B. Wallace, L. Ault, J. Larivière-Chartier, R. Goubran, F. Knoefel. *Vital Sign and Well-being Assessment Using Bed Based Sensing. Gerontechnology 2020;19(Suppl.):<page>.*

Background: Bed-based sensors designed to assess sleep quality and vital signs have entered the market. The placement of sensor mats within a bed including placement under the mattress has been shown to provide a mechanism to assess respiration rate and apnea[1], heart rate[2] and sleep disorders[3] that can be associated with dementia[4]. This leads to their potential to provide a better understanding of the ongoing well-being of aging adults to support and extend their independence[5,6].

Methods: Two commercially available under mattress sensors, Emfit QS (E) and the Withings Sleep (W), were deployed in a participant's home as part of a longitudinal study. The measures from these sensors were compared to each other and to clinical reference measures (pulse oximeter). An age 55 male and age 50 female tested the devices where the two sensors are placed side by side under the mattress under the chest area of the subject per sensor instructions. The two sensors capture data automatically with supporting cloud-connected applications from the sensor supplier. Both mats measure heart rate with W providing a measure every minute and E providing 15 samples/minute. The male research subject has a diagnosed bradycardia with a known stable resting heart rhythm of ~35 beats/minute while the second subject has a more typical resting rhythm of ~60 beats/min.

Results: The results show that both mats can detect and track the normal heart rhythm (Figure 1) while failing (Figure 2) to capture the bradycardia rhythm with near random results. Neither sensor was able to correctly measure the bradycardia rhythm with neither ever reporting a heart rate below 38 beats/min. The sleep state assessments for the two sensors differ greatly from each other including one instance where E reported light sleep while W correctly reported the subject was not in bed.

Discussion: This work shows the potential and issues associated with the use of in-bed sensors for the assessment of well-being. There appears to be a potential floor in the sensor heart rate algorithms. The work also shows how the results of these sensors can be contradictory and perhaps have errors caused by the inability to distinguish between the two occupants.

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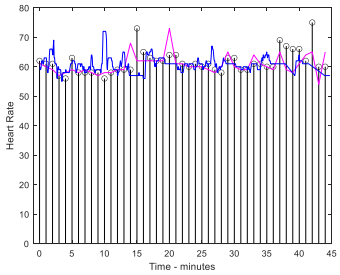

Figure 1 Measurement of Normal Heart Rhythm. Black = pulse oximeter, magenta = W, blue = E

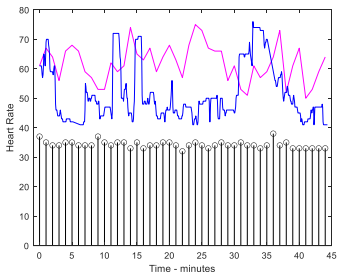

Figure 2 Measurement of Bradycardia Heart Rhythm. Same legend as Fig 1