

Diaphragm Ultrasound Education for Respiratory Scientists: Evaluating Training Outcomes and Measurement Reliability

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Background

- Diaphragm ultrasonography is a non-invasive bedside method to assess diaphragm motion and thickness. It is a superior alternative to fluoroscopy yet not widely performed.
- Respiratory scientists are uniquely positioned to integrate diaphragm ultrasound into clinical settings.
- There is currently no established training framework for diaphragm ultrasound.

Aims and Hypothesis

- **Aim:** assess whether a four week structured training program can successfully train ultrasound naïve respiratory scientists to perform reliable right hemidia-phragm ultrasound measurements.
- **Hypothesis:** inter-rater and intra-rater reliability of measurements would show good agreement.

Materials and Methods

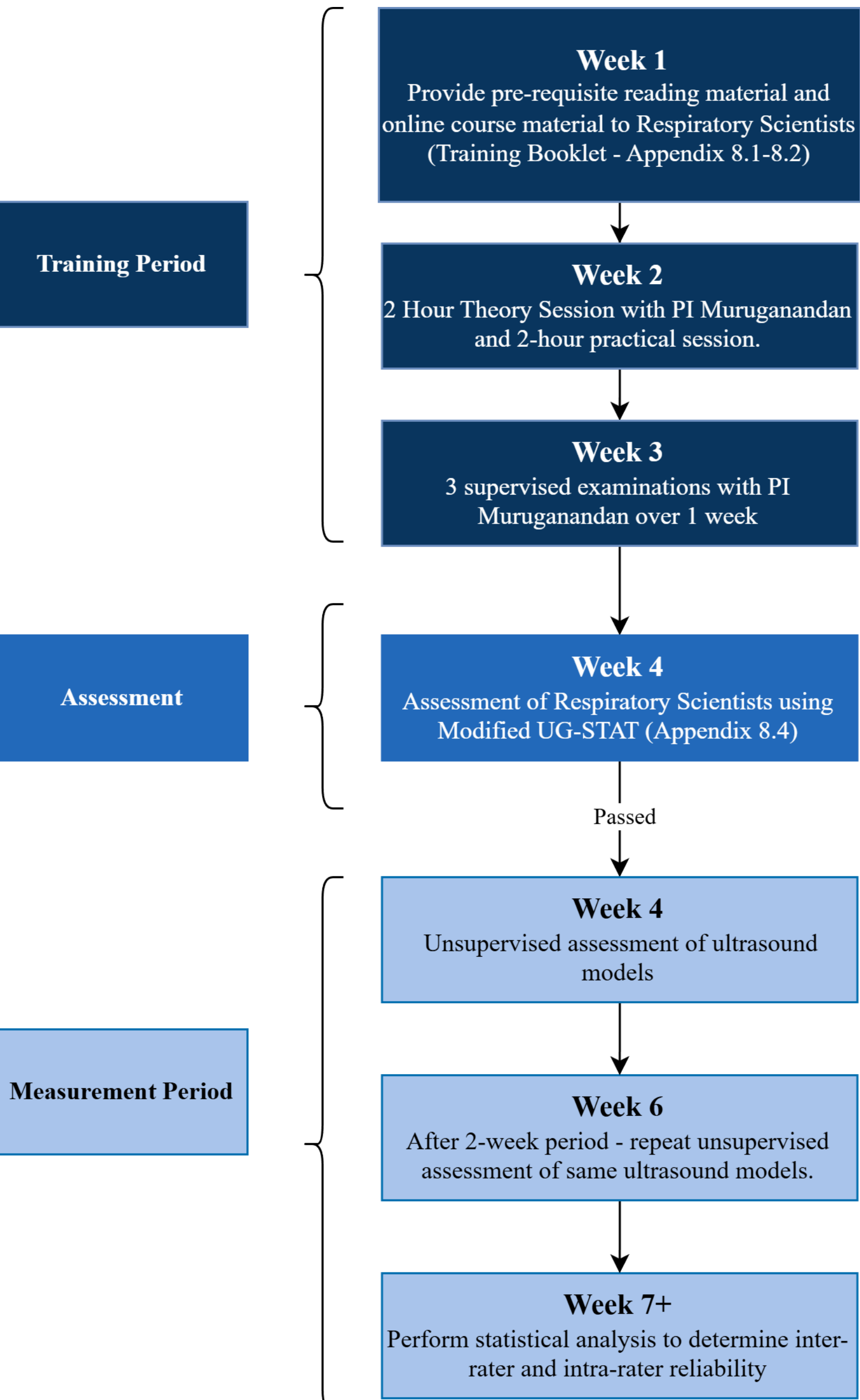


Figure 1: Flowchart of Training Timeline

- Inter-rater reliability of measurements were obtained during session 1 and 2
- Intra-rater reliability of measurements were obtained across session 1 and 2

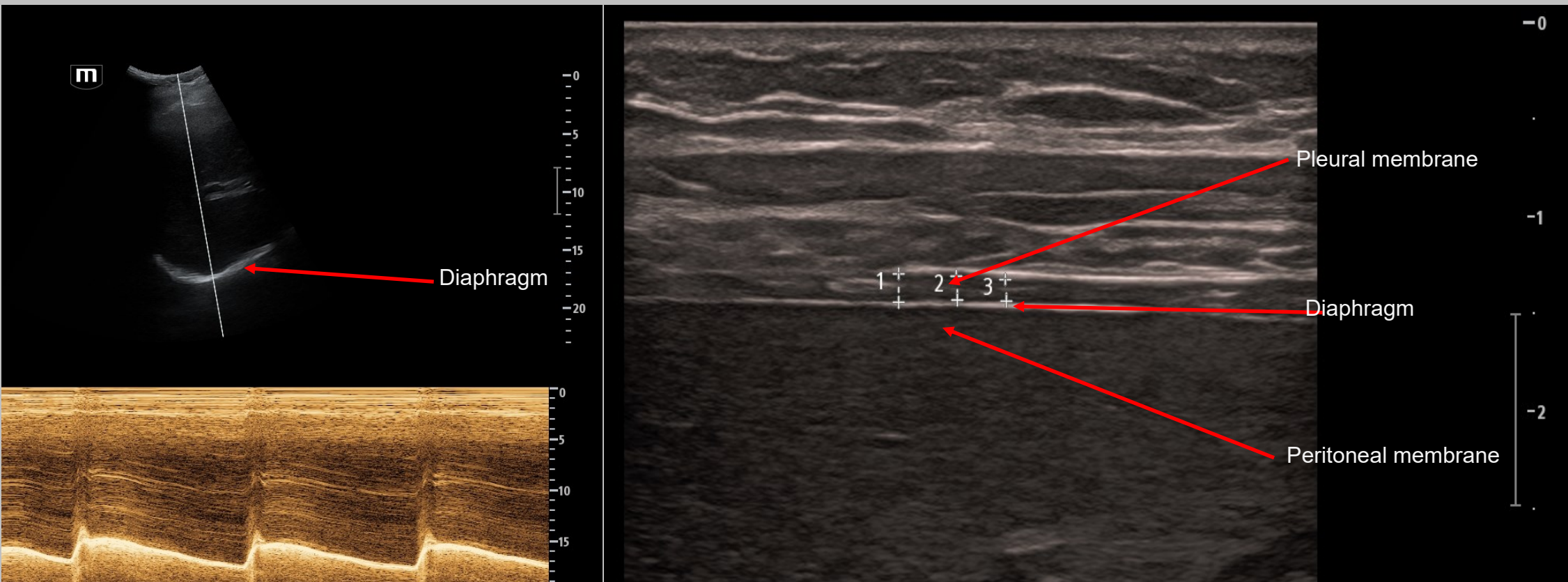


Figure 2: B mode and M mode measurements of diaphragm excursion (left) and thickness (right).

Results and Discussion

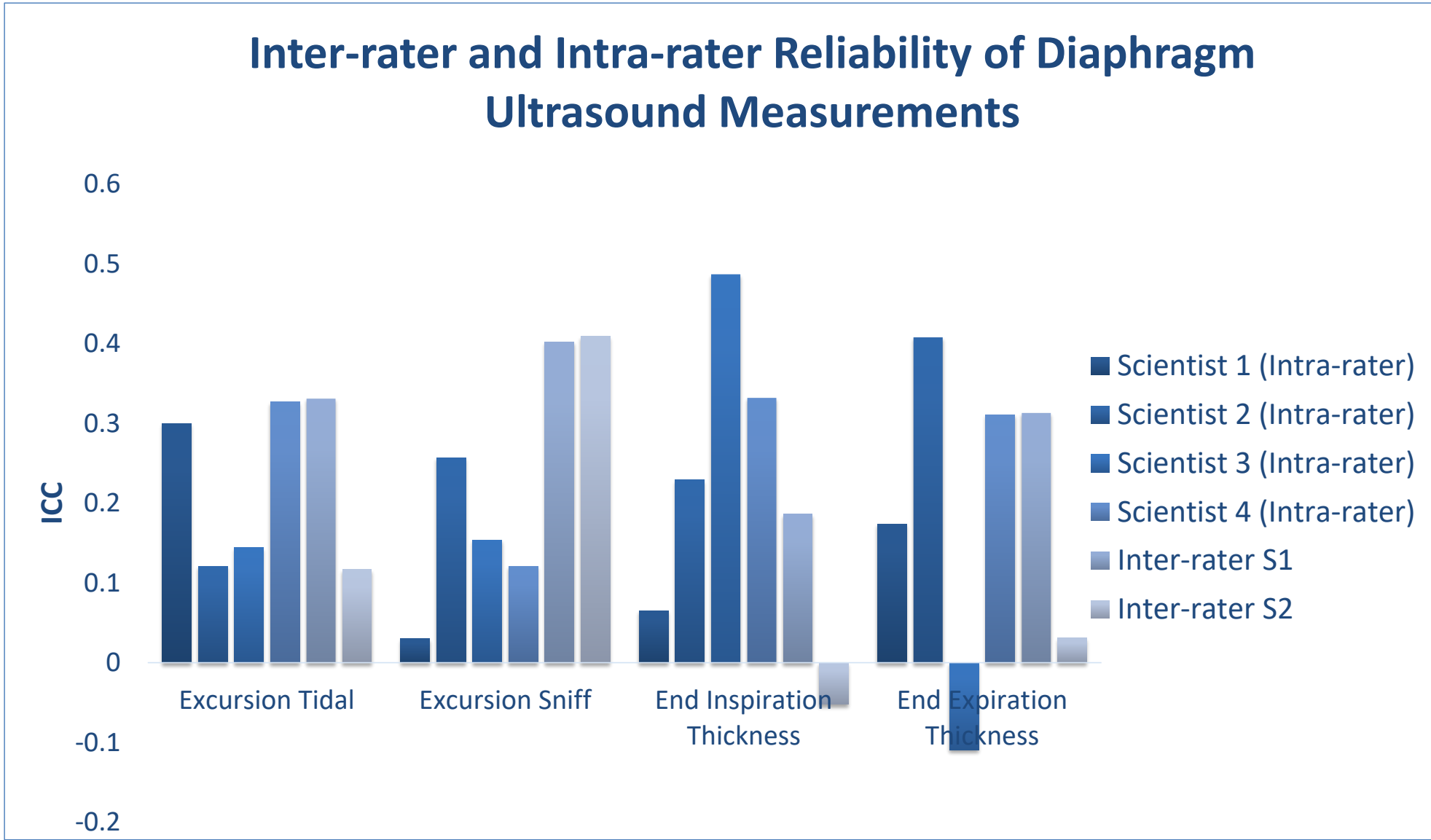


Figure 3: Inter-rater reliability of measurements across four scientists during session one and two, and intra-rater reliability across session one and two.

- All intra-class correlation coefficient values were <0.5 , which indicates poor reliability of measurements across scientists as well as across time. (1)
- Inter-rater reliability was greatest for diaphragm excursion measurements.
- As scientists performed more scans they became quicker.
- Results are inline with some other studies that used novices (2) but expert operators are shown to have excellent agreement.

Limitations

- Pilot work with limited capacity to test educational program negating ability to deliver it to an ultrasound naïve population.
- Limited by clinical commitments and difficulties finding availability for supervised practice.
- ICC is a summary statistic, not enough statistical power to exclude outliers when performing ICC calculations.

Future Directions

- Extended training program, minimum of 40 scans, at least half of which are supervised. (3)

Conclusion:

- A four week diaphragm ultrasound training program was unable to train novice respiratory scientists to reliably perform diaphragm excursion and thickness measurements.
- Alterations to the first iteration of the training program with greater focus on supervised examinations, and troubleshooting with more opportunities for Q&A after sessions may be more effective in this context, but requires further evaluation

References

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