Klinik für Pneumologie/Schlafmedizin

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Nocturnal cough and sleep quality to assess asthma control and predict attacks

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Introduction

- Objective markers for asthma, that can be measured without extra patient effort, could mitigate current shortcomings in asthma monitoring
- We investigated whether smartphone-recorded nocturnal cough and sleep quality can be utilized for the detection of periods with uncontrolled asthma or meaningful changes in asthma control, and for the prediction of asthma attacks

Methods

- We analyzed questionnaire and sensor data of 79 adults with asthma
- Data were collected in situ for 29 days by means of a smartphone
- Sleep quality and nocturnal cough frequencies were measured every night with the Pittsburgh Sleep Quality Index and by manually annotating coughs from smartphone audio recordings
- Primary endpoint was asthma control assessed with a weekly version of the Asthma Control Test
- Secondary endpoint were self-reported asthma attacks

Results (1)

- 79 analyzed patients: median ACT score of 21 points (IQR = 18 – 23) in 308 available weeks
- Asthma was controlled in 192 weeks and uncontrolled in 116 weeks
- Clinically significant deteriorations occurred in 29 weeks in 25 patients
- Eight asthma attacks occured in a total of 2,004 study days
- Mixed effects regression analyses showed that nocturnal cough and sleep quality were statistically significantly associated with asthma control on a between- and within-patient level (p < .05)
- Decision trees indicated that sleep quality was more useful for detecting weeks with uncontrolled asthma (balanced accuracy (BAC) 68% vs. 61%; Δ sensitivity -12%; Δ specificity -2%), while nocturnal cough better detected weeks with asthma control deteriorations (BAC 71% vs. 56%; Δ sensitivity 3%; Δ specificity -34%)
- Cut-offs using both markers predicted asthma attacks up to five days ahead with BACs between 70% and 75% (sensitivities 75%-88% and specificities 57%-72%, figure)

Results (2)
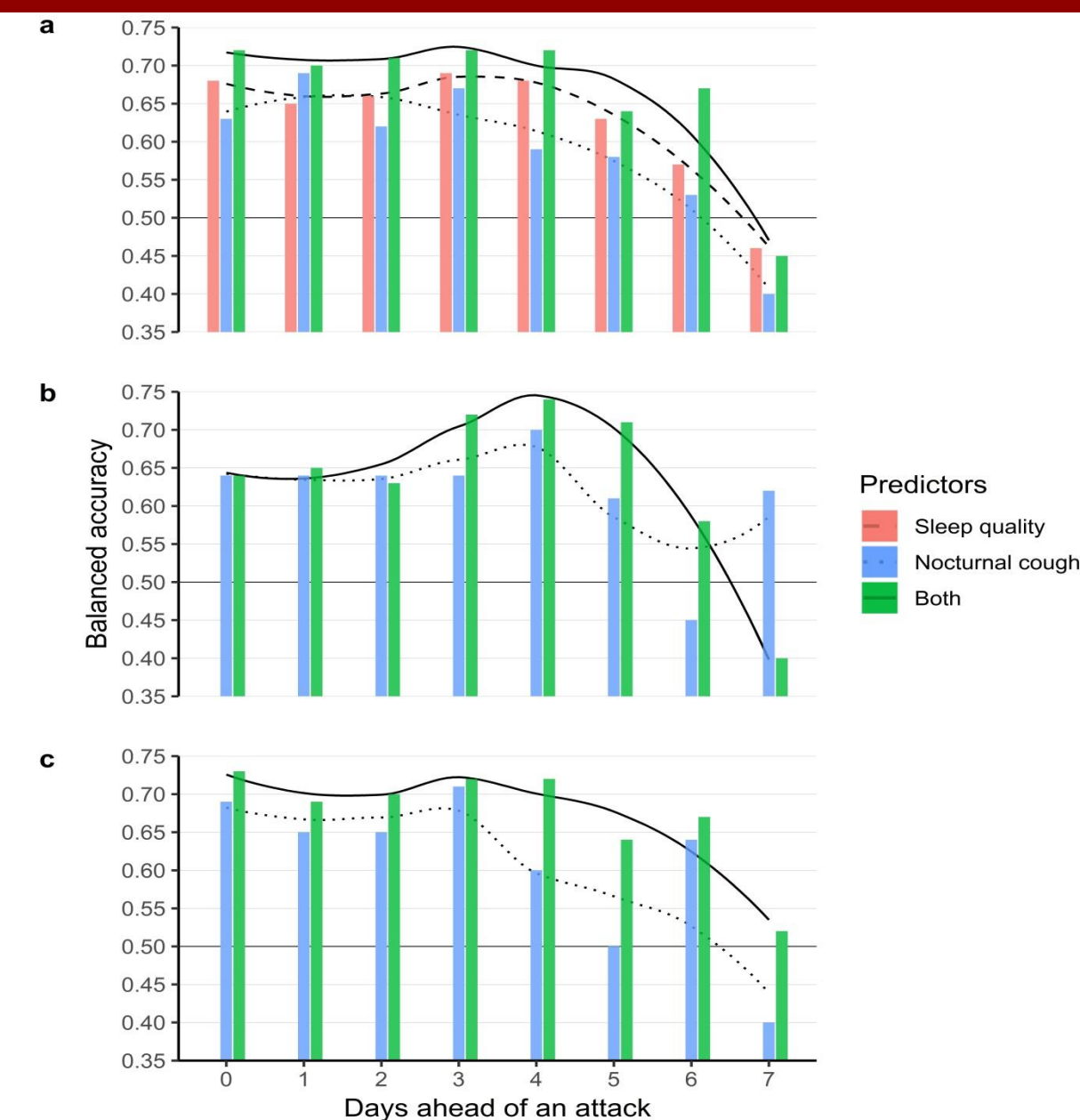
Conclusion

- Nocturnal cough and sleep quality have useful properties as markers for asthma control and seem to have prognostic value for the early detection of asthma attacks

Acknowledgments