

Respiratory health study: Pulmonary infection screening based on wearable sensor data

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Abstract

The proliferation of smart devices provides the possibility of early detection of the signs of pulmonary infection. The present study validates a smart device-based algorithm to monitor the risk of pulmonary infection. An algorithm based on smart devices (Huawei Device Co., Ltd., Shenzhen, China) has been developed among 87 patients with pulmonary infection and 458 healthy subjects, consisted of the heart rate variability, respiratory rate, oxygen saturation, body temperature, and cough sound. The algorithm embedded into the "Respiratory Health Study" application to detect the risk of pulmonary infection was further validated in hospital. The pulmonary infection was diagnosed by the doctors with the clinical evaluation, lab test, and imaging examination, as golden standard. The accuracy, sensitivity, and specificity of the algorithm predicting pulmonary infection were evaluated. 80 patients with pulmonary infection and 85 healthy volunteers were recruited. The area under the curve (AUC) of the algorithm in predicting pulmonary infection was 0.86 (95% Confidence Interval, CI: 0.82-0.91) ($P < 0.001$). The overall accuracy of the algorithm were 85.9%, the sensitivity was 81.4%, and the specificity was 90.4%, respectively, compared to golden standard. The algorithm of heart rate, respiratory rate, oxygen saturation and body temperature demonstrated the accuracy of 68.2%, meanwhile, the accuracy of the algorithm with cough sound was 82.6%. The wearable devices could facilitate the detection of the risk of pulmonary infection. Multi-source features were useful to enhance the performance of pulmonary infection screening algorithm.

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