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Application of fatigue scale in respiratory rehabilitation of COPD patients

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Abstract: *COPD is one of the common chronic airway inflammatory diseases in clinic, which is one of the preventable diseases in clinic. It is a clinical syndrome caused by lung function injury, dyspnea caused by exposure to a large number of toxic particles or gases, and progressive decline of respiratory function. Some research results show that COPD is the main reason for the high mortality and disability rate of people. With the rapid development of social economy and the aggravation of aging, the clinical incidence rate of COPD in patients shows an upward trend. The treatment principle of COPD is to reduce the further impairment of the patient's pulmonary function, reduce the risk of acute attack, and save the patient for rehabilitation. In the rehabilitation period, fatigue scale is commonly used in respiratory rehabilitation of COPD patients, which has a high predictive value for patients' rehabilitation and prognosis. This paper reviews the literature on the application of fatigue scale in respiratory rehabilitation of COPD patients in recent years, and summarizes it as follows.*

Keywords: *Fatigue scale; COPD; Respiratory rehabilitation; Progress*

1. Introduction

Fatigue is one of the most common symptoms in COPD patients, ranking only second to dyspnea, which has a serious impact on patients' quality of life. In the research process of COPD patients at home and abroad, respiratory rehabilitation is an important reason to promote patients' recovery, which can effectively reduce patients' dyspnea and fatigue [1, 2]. However, compared with foreign research, the respiratory rehabilitation of COPD patients in China still needs further research. The scales to evaluate the improvement of fatigue symptoms in COPD patients mainly include the single-dimensional scale and multi-dimensional scales. The single-dimensional scale includes the COPD specific scale and the non-specific scale, which has the characteristics of simple content, less time-consuming and easy to use. The multi-dimensional scale also includes COPD specific scale and non-specific scale, which is characterized by rich fatigue dimensions and long evaluation time. It can know the source of fatigue, which is conducive to timely adjustment of respiratory rehabilitation strategies to improve clinically related fatigue in COPD patients.At present, the fatigue scale is used clinically to evaluate respiratory fatigue in COPD patients [3, 4]. On this basis, the research progress of fatigue scale in respiratory rehabilitation of COPD patients is summarized as follows.

2. Specific single dimension fatigue scale

Asthma Fatigue Scale (CAFS) is a one-dimensional COPD and asthma patient-specific fatigue self-rating scale developed by Revicki equal to the 2010 study. CAFS has 12 entries used to measure fatigue within the past 7 d in COPD and asthma. The scale is Likert 5, the top 10 items: last =1, rarely =2, sometimes =3, often =4, very often =5; 11 and 12 items: last =5, rarely =4, sometimes =3, often =2, always =1. The original score of CAFS assessment requires linear transformation, with a total score of 0 to 100. The higher the score, the higher the fatigue level. The internal consistency reliability coefficient of CAFS was 0.95 and 0.82 in stable COPD patients and 0.84 in asthmatics. CAFS correlated well with other self-rated workers in COPD patients with COPD, with a correlation coefficient of 0.81 with the total score of the St. George's Respiratory Questionnaire and 0.80 with the living questionnaire of COPD patients.

The Chronic Obstructive Pulmonary Disease and Asthma Fatigue Scale (CAFS) can be used to evaluate COPD patients, mainly for single-dimensional COPD evaluation. The scoring standard is

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Likert-level 5 score, and the full score of the scale is 100. The score is proportional to the fatigue level of COPD patients, and the original score needs to be transformed linearly. CAFS is well correlated with other clinical measurements of fatigue levels in COPD patients. Foreign research results show that [5], CAFS can be used in the evaluation before and after drug treatment, which is conducive to good display of fatigue symptom in COPD patients. This study belongs to the category of respiratory rehabilitation, but there is no Chinese version of CAFS, which can only present in single dimension for fatigue evaluation, and the source of fatigue cannot be analyzed. It has high specificity for COPD disease, simple content and high understanding degree, and can be further applied in respiratory rehabilitation of COPD patients to evaluate the intervention effect of patients [6].

3. Non-specific single dimension fatigue scale

The The Rating of Perceived Exertion (RPE) scale was developed by the Swedish psychology expert Borg and developed to assess how much people feel exertion and fatigue during exercise. RPE is a series of numerical, fatigue level 6~ 20, for Borg 6 ~ 20 RPE, exercise consciously fatigue score is 6 points said "easy", 7 points said "very very easy", 8,9 points said "very easy", 10,11 points said "very easy", 12,13 points said "a little difficult", 14,15 points said "difficult", 16,17 points said "very difficult", 18 ~ 20 points said "very, very difficult". Studies show that Borg 6 ~ 20 RPE is related to the heart rate during exercise, and Borg 6 ~ 20 RPE multiplied by 10 can determine the heart rate during exercise. For example, Borg 6 ~ 20 RPE is 12, and the heart rate during exercise is about 120 times / min. The assessment of RPE is based on the score of the subject's subjective feelings such as heart rate, dyspnea, fatigue and the exertion during sensorial exercise. RPE scale is easy to do, easy to use, is one of the few through patients exercise fatigue assessment of exercise intensity scale, however, according to the RPE scale of the patient self-evaluation, let the patient with their own feeling (heartbeat, breathing, sweating, muscle fatigue, etc.) to estimate the intensity of exercise, therefore, patients know the usage of the RPE scale and the significance of the value is the key to effectively use the RPE scale. It is recommended that the RPE scale should be applied to understand the assessment of exercise intensity in patients with good stable COPD and respiratory rehabilitation in mild and moderate AECOPD patients, so as to help patients develop a safe and reasonable exercise prescription.

The subjective fatigue scale can determine the good exertion level and breathing fatigue level of COPD patients during exercise. There are research results that show [7] that in the respiratory rehabilitation of patients with aggravated chronic obstructive pulmonary disease, their fatigue score has not been significantly improved after 3 weeks of respiratory rehabilitation. In part, that maybe because the patients are affected by subjective feelings, and another part, that’s because the research sample size of patients is small, which may affect the research results of patients. The subjective fatigue scale is convenient for patients to use, and the content is simple and easy to implement. Targeted evaluation on the fatigue experience of patients can be done during exercise. Patients’ subjective feeling can be self-evaluated during exercise to determine the intensity of patients’ exercise. Patients with COPD use the subjective fatigue scale for targeted evaluation. It can play the role of safe and reasonable sports rehabilitation program for patients.

4. Specific multidimensional fatigue scale

4.1 Manchester -COPD fatigue scale

The Manchester-COPD Fatigue Scale (The Manchester Chronic Obstructive PulmonaryDisease Fatique Scale, MCFS) was an AI-Hair self-rated scale equivalent to 2009 according to COPD Fatigue Scale (COPD-Fatigue Scale, COPD-FS) to assess fatigue over the past 2 weeks. The scale has three dimensions, including somatic (11 items), cognition (7 items), and psychology (9 items), with a total of 27 items. MCFS adopts Likert 5 score, with no fatigue =0, minimal fatigue =0.5, sometimes fatigue = 1, frequent fatigue =1.5, always fatigue 2, and total score of 0 to 54. The higher the score, the more severe the fatigue, MCFS internal consistency Cronbach's a coefficient of 0.97 and retest reliability of 0.97, which is a specific tool for evaluating fatigue in stable COPD patients. The impact of MCFS changes after old respiratory rehabilitation in COPD on quality of life, dyspnea, anxiety and others requires further prospective, RCT and long-term follow-up to test the effect. Although the scale has COPD disease specificity, simple, contains multidimensional fatigue, fatigue source and fatigue of COPD patients can be used for respiratory rehabilitation analysis of fatigue improvement, but at present the scale has not yet Chinese and application, at the same time, the scale items are more, evaluation takes a

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long time, easy to cause patients assessment fatigue, affect the research effect.

Manchester-COPD fatigue scale can effectively evaluate the fatigue status of the past two weeks in patients with COPD. The results of some scholars' studies showed that the effectiveness of Manchester-COPD fatigue scale was first verified when it was used during 8 weeks of respiratory rehabilitation training in patients with COPD. However, due to the impact of Manchester-COPD fatigue scale on patients' quality of life, further verification is needed [8]. Manchester-COPD fatigue scale has high specificity for COPD disease and good multi-dimensional fatigue that can effectively evaluate the effect of respiratory rehabilitation in patients with COPD. However, at the present stage, there is no Chinesization and application in clinical practice. Meanwhile, it takes a long time to measure patients, which further increases the risk of fatigue evaluation of patients and affects the research effect to a certain extent [9].

4.2 Revised chronic disease function evaluation- fatigue scale

The revised Functional Assessment of Chronic Diseases-fatigue Scale (Modified Functional Assessment ofChronic lllness Therapy Fatigue Scale, MFACIT-FS) was developed by Yellen to 1997 for measuring tumor fatigue studies. In 2014, Chinese scholar Wang Siyuan et al. put the scale in Chinese and applied it in hemodialysis patients, and the Cronbach's a coefficient of Chinese FACIT-FS was 0.929 and the retest reliability was 0.965. Al-Shair et al 2012 to measure COPD, patients' fatigue in the past 1 week. The MFACIT-FS has three dimensions, namely general fatigue, behavioral ability, and psychosocial fatigue, with a total of 13 items. Using 0 to 4 points, 0 points means "no fatigue at all", 4 points means "very tired", the total score is 0 to 52 points, the higher the score, the less the fatigue MFACIT-FS internal consistency Cronbach's a coefficient is 0.91. MFACIT-FS has the specificity of COPD disease, good aggregation validity with the original scale, good reliability and validity, few items, relatively short content, easy to understand, 3~4 min evaluation, simpler application, and multi-dimensional fatigue.

Chinese scholars have applied the revised chronic disease therapeutic function evaluation - fatigue scale to hemodialysis patients, which has good specificity for COPD disease. It also has good aggregation validity, high credibility, fewer monitoring items and relatively simple content compared with the original scale. It's also easy for patients to understand, more concise to test, and has higher multi-dimensional fatigue of patients [10]. However, at the present stage, there is still a lack of research on the application of respiratory rehabilitation in COPD, so as to reduce the risk of patients in acute respiration and promote timely adjustment of patients' respiratory rehabilitation plans [11].

5. Nonspecific multidimensional fatigue scale

5.1 Multidimensional Fatigue Scale (Multidimensional Fatigue Index-20, MFI-20)

The MFI-20 was designed by Smets et al of the Dutch Research Laboratory of Psychology in 1995 for cancer patients to determine fatigue in the past 2 weeks. In 2008, Miao Yu and other put it in Chinese and applied it among military grassroots medical workers. The MFI-20 has five dimensions, including general fatigue, physical fatigue, mental fatigue, lack of motivation and decreased decline, each dimension contains four items, a total of 20 items. Using Likert 5 score, scoring in the positive and negative direction, each dimension scored 4 to 20 points, the higher the score, the more fatigue, the internal consistent Cronbach 'sa coefficient of the scale was 0.882, and the mean Cronbach' sa coefficient of each dimension was 0.702. The MFI-20 can assess all aspects of fatigue or assess one of the dimensions separately as needed. MFI-20 was able to define the source of clinically relevant fatigue in COPD patients. Although the scale takes less, about 4~5 min, there are 20 items with positive and negative scores, which may cause patient fatigue and affect the study effect

5.2 Brief Fatigue Scale (Brief Fatigue Inventory, BFI)

The BFI, a self-rating scale developed by Mendoza et al 1998 on the concise Pain scale, aims to rapidly assess the fatigue severity of cancer patients for clinical screening and clinical trials. The BFI consists of 4 dimensions with 9 entries, measuring fatigue on a numerical scale ranging from 0 to 10. Three items assessed the severity of fatigue in the patient "present level", "past 24 h general level" and "past 24 h maximum severity level," with 0 indicating "no fatigue" and 10 indicating "fatigue reaching the greatest severity you can imagine". There are six items in the past 24 h fatigue affects different

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aspects of life including general activities, emotions, walking ability, normal work (including work and housework), the relationship with others, life entertainment, 0 said "no influence", 10 said "complete impact", the higher the score, the more serious fatigue. Depending on the purpose of the measurement, this time interval (24 h) can be changed to the past 1 week. The internal consistency of the scale had a Cronbach's a coefficient of 0.96. Studies have confirmed that the Chinese version of BFI is an effective and reliable measure of cancer-related fatigue in Chinese patients. This scale internal consistency in COPD of respiratory rehabilitation patients Cronbach's a coefficient of 0.96, retest reliability coefficient of 0.86.BFI as a self-rating scale, although does not have COPD disease specificity of the, but can analyze the influence of fatigue on general activity, mood, walking ability, etc., at the same time, BFI items simple, easy to understand, easy to use, less time, can evaluate the fatigue in the past 24 h, suggest that the researchers can conduct fatigue assessment and screening in respiratory rehabilitation of COPD patients.

5.3 Personal Fatigue Strength Scale (Checklist Individual Strength, CIS)

CIS is a 1994 scale designed by Vercoulen et al. to measure fatigue in chronic fatigue syndrome. It can be used to measure fatigue severity and behavioral outcomes, and to measure the severity of fatigue in the past 2 weeks. CIS has 4 subscales, namely subjective fatigue scale (8 items), attention scale (5 items), dynamic scale (4 items) and body scale (3 items), a total of 20 items. CIS used the Likert 7 score method of 1 to 7 for each entry, from "very agree" to "very disagree". 11 were reverse problems with a total score of 140 and 276 as fatigue. The higher the total score, the more fatigue. The Cronbach's a coefficient of CIS was 0.90. The reliability and validity of CIS translated version have been studied and verified in patients with cerebral defecation in China, and the reliability and validity is good. CIS-FS is the subjective fatigue subscale of CIS, evaluating fatigue severity, consisting of 8 items, total score 8 (normal fatigue) ~56 (most severe fatigue), score 26, indicating normal fatigue: score 27-35, indicating moderate fatigue, score> 36, indicating severe fatigue. There are many CIS entries, reverse entries, and different items of the same symptom will repeat. Patients will get tired of answering many times and reduce the response rate. However, CIS-FS entries are few, and the threshold of simple fatigue has been studied, and is often used in the assessment of fatigue. At the same time, CIS from the degree of fatigue itself, including fatigue assessment of attention, power and physical activity, can be used to measure fatigue severity and fatigue behavior results, researchers can further study and verify the Chinese version of CIS in COPD validity, can explore the effect of CIS to measure the stable COPD patients fatigue severity and fatigue behavior results.

The effectiveness and reliability of multidimensional fatigue scale and concise fatigue scale for the evaluation of cancer in Chinese patients in clinic have been verified. The reliability and validity of the concise fatigue scale are stronger in COPD patients. However, the results are limited to a certain extent because the COPD patients involved in the study have undergone respiratory rehabilitation programs [12]. The concise fatigue scale can be used in respiratory rehabilitation patients with COPD to conduct targeted evaluation of patients' pain and fatigue. Patients' physical activities are affected by dyspnea and fatigue, and pain has a significant impact on patients' sleep and emotions [13]. Multidimensional fatigue scale can conduct targeted analysis on the source of fatigue related to patients, and play a good role in improving patients' respiratory rehabilitation [14]. Multidimensional fatigue scale and concise fatigue scale have low specificity for COPD disease, and can evaluate the effect degree of fatigue on patients' activities, emotion and walking ability. The items of these two scales are simple and have a high understanding degree. These two scales are simple to use and the measurement time is short. In particular, the concise fatigue scale can conduct targeted evaluation of fatigue within 24 hours [15].

6. Conclusions

In conclusion, respiratory rehabilitation is a scientific and comprehensive treatment means, which can effectively improve the quality of life of patients with COPD and promote the improvement of fatigue in patients with COPD. In respiratory rehabilitation of COPD patients, the fatigue scale can be used for the targeted evaluation of the fatigue state of patients at a certain time. However, respiratory rehabilitation is a continuous and dynamic comprehensive intervention process, and further studies are still needed to evaluate the improvement of fatigue before and after respiratory rehabilitation.

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