'Against all odds' – Fight for the future of asthma

M13 ACCURATE DIAGNOSIS OF ASTHMA USING EITHER SINGLE OR LONGITUDINAL BREATH RECORDS CAPTURED ON A NOVEL FAST RESPONSE CAPNOMETER

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Introduction The diagnosis of asthma can be challenging and often requires multiple diagnostic tests and forced expiratory manoeuvres, such as spirometry with reversibility testing or regular peak flow measurements in order to capture variable airflow obstruction.

Objective To assess the performance of a diagnostic model in its classification of participants with and without asthma, built using interpretable data processing and machine learning techniques applied to a dataset of CO2 breath records (75 seconds of tidal breathing), captured on TidalSense's N-Tidal™ handheld capnometer.

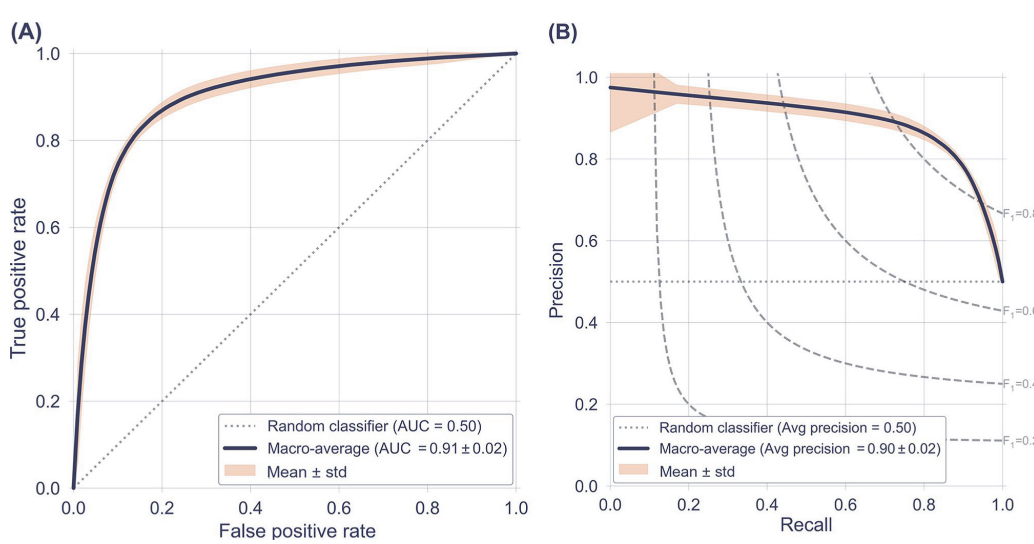
Methods Participant records were drawn from 4 clinical studies (GBRS, ABRS, CBRS, CBRS2). This pooled dataset included participants recruited from primary and secondary care. Two XGBoost models were trained and validated on 82 features derived from the high-resolution CO2 data of 146 asthmatic and 133 non-asthmatic participants (which included healthy volunteers, those with COPD, bronchiectasis, pulmonary fibrosis, heart failure, anaemia, and other cardiorespiratory conditions).

The model used breath waveform features from a single breath record. The model was trained using 117 asthmatic, and 106 non-asthmatic participants and performance metrics were generated from an unseen validation set of 29 asthmatic, and 27 non-asthmatic participants. This was repeated 20 times with different validation participants for additional statistical power, and the average and variability of these metrics were recorded.

Results The classification model achieved AUROC of 0.908 ± 0.016, sensitivity of 0.800 ± 0.043, specificity of 0.883 ± 0.012, positive predictive value (PPV) of 0.873 ± 0.010, and negative predictive value (NPV) of 0.817 ± 0.031 in detecting asthma from a single breath record.

Conclusion TidalSense's N-TidalTM capnometer and machine learning classifier could be used as an accurate, rapid, point-of-care diagnostic test for asthma, particularly in primary care. Future work will incorporate longitudinal capnography data into a diagnostic classifier.

Please refer to page A293 for declarations of interest related to this abstract.



Abstract M13 Figure 1 Performance of the diagnostic classifier summarised in an (A) ROC curve and a (B) Precision-recall curve