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Advances in the study of fatigue in patients transferred out of ICUs

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Abstract: *Fatigue is one of the more common symptoms in patients transferred out of ICU, which has a significant impact on their recovery and quality of life. This article introduces the concepts, current situation, influencing factors, assessment tools, and interventions related to fatigue in patients transferred out of ICUs, to provide references for clinical nurses to strengthen the awareness of managing fatigue in patients transferred out of ICUs, to formulate management programs, and to carry out related research.*

Keywords: *intensive care unit; fatigue; influencing factors; intervention; review*

1. Introduction

With the advancement of medical diagnostic and treatment technologies, the survival rate of ICU patients has greatly improved. It has been reported that patients transferred out of ICUs often face problems related to reduced fitness levels, negative emotions, sleep disorders, and fatigue [1,2]. Fatigue, as one of the more common clinical manifestations of physiologic dysfunction in post-ICU syndrome, the symptom often lasts for months to years. Studies have shown [3,4] that fatigue has a significant impact on the physiology and psychology of patients, which not only affects their ability to participate in their care, but also influences their recovery process and health-related quality of life, increases their dependence on their caregivers, and imposes a certain economic burden on families and society. Therefore, early identification and intervention are particularly important to reduce the adverse outcomes of patients.

Fatigue is a more complex symptom that refers to extreme exhaustion that cannot be relieved by sleep and causes an individual's physical and mental activity to drop to normal levels [4]. Hernandez-Ronquillo [5] et al. define fatigue as "extreme and persistent tiredness, debility, or exhaustion that may be physical, mental, or both at the same time." Aaronson [6] considers fatigue to be "a perceived decrease in one's ability to perform physical or mental activities, as affected by imbalances in resource availability, utilization, or recovery from activities." The North American Nursing Association, on the other hand, defines fatigue as an overwhelming sense of persistent tiredness and a decrease in the normal level of physical and mental work capacity [4]. The definition of fatigue has not yet been harmonized nationally and internationally, and the concept needs to be further defined.

2. The current situation of fatigue in ICU-transferred patients

Fatigue, as a more common symptom of ICU transfer-out patients, has currently attracted the attention of foreign scholars. Some studies have shown that the incidence of fatigue in ICU transferred-out patients is 14% to 81% [7]. However, affected by different countries, regions, and populations, the incidence of fatigue in patients transferred out of ICUs reported in different studies still varies considerably. Fagerberg [8] et al. followed up on 23 ICU-transferred patients and found that 17.74% of ICU-transferred patients experienced fatigue symptoms. Tuzun [9] investigated 56 ICU-transferred patients, and the results showed that the patient incidence of fatigue in the first and third year after intensive care was 48% and 45%, respectively. The results of a longitudinal study by Langerud [10] and others showed that the incidence of fatigue in patients discharged from the ICU for three months and one year was 15.3% and 13.8%, respectively. Zhou Tian [11] and others found that 82 out of 150 patients transferred out of the emergency ICU had different degrees of fatigue symptoms, 35.37% of patients had mild fatigue, 46.34% had

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moderate fatigue, and 18.29% had severe fatigue.

Fatigue symptoms are more common in patients transferred out of the ICU than patients' self-reported symptoms such as anxiety, dyspnea, and pain, and there are some differences in the time point of occurrence, severity, and duration. Relevant data showed [2] that more than 50% of ICU patients experienced fatigue symptoms in the first year after ICU transfer. It has been found [9] that the incidence of fatigue in ICU patients can be as high as 67% between 2 and 9 months after ICU transfer. Choi [12] et al. showed that fatigue symptoms were most common in ICU patients in the first 4 months after transfer. Granja [13] et al. surveyed 464 ICU-transferred patients and found that patients had a higher self-reported fatigue level 6 months after discharge than they had before their admission to the hospital. As many as 65% of survivors affected by this symptom were unable to return to their pre-admission level of physical activity. Compared with the findings of other scholars, Morel [3] and others showed that fatigue persisted longer in ICU-transferred patients, with nearly 60% of ICU-transferred patients still feeling fatigued 5 years after discharge. In summary, the current domestic and international reports on the incidence, time point of occurrence, and duration of fatigue in patients transferred out of ICU are inconsistent and need to be further explored in depth in the future.

3. Influencing factors

3.1 Demographic factors

Males were less likely to report self-reported fatigue compared to female patients [14,15]. Morel [3] et al. noted that gender was an independent risk factor for the development of fatigue symptoms in patients and that there was a higher prevalence of self-reported fatigue in female patients amongst patients transferred out of the ICU. Unlike the findings of Morel [3], Wintermann [16] found that fatigue symptoms were more severe in males in his study, and found that fatigue levels in female patients decreased throughout 3 to 6 months during follow-up, but remained at a constant level in male patients. In addition, age also affects the level of fatigue in patients. Tuzun [9] found that fatigue scores were significantly higher in younger patients than in older patients within 1 year after ICU transfer. However, it has also been noted [11] that patients aged ≥60 years had higher levels of fatigue, which may be related to factors such as muscle loss and reduced muscle strength as patients age. Carenzo [15] and others have shown that fatigue-related burdens were significantly higher in patients younger than 65 years of age. In addition to factors such as gender and age, a research study on ARDS patients showed that whether or not they were inaugurated before admission affected their fatigue levels, with patients who were in an inaugurated state before admission having lower fatigue levels [14]. However, the conclusions reached by different scholars have not yet been agreed upon, and the influence of demographic factors on the level of fatigue of patients still needs to be further explored.

3.2 Disease factors

Disease factors are one of the most important factors affecting the degree and duration of fatigue in survivors of critically ill patients. It has been shown [17] that fatigue symptoms are more severe in patients with a history of respiratory disease. It has been confirmed [9,18] that patients infected with COVID-19 have persistent fatigue symptoms. Neufeld [14] and others found that the prevalence of fatigue in ARDS patients 6 months after ICU transfer was significantly higher than that of their anxiety and depressive symptoms. The results of Tuzun [9] and others further confirmed that the lung function scores of patients with fatigue symptoms were significantly lower than those of non-fatigue patients. Further analysis of the reasons for this may be related to the fact that respiratory dysfunction may limit the patient's daily activities and affect their sleep. In addition, the type of surgery the patients underwent was also significantly associated with the occurrence of fatigue. A related study [18] showed that patients undergoing emergency surgery were more likely to experience fatigue, weakness, muscle weakness, and related cognitive impairment within one year after ICU compared to patients undergoing elective surgery.

The length of hospitalization reflects the severity of the patient's illness to some extent. The length of hospitalization has been reported to be significantly associated with patient fatigue [19]. Zhou Tian [11] and others showed that emergency ICU hospitalization of ≥7 days was an independent influencing factor leading to patient fatigue. It may be because patients were bedridden or in a braked state for a long period, which led to their muscle atrophy and decreased muscle strength. In addition to the length of hospitalization, the APACHE II score, an important assessment tool for determining the severity of a patient's illness, has also been shown to be associated with the degree of patient fatigue. When the

APACHE II score is higher, the degree of patient fatigue is more severe [10,19].

3.3 Physiological/psychological factors

Physiological and psychological factors such as sleep disorders, physical debility, anxiety, and depression can have a major impact on patients' fatigue symptoms. Sleep disorders have been reported [11] to be an important factor contributing to patient fatigue. There is an association between fatigue and sleep disorders, and they affect each other. Patient fatigue can lead to increased sleep or altered sleep patterns, and when patients are sleep-deprived they may further exacerbate fatigue symptoms. Pollack [20] and others have shown that patients who experience debility have higher levels of fatigue, anxiety, and lethargy, and are in poorer health compared to older patients who do not experience debility. Literature suggests [21] that some patients transferred out of the ICU experience varying degrees of chronic pain, and that a range of negative effects of pain can exacerbate patients' suffering, leading to depression and fatigue, thus creating a vicious cycle. Longitudinal studies such as Choi [12] have further confirmed the relationship between pain, sleep disorders, and debilitation and fatigue in patients transferred out of the ICU. It was found [12] that the severity of pain was significantly and positively correlated with the severity of sleep disturbances, fatigue, and debility in patients in the 2nd and 4th month after transfer out.

In addition to the physiological factors mentioned above, psychological factors such as stress, anxiety, and depression are also more common factors leading to fatigue in patients, and Neufled [14] et al. found that fatigue symptoms were highly correlated with their psychological conditions such as anxiety and depression in a one-year follow-up of ARDS patients. Zhang [22] and others further confirmed that the psychological factors of tension and anxiety were positively correlated with their fatigue, i.e., the heavier the negative emotions of the patients, the heavier their fatigue.

4. Assessment tools

4.1 Functional Assessment of Chronic Therapy-Fatigue Subscale (FACIT-F)

The FACIT-F was developed by Yellen [23] in 1997 for cancer patients and is a unidimensional fatigue assessment scale used to measure the patient's fatigue over the past 7 days. The scale consists of 13 entries on a 5-point Likert scale, with scores ranging from 0 to 4 indicating "not at all" to The scale consists of 13 items on a 5-point Likert scale from 0 to 4, ranging from "not at all" to "very much", with two of the items reverse scored, and the total score ranges from 0 to 52, with lower scores indicating higher levels of fatigue. The original scale has good internal consistency. Spadaro [24] used the scale to validate it in ICU-transferred patients, and the scale had a Cronbach's alpha coefficient of 0.937, which can be used to assess fatigue in ICU-transferred patients up to one year after discharge from the hospital. The scale has now been translated into several languages and has been extensively validated in patient populations with inflammatory bowel disease, chronic obstructive pulmonary disease, and cancer.

4.2 Multidimensional Fatigue Inventory (MFI-20)

Developed by Dutch scholar Sments [25] in 1995, this scale was initially used for cancer patients and consists of 20 entries in five dimensions: comprehensive fatigue, physical fatigue, mental fatigue, reduced activity, and reduced ability. The scale is scored on a 5-point Likert scale, with "not at all" to "completely" assigned a score of 1 to 5, and a total score of 20 to 100, with entries 1, 3, 4, 6, 7, 8, 11, 12, 15, and 20 scored on a reversed scale. The higher the score, the more serious the fatigue. Han Qiufeng [26]et al. further validated the scale in tumor patients, and Cronbach's alpha coefficient of each entry of the scale ranged from 0.854 to 0.869, with good reliability and validity. Winterman[27] et al. further validated the scale in critically ill patients and concluded that Cronbach's alpha coefficient of the scale was 0.91. At present, the scale has been translated into French, Swedish, and other languages, and is widely used in oncology patients and diabetic patients, which is simple and easy to understand and fill out.

4.3 Fatigue Severity Scale (FSS)

This scale was developed by American scholars such as Krupp [28] to assess patients' fatigue in the past week. The scale has a Cronbach's alpha coefficient of 0.89 and consists of 9 entries, which are scored on a Likert scale of 7, with scores ranging from 1 to 7 representing the range from "strongly disagree" to

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“strongly agree”, scores <4 being no fatigue, 4 to 4.9 being moderate fatigue, and ≥4.9 beings≥4.9 being moderate fatigue. A score of 1 to 7 indicates “strongly disagree” to “strongly agree”, a score of <4 is no fatigue, 4 to 4.9 is moderate fatigue, and ≥5 is severe fatigue, with higher scores indicating more severe fatigue in patients. The scale is more concise and acceptable. Gu Xiaojie [29] et al. validated the scale in diabetic patient species, and Cronbach's alpha coefficient of the scale was 0.893, the re-test reliability was 0.905, and the horizontal content validity index was 0.902, which had good reliability and validity. However, the applicability of this scale for assessing the level of fatigue in patients transferred out of ICU still needs further study.

4.4 Piper Revised Scale for Fatigue

This scale was revised by Jakobsson [30] in 2013, which includes 22 entries in four dimensions: behavioral, emotional, perceptual, and cognitive, and is scored on a 0-10 point scale, with a score of 0 indicating that the patient has no fatigue, a score of 1-3 indicating that the patient is mildly fatigued, a score of 4-6 being moderately fatigued, and a score of 6 or more indicating that the patient is severely fatigued. Zhou Tian [11] used this scale to investigate patients transferred out of the emergency ICU but did not report the reliability of the scale in his study.

4.5 The PedsQL™ Multidimensional Fatigue Scale (The PedsQL™ Multidimensional Fatigue Scale)

This scale was developed by Varni [31] and others, including 18 entries in three parts: general fatigue, sleep fatigue, and cognitive fatigue, and is mainly used to assess the fatigue status of children and adolescent patients aged 2 to 18 years old, which is scored on a 5-point Likert scale, with scores ranging from 0 to 4 for “never” to “almost always”. The scale is scored on a Likert 5-point scale, with “never” to “almost always” assigned a score of 0 to 4, and its total score ranges from 0 to 100, with higher scores indicating better functioning and lower fatigue [32]. Colville [33] further validated the scale in a group of children after intensive care and concluded that the Cronbach's alpha coefficient of the scale was 0.88 and that the coefficients of the dimensions were 0.82, 0.82, 0.83, 0.84, and 0.85 respectively, and the coefficients of the dimensions were 0.85 and 0.85, respectively. Coefficients were 0.82, 0.65, and 0.87, respectively.

5. Interventions

5.1 Early exercise rehabilitation

Studies have shown [34] that early activity helps to improve patients' mobility and muscle strength, thus restoring their ability to perform activities of daily living and improving their quality of life. Daynes [35] conducted a 6-week exercise rehabilitation intervention for patients infected with COVID-19, which not only effectively reduced the patients' fatigue, anxiety, and depression levels, but also effectively improved the patients' mobility and health-related quality of life. Weng Fengxia [36] adopted an early activity enhancement strategy to intervene with 83 exceptionally critically ill ICU patients; the experimental group carried out early activities to increase the length and frequency of patient activities, while the control group used conventional activity strategies, and evaluated the patients 30 days after discharge from the hospital, and found that early rehabilitation effectively reduced the level of patient fatigue and shortened the length of hospitalization of the patients. Therefore, a multidisciplinary team should be united at an early stage to establish a personalized early activity program according to the age and condition of the patients, and to carry out progressive exercise activities to reduce muscle loss and physical dysfunction and reduce the fatigue level of the patients.

5.2 Strengthening self-management

Studies have shown [36] that strengthening patients' self-management can effectively reduce patients' fatigue symptoms and improve their health-related quality of life. Existing studies have confirmed [37] that strengthening patient self-management of disease has achieved good results in reducing fatigue symptoms in patients with cancer, viral infections, and systemic lupus erythematosus, but there are fewer interventions for fatigue in survivors of critical illnesses, affected by the different disease characteristics of the patient and the developmental trajectory of the patient, so in the future, we should adjust the interventions according to the needs of the survivors of critically ill patients. In the future, interventions should be further adjusted according to the needs of critically ill survivors, and patient self-management education should be actively carried out to improve patients' self-efficacy and fatigue symptoms. ICU liaison nurses were set up to enhance patient support for fatigue self-management and to increase their participation in the care plan.

5.3 Forming a multidisciplinary team for follow-up visits

Early rehabilitation intervention for patients transferred out of the ICU still faces great challenges, and post-ICU follow-up can provide appropriate support for patients and their families. Currently, there are various forms of post-ICU follow-up in foreign countries, such as post-ICU outpatient clinics, face-to-face follow-up, and remote follow-up [38]. Although there is a certain gap in the degree of implementation of post-ICU follow-up in different countries, most of the main personnel carrying out post-ICU follow-up are still nurses. Due to factors such as the type and severity of disease in critically ill patients, it may be difficult to meet the needs of patients with only nurses as the main follow-up, therefore, it is particularly important to form a multidisciplinary team to provide support for patients [38]. In addition, the time and frequency of ICU follow-up visits should be personalized according to the patient's condition, so that existing symptoms can be detected and intervened in an early manner, thus promoting the recovery of physical and psychological functions and improving the patient's quality of life.

6. Summary

At present, the fatigue symptoms of ICU transfer patients have not been widely paid attention to by domestic and foreign scholars, and the influencing factors of their fatigue symptoms still need to be further studied, there is a lack of specific assessment tools and related interventions for fatigue in critically ill patients, so in the future, it is necessary to develop localized specific assessment tools according to China's national conditions, and at the same time, carry out qualitative and longitudinal studies to identify the influencing factors of the fatigue of ICU transfer patients, to carry out early intervention and develop targeted interventions for patients to improve their quality of life. At the same time, qualitative and longitudinal studies should be conducted to identify the factors affecting fatigue in patients transferred out of ICUs, so that early intervention can be carried out and targeted interventions can be formulated to improve their fatigue symptoms and quality of life.

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