

Device to Measure Respiratory Movement with Ventilation in Infant Patients

Authors: Damian Mozier¹, Blake Meyer¹, Robert Colson¹, Isabel Creamer¹
 Advisors: Dr. Adrian Shieh¹, PhD and Dr. Heather Brossman², PT, DPT, MS, DHS
¹Drexel University School of Biomedical Engineering, Science and Health Systems
²Drexel University College of Nursing and Health Professions

Problem

Societal Need

- 3/4 of top 4 causes for hospitalizations in kids age 1-4 are respiratory related [1]
- Δ in chest circumference used to assess improvement, interventions, and create discharge timelines

Current Limitations of Manual Measurement [2]

- ✗ Inter/Intra-User Variation
- ✗ Calibration
- ✗ Difficult to use

Objective

Create a device for measuring infant chest circumference change with breathing that is

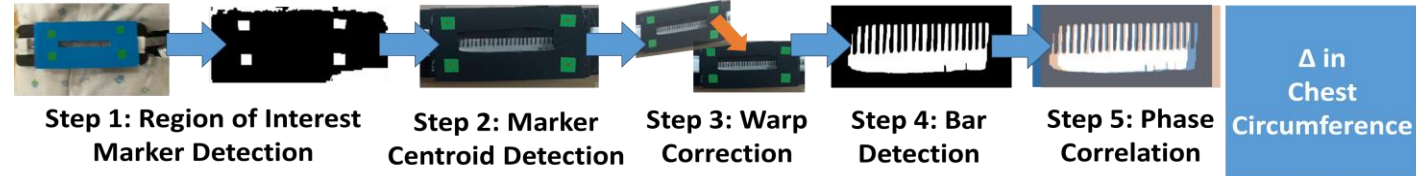
- ✓ Noninvasive
- ✓ Accurate
- ✓ Easy-to-use

To be used by Pediatric Respiratory Therapists

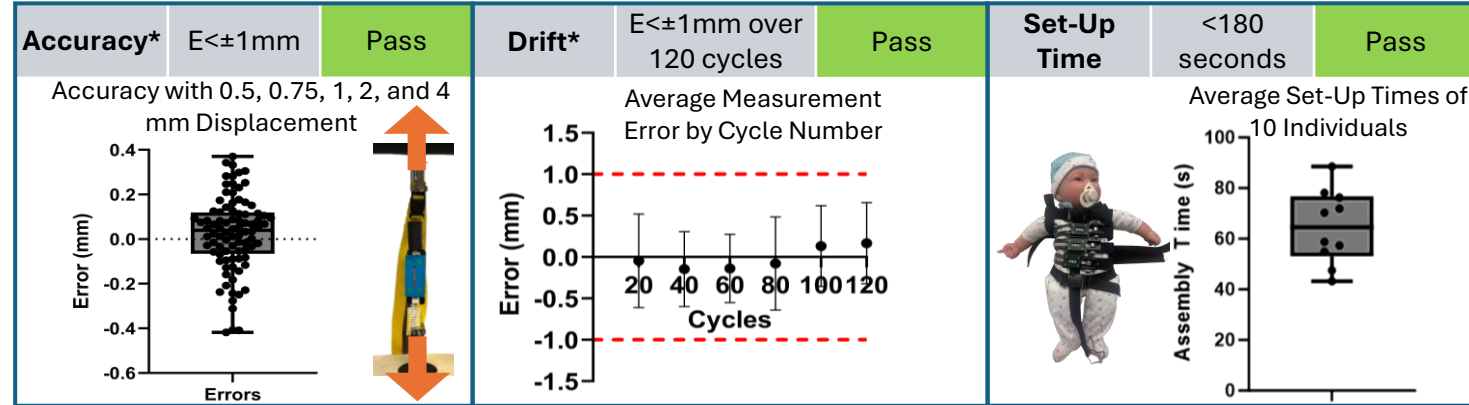


Results
 across clinicians

Code Processing



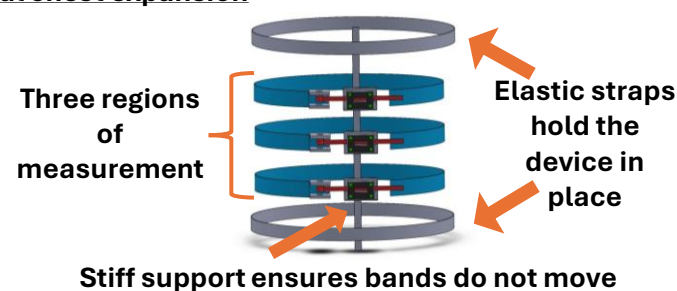
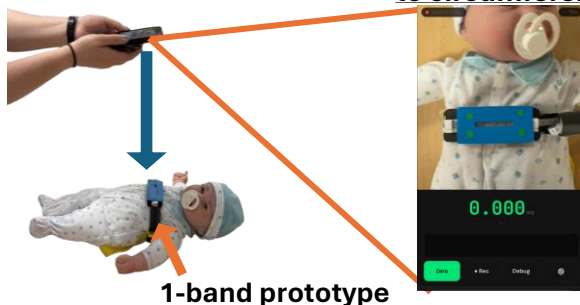
Results



* Force to displace band was < 18.4 N per meter width normal force, necessary for unrestricted breathing

Solution

A 3-band measurement system and web app that can record marker movement of the band and translate to circumferential chest expansion



Chest Expansion $\rightarrow$ Band Displacement $\rightarrow$ Code Processing $\rightarrow$ Measured Circumference Change

Conclusion

Innovation: Created a more reliable and accurate assessment device without increasing burden on pediatric respiratory therapists

User Impact: Standardized assessment of patient recovery and longitudinal evaluation to create better standard of care

Societal Impact: Improve patient outcomes and treatment timelines in children with respiratory related hospitalizations

Acknowledgments

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References

- [1] Weiss et al., 2022, 10.14238/pi18.9-10.1978.243-62 [2] Phulgirkar et al., 2023, 10.4103/jopp.jopp_46_23 [3] G. L. Harris, 2019, 10.6028/nist.ir.6969-2019