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*Short Report*

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# Lung POCUS in the cardiac PICU is feasible and accurate but be aware of your apical lung views!

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## Short report

Up to 63% of the patients admitted to the Pediatric (cardiac) Intensive Care (PICU) unit need Invasive Mechanical Ventilation (IMV), which is associated with complications, such as pneumothorax, pleural effusion, consolidation and/or fluid overload. Lung Point-of-Care Ultrasound (POCUS) is rapidly evolving in our daily practice due to its advantages such as the lack of exposure to ionizing radiation, fast bedside use and easy repeatability in the event of an acute changes of the clinical situation [1].

We conducted a pilot study to assess the feasibility and accuracy of lung POCUS in our cardiac PICU population, comparing lung POCUS with Chest X-ray (CRX) in our routine clinical practice. This retrospective, observational study was approved by the Departmental Science Commission on May 6th, 2022, and informed consent was waived. We considered all lung POCUS studies performed between January and March 2022 for the study. A 6-point exam for general lung ultrasound was conducted using a linear probe by a trained operator. Patients were included if a comparative CXR, taken within six hours of ultrasound, was available. Lung POCUS images were anonymously compared by two observers with the written CXR reports noted by the radiologist. We defined four diagnostic possibilities: presence/absence of pneumothorax, consolidation, pleural effusion and fluid overload (defined as confluent B-lines). The gold standard was defined as an observed complication in any of the radiologic imaging tools used.

During the study period, a total of 72 lung POCUS examinations were performed, of which 25 were conducted within the six-hour window of a comparative CXR. The indication for IMV in all patients (n=14) was post-cardiac surgery with a median age of 2 months (IQR 0-3 months). Lung POCUS exhibited higher sensitivity in detecting of all four observed complications compared to CXR. In four cases, complications were missed on lung POCUS while present on CXR: consolidation of the upper lobe in 2 cases, retrocardiac consolidation, and a very small (2 mm) apical pleural effusion. However, none of these missed observations had clinical implications.

Our study demonstrated that the use of lung POCUS in critically ill cardiac children had better sensitivity for the detecting pulmonary complications like pneumothorax, pleural effusion,

consolidation and/or fluid overload when performed by trained staff compared to CXR. These results are consistent with current literature for a general PICU population [2-4]. Known diagnostic challenges of lung POCUS include visualization of specific regions such as the paravertebral and retrocardiac regions, patients with air leak syndromes, and errors due to inadequate training or experience of the operator. In addition to these challenges, we also want to raise awareness for the apical views of the lungs in pediatric POCUS, as abnormalities can easily be missed in this region if not explicitly sought. In conclusion, lung POCUS is feasible in the cardiac PICU population with good sensitivity for pulmonary complications.

## Declarations

**Ethics approval and consent to participate:** This study was approved by the Departmental Science Commission on May 6th, 2022 with waiver of informed consent (N22.019).

**Availability of data and material:** The dataset used and/or analyzed during the current study is available from the corresponding author on reasonable request.

**Competing interests:** The authors declare that they have no competing interests.

**Authors' contributions:** SH, TL and AW performed all lung ultrasounds, lung POCUS images were anonymously compared by two observers (SH, TL and/or AW) with the written CXR reports noted by the radiologist, SH analyzed all collected study data and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

## References

1. Ammirabile AD, Buonsenso, Di Mauro A. Lung Ultrasound in Pediatrics and Neonatology: An Update. Healthcare (Basel). 2021; 9: 8.

2. Abdalla WM, Elgendy, Abdelaziz AA, Ammar MA. Lung Ultrasound Versus Chest Radiography for the Diagnosis of Pneumothorax in Critically Ill Patients: A Prospective, Single-Blind Study. Saudi J Anaesth. 2016; 10: 265-9.

3. Balk DS, Lee C, Schafer J, Welwarth J, Hardin J, Novack V, et al. Lung Ultrasound Compared to Chest X-Ray for Diagnosis of Pediatric Pneumonia: A Meta-Analysis. Pediatr Pulmonol. 2018; 53: 1130-39.

4. Schapka E, Gee J, Cyrus JW, Goldstein G, Greenfield K, Marinello M, et al. Lung Ultrasound Versus Chest X-Ray for the Detection of Fluid Overload in Critically Ill Children: A Systematic Review. J Pediatr Intensive Care. 2022; 11: 177-82.