261. Assessment of functional status

E2867
The use of the incremental shuttle walking test in the BODE index
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Background: The multi-dimensional BODE index has gained acceptance in its utility for assessing patient outcomes. We have evaluated the substitution of the 6 min walking distance (6MWD) with the incremental shuttle walking test distance (ISWT) as the measure of exercise capacity in the index.

Method: 645 patients screened for pulmonary rehabilitation with COPD were followed up over a period of 5 years. Each patient was assigned a BODE score from 0 to 10 using the original factors and weighting but substituting the following points for ISWT quartiles: <80m=3 points, 80-149m=2 points,150-249m=1 point, ≥250m=0 points. One, 2 and 5 year survival from date of initial screening was obtained from hospital records.

Results: BODE scores were compared between those who were still alive and those who were dead at 1 year (6.2 vs 4.6, mean diff 1.6 (95%CI 0.9 to 2.2), p<0.0001); 2 years (6.1 vs 4.7, mean diff 1.4 (0.9 to 2.0), p<0.0001) and 5 years (6.3 vs 4.6, mean diff 1.7 (1.2 to 2.3), p<0.0001). To evaluate the capacity of the index to predict risk of death, we performed Cox proportional hazards regression analysis. The hazard ratio for death per one-point increase in the BODE score was 1.29 (95% CI 1.17 to 1.43) which compares well with the hazard ratio of 1.34 documented by Celli et al, NEnglJM 350;10, 2004.

Conclusion: The conceptual framework of the BODE index and its capacity to predict risk of death persists regardless of which test of exercise capacity is used as the ‘E’ component of the BODE. We found that the BODE scores at initial screening for those patients who subsequently had died by 1, 2, or 5 year follow up were significantly worse than those who survived.

E2868
COPD related fatigue: evaluation of factors associated with fatigue in COPD and comparison with healthy subjects
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Background: Fatigue in COPD impairs functional status; however there are few studies examining mechanistic pathways of this symptom.

Aims: This study compares fatigue in COPD patients with that of healthy age-matched subjects and identifies predictors of COPD related fatigue (RF).

Methods: 74 COPD patients, with mean age 69.9 (49-87) yrs, mean (SD) % predicted FEV1 46.5 (20.0) % and FEV1/FVC ratio 0.44(0.13) and 35 healthy subjects, mean age 67.1 (50-84) yrs completed the Multidimensional Fatigue Inventory (MFI 20). Patients’ assessment included Depression (HADS), lung function, BMI, muscle strength, incremental shuttle walk test (ISWT), exercise oxygen saturation (SpO2), Borg breathlessness (CR-10) and exertion (RPE). Serum level of Interleukin 6 (IL-6) was recorded. Differences in MFI 20 between groups were examined and predictors of fatigue identified using logistic regression.

Results: Significant differences (p<0.01) were found between the COPD and healthy subjects for all dimensions of MFI 20. There were significant differences between GOLD stages for Physical Fatigue and Reduced Activity only. Predictors of General Fatigue were depression, muscle strength and % predicted FEV1; % predicted FEV1/FVC; Reduced Motivation was predicted by end SpO2, depression and RPE.

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Conclusions: All dimensions of fatigue were higher in COPD than healthy aged subjects. Psychological and physiological factors differ according to the dimension of fatigue under investigation. COPD RF is a multiple component symptom requiring further consideration.

E2869 Comparison of activities of daily living in patients with moderate and severe chronic obstructive pulmonary diseases
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Purpose: Patients with chronic obstructive pulmonary disease (COPD) frequently experience activity restriction during activities of daily living (ADL). The aim of this study was to compare ADL between moderate and severe COPD patients.

Methods: Ten patients with moderate (55.2±10.8 years, FEV1=65.8±11.4%) and eight patients with severe COPD (59.4±9.5 years, FEV1=33.6±9.8%) participated in this study. Perceived and actual performance in ADL, were determined using London Chest Activities of Daily Living Scale (LCADL) and the Glittré ADL test, respectively. The Glittré ADL test includes a set of ADL activities like walking stairs, carrying, lifting objects, bending down and rising from a seated position.

Rationale: The Sit-to-Stand test (SST) is accepted and utilized during functional exercise testing. There is a lack of evidence in literature regarding the neurophysiological effectiveness of SST in regard to neurophysiological test.

Methods and subjects: Fourteen patients with moderate to severe COPD randomly participated in the study. Functional capacity was evaluated with six-minute walk test (6MWT). Oxygen saturation was measured using pulse oximetry and dyspnea perception (p<0.05). Seattle ADL test is usually performed with subjects in a sitting position. The aim of this study was to investigate the relationship between peripheral and respiratory muscle strength, and fatigue and performance of ADL in patients with heart failure.

Results: Thirty two patients with heart failure (69.1±9.75 years, NYHA class II-IV) and 6MWT (128 meters). St. George’s Respiratory Questionnaire point was 50.9 (p<0.05). BODE index was negatively correlated with neck flexors, elbow flexors, shoulder flexors, knee extensors, and hand grip muscles strength and fatigue perception (p<0.005). NYHA was significantly related with neck flexors, elbow flexors, shoulder flexors, knee extensors, hand grip muscles strength and fatigue perception (p<0.005). The significance of the study was to investigate the relationship between peripheral and respiratory muscle strength, and fatigue and performance of ADL in patients with heart failure.

Conclusion: The study confirmed that SST may determine functional status as easily as the 6MWT and using Barthel Index. Results: ADL, MIP, and MEP were significantly related with neck flexors, shoulder flexors, knee extensors, hand grip muscles strength and fatigue perception (p<0.005). The aim of the study was to investigate the relationship between multidimensional disease severity and peripheral muscle endurance and fatigue in chronic obstructive pulmonary disease.

Method: Twenty-two males, the mean age 62.5±6.5 years, patients with COPD participated in the study. Functional capacity was evaluated with six-minute walk test (6MWT). Oxygen saturation was measured using pulse oximetry and dyspnea and fatigue perception was recorded using modified Borg Scale before and after the 6MWT. The subjects’ disease multidimensional severity was measured using SAFE (St. George’s Respiratory Questionnaire, air flow limitation and exercise tolerance) index and BODE (body mass index, airflow obstruction, dyspnea, exercise capacity) index. Fatigue level was assessed using Fatigue Impact Scale, and ADL using Barthel Index.

Results: ADL, MIP, and MEP were significantly related with neck flexors, shoulder flexors, knee extensors, hand grip muscles strength and fatigue perception (p<0.005). NYHA was significantly related with neck flexors, elbow flexors muscle strength and fatigue (p<0.005). The significance of the study was to investigate the relationship between peripheral and respiratory muscle strength, and fatigue and performance of ADL in patients with heart failure.

Conclusion: The study confirmed that SST may determine functional status as easily as the 6MWT and using Barthel Index.

Results: The results of the blood lactate concentration during rest and at the end of exercise were compared to the median frequency obtained with the Student t test. The initial and final values obtained from SST and 6MWT were compared within each group (p<0.05). The Glittré ADL test includes a set of ADL activities like walking stairs, carrying, lifting objects, bending down and rising from a seated position. The sit-to-stand test is most accepted and utilized test during functional exercise testing. The results of the blood lactate concentration during rest and at the end of exercise were compared to the median frequency obtained with the Student t test. The initial and final values obtained from SST and 6MWT were compared within each group, and the correlation between the initial and final values for each functional test was also verified between the initial and final values of SST.

Conclusions: The sit-to-stand test to the functional status, physical activity level and quality of life in the chronic obstructive pulmonary disease.

Introduction: the chronic obstructive pulmonary disease (COPD) leading to symptoms such as dyspnea, diminution of functional capacity and the quality of life; necessitating the application of clinical tests.

Aim: to verify correlations between metabolic and ventilatory responses of the Six-Minute Step Test (6MST) and of the Sit-to-Stand Test (SST), the functional status and quality of life.

Methods: 11 men with COPD (age from 58 to 80 years) were assessed by 6MST, SST, London Chest Activity of Daily Living (LCADL) and by Saint George Respiratory Questionnaire (SGRQ).

Results: were observed negative correlations (r=-0.68) (Spearman; p<0.05) of the oxygen consumption (VO2) and pulmonary ventilation (VE) in the 6MST with the LCADL self-care, leisure and physical sections; and SGRQ activity and the psychosocial impact components and total score. Negative correlations was found between the VO2 in the 6MST and LCADL total score; and VE in the 6MST and LCADL domestic section, and SGRQ symptoms component. There was negative correlation of the peak metabolic demand (VO2/VO2max) in the 6MST with the LCADL self-care, physical sections, and total score; and positive correlations (r=0.70) with the SGRQ physical and psychosocial impact components and total score.

Conclusion: the results show that the metabolic and ventilatory variables of 6MST influenced the functional status and quality of life, suggesting that the lower the VO2/VO2max and VE, the greater the limitation of dyspnea when performing the ADL and worse quality of life of these individuals. Ethics Committee 46/2007.

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COPD. Improvements in perceived and actual fatigue level may positively affect multidimensional disease severity in these patients.

E2874
Muscle force of biceps and deltoids contributes to arm functional capacity and endurance in patients with chronic obstructive pulmonary disease
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Rationale: Although the force-generating capacity of the upper limb muscles is reduced in patients with chronic obstructive pulmonary disease (COPD), it is unknown whether this impairment relates to their difficulty with arm functional tasks. The aim of this study was to examine the relationship between upper limb muscle force and arm function in patients with COPD.

Methods: A cross-sectional study was performed on 15 individuals with COPD (7 females, 66±9 yrs; FEV1 = 31±6.10 L/76% pred). Measures of muscle force were obtained of the biceps, triceps, anterior and middle deltoids on the dominant side using an isometric dynamometer. Arm functional capacity and endurance were measured using the 6-minute poolbound and ring test (6PBRT) and the incremental unsupervised arm exercise test (UULEX), respectively.

Results: Performance during the 6PBRT was associated with maximum force of the biceps (r = 0.62; p = 0.018), anterior (r = 0.73; p = 0.005) and middle deltoids (r = 0.59; p = 0.03) but not triceps (r = 0.33; p = 0.26). Likewise, performance during the UULEX was associated with maximum force of the biceps (r = 0.73; p = 0.003) anterior (r = 0.7; p = 0.007) and middle deltoids (r = 0.62; p = 0.02), but not triceps (r = 0.5; p = 0.058).

Conclusions: Upper limb muscle force is determinant of arm functional capacity and endurance in patients with COPD. Pulmonary rehabilitation programs should emphasize resistance training of the biceps and deltoids to optimize arm function in these patients.

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E2875
Evaluation of the surrey information on function tool (SIFT) as a functional outcome measure for pulmonary rehabilitation (PR)
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SIFT was developed as a functional outcome measure for PR as other similar tools were not deemed time efficient. We aimed to evaluate its validity against the Canadian Occupational Performance Measure (COPM) pre and post PR, and its sensitivity to change with PR. Both tools have two components: SIFT Function (F) and Contentment (C); COPM Performance (P) and Satisfaction (S). Patients rate chosen tests.

Patients attending PR and who consented (n=52) completed both SIFT and COPM in random order pre and post PR. Randomisation was by sealed envelopes.

Validity: SIFT F correlated well with COPM P (Pearson correlation r=0.53*) (p=0.003) and SIFT C with COPM S (Pearson correlation r=0.63*) (p=0.000) (Table 1).

<table>
<thead>
<tr>
<th>Mean (SD) scores for SIFT and COPM pre and post PR</th>
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<tr>
<td>n=52</td>
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<tr>
<td>Mean score pre PR (SD)</td>
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<tr>
<td>Mean score post PR (SD)</td>
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<td>Mean Change (SD)</td>
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Sensitivity to change: Both components of both tools were highly sensitive to change (paired t-test p<0.001*) (table 1) with no statistically significant difference between the 2 tools.

Conclusion: SIFT is a valid, sensitive and simple functional tool to use for PR.

E2876
Does the BODE index reflect the level of physical activity in daily life in patients with COPD?
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Introduction: The BODE index was initially used to predict mortality risk in patients with Chronic Obstructive Pulmonary Disease (COPD), and its use to classify disease severity has gained growing interest ever since. It is not fully known to what extent this index reflects the level of daily physical activity in these patients.

Objectives: To study the relationship between the level of physical activity in daily life and disease severity as assessed by the BODE index in COPD patients.

Methods: Fifty-four patients with COPD (27 men; age 66±8 years; FEV1 = 46±16 predicted) were submitted to lung function testing, assessment of dyspnea (Medical Research Council scale, MRC) and 6-minute walking distance (6MWD). The BODE index was calculated based on the body mass index, FEV1, MRC and 6MWD, and patients were then divided in four quartiles (Q1: 0 to 2 points, n=18; Q2: 3 to 4 points, n=13; Q3: 5 to 6 points, n=16; Q4: 7 to 10 points, n=7). Physical activity in daily life was assessed with two motor sensors (Dynaport [McRoberts] and SenseWear Armband [Bodymedia]).

Results: There were weak but significant correlations between the BODE index and daily time spent walking and standing, movement intensity in daily life and total daily energy expenditure (r = -0.35, p = -0.42, p<0.05 for all). When comparing quartiles, the only significant differences were the lower time spent sitting and higher time spent walking and standing in Q4 in comparison to Q4 (p<0.05 for all).

Conclusion: The level of physical activity in daily life has only modest correlation with the classification of disease severity given by the BODE index, just reflecting differences between patients with mild and very severe disease.

E2877
Functional tests and relation to BODE index in chronic obstructive pulmonary disease
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Introduction: In the Chronic Obstructive Pulmonary Disease (COPD) the exercise capacity is reduced and it increases the mortality risk that has been evaluated by the BODE Index (Body mass index; airflow Obstruction; Dyspnea and Exercise capacity).

Aims: To investigate the pulmonary ventilation (VE), oxygen consumption (VO2), and production of carbon dioxide (VCO2) during Activities of Daily Living (ADL) and tests of the upper limbs (UL) and lower limbs (LL); and to determine correlations between the variables evaluated during ADL, UL and LL test to the BODE Index in individuals with COPD.

Methods: 17 men (age from 58 to 80 years): 10 composed the COPD Group (COPDG) and 7 healthy composed the Control Group (CG). All performed the ADL Test, the Six Minute Walking Test (6MWT), the Six Minute Walking Test on Treadmill (6MWTT), the Sit To Stand Test (STST) and the Hand Grip Test (HGT). The correlations between the tests performed and the BODE Index were found for the COPDG.

Results: Intergroup analysis detected significant differences (p<0.05) in relation to ADL of lifting container to eye level (VE, VCO2), combing hair, lifting containers to above shoulder level, hanging out clothes and sweeping the floor (VCO2) and in 6MWT, 6MWTT and STST. The BODE Index presented a correlation (r=0.66) to 6MWTT, STST and HGT. The correlations between the tests performed and the BODE Index were found for the COPDG.

Conclusion: COPDG presented a lower tolerance to physical effort compared to the CG during performance of the ADL and LL tests. The BODE Index presented an association to limiting factors evaluated in the 6MWTT, STST and HGT for the COPDG, and based on these findings suggests the possible use of these tests to calculate physical exercise capacity in the BODE Index. Ethics Committee (16/2007).

E2880
Validation of the self-paced step test for assessment of exercise tolerance in elderly people
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The clinical tests, which use a step as ergometer, usually have two features that makes difficult its usage by elderly people or chronic degenerative disease patients: the cadence is constant and the step height is not proportional to their physical condition. Thus, the aim of this study was to develop and validate a test to exercise tolerance assessment of 60 to 69 years old subjects, using a 15 centimeters step height as ergometer and self-paced. The self-paced step test (SPST) was compared to six-minute walk test (6MWT) in a sample (12 male; 35 female) of elderly people. Reliability in both tests was evaluated: the SPST required time for cardiovascular, respiratory, effort and fatigue perception changes were compared to 6MWT changes and it was established a performance correlation (exercise tolerance) of the subjects in both tests. The statistical analysis included: F test, Student T test, Wilcoxon Test, All of them with significance level p ≤ 0.05; The Pearson’s correlation was used in reliability and validation evaluation. The most important results were: the heart rate (HR) had a different behavior between tests, p=0.04 in the 5th minute and p=0.01 in 6th minute. Borg’s scale fatigue had p=0.001 in 4th minute and p=0.007 in 6th, and the Borg’s scale effort had p=0.16.
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Conclusion: The lower PCI observed in asthmatic groups suggest autonomic dysfunction of HR. The major RCI and RECI in asthmatic children suggest that these indexes can be used to identify respiratory muscle overload in different respiratory diseases.

E2886
Step counting and energy expenditure estimation in patients with COPD and healthy elderly: accuracy of two motion sensors

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Aim: To compare the accuracy of two motion sensors concerning step counting and energy expenditure (EE) estimation in patients with Chronic Obstructive Pulmonary Disease (COPD) and in healthy elderly: a simple pedometer (Digiwalker SW 700, Yamax) and a technologically advanced multi-sensor (SenseWear Armband, Bodymedia).

Methods: Thirty COPD patients (17 men, 67±8 years, FEV1 46±17%pred, BMI 24±4 kg.m-2) and thirty matched healthy elderly (15 men, 68±7 years, FEV1 104±21%pred, BMI 25±3 kg.m-2) wore the two motion sensors during a protocol of treadmill walking at three different speeds, for one minute each speed, interspersed by a minute of rest. The three speeds corresponded to 30%, 60% and 100% of the average speed achieved during a previously performed 6-minute walking test. Simultaneously, as reference methods, EE was estimated by oxygen consumption analysis with a portable metabolic system, and the number of steps was registered by a video camera.

Results: In the higher speed, the pedometer was accurate in step counting and EE estimation both in COPD patients and in healthy elderly, but underestimated the results in the two other speeds in both groups. The multi-sensor did not show accurate estimates of step counting in any speed, but accurately estimated EE in all speeds in healthy elderly and in the intermediate and higher speeds in patients with COPD.

Conclusion: Both in patients with COPD and in healthy elderly, the SenseWear Armband had better energy expenditure estimates during most walking speeds in comparison to the DigiWalker. Conversely, for step counting, accuracy was observed only with the DigiWalker during high walking speed in both groups.