2022 advocates for an assessment based on an algorithm that uses routine clinical data to risk-stratify patients planning commercial flights. The possible outcomes are as follows: 'no in-flight oxygen required', 'consider Hypoxic Challenge Test' (HCT), 'consider in-flight oxygen at 2 L/min greater than the long-term oxygen therapy prescription (LTOT)', or 'consider in-flight oxygen at 2 L/min'.

**Methods** We evaluated the accuracy of the pre-flight assessment algorithm for patients with restrictive lung disease who had undergone a Hypoxic Challenge Test (HCT) prior to the implementation of the current clinical statement.

**Results** Seventy-four patients, comprising of 49 males, with a mean age of 70 years, were included in the study. The mean, standard deviation, and percent predicted values for various respiratory parameters were as follows: forced expiratory volume in 1 second (FEV₁) of 2.05 litres (0.81), 77% predicted; forced vital capacity (FVC) of 2.52 litres (0.80), 72% predicted; total lung capacity (TLC) of 4.01 litres (1.12), 67% predicted; and transfer factor of 3.93 ml/min/kPa (1.00), 51% predicted.

Among the patients identified as not requiring in-flight oxygen, eleven individuals failed the hypoxic challenge test (HCT). Twelve patients who were considered to require in-flight oxygen were able to maintain adequate oxygen levels (\( \text{PaO}_2 > 6.6 \text{ kPa} \)) while breathing the hypoxic mixture (table 1).

**Conclusions** The algorithm is a useful and pragmatic tool in identifying patients requiring HCT/oxygen during air travel. However, clinicians need to be aware that some patients advised not to use oxygen may fail an HCT and others in whom oxygen is recommended but not needed may unnecessarily be deterred from travelling. It is important to conduct studies with larger patient cohorts to further investigate these aspects.

### Abstract P99 Table 1  
Comparison of BTS algorithm vs HCT

<table>
<thead>
<tr>
<th></th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>No HCT</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Consider HCT</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Consider in-flight O₂</td>
<td>12</td>
<td>22</td>
</tr>
</tbody>
</table>

**P100 EXAMINING THE RELATIONSHIP BETWEEN EXHALED AEROSOL AND CARBON DIOXIDE ACROSS HUMAN ACTIVITIES**

1BP Moseley, 2JA Archer, 1CM Orton, 2HE Symons, 1NA Watson, 1KEJ Philip, 1JH Hull, 1D Costello, 2JD Calder, 2PL Shah, 2BR Bzdek, 2JP Reid. 1Royal Brompton Hospital, London, UK; 2University of Bristol, Bristol, UK; 3Imperial College London, London, UK; 4Wexham Park Hospital, Slough, UK

**Background** The COVID-19 pandemic caused >750 million infections and just under 7 million deaths worldwide, along with shutdowns in social and economic activities. Respiratory particles produced during non-vocalised activities such as breathing, and vocal activities including singing and speaking
serve as a major route for respiratory viral disease transmission.

Methods This work reports concomitant measurements of the exhaled volume of carbon dioxide (VCO2) and minute ventilation (VE), along with respiratory aerosol emitted during breathing, exercising, speaking, and singing, across 33 healthy adult participants.

Results VCO2 and VE appear to follow a similar trend to aerosol number concentration during the non-vocalised, exercise activities. Vigorous and very vigorous exercises generated 6 and 10 times more exhaled CO2 (L/min) than breathing at rest (p<0.001), ~5 and 8 times greater VE than breathing (p<0.001), respectively. And both vigorous and very vigorous exercise generated significantly more aerosol particles than breathing (p<0.001). When considering non-vocalised activities (breathing at rest, vigorous exercise, and very vigorous exercise), a strong correlation (R² = 0.71) between exhaled CO2 production (in mL/s) and mean aerosol mass emission rates is evident. During vocalisation the amount of exhaled CO2 when breathing at rest was similar to that exhaled while speaking (p=0.27) and singing at 70–80 dBA (p=0.23) and only modestly different to that emitted when singing at 90–100 dBA (p=0.02). Conversely, speaking and singing at 70–80 dBA, and singing at 90–100 dBA, generated significantly more aerosol particles than breathing (p<0.001). Consequently, a relatively poor correlation (R² = 0.02) was observed between exhaled CO2 production in (mL/s) and mean aerosol mass emission during vocalization.

Conclusion The correlation between the aerosol mass exhalation and VCO2 is only observed across activities that do not involve vocalisation, i.e. from breathing at rest through to vigorous exercise. Subsequently, using CO2 as a surrogate measure of respirable aerosol in, for example, an indoor space provides and underestimation of the amount of airborne respiratory pathogen exhaled by an infected individual when they are vocalising. Therefore, additional surrogate measures are needed for vocalising.

P101 NEURAL RESPIRATORY DRIVE AMONG COPD PATIENTS WITH MILD OR MODERATE AIRFLOW LIMITATION IN PRIMARY CARE: REPRODUCIBILITY, RELIABILITY AND ASSOCIATION WITH OTHER BIOMARKERS

TH Harries, 1R D’Cruz, 1G Gilworth, 1CI Corrigan, 1PB Murphy, 1N Hart, 2M Thomas, 1H Ashdown, 1D Daines, 1PT White, 1King’s College London, London, UK; 2University of Southampton, Southampton, UK; 3University of Oxford, Oxford, UK; 4University of Edinburgh, Edinburgh, UK.

10.1136/thorax-2023-BTSabstracts.253

Introduction and Objectives Neural respiratory drive (NRD) is central control of breathing maintained through the respiratory muscles, particularly diaphragm and intercostals. NRD can be measured by surface electromyography (EMG) of the second intercostal space parasternal muscles (EMGpar). It is closely correlated to the subjective measurement of breathlessness in COPD patients with severe/very severe airflow limitation. It has not previously been assessed in ambulatory COPD patients with mild or moderate breathlessness in primary care. Its potential as a primary care research tool has not been evaluated.

This study aimed to assess the reliability and reproducibility of NRD across a group of COPD patients with mild/moderate airflow limitation (FEV1 (forced expiratory volume in one second) ≥50% predicted) in primary care. Relationships between NRD and measures of quality of life, lung function and breathlessness were assessed.

Methods Patients with stable mild/moderate COPD were recruited from general practices. Second intercostal space NRD (EMGpar; NRDI), spirometry, measures of breathlessness and quality of life (CRQ-SAS, mBorg, CAT, mMRC) were recorded at baseline, 3 and 6-month follow-up. Intraclass correlation coefficients were calculated for each of the variables and Bland-Altman plots generated.

Results 40 COPD patients with mild/moderate airflow limitation were recruited. There was high intra-rater and inter-rater agreement in each of the measures of NRD, including EMGpar & NRDI (ICC > 0.9). There were moderate correlations between EMGpar and FEV1% predicted (Pearson’s r = -0.42; p=0.01) and between NRDI and FEV1% predicted (Pearson’s r = -0.35; p=0.04). Consistent correlation was not seen between either EMGpar or NRDI and any CAT, CRQ domain, mBorg, or mMRC scores across the assessments.

Conclusions Assessment of NRD using surface electromyography had a moderate correlation with FEV1 but was not found in this study to be a sensitive measure of breathlessness in COPD patients with mild or moderate airflow limitation. The reliability of the recording in these patients and its established usefulness in assessing breathlessness in severe and very severe airflow limitation suggests that if the measurement can be made more sensitive it will be useful in interventional studies in primary care settings.

Please refer to page A289 for declarations of interest related to this abstract.

P102 SYMMETRIC PROJECTION ATTRACTOR RECONSTRUCTION (SPAR): WHOLE-WAVEFORM ANALYSIS OF ABDOMINAL RESPIRATORY MOVEMENT PROVIDES A NEW BIOMARKER OF OBSTRUCTIVE SLEEP APNOEA

1MS Serna-Pascual, 1M Volovyay, 2S Higgins, 2J Steier, 2G Rafferty, 2C Jolley, 2P Aston, 1M Nandi, 1King’s College London, London, UK; 2Guy’s and St Thomas’ NHS Foundation Trust Sleep Disorders Centre, London, UK; 3University of Surrey, Guildford, London, UK.

10.1136/thorax-2023-BTSabstracts.254

Background Obstructive Sleep Apnoea (OSA) is conventionally quantified by the Apnoea-Hypopnea Index (AHI), used to classify disease severity. Automation of AHI detection relies on identification of singular data points in long, multi-channel polysonomography (PSG) recordings. This can be easily compromised by signal noise. We present a novel mathematical method, the Symmetric Projection Attractor Reconstruction (SPAR), that may overcome this problem by transforming whole cyclic physiological recordings into corresponding ‘at-at-a-glance’ images (‘attractors’) which capture all available waveform morphology information, without relying on single point detection. Attractor quantification may provide a more rapid and robust mean of quantifying the number and duration of overnight apnoeic and hypopneic events.

Aim To test whether SPAR can categorize overnight obstructive sleep apnoea recordings according to severity classifications informed by expert-annotated AHI.

Methods 74 PSG recordings were analysed (52 non-OSA subjects/22 severe-OSA patients, 43.0/27.3% female, 37.4/48.9

Poster sessions

Thorax 2023;78(Suppl 4):A1–A311