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## Letter to the Editor

# Contact-free monitoring of respiratory rates for triage of patients presenting to the emergency department<sup>☆☆</sup>



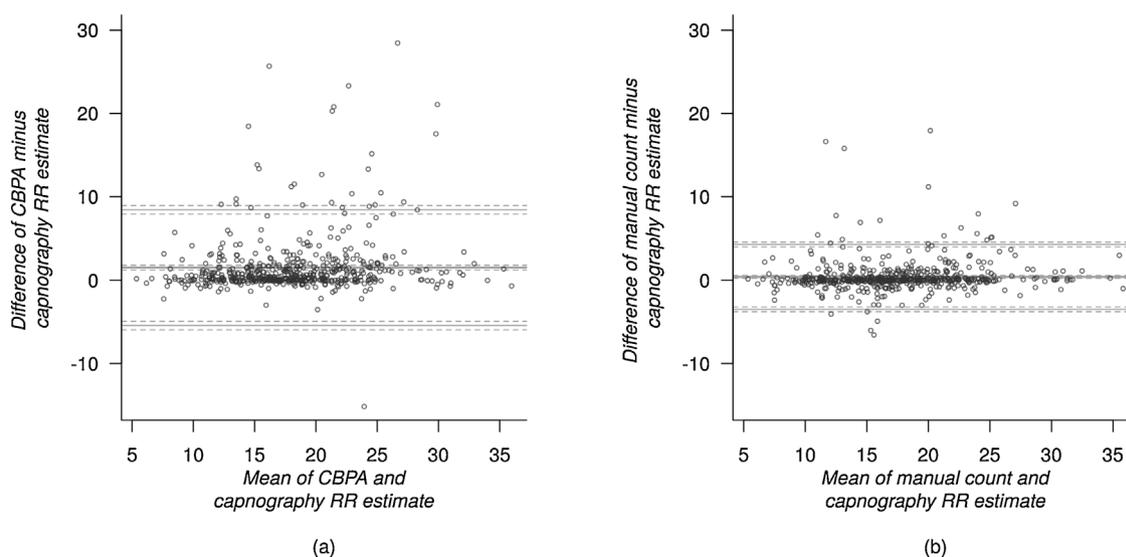
Dear editor,

Measuring respiratory rate (RR) helps in identifying critically ill patients at risk of death.<sup>1</sup> However, the measurement of RR is often inaccurate and undertriage may be a consequence.<sup>2</sup> A pilot study investigating the performance of a camera-based prototype application (CBPA) for measuring RR showed promising preliminary results in a small sample of healthy young volunteers.<sup>3</sup>

The aim of this study was to evaluate a CBPA measuring respiratory rates (RR) in an emergency department (ED) as an alternative to the current method of manual counting.<sup>3</sup> To determine the sensitivity and specificity of CBPA in detecting tachypneic patients defined as a respiratory rate higher than 20 per minute. We monitored RRs in a large group of walk-in patients with CBPA while simultaneously measuring by manual counting and capnography

as a gold standard. We calculated the sensitivity and specificity of the CBPA method in detecting patients with a RR faster than 20 breaths per minute (bpm) (and the 95% confidence interval of both) as compared to the capnographic gold standard measurement.

In a convenience sample of 552 emergency patients, the accuracy of CBPA in detecting tachypneic patients was high. Sensitivity was 97.4% (95% CI 93.8%–99.1%) and specificity was 87.8% (95% CI 84.1%–90.8%). The mean error of RR measurements by CBPA versus capnography and manual counting versus capnography alone was similar. The agreement of the measurements comparing the three methods was represented in Bland-Altman plots (see Fig. 1). The mean error of RR measurements by CBPA with respect to capnography decreases after 40 s of measuring (being 1.75 bpm



**Fig. 1 – Bland-Altman plot illustrating the deviance of CBPA estimates relative to capnography-based estimates as a function of the mean (a) and accordingly, manual estimates in respect to capnographic estimates (b).**

**The middle solid horizontal line shows the mean deviance and its 95% confidence interval (CI95) is expressed as a dashed line. The estimated 95% quantiles and their CI95 are indicated by the other solid and dashed lines respectively.**

\* Registration: [clinicaltrials.gov](https://clinicaltrials.gov), NCT03393585, ethics: EKNZ, reference number 2017-01583.

☆☆ Prior Presentations: None.

after 60 s) and more than 99% of measurements are usable at this time point.

Our study is a single center study, which might impair the generalizability of our results. However, as there were no exclusion criteria for illness, comorbidities or sex, our sample constitutes a representative collection of walk-in patients presenting to the ED (mean age 53,7, SD 21; 276 (49.8%) were male; mean BMI was 25,6 SD 4.9).

In conclusion, this study showed that CBPA provides reliable RR assessment that could help facilitate complete, correct and current vital sign assessment in the ED setting.

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## Author contributions

CHN, CB and SA obtained research funding and designed the study and overall implementation of the trial. CHN supervised the conduct of the trial and data collection. SA, MC, CW undertook recruitment of patients and managed the data, including quality control. AS provided support in data collection. MR and IK trained the study personnel and gave technical support. GD provided statistical advice on study design and analyzed the data. SA and CHN drafted the manuscript and all authors contributed substantially to its revision. CHN takes responsibility for the paper as a whole.

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## Conflicts of interest

Philips<sup>®</sup> supplied financial support for the independent statistical analysis performed by the Clinical Trial Unit<sup>3</sup> as well as for the software and equipment used.

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