Pediatric Nocturnal Respiratory Rate Monitoring Using a Non-Contact and Passive Bedside Device: Accuracy of the *Albus Home* Research Device (RD)

Dr C. Wheeler[1], Dr W. Do[1], Prof M. De Vos[2], Dr R. Russell[3], Prof M. Bafadhel[3]

[1]Albus Health (Registered BreatheOx Ltd), Oxford, UK. [2]Institute of Biomedical Engineering, University of Oxford, UK. [3]Respiratory Medicine Unit, Nuffield Department of Medicine, Oxford, UK.

Rationale

- Remote monitoring is increasingly important. Existing monitoring can be difficult in children due to subjectivity, adherence or technique.

- Respiratory rate (RR) is important and objective. Yet, there are no reliable long-term monitors of RR.

- **Albus Home RD** is a novel contactless monitor of RR, cough and air-quality metrics.

- *Aim*: assess accuracy of **Albus Home RD** (Fig. 1), compared to gold-standard wearable PSG (SOMNOtouch™ RESPIRATORY, Somnomedics; Fig. 2).

Methods

- Healthy children were monitored overnight in their normal home bedroom environment.

- Two devices monitored RR: **Albus Home RD** (Fig. 1) and a wearable polysomnography (PSG) kit (Fig. 2).

- Both device RR readings were recorded in 30-second segments (as breaths/min) and time-synchronized.

- **Albus Home RD** generated continuous, automated RR readings using proprietary signal processing algorithms.

- Gold-standard PSG RR data were recorded by clinician manual-count of raw respiratory traces from thoracoabdominal respiratory effort belts.

- 10-minute periods per hour per night were chosen for device comparison, where data were free from confounding artefacts.

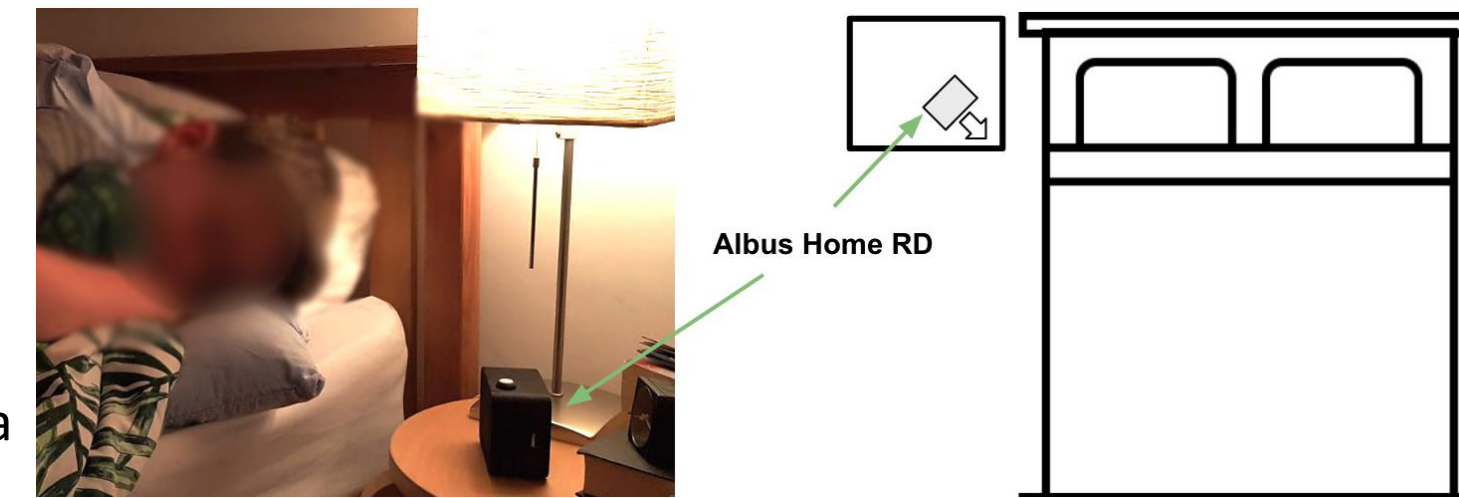- Accurate RRs are within +/-10% or +/-2 breaths/min of the PSG RR.

Figure 1: Example use-case and placement of **Albus Home RD**

Figure 2: The current gold-standard, wearable PSG (SOMNOtouch™ RESPIRATORY, Somnomedics).

Results

- 9 healthy children (3F:6M) underwent nocturnal RR monitoring. Ages ranged 6-16yo; BMI 13.3-20.0.

- 1220 RR segments (610 minutes) were compared to gold-standard.

- **Overall accuracy was 93%** (mean absolute percentage error=0.05 (SD=0.06)).

- **Median participant accuracy was 93.3%** (IQR=3.1%)

Bland-Altman plot for participant with mid-range RR accuracy (93.3% accurate; n=120 comparisons)

Difference between Albus Home RD RR and PSG RR (breaths/min)

+1.96*SD=1.40

Av. difference=-0.5 bpm

-1.96*SD=-2.34

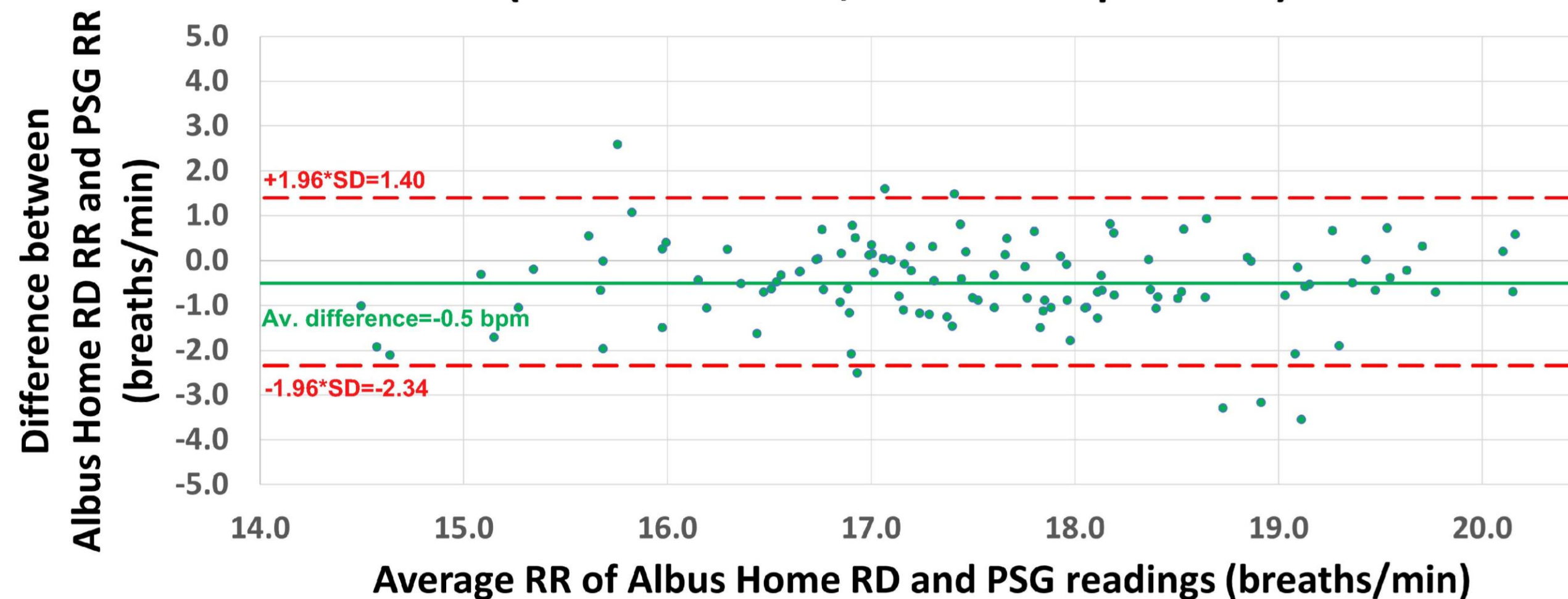Average RR of Albus Home RD and PSG readings (breaths/min)

Figure 3: Bland-Altman plot demonstrates agreement of **Albus Home RD** RR with gold-standard for participant with mid-range accuracy (93.3%); average difference=-0.5bpm.

Conclusions

- **Albus Home RD measured nocturnal RR with high accuracy in real-world home environments.**

- **Non-contact design with wireless sensors facilitates long-term adherence for remote monitoring. This automated system could enable scalable monitoring in clinical care and research.**

- **Accurate remote monitoring has exciting potential to reduce burden of daily monitoring for patients and carers.**

Figure 4: The plug-and-play **Albus Home RD** wirelessly captures automated RR, cough and air-quality metrics.

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