

The modified medical research council dyspnea scale nursing essay

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Introduction

Worldwide, Chronic obstructive pulmonary disease (COPD) is a leading cause of chronic morbidity and mortality (1) and is a major public health concern (2). It is currently ranked fourth cause of death and is projected to rank third by 2020 (3). The major characteristic of COPD is the presence of a persistent airflow limitation caused by a chronic inflammatory response, which slowly progresses over a period of years, and is by definition largely irreversible (4; 5). Patients typically suffer from chronic cough, chronic sputum production and dyspnea (6). Exacerbations, which are defined as periods of increased symptoms and reduced lung function, are common phenomena within this disease (4; 4; 7; 8). At group level exacerbations become more frequent with increased disease severity but some patients are characterized by repeated exacerbations and some have no exacerbations (9). Exacerbations are associated with an impaired quality of life, reduced survival, and a high healthcare expenditure, leading to a social and economic burden (10; 11). The latter is the result of the high rate of COPD hospital admissions (12). Prevention of exacerbations is therefore an important goal in the management of stable COPD (13; 14) Already early in the stages (as of GOLD-stage I), patients with COPD are less active when compared to healthy controls (15-18). Noticeable, in the study of Pitta, et al. almost half of the patients did not walk more than the daily-recommended 30 minutes of physical activity (19). Regular physical activity and an active lifestyle have shown to be positively associated with exercise capacity and the feeling of dyspnea (20). A study of Garcia-Aymerich, et al. showed that patients who were more physically active show slower loss of lung function and fewer

exacerbations (12; 21; 22). This in turn, can reduce the risk of COPD readmission and mortality (21). An adequate level of physical activity in COPD patients is important and needs to be integrated into daily life. Therefore, encouraging patients to become more physically active has become a major focus in contemporary COPD therapy. Up till now, COPD has been diagnosed based on the GOLD guidelines and according to these guidelines, subdivided into four categories, the forced expiratory volume in one second (FEV1) after bronchodilation is used (4; 7). This classification has been criticized because the classification is one-dimensional and does not take into account the symptoms experience of the patient (23). Because exacerbations seem to induce more symptoms (24) and symptoms and exacerbations are independent predictors of prognosis (25), another criticism is that the classification does not take the presence of exacerbation into account (23). The rate at which exacerbations occur, varies greatly between patients (26), but surely, the best predictor of having frequent exacerbations (2 or more exacerbations per year) is a history of previous treated events (9Pub Date). Therefore, FEV1 alone is a poor descriptor of disease status and for this reason the treatment strategy for stable COPD should also consider individual patient's symptoms and future risk of exacerbations. The new classification has the aim to integrate all these aspects in one combined assessment. The goal of this classification is to determine the disease severity of the individual patient, it's impact on the patient 's health status and the risk of future events in order to recommend optimal therapy (4). As mentioned above, physical activity plays a crucial role in COPD patient's health status and future risk of exacerbations.

Moreover, the level of physical activity is found to be the strongest predictor of survival(27). Up till now there has not been done any research about the relationship between the new GOLD classification and physical activity. It is unclear whether this multicomponent staging index could be a good indicator of inactivity or non-compliance to physical activity recommendations. Although potentially valid, it is unclear whether PA levels would also be different between GOLD stages A-D. Hence this study aimed to investigate if the new classification of COPD bodes the amount of physical activity in daily life in COPD patient.

Materials and Methods

Study SubjectsIn total, 54 patients with COPD were recruited between Q2 2011 and Q4 2012 in Belgium. A post bronchodilator spirometry at baseline was performed to confirm the diagnosis of COPD ($FEV_1/FVC < 70\%$) (4). Patients had to be current or ex-smokers with a smoking history of at least 10 packyears and were able to read and write and to use the physical activity monitors. Subjects with orthopaedic or neurological complaints interfering with physical activity and cognitive impairments were excluded. Patients could not enter the study if they were suffering from a respiratory disease other than COPD or had had a COPD exacerbation within 4 weeks prior to the start of the study. All patients signed a written informed consent at their first visit.

Study DesignThis longitudinal study with one-year follow-up consists of two test weeks with six months interim. Figure 1 provides an overview of the study protocol. Figure 1

Patients included for first visitation LF, MRC, CAT(n= 54)6 months Drop-outs after inclusion 1 diagnosis palliative

lungcancer2 Refusal further participation by patientInquiring exacerbationsPhysical activity monitoring (1 week)Drop-outs after monitoring1 diagnosis palliative lungcancer1 lungtransplantation1 general decline + syncope1 general decline(diagnosis dementia + hipfracture)Patients included in analysis (n= 47)Physical activity monitoring (1 week)LF, MRC, CATPatients included in study (n= 47)6 monthsMethodsPulmonary function testTo obtain data on Forced Expiratory Volume in one second (FEV1) and Forced Vital Capacity (FVC), a spirometry was performed (Jaeger Master Screen Body; CareFusion; Germany) according to the guidelines of the American Thoracic Society and the European Respiratory Society (22) . More detailed information about the execution of these tests is described elsewhere. The test was performed three times to obtain an accurate measure. One single measurement should not have exceeded 5% of the other two. The pulmonary function test was performed at baseline and after one-year follow-up. Physical ActivityPhysical activity was measured two periods of one week with six months in between to rule out any seasonal influence. The level of daily PA was measured objectively by using physical activity monitors, which are recently validated against indirect calorimetry (28). The activity monitors are validated against the golden standard (indirect calorimetry) (28; 29). Physical activity was measured from rising in the morning until completing the daily activities, except during bathing for 4 consecutive days in each test period. The ActiGraphGTX3 (ActiGraph, Pensacola, FL) contains of a tri-axial accelerometer to measure several dimensions of physical activity. In this study, the data of steps taken, activity counts and energy expenditure (Kcal)

were used to represent the patients' level of physical activity (30-32). The monitor had to be worn at the level of the right hip. The Minimod (DynaPort © MiniMod, McRoberts; The Hague, the Netherlands) is also a tri-axial accelerometer. The core function of this device is the detection of activity types such as: lying, sitting, standing, locomotion (walking and shuffling) and the transitions between posture and motion. In this study data from walking time, total time of activity and mean intensity during walking was used (29; 33; 34). The Minimod was worn in an elastic strap in the middle of the lower back. We considered a measurement as valid if the patient wore the devices for 4 weekdays. Also, the device should be worn for 8 hours a day (16; 29; 35). This was considered to be both an acceptable duration to patients and sufficient to capture most domestic activity (36). Data that did not meet these criteria were excluded.

3. The new GOLD classification

According to the new GOLD guidelines, this new classification needs the following components, which were measured at one-year follow-up: Pulmonary Function Spirometry was executed to classify the patients. Patients were classified as having COPD if their FEV₁/FVC was below 0.70. The classification consisted of four stages. Mild COPD if FEV₁ was above 80% predicted, moderate COPD if FEV₁ was above 50% and below 80% predicted, severe COPD if FEV₁ was above 30% and below 50% and very severe COPD if FEV₁ was below 30% predicted.

COPD Assessment Test (CAT)

The COPD Assessment Test (CAT) is a disease-specific questionnaire. The CAT is designed to determine the impact of COPD on the patient's wellbeing and activities in daily life. The test includes eight questions, all responded to on a Likert-type scale ranging from 0 to 5. A higher score indicates a worse health

status. This test is also proven to be valid and reliable in patients with COPD (37; 38). Patients with a score below 10 are defined as less symptomatic and those with a score above ten as high symptomatic (4). Modified Medical Research Council Dyspnea Scale (mMRC) Patients had to complete the Modified Medical Research Council Dyspnea Scale. This is a simple and valid method of categorizing patients with COPD in terms of their disability. This 5-point scale was used to define the patient's level of dyspnea. Scores could range from 0 (none) to 4 (very severe) (39). Exacerbation history According to the GOLD guidelines acute exacerbations of chronic obstructive pulmonary disease (COPD) are commonly described as events in the natural course of the disease that are characterized by a change in the patient's baseline dyspnea, cough and/or sputum, which is beyond normal day-to-day variations. They are acute in onset and may warrant a change in regular medication (40). None or one exacerbation in the past year indicates a low risk of future exacerbations, while two or more indicate a high risk. In this study, the exacerbations during one year were accurately queried every month and changes in medication were registered. To categorize patient into the new GOLD quadrants (figure 2), there is a certain hierarchy to follow. First the patients' symptom experience needs to be examined, using the mMRC or CAT scale and one has to determine if the patient is low or high symptomatic. Based on the GOLD guidelines, the CAT score is preferred. Secondary, to determine the risk, the spirometric classification and the amount of exacerbations in the previous year had to be taken into account. If there is a discrepancy between both, the assessment pointing to the highest risk should be used. Figure 2: Association between symptoms, spirometric

classification and future risk of exacerbation (4) Statistical analysis Statistical analysis was performed with SAS statistical package v9. 3, SAS institute, Cary, NC, USA. The descriptive data were reported as a mean and standard deviation (continuous variables). Patients were divided into quadrants taking into account the symptom experience, the old GOLD classification and the exacerbation risk. Division was performed for MRC en CAT separately to allow for comparison. Physical activity was determined based on the intensity and amount of steps and the mean values of the two weeks were defined. Normal distribution was checked with the Kolmogorov-Smirnov test. Linear trends of physical activity were analyzed for intensity and steps separately across the new GOLD classification using an ANOVA. A post hoc Tukey-Kramer test was performed to compare the mean values between separate groups. We tried to predict if the quadrant (A, B, C, D) predicts the amount and intensity of physical activity by using a regression analysis. Statistical significance was set at 0. 05 for all analysis. Results

Patient characteristics

We included a total number of 54 patients in this study. Seven patients were lost for follow-up. 21% were women and 79% were men (10/37).

Characteristics at baseline are described in table 1. The mean age of the patient population was 67, 6 ± 6, 2 years. Fourteen patients were active smokers. Variable Mean and Std Dev Age (yrs) 67, 6 ± 6, 2 Gender

(F/M) 10/37 BMI (Kg/m²) 26, 9 ± 4, 5 FEV₁ (% pred) 64, 6 ± 21, 6 Exacerbations (per yr) 1, 6 ± 1, 5 CAT 14, 0 ± 7, 9

Table 1: Patient characteristics at baseline

Characteristics of Physical Activities in Daily Life

Division into new GOLD quadrants

When dividing patients into the new GOLD classification according to the CAT, MRC, and GOLD, the patient distribution is shown in table 2. Results for mean intensity and steps are shown in figure 3.

CATMRCGOLDA101910B14524C51010D18133Table 2: Quadrant divisionCAT:

For the intensity, there was no significant difference found, but a trend ($p=$

0, 0604) was visible between group A and D. For the amount of steps a

significant difference was found between B and D. MRC: For the intensity,

there was a significant difference in PA between A en D. For the steps, a

significant difference was found between A and B, C and D, and A and D.

GOLD: A significant difference was found between groups A and C for

intensity. For the steps no difference was found between groups, although

there is a trend ($p= 0, 0610$) for a significant difference between A and D.

Also, we see a linear decrease for both variables, although it is not

significant. Figure 3: Overview of the PA distribution using intensity and

stepsBecause of the small differences between groups, we assembled

groups to increase the power. When classifying patients into " high (C and D)

or low risk" (A and B) by taking into account the patients exacerbation

history, 23 patients are classified as being at high risk and 24 for low risk.

After applying a t-test, we found that both groups differ significantly ($p= 0,$

0041). This is in accordance with the (old) GOLD classification. When doing

the same based on the patient's symptoms (A-C; " less symptoms", B-D; "

more symptoms"), no difference was found between the bundled groups

when applying the CAT. However, for the MRC we found a significant difference between the two groups ($p < 0,0001$). We can conclude that the CAT underestimates the difference in PA when classifying for the symptoms. We also investigated whether patients are categorized into "high risk" due to their exacerbation history, (old) GOLD classification or both. For the "high risk" group, 10 patients were categorized based on their exacerbation history, 2 patients on their classification into (old) GOLD and 11 patients for both. xAfter the first week of activity monitoring, there were 14 smokers and 33 non-smokers.

Relation of physical activity with quadrant

Discussion

Principal findingsThe results of this study demonstrate that the new COPD classification does not discriminate for PA between the quadrants. When using the two different questionnaires for the symptoms, there is a significant difference between some groups, but this does not count for all the groups. When using the GOLD classification, a linear non-significant decrease is found (figure 3), which is in accordance with the study of Troosters, et al., although in his study the results were significantly different between groups for the discrimination of PA (18). We performed our analysis using two questionnaires. We tried to find out whether being low- or high-symptomatic could discriminate for physical activity. When using the CAT, no discrimination was possible while the MRC actually could discriminate. Therefore we can recommend the MRC questionnaire for classifying the patients according to their symptoms. This is in contrast to the GOLD

guidelines, which prefer to administer the CAT when classifying the patients into the new GOLD quadrants (4). Because the vast majority of patients who were classified as being at high risk, were in the upper quadrants because of their exacerbation risk, we can conclude that the exacerbation history discriminates more than the (old) GOLD classification when assessing a patient's risk. Weaknesses of the StudyOur study has some weaknesses. First, relatively few patients were recruited, what can be an explanation for the insufficient power to demonstrate clinically significant differences in this study. Also, the study showed an inhomogeneous distribution of patients among GOLD quadrants, which caused problems to allow for sub-analysis. Also, when using a different questionnaire, the division was totally different. Moreover, there were fewer women than men recruited, which can possibly influence our results. Since our COPD patients were only recruited from Belgium, they are possibly not completely representative for the general activity level in this age cohort Activity questionnaire data from large population samples suggest that Belgians are among the least active populations worldwide(41; 42). Also, there were relatively much dropouts in quadrant D, which decreases the power as well. Strengths of the StudyAlthough compliance with wearing an activity monitor is always critical to obtain accurate physical activity measurements, information on patients' adherence with wearing the activity monitor during the measurement period in COPD studies is rare(43). In the present study the activity monitor was worn for ...% of the days and more than ...% of the time. Repeated measures of lung function and physical activity were applied to discard seasonal influence. The new GOLD classification is simple to calculate and requires no

special equipment. This makes it a practical tool of potentially widespread applicability. The DAM is shown to accurately assess the time spent in different postures and activities in patients with COPD. Therefore, it is a promising tool for providing accurate data on the amount of daily activity in these patients. Several studies have shown moderate to high inter-device reliability (intra-class correlation coefficient (rICC) = 0.99 for the Actigraph Model 7164 and rICC = 0.86-0.99 for the Dynaport Minimod. Comparison With Previous Studies and Interpretation In the past, the relationship between physical activity and disease classification has been investigated in several studies (8; 18; 44-46). According to the study of Jehn et al., there is a positive relationship between the intensity of PA and the old GOLD classification(8). Troosters et al., confirmed this statement as well. He reported a significant decline in PA from GOLD stage II. When we compare intensity in GOLD, we see a trend toward the same results, although our results are not significant. Also, in the study of Margarita et al., who examined the amount of physical activity by using questionnaires instead of activity monitors, the conclusion was that the patients with a more severe health status, performed the least amount of PA. In this study, again no multidimensional classification system was used(46).

Currently, lung function is the most frequently used indicator of severity in COPD, as determined by the GOLD classification. In this study, MRC and BODE turned out to be superior predictors of physical activity in daily life than the GOLD. This suggests that lung function alone is not able to provide reliable estimate of physical activity level in daily life. On the other hand, a multicomponent index such as the BODE seems to be more adequate than the FEV1 alone in order to estimate physical activity level in COPD. Interestingly, the MRC had good sensitivity and specificity to predict active and inactive patients as well, reinforcing the validity of this simple unidimensional scale.

In addition, we observed that the MRC and the BODE-index are better than the FEV1-based 'GOLD' in predicting patients who are active in daily life.

Due to the incorporation of dyspnoea and exercise capacity the BODE index is a reliable predictor of objective COPD outcomes such as hospitalisation and survival.

The Global Initiative for Chronic Obstructive Lung Disease and the American Thoracic Society recommend that a patient's perception of dyspnea be included in any new staging system for COPD.

In summary, patients with COPD are severely inactive during and after hospitalization for an AE. In addition, in patients with frequent exacerbations, the physical inactivity is even more marked.

Likewise, we also know that performing PA is the result of a complex interaction of many factors, and that its behavior can only be analyzed from a multidimensional standpoint, in which in addition to disease severity other variables are taken into consideration, such as psychosocial and physical conditions and even cultural aspect.

The present study shows that an unidimensional staging system based on FEV1 poorly reflects the overall disease impact in COPD patients. To get a more comprehensive view on this heterogeneous disease, a multidimensional grading system such as the BODE index could be more appropriate.

Clinical Implications Beside pulmonary deficits COPD also goes accompanied by systemic manifestations such as muscle weakness, exercises intolerance, osteoporosis and cardiovascular disease (4; 13; 47). One of the crucial factors in the development of these systemic consequences is physical inactivity (17; 48; 49). Patients with COPD frequently report dyspnea related to everyday tasks. This in turn contributes to a downward spiral of symptom-induced inactivity, leading to deconditioning and muscle weakness (16). Time spent in physical activity during daily life (eg, walking), together with intensity and frequency, are fundamental parts of recommendations of physical activity for health maintenance. This study revealed that the new GOLD classification is not (?) a reliable predictor of objective COPD physical activity such as patients' mean intensity and steps. Future research should focus more on a global level to generalize the results. Also, more attention have to be paid about whether to use the MRC or the CAT in specific

situations or for specific goals. For more firm conclusions, larger populations have to be used.

Conclusion

COPD is increasingly considered as a disease, which does not just influence the lungs. It has been suggested as a part of the 'chronic systemic inflammatory syndrome'. The complexity of COPD and its frequent co-morbidities requires assessment and staging of the disease beyond the degree of airflow limitation. Our results provide evidence that the new GOLD classification system is not (?) a predictive tool for assessing PA in COPD patients. We found some significant differences between the quadrants, but this does not count for all of them. The classification is able to discriminate for PA in high- or low symptomatic patients when using the MRC. Future COPD guidelines should consider the recommendation that COPD patients be encouraged to maintain or increase their levels of regular physical activity. Given that COPD is a chronic disease associated with a high socioeconomic burden and health consequences, such a measure is likely to result in a relevant public health benefit.