

Estimation of respiratory rates based on photoplethysmographic measurements at the sternum - DTU Orbit (08/11/2017)

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The respiratory rate (RR) is a clinically important vital sign and is a frequently used parameter in the general hospital wards. In current clinical practice, the monitoring of the RR is by manual count of the chest movement for one minute. This paper addresses a new approach where the respiratory rate is extracted using photoplethysmography (PPG) on the chest bone (sternum). Sternal PPG signals were acquired from 10 healthy subjects resting in a supine position. As reference signals, finger PPG, electrocardiogram (ECG), and capnography were simultaneously recorded during spontaneous and paced breathing. The sternal PPG signals were then compared with the reference signals in terms of Bland-Altman analysis, the power spectrum analysis and the magnitude squared coherence. The Bland-Altman analysis showed an average bias of 0.21 breaths/min between RR extracted from sternal PPG and capnography. The respiratory power content at the sternum was 78.8 (38) % in terms of the median and (the interquartile range). The cardiac content was 19 (18.4) % within the cardiac region. The results from the magnitude squared coherence analysis was 0.97 (0.09) in the respiratory region (6 to 27 breaths/min) and 0.98 (0.01) in the cardiac pulse region (30-120 beats/min). This preliminary study demonstrates the possibility of monitoring the RR from sternal PPG on a healthy group of subjects during rest.

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