Evaluation of EarlySense Device for Automatic Detection of Nocturnal Cough in Asthmatic Children - Preliminary Results

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Introduction: Early detection and treatment of impending asthma exacerbations may decrease severity and improve outcome. The EarlySense Device (ESD) was shown to provide contact-free, nocturnal respiratory monitoring for early warning of impending asthma exacerbation, independent of patient compliance. Cough is known to be correlated with worsening asthma. An advanced version of ESD automatically detects cough through simultaneous analysis of body motion and acoustic signals.
Objective: To evaluate the accuracy of ESD in cough detection, as a preliminary step in providing an improved early warning for asthma exacerbations.
Method: 11 patients (age 5-14) with documented asthma for $\geq$1 year and 10 healthy children were enrolled. All studies were at home during natural sleep. Objective reference cough counts were determined via audio records analyzed manually by trained technicians. These reference data were subsequently compared to the ESD output.
Results: Patients were monitored 119 nights (714 hours) and healthy children during 245 nights (1470 hours).Auscultation by headphone revealed 753 cough events. ESD detected 570 coughs (sensitivity of 75.7%). In 88% of the nights, the absolute error of ESD vs. reference was $\leq$ 5 with a high correlation (Corr. Coef. of 0.83).
There was a significant difference in number of cough per night between all asthmatic and healthy children 6.0$\pm$13.2 (range 0-103) vs. 0.2+0.7 (range 0-5) respectively ($p<0.01$).
Summary: These preliminary results suggest the reliability of ESD in cough detection. We expect that integrating cough detection with our previously reported respiratory parameters will improve the ability of ESD to provide early warning of asthma exacerbations.

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