

Pulse Oximetry Markers for Cardiovascular Disease in Sleep Apnea

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Aim: Patients suffering from sleep apnea have an increased risk to develop cardiovascular diseases. Evidence, however, suggests that the apnea hypopnea index (AHI), which is commonly used for the diagnosis of sleep apnea, does not correlate well with this risk. Therefore, there is a clinical need to define markers beyond the AHI to phenotype sleep apnea patients.

Methods: This study investigated the use of parameters extracted from pulse oximeter signals to determine the cardiovascular status of sleep apnea patients. Oxygen saturation (SpO_2) and pulse photoplethysmography (PPG) features were extracted around SpO_2 desaturations. These parameters were then averaged per patient and a random forest feature selector was used to extract the feature set which could differentiate best between cardiovascular controls and patients who suffered from a cardiovascular event in the past.

A dataset of 975 patient recordings was used for this study, of which 90 patients were used to train a classifier to predict the cardiovascular status.

Results: The resulting feature set showed that sleep apnea patients with a cardiovascular comorbidity tend to have more severe oxygen desaturations, and often do not have a complete resaturation to their baseline SpO_2 values. A decreased variability in the PPG pulse upslope, correlated with the PPG amplitude variability could point to less (severe) arousals in these patients, which can contribute to the increased severity of the oxygen desaturations.

The classifier based on the SpO_2 features, including the age obtained the best performance with an averaged test AUC of 77.7 %. The investigated PPG features did not seem to have an added value to this classifier.