Abstract P242 Table 1 Descriptive statistics for physiological parameters by condition, including indications of statistical significance

	MND		
Variable	**Pass**	**Fail**	**p value**
Age	61.5 (12.67)	66 (14.18)	0.076
FEV_1	2.12 (0.80)	1.25 (0.71)	0.001
FEV_1 %	70 (24.43)	45 (21.04)	0.001
FVC	2.61 (1.02)	1.74 (0.88)	0.003
FVC %	68 (24.09)	49 (19.68)	0.004
PaO_2 21%	10.30 (1.14)	9.045 (1.18)	0.001
PaO_2 15%	7.60 (1.147)	6.39 (0.25)	0.001
$PaCO_2$ 21%	5.28 (0.75)	6.24 (0.86)	0.001
BE 21%	2.35 (2.37)	5.70 (3.34)	0.001

planned air travel (77 male). Data from patients requiring in-flight oxygen was compared to patients who did not, in accordance with the British Thoracic Society recommendations 2011: Managing passengers with stable respiratory disease planning air travel. Statistical analysis was performed using one-way ANOVA, Kruskal-Wallis, and Chi-Squared tests, as appropriate.

Results There was no significant difference between the pass (n=94) and fail (n=24) groups for age, gender, smoking history or BMI. There was a significant difference for all spirometry data (FEV_1, FVC and FEV_1/FVC ratio – absolute, percent predicted and standardised residuals). Moreover, the resting blood gases ($FiO_2$21%) data showed significant difference for all parameters with the exception of pH (<0.001). The Regression analysis showed limited predictive value of spirometry and/or resting blood gas data with the exception of $PaCO_2$ and base excess (BE).

Conclusions The predictive value of spirometic paraments and resting blood gases are limited in assessing hypoxaemia during commercial flight in MND patients, with the exception of parameters relating to respiratory failure. Despite the significant difference between the two groups, routine physiological data was limited in the predictive regression equations. We recommend that the safest approach in managing this group of patients is to perform an HCT in all patients intending to use air travel until more evidence-based data is available.

P243 CAN HISTORICAL ASSUMPTIONS BE USED TO ASSESS FITNESS TO FLY FOR MND AND ILD PATIENTS? AN EVALUATION OF PHYSIOLOGICAL PARAMETERS TO RISK STRATIFY PATIENTS PLANNING AIR TRAVEL

[1]IJ Cliff, [1]N Mustfa, [1]H Stone, [1]C Hurst, [2]E Crawford, [1]MB Allen. *[1]University Hospitals of North Midlands NHS Trust, Stoke-on-Trent, UK; [2]Shrewsbury and Telford Hospital NHS Trust, Shrewsbury, UK*

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Introduction The risk associated with commercial flight for respiratory compromised patients is well known. Many of the assumptions are based on studies that have included patients with Chronic Obstructive Pulmonary Disease (COPD) and have often been extended to other respiratory and non-respiratory disorders. This study aimed to examine differences in physiological parameters and Hypoxic Challenge Test (HCT) outcome in patients with Motor Neurone Disease (MND), Interstitial Lung Disease (ILD) and COPD.

Methods Respiratory patients who were referred into a fitness to fly service (n=225) with COPD (n=51), MND (n=118) and ILD (n=56) completed baseline lung function and a HCT as part of a risk stratification for planned air travel. Statistical analysis was performed using one-way ANOVA, Kruskal-Wallis, and Chi-Squared tests, as appropriate.

Results Demographic data relating to age, smoking history and BMI were significantly different between the patient groups. Spirometric data showed significant differences in Forced Expiratory Volume in one second (FEV_1) absolute, percent predicted and standardised residuals, however there was no significant difference in Forced Vital Capacity (FVC) absolute or percent predicted. Resting capillary blood gases (CBGs) ($FiO_2$21%) showed significant differences between patient groups in all parameters with the exception of pH. Responses to the hypoxic mix during the HCT ($FiO_2$15%) showed differences in all CBG values with the exception of pH. This was also mirrored in the corrective values ($FiO_2$28%). The difference between the PaO2 at rest (21%) and during the HCT (15%) is higher in the MND and ILD groups (2.66and 2.74 kPa respectively) versus the COPD group (2.2kPa). The HCT fail rate was greatest for the COPD group (table 1).

Conclusions In this retrospective, exploratory examination, the physiological data supports significant differences between the disorders for the majority of data. The assumptions and algorithms based on the study of COPD patients cannot be assumed for MND or ILD, and these groups need to be

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	MND		ILD		COPD		
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**p value**
Age	63	12.99	69.5	7.05	66	9.24	0.001
FEV_1 (L)	1.94	0.85	1.91	0.65	1.13	0.61	0.001
FEV_1 %	65.93	25.72	76.1	19.19	44.76	25.55	0.001
FVC (L)	2.46	1.05	2.54	0.84	2.62	0.95	0.676
FVC %	64.59	24.35	70.8	18.11	74.24	23.13	0.059
PaO_2 21%	10.12	0.12	9.46	1.05	8.68	1.01	0.001
PaO_2 15%	7.46	1.01	6.72	0.75	6.48	0.92	0.001
PaO_2 28%	11.7	2.56	11	2.56	8.94	2.25	0.002
% HCT Fail	20.34		51.79		62.75		0.001

specifically studied to better understand their response to the commercial cabin environment.

P244 AN ALGORITHM FOR AUTOMATICALLY IDENTIFYING TRENDS IN MAXIMUM AND MINIMUM FEV1

NJ Bell, A Kendrick. *Department of Respiratory Medicine, Bristol Royal Infirmary, Bristol, UK*

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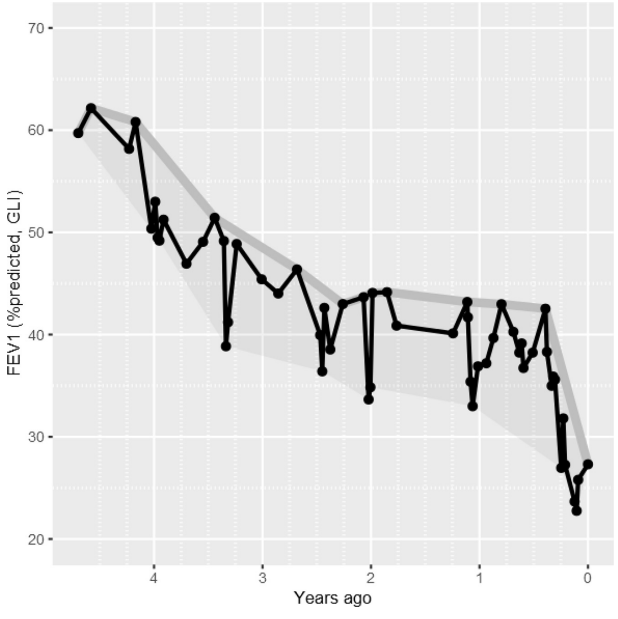
Background FEV_1 is a critical metric in bronchiectasis, however pulmonary exacerbations make it highly variable over time, notably in Cystic Fibrosis (CF). Trends in FEV_1 are usually calculated by linear interpolation through all readings. FEV_1 is a forced maximal procedure, which gives trends in the maximum FEV_1 achievable over time a distinct meaning from an average which includes low values associated with pulmonary exacerbations. Deteriorating patients frequently dismiss low readings as unrepresentative, however the trend in the maximum value achievable over time is harder to dismiss. However, automatic calculation of a trend in maximum FEV_1 is surprisingly challenging (e.g. rolling maxima are slow to respond to changes).
Aim Proof of concept study to develop a practical algorithm to automatically identify and visualise trends in maximum & minimum FEV1.
Methods/Results An R function using the R package concaveman (https://R-project.org) employing the Concave Hull algorithm (Park J *et al*, J Info Sci Eng (2013) 29(2) 379–392) was written, wrapping an 'envelope' around the plot of% predicted FEV_1versus date, from which maximum and minimum trendlines were extracted. Linear interpolation of the maximum FEV_1 trace allows calculation of the rate of change in maximum FEV_1 (likewise for minimum FEV_1).

An 'R Shiny' script allows the visualisation to be accessed from any web browser on the Trust network, using live data for any patient. Clinically credible trends were identified for all patients attending our Regional Adult CF Specialist Centre with more than 2 years of data available.



Abstract P244 Figure 1

The figure 1 shows a sample visualisation of FEV1 vs time in a deteriorating patient generated by the script (black points/line = raw readings; thick grey line = maximum FEV1 trendline ; grey area = envelope included by maximum and minimum trendlines)
Conclusion Data collection is ongoing to evaluate patient experience of this visualisation as a tool in consultations however initial response seems to be favourable when it has been used to discuss clinical trajectory or response to therapies with patients and colleagues. We also plan to explore the significance of the envelope area.

P245 ACUTE THORACOABDOMINAL AND CENTRAL HAEMODYNAMIC RESPONSES TO INSPIRATORY MUSCLE LOADING IN HEALTHY YOUNG ADULTS

J Manifield, N Chynkiamis, C Alexiou, D Megaritis, E Hume, G Barry, I Vogiatzis. *Northumbria University, Newcastle upon Tyne, UK*

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Introduction Inspiratory muscle training (IMT) has been shown to improve inspiratory muscle strength and exercise tolerance in healthy and diseased populations, however the acute physiological effects of short bouts of tapered flow resistive loading (TFRL) remain unclear. We investigated the acute responses of TFRL at low, moderate, and high IMT intensities and aimed to determine an optimal training load.
Methods Twelve healthy adults (26±3 years) performed 3 loaded trials (at 30, 50 and 70% maximal inspiratory pressure; PI_{max}) applied in a balanced ordered sequence and lasting 3 minutes each. Thoracoabdominal volumes (captured by Optoelectronic Plethysmography), cardiac output (recorded by Cardio-impedance), gas exchange, and dyspnoea scores were assessed throughout.
Results Inspiratory loading induced significant increases in thoracoabdominal tidal volumes compared to QB (0.69±0.06 L): by 2.71±0.30 L at 30% PI_{max} (p=0.003); 3.01±0.27 L at 50% PI_{max} (p=0.002); and 3.02±0.27 L at 70% PI_{max} (p=0.002). Increased end-inspiratory rib cage volume and decreased end-expiratory abdominal volume contributed to the expansion of thoracoabdominal tidal volumes. A significant difference in thoracoabdominal tidal volumes was observed between 30 and 50% PI_{max} (p=0.033) and between 30 and 70% PI_{max} (p=0.049). Cardiac output was significantly increased from rest (6.11±0.28 L/min) to 7.74±0.31 L/min at 30% PI_{max} (p=0.004), 8.38±0.66 L/min at 50% PI_{max} (p=0.003), and 8.36±0.57 L/min at 70% PI_{max} (p=0.003). With increasing inspiratory intensity, BORG ratings for dyspnoea progressively increased from 2.36±0.20 at 30% PI_{max}, to 3.45±0.21 at 50% PI_{max} (p=0.003), and to 4.91±0.25 at 70% PI_{max} (p=0.003). A significant difference in dyspnoea ratings was also observed between 50 and 70% PI_{max} (p=0.002). End-tidal carbon dioxide pressure ($P_{ET}CO_2$) progressively decreased from QB during 30% PI_{max} (26.23 ±0.59 mmHg; p=0.005), 50% PI_{max} (25.87±1.02 mmHg; p=0.005) and 70% PI_{max} (24.30±0.82 mmHg; p=0.005). Significant differences in $P_{ET}CO_2$ were found between 30% and 70% PI_{max} (p=0.017) and 50% and 70% PI_{max} (p=0.037).
Discussion Thoracoabdominal tidal volumes and cardiac output responses were nearly identical between 50% and 70% PI_{max}, however adverse physiological responses, such as