Long-term quasi-continuous oxygen saturation levels obtained from sternal photoplethysmography on patients with obstructive lung diseases

Calculation of long-term quasi-continuous oxygen saturation ($SpO_2$) levels is highly relevant for critically ill patients. The purpose of this study is therefore to conduct a preliminary investigation of the clinical reliability of long-term photoplethysmography (PPG) recordings obtained from the sternum of patients admitted to the hospital with obstructive lung diseases. Due to the lack of a gold standard reference that is suitable for long-term monitoring without interfering with the patient’s activity level, we extracted reliable segments based on knowledge from the basic pulse oximeter theory as well as knowledge about the inherent physiological regulation of the $SpO_2$ levels. We included 15 admitted patients who were monitored with a prototype of a sternal PPG sensor for approximately 20 hours. On average, we found that clinically reliable $SpO_2$ levels could be calculated for 58% of the recording time. Furthermore, the average and standard deviation of the longest period of time with unreliable data was only 23.6 ± 19.38 minutes. This indicates a high potential for quasi-continuous calculation of $SpO_2$ levels from sternal PPGs in many different clinical applications in the future.

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