Diagnosing pneumonia with Lung Ultrasound: Assessing our ability to train and standardize physicians to Ultrasound Diagnosis of Pneumonia in children as part of a Pneumococcal Conjugate Vaccine effectiveness study from Sylhet, Bangladesh

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Objective

- We aimed to evaluate our ability to train and standardize physicians to use LUS, to diagnose pediatric pneumonia, as part of a pneumococcal conjugate vaccine (PCV) effectiveness study conducted in Sylhet, Bangladesh.

Background

- tool for the point-of-care diagnosis of pediatric pneumonia [1].
- The is currently no standardized approach to teaching how to use LUS to diagnose pediatric pneumonia [1].

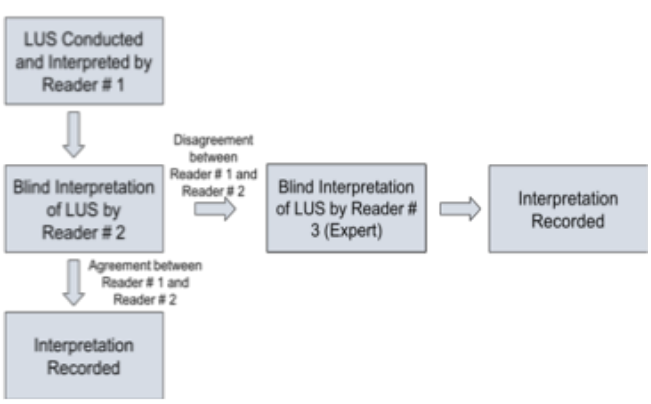
Methods

- Children aged 3-35 months enrolled in the PCV-10 impact evaluation underwent LUS after clinical diagnosis of pneumonia.
- Twenty-five physicians underwent a standardized teaching program to conduct and interpret LUS between May 2015 and October 2017.
- Each eligible child had LUS conducted by a study physician. A second physician, blinded to the first LUS results, interpreted the recorded LUS on the same day. Upon disagreement between the first and second readers, a blinded interpretation was done by an expert third reader.
- The inter-rater reliability among study physicians and between study physicians and expert readers, using Cohens kappa, was used to assess standardization.

Results

- We analyzed LUS data from 8,308 children enrolled into the PCV-10 study with clinical pneumonia. 28.9% of these children had evidence of sonographic pneumonia on LUS.

Figure 1. Flow Diagram of LUS Quality Control Process



Results

Inter-Reader Agreement Between Lung Ultrasound Readers

- Study physicians had high agreement when the first and second readers were compared (Figure 2).
- This agreement is slightly reduced, but still when both readers are compared to an expert reader (Figure 2).

Figure 2. Inter-Rater Agreement between Lung Ultrasound Readers

Inter-Reader Agreement	Kappa	95 % Confidence Interval	Adjusted Kappa*
Reader # 1 + Reader # 2	0.85	0.84-0.86	0.88
Reader # 1 + Reader # 2 + Reader # 3(Expert)	0.81	0.79-0.82	

Conclusions

- potential to improve diagnostic capabilities and may be directly applicable in field intervention trials of pediatric pneumonia.
- We have developed a teaching and quality control program to train and standardize physicians to diagnose pneumonia on LUS.
- Our program has been able to train and standardize 25 physicians with a high level of inter-rater agreement.
- We have been successful in maintaining this level of agreement over the course of our 2.5 year study.

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References

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