Phenotype-based and Self-learning Inter-individual Sleep Apnea Screening with a Level IV Monitoring System

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Objective: We propose a phenotype-based artificial intelligence system that can self-learn and is accurate for screening purposes, and test it on a Level IV monitoring system.

Methods: Based on the physiological knowledge, we hypothesize that the phenotype information will allow us to find subjects from a well-annotated database that share similar sleep apnea patterns. Therefore, for a new-arriving subject, we can establish a prediction model from the existing database that is adaptive to the subject. We test the proposed algorithm on a database consisting of 62 subjects with the signals recorded from a Level IV wearable device measuring the thoracic and abdominal movements and the SpO2.

Results: With the leave-one cross validation, the accuracy of the proposed algorithm to screen subjects with an apnea-hypopnea index greater or equal to 15 is 93.6%, the positive likelihood ratio is 6.8, and the negative likelihood ratio is 0.03.

Conclusion: The results confirm the hypothesis and show that the proposed algorithm has great potential to screen patients with SAS.

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