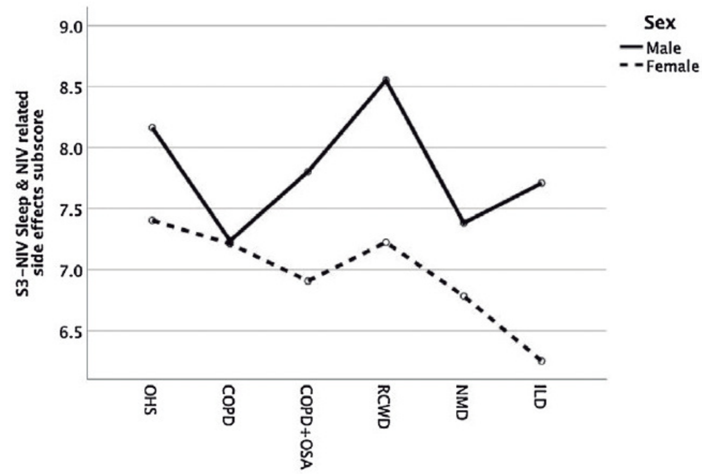

Figure 3. Differences in S3-NIV sleep & NIV related side effects subscore according to disease groups and sex.

Figure CO 006D

CO 007. HOME MECHANICAL VENTILATION IN NEUROMUSCULAR DISEASE – EXPERIENCE OF AN ADULT PULMONARY NEUROMUSCULAR CLINIC

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Introduction: Neuromuscular diseases have varied clinical behaviors and cause progressive muscle atrophy and weakness, with possible repercussions on the respiratory muscles and, thus, respiratory functional compromise with the need for complex home mechanical ventilation and assisted coughing. The Pulmonary Neuromuscular Clinic(PNC) of the Integrated Responsibility Center for Sleep and Non-Invasive Ventilation of the University Hospital Center of São João(CRI Sono/VNI CHUSJ) has a long experience in the follow-up of respiratory neuromuscular patients.
Objectives: To characterize the PNC of CRI Sono/VNI CHUSJ regarding the patients under follow-up and evaluation protocols.
Methods: Retrospective review of information in the electronic clinical records of all the patients with at least one PNC consultation in 2020 (N = 231). For each patient analyzed, the clinical situation at the time of the last PNC consultation of 2020 was considered. The research project was approved by the Ethics Committee of the CHUSJ.
Results: In the patients under follow-up, there was a predominance of men (57.6%, n = 133) and a mean age of 51 years (minimum 17, maximum 83). The most frequently found neuromuscular diseases are: amyotrophic lateral sclerosis (ALS) (26.4%, n = 61), myopathies (12.6%, n = 29), Steinert's myotonic dystrophy (10.8%, n = 25) and myasthenia gravis (5.6%, n = 13). There is overlap with obstructive sleep apnea in 24.2% of patients (n = 56). Patient referrals mainly come from Neurology (54.1%, n = 125), Pediatrics/Pulmonology (9.1%, n = 21) and General Pulmonology (6.5%, n = 15) outpatient consultations and from the Neurology ward (8.7%, n = 20). Patients are evaluated under a protocol by a doctor and a respiratory physiotherapist; non-invasive functional assessment methods are preferred. In the first consultation: symptom inquiry; spirometry (sitting + lying down); measurements of peripheral oxygen saturation (SpO_2), transcutaneous capnography ($tcCO_2$) and peak cough flow; cardiorespiratory polygraphy. Subsequent visits: symptom inquiry; measurements of SpO_2, $tcCO_2$, slow vital capacity and peak cough flow (the latter two also in maximum insufflation capacity (MIC) if the patient performs air stacking); analysis of ventilator and in-exsufflator adhesion data. The frequency of patient surveillance is decided according to the behavior and the clinical/functional evolution of the underlying neuromuscular disease. Patients are adapted to mechanical ventilation in an outpatient laboratory. In 2020, 124 patients (53.7%) were under mechanical ventilation and 8 patients under continuous positive pressure at night. The ventilation modes in use were: pressurimetric (79%, n = 98), volumetric (4%, n = 5), hybrid (1.6%, n = 2), pressurimetric + volumetric (in different periods of the day) (14.5%, n = 18) and servoventilation (0.8%, n = 1). 25 patients (10.8%) were ventilated for > 16 hours/day (of which 15 in daytime volumetric + night pressurimetric, 4 in day/night pressurimetric[of which 2 in invasive mechanical ventilation], 3 in day/night volumetric, 2 in day/night hybrid (AVAPS) and 1 in day volumetric+night hybrid (AVAPS). 15 patients (6.5%) performed intermittent mouthpiece ventilation. 23 patients (10%) had percutaneous gastrostomy (PEG). 37 patients (16%) were under mechanical in-exsufflation (assisted cough). 9 patients were tracheostomized (diseases: ALS = 4 patients; mucopolysaccharidoses = 2 patients; remaining: nemaline myopathy, hereditary congenital muscular dystrophy, post-acute respiratory failure with orotracheal intubation). In the 2015-2020 period, 95 patients had at least one respiratory hospitalization (average of 2.9 admissions/patient, with average duration = 15 days). By the end of 2020, there were 16 deaths.
Conclusions: In this study, it was possible to document the complexity of the respiratory management of neuromuscular patients being followed up by the PNC team of the CRI Sono/VNI CHUSJ, which requires a highly differentiated multidisciplinary care by experienced and dedicated health professionals.

Keywords: *Mechanical ventilation. Mechanical in-exsufflation. Neuromuscular disease. Amyotrophic lateral sclerosis. Myopathies. Sleep respiratory pathology. Percutaneous gastrostomy.*

CO 008. TREATABLE TRAITS AND ITS RESPONSIVENESS TO PULMONARY REHABILITATION IN PEOPLE WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND INTERSTITIAL LUNG DISEASE

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Introduction: Chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD) are complex respiratory diseases showing heterogeneous clinical manifestations. Recognising their treatable traits, known as identifiable and measurable characteristics that are clinically relevant and potentially treatable, may be a first step to individualise care and improve clinical outcomes in these individuals. Pulmonary rehabilitation (PR) is a non-pharmacological, multidisciplinary and multicomponent intervention, which provides a unique opportunity to address multiple treatable traits at once and to implement personalised treatments. However, research on this topic is still scarce. This study aimed to identify candidate treatable traits in people with COPD and ILD and to assess its responsiveness to PR.

Methods: Data from two observational prospective studies were analysed. Individuals were eligible if medically diagnosed with ILD or stable COPD, and had participated in a 12-week community-based PR programme. Sociodemographic and anthropometric data were collected to characterise the sample. The number of acute exacerbations, peripheral oxygen saturation, dyspnoea, cough, sputum, impact of disease, anxiety and depression symptoms, fatigue, health-related quality of life, exercise capacity, functional status, quadriceps and inspiratory muscle strength, balance status and physical activity were collected to establish candidate treatable traits. The instruments used to assess each outcome measure and the parameters defining treatable traits are described in Table 1. Minimal clinically important differences (MCID) or clinically relevant cut-offs of each measure were used to assess responsiveness to PR. Prevalence of treatable traits and the proportion of people who achieved MCIDs or surpassed the clinically relevant cut-offs after PR, were compared between people with COPD and ILD.

Results: One-hundred and forty-four individuals were included (90 people with COPD: 70 ± 8 years, 79% men, 49.9 ± 17.8 FEV1 %predicted, 78.3 ± 19.9 FVC %predicted; and 54 people with ILD: 64 ± 12 years, 37%men, 54.7 ± 17.5 DLCO %predicted; 80.1 ± 18.7 FVC %predicted). Five pulmonary and 13 extrapulmonary candidate treatable traits were identified before PR (table). Generally, the prevalence of these traits was similar in both populations. Nevertheless, people with COPD showed a significantly higher prevalence of impact of sputum (43.9% *vs.* 23.3%, p = 0.028) and cough (34.8% *vs.* 16.3%, p = 0.034) and disease impact (81.1% *vs.* 31.1%, p = 0.008) than people with ILD (table). Both populations showed improvements above the MCIDs or the relevant cut-offs following PR in all candidate treatable traits (fig.). Moreover, after PR, a significantly higher number of people with COPD showed improvements in health-related quality of life (81.0% *vs.* 63.3%, p = 0.026), impact of the disease (87.7% *vs.* 69.7%, p = 0.025) and quadriceps muscle strength (65.0% *vs.* 31.3%, p = 0.044), compared to people with ILD, who instead showed a significantly higher reduction in fatigue (74.3% *vs.* 49.2%, p = 0.015).

Conclusions: The candidate treatable traits seem to be similar in people with COPD and ILD and PR is indeed a highly effective treatment for addressing them in both populations. Further research validating treatable traits in respiratory diseases and exploring the most adequate person-centred interventions to tackle the different traits is needed to promote precision medicine.

Keywords: *Treatable traits. Pulmonary rehabilitation. Precision medicine. Chronic obstructive pulmonary disease. Interstitial lung disease.*

Table 1: Candidate treatable traits identified before pulmonary rehabilitation in people with chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD) (n=144).

Treatable traits identified, n (%)	COPD (n=90)	ILD (n=54)	p-value*
PULMONARY			
Exacerbation history			
2 or more acute exacerbations or 1 acute exacerbation with hospitalization last year [1]	23 (25.6)	9 (16.7)	0.327
Oxygen desaturation			
SpO_2<88% in 6MWT [1]	15 (17.2)	7 (13.0)	0.496
Dyspnoea			
mMRC≥2 [1][2][3]	59 (65.6)	32 (59.3)	0.448
Presence of sputum			
Sputum symptoms (CASA-Q) total score <70% [4]	34 (51.5)	19 (44.2)	0.454
Sputum impact (CASA-Q) total score <70% [4]	29 (43.9)	10 (23.3)	**0.028**
Presence of cough			
Cough symptoms (CASA-Q) total score <70% [4]	34 (51.5)	18 (41.9)	0.324
Cough impact (CASA-Q) total score <70% [4]	23 (34.8)	7 (16.3)	**0.034**
EXTRAPULMONARY – symptoms and health status			
Anxiety symptoms			
HADS-A score ≥8 points [5]	27 (37.5)	18 (51.4)	0.171
Depression symptoms			
HADS-D score ≥8 points [5]	34 (46.6)	14 (40.0)	0.520
Fatigue			
FACIT-FS total score <43 points [6]	67 (80.7)	35 (76.1)	0.535
Health-related quality of life impairment			
SGRQ≥25 points [1]	78 (86.7)	45 (83.3)	0.583
Impact of disease in daily life			
CAT≥10 points [1][7]	73 (81.1)	33 (31.1)	**0.008**
EXTRAPULMONARY – physical status			
Exercise capacity intolerance			
6MWT<70% predicted [8]	21 (23.6)	10 (18.5)	0.475
Functional status impairment			
1STS repetitions<70% predicted [9]	45 (51.1)	32 (59.3)	0.346
Quadriceps muscle strength impairment			
HHD of quadriceps <70% predicted [10]	21 (23.3)	16 (29.6)	0.403
Inspiratory muscle strength impairment			
MIP<70cm/H_20 in women; <80cm/H_20 in men [11]	40 (48.2)	22 (41.5)	0.445
Balance impairment			
Brief BESTest total score <16.5 points [12]	39 (46.4)	20 (42.6)	0.669
EXTRAPULMONARY – behavioural factors			
Overweight/obesity			
BMI>30 kg/m² [13]	19 (21.1)	20 (37.0)	**0.037**
Physical inactivity			
BAAPT total score ≤3 points [14]	75 (83.3)	30 (85.7)	0.744

Legend: mMRC: modified British medical research council dyspnea questionnaire; SpO2: peripheral oxygen saturation; CASA-Q: cough and sputum assessment questionnaire; CAT: COPD assessment test; HADS: hospital anxiety and depression scale (anxiety component-HADS-A; depression component-HADS-D); FACIT-FS: functional assessment of chronic illness therapy-fatigue subscale; SGRQ: St. George's respiratory questionnaire; 6MWT: six-minute walk test; 1STS: one-minute sit-to-stand test; HHD: hand-held dynamometry; MIP: maximal inspiratory mouth pressure; Brief BESTest: brief balance evaluation systems test; BMI: body mass index; BAAPT: brief physical activity assessment tool; [1] GOLD Report, 2021; [2] Hul et al. ERJ Open Res., 2020; [3] Spruit et al. Sports Med, 2020; [4] Crawford et al. Respir Med., 2008; [5] Zigmond et al. Acta Psychiatr. Scand., 1983; [6] Cella et al. Cancer, 2002; [7] Kon et al. Lancet Respir Med, 2014; [8] Koolen et al. J. Clin. Med., 2019; [9] Bohannon et al. J. Cardiopulm. Rehabil. Prev., 2019; [10] Bohannon et al. Arch. Phys. Med. Rehabil., 1997; [11] Laveneziana et al. Eur Respir J, 2019; [12] Jácome et al. Phys Ther, 2016; [13] Guo et al. Medicine, 2016; [14] Marshall et al. Int J Sports Med, 2005; *p-value for the differences between 2-groups (COPD and ILD) using chi-square test.

Figura CO 008A

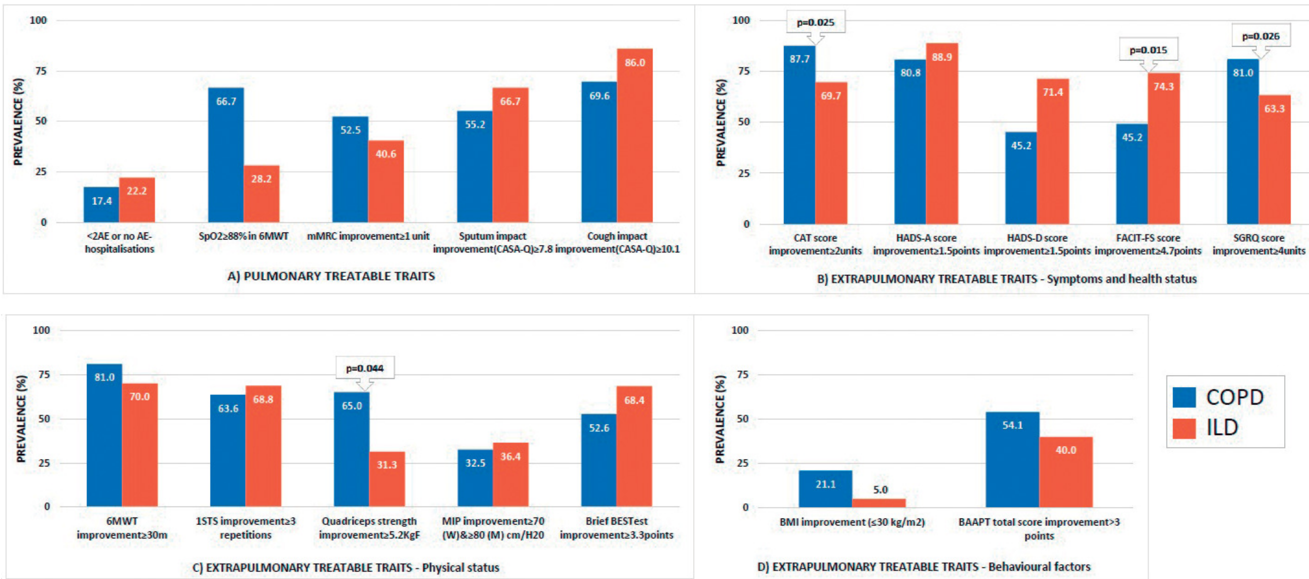

Figure 1: People with chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD) who achieved minimal clinically important differences, or surpassed clinically relevant cut-offs, in candidate treatable traits following pulmonary rehabilitation.
Legend: AE: acute exacerbation; SpO2: peripheral oxygen saturation; mMRC: modified British medical research council dyspnea questionnaire; CASA-Q: cough and sputum assessment questionnaire; CAT: COPD assessment test; HADS: hospital anxiety and depression scale (anxiety component-HADS-A; depression component-HADS-D); FACIT-FS: functional assessment of chronic illness therapy-fatigue subscale; SGRQ: St. George's respiratory questionnaire; 6MWT: six-minute walk test; 1STS: One-minute sit-to-stand test; MIP: maximal inspiratory mouth pressure; W: women; M: male; Brief BESTest: brief balance evaluation systems test; BMI: body mass index; BAAPT: brief physical activity assessment tool *p-value for the differences between 2-groups (COPD and ILD) using chi-square test; p-values were only presented for statistically significant differences ($p<0.05$).

Figura CO 008B

CO 009. NEW DATA ON TELEMONITORING PHYSICAL ACTIVITY AND THERAPEUTIC IMPLICATIONS

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Introduction: Pulmonary rehabilitation is based on a thorough patient assessment, which include functional exercise capacity and physical activity. For this purpose, it is important to appropriately monitor peripheral oxygen saturation (SpO2) and heart rate (HR) at rest and exertion individual responses, as relevant inputs to consider when optimizing oxygen therapy and designing exercise-based interventions. To understand whether exercise-field tests identify patients who desaturate (SpO2 < 90%) during physical activities, this study compared the six-minute walk test (6MWT) and daily-life telemonitoring.
Methods: Cross-sectional study including 100 patients referred for pulmonary rehabilitation. The 6MWT was performed in hospital with continuous assessment of SpO2, HR, walked distance and calculated metabolic equivalent of tasks (METs). Patients were also evaluated in real-life by SMARTREAB telemonitoring, a combined oximetry-accelerometery with remote continuous assessment of SpO2, HR and METs. Differences between the means in 6MWT and SMARTREAB telemonitoring were assessed with paired-sample t-tests. Mean differences between patients who only desaturated in the SMARTREAB telemonitoring and those who also desaturated in the 6MWT were assessed with independent sample t-tests. A p-value of less than 0.05 was considered statistically significant.
Results: Convenience sample of 100 patients referred for pulmonary rehabilitation, 50% male, with a mean age of 66.1 ± 9.8 years and diagnosis including 41% chronic obstructive pulmonary disease, 22% interstitial lung disease, 15% idiopathic pulmonary fibrosis, 15% asthma, 10% bronchiectasis and 12% other. SMARTREAB telemonitoring identified 24% more desaturators compared with the 6MWT. Moreover, there were significant mean differences between 6MWT and SMARTREAB telemonitoring in lowest SpO2 of 7.2 ± 8.4% ($p < 0.0005$), in peak HR of -9.3 ± 15.5% ($p < 0.0005$) and in activity intensity of -0.3 ± 0.8 METs ($p < 0.0005$). Considering SpO2 profile, there were 6% non-desaturators, 3% only 6MWT desaturators, 27% only SMARTREAB desaturators and 64% both methods desaturators. The 85% peak HR was surpassed by 11% of patients in the 6MWT and 32% of patients with SMARTREAB telemonitoring. About activity intensity, 2.5 METs intensity was surpassed by 56% of the patients in the 6MWT, and 77% of the patients with SMARTREAB telemonitoring. Moreover, SMARTREAB telemonitoring, further detected a median of 2 to 9 daily episodes with SpO2 < 90% and longest period of desaturation of 25 to 33 minutes per patient desaturator. Because of this, intraday SpO2 fluctuations must be considered when algorithms of telemedicine assistance are determined by telemonitoring applications merely based on a daily SpO2 spot check. Also, as 27% of patients do not desaturate on a 6MWT but are daily desaturators, ambulatory oximetry preciseness should be applied for oxygen titration purposes. Furthermore, a comprehensive regular assessment of physical activity with oximetry and accelerometery is recommended, as it provides combined perspectives of quantity (duration), intensity (METs), modality (type) and quality (SpO2 and HR) of patient's daily living.
Conclusions: The 6MWT underestimates the proportion of patients with exercise-induced oxygen desaturation compared to real-life telemonitoring. These results help defining oximetry-guided interventions, such as telemedicine algorithms, oxygen therapy titration and regular physical activity assessment in pulmonary rehabilitation.

Keywords: *Telemonitoring. Physical activity. Continuous oximetry. 6MWT.*

CO 010. PULMONARY TELEREHABILITATION EMERGED DURING PANDEMIC: PROGRAMS ADAPTATIONS AND PATIENT EXPERIENCE

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Introduction: With health systems overwhelmed by the increasing demand of coronavirus disease 2019 (COVID-19), pulmonary telere-