

Abstract M12 Figure 1 Performance amongst doctors of various grades on all 'yes' 'no' questions pre and post placement

of confidence and capability in various aspects of respiratory care.

REFERENCE

1. Community Research (2020), *Research into doctors' induction*. Available at: <https://www.gmc-uk.org/-/media/documents/research-into-doctors-inductiondocx-83264029.docx> (Accessed: 02/05/2023)

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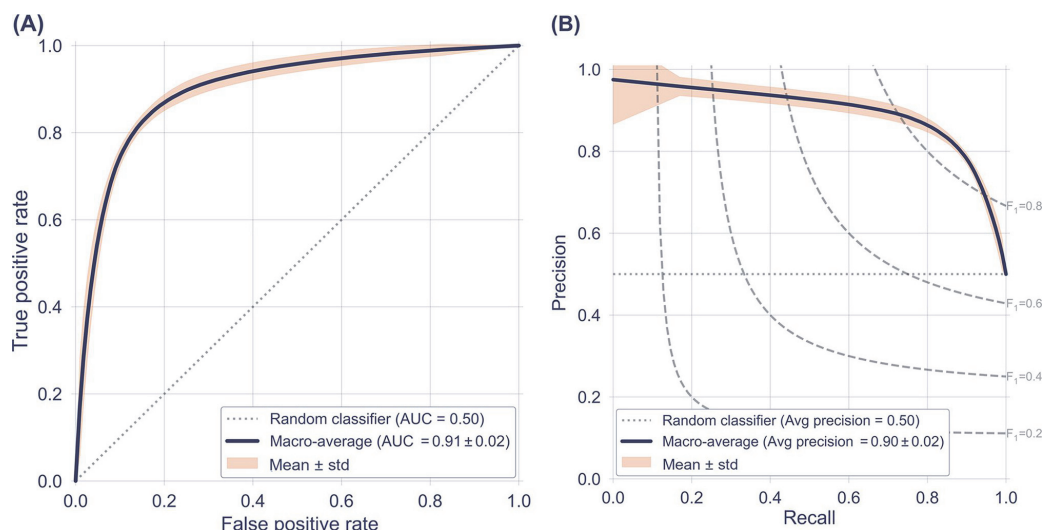
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Introduction The diagnosis of asthma can be challenging and often requires multiple diagnostic tests and forced expiratory manoeuvres, such as spirometry with reversibility testing or regular peak flow measurements in order to capture variable airflow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



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

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-Tidal™ 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.

M14

SCREENING TOOLS FOR WORK-RELATED ASTHMA AND THEIR DIAGNOSTIC ACCURACY: A SYSTEMATIC REVIEW

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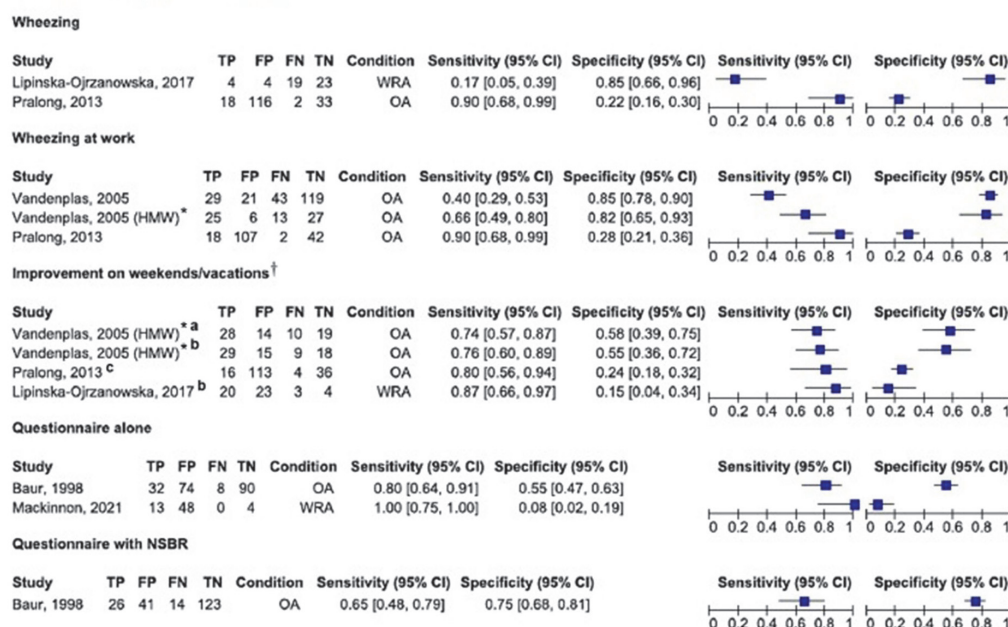
Introduction One in four cases of asthma in adults are caused or worsened by work (work-related asthma: WRA). Early detection of WRA could prevent poor health and employment outcomes, but WRA is often missed, or diagnosis delayed. Standardised screening tools and their effectiveness in practice are not well established. We aim to summarise and compare the performance of screening tools for identifying WRA in both clinical settings and workplaces.

Methods We searched for articles using structured questionnaires or prediction models (that may also include physiological tests) to identify WRA in clinical settings or workplaces, in MEDLINE, EMBASE, other bibliographic databases and grey literature between 1975–2021. Studies were screened independently by two reviewers using predetermined criteria, also with data extraction. Quality was assessed using QUADAS-2 and/or PROBAST tools. Screening tools and their indices of accuracy were summarised with paired forest plots of sensitivities and specificities.

Results Of 17,006 articles identified by the search, 6 studies were included following full-text review. Four studies focused on occupational asthma and two on WRA. All comprised tertiary hospital (n=4) and specialist centre (n=2) populations. The screening tools used were questionnaires alone (asking about generally respiratory symptoms and their relation to work, n=5), questionnaire with methacholine challenge test (n=1) and diagnostic models (n=3). Three studies using questionnaires alone reported only the performances of each individual questionnaire items (e.g. wheezing, wheezing at work). The item 'improvement of symptoms on weekends/vacations' showed 74–87% sensitivity

Screening tools for work-related asthma and their diagnostic accuracy: a systematic review
Kongsupon et al, 2023

Figure 1. Paired forest plot of questionnaire items (wheezing, improvement of symptoms off work), questionnaires alone and questionnaire with objective tests.



*Only participants with HMW agents were calculated

†Asking about the improvement of symptoms differently: a during vacations, b at weekends, c off work

FN= false negative, FP= false positive, HMW= high molecular weight agents, NSBR= non-specific bronchial response, OA= occupational asthma, TN= true negative, TP= true positive, WRA= work-related asthma

Abstract M14 Figure 1 Paired forest plot of questionnaire items (wheezing, improvement of symptoms off work), questionnaires alone and questionnaire with objective tests