AAP DISTRICT VIII SECTION ON NEONATAL PERINATAL MEDICINE

2021 ANNUAL CONFERENCE **ORIGINAL RESEARCH** (BASIC SCIENCE or CLINICAL)
ABSTRACT SUBMISSION FORM

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Trainee? Yes ☒ No ☐

If yes, type and year of training: Clinical Fellowship training (Second Year)

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DEADLINE FOR RECEIPT OF ABSTRACT IS FEBRUARY 19, 2021. Submissions will be accepted for either poster or oral presentation. Authors will be notified of acceptance and format for presentation (poster or poster symposium) by **March 12, 2021.**

Title: Automated detection of respiratory rate in infants using video images: A feasibility study

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Background: Monitoring respiratory rate (RR) is vital in the clinical assessment of infants with suspected pneumonia. Contact-based monitors such as electrocardiograms and pulse oximeter involve high maintenance costs for supplies (Harford M et al., Physiol Meas 2019). Non-contact monitoring technologies can detect chest movements by measuring depth without the need to apply direct sensors (Cenci A et al., IDETC-CIE 2015). However, these require costly equipment and are not yet available in the clinical setting.
Objective**:** To create an algorithm that can automatically measure RR and identify breathing abnormalities in young infants from conventional Red Green Blue (RGB) video images.

Methods: Videos were captured from 13 stable neonates admitted to a tertiary care NICU (Vancouver, Canada), with a resolution of 1620×1236 pixels, with 8 bits per pixel, and at 20 frames/second using a high-resolution Basler RGB camera mounted on a tripod stand 1 m away from the infant. Parents gave informed consent. Each video frame was split into candidate overlapped Regions of Interest (ROI) and grouped into motionless and moving regions. The moving regions were selected as the ROI. The motion magnification algorithm (Wu H et al, ACM Trans. Graph. 2012) was used to magnify the breathing motion and estimate the breath pulse from the videos. This was compared to RR visually counted by a medical expert looking at the video sequence.

Results: Following series of improvement of the ROI detection, signal smoothing and breath cycle identification algorithms, we show that the algorithm correctly identifies the infant's chest and detect individual breaths and even apnea events: an exemplar is shown on a stable infant (41 weeks post-menstrual age; weight 3179 g) with images taken in a low-light environment. There was a good correlation between visually counted (by an expert) and automatically detected RR (Pearson $r = 0.88$; $p = 0.046$). We also defined optimal video recording conditions, the effect of ambient lighting, image stability and infant's position. More details will be provided at the PAS 2021 meeting.

Conclusion: We developed an algorithm that can measure RR and identify apneic events using RGB video images in young infants. Further studies, using large datasets and including infants with vital sign abnormalities, are needed to establish the effectiveness of this approach in the clinical setting, e.g., telemedicine, remote clinic visit and critical care.