016/j.chest.2020.04.052</p>