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Original Article

Can clinical frailty scale be used routinely in patients aged 50 years and older in intensive care units?

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Abstract

Aim: Frailty can be defined as reduced resistance capacity against the environmental stresses due to a cumulative decline in the physiological reserves of the subject. Clinical Frailty Scale (CFS) can be used to measure frailty. We aimed to calculate the prevalence of frailty in patients admitted to intensive care unit (ICU) and analyze some general features of those patients.

Material and Methods: The study was conducted in general ICUs of a state hospital. Patients who were admitted between January 2016 and March 2018 were analyzed retrospectively. Demographic characteristics, "Clinical Frailty Scale" (CFS) score, clinical data and other patient results were recorded. Subsequently, patients were divided into two groups as frail (CFS≥5) and non-frail (CFS<5) and then statistically compared.

Results: A total of 1139 patients were included in the study. The frailty rate of patients aged 50 years and over was 54.7%. The median age of the frail group was significantly higher (78 vs 69 year; p<0,0001). APACHE II, mechanical ventilation rate, and length of ICU stay were significantly higher in the frail group (25 vs 22; p<0,0001 ve 69,8% vs 52%; p<0,0001 ve 14 vs 11days; p=0,007, respectively). Intensive care costs were also significantly higher in the frail group (1540 vs 1242 US Dollar; p=0,019). The total mortality rate was 39.9%; in frail group. This rate was significantly higher than non-frail group (48,6% vs 29,3%; p<0,0001). Frailty (CFS≥5) were shown to be an independent risk factor for mortality (p=0.014, OR 1.464, 95% CI 1.081-1.982)

Conclusion: We recommend the routine use of CFS, which is especially useful in predicting frailty and mortality in intensive care unit.

Keywords: Frailty; Clinical Frailty Scale; Intensive Care; Mortality.

INTRODUCTION

There is no certain consensus on the definition of the concept of frailty which has been suggested by the geriatrists in the recent years (1). Frailty is a term used to define some conditions such as general debility and cognitive impairment. The fact whether psychosocial factors should be included in the definition is controversial. It may be defined also as the reduced resistance capacity against the environmental stressors due to a cumulative decline in the physiological reserves of the subject and a difficulty to maintain homeostasis (2).

There are mainly two methods to measure frailty named as phenotype and deficit models. Clinical Frailty Scale (CFS) developed by Rockwood et al. measures frailty according to the cumulative deficit model (3-5). CFS, as one of the most commonly preferred scales, is based on clinical impression. CFS is a totally 9 point-scale. CFS scores of 1 and 9 are interpreted as "very fit" and "terminally ill", respectively. CFS≥5 value is usually accepted as the threshold value for frailty (Table 1) (6,7).

The admissions of the patients with risk for frailty are increased in the recent years. Also the fact that to what extent intensive care treatment may provide a beneficial effect on this patient group with a higher mortality rate is another important issue. The physiological reserves of the patients prior to intensive care treatment and comorbidities may affect the outcomes of healthcare service in the intensive care unit. Clinicians need various scoring systems to predict this clinical condition. In this context, detection of frailty may be useful in prediction of the outcomes in the intensive care unit patients (3).

We aimed to calculate the prevalence of frailty in the

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patients admitted to intensive care unit patients of the tertiary stage healthcare facilities and to analyze the relationship between this prevalence rate and some general features such as primarily mortality rate and frailty values of those patients.

Table 1. Clinical Frailty Scale (6,8)

1	Very fit	Robust, active, energetic, well motivated, and fit.
2	Well	Without active disease symptoms but less fit than category 1
3	Managing well	Medical problems are well controlled, but not regularly active
4	Apparently vulnerable	Although not frankly dependent, commonly complain of being slowed up or being tired during the day
5	Mildly frail	Limited dependence on others for IADLs
6	Moderately frail	Help is needed with BADLs and IADLs
7	Severely frail	Completely dependent for all BADLs and IADLs
8	Very severely frail	Completely dependent, approaching end of life.
9	Terminally ill	Life expectancy <6 months but not otherwise evidently frail.

IADLs= instrumental activities of daily living: banking, transportation, cooking, cleaning, medication management, shopping.
BADLs= basic activities of daily living: feeding, bathing, dressing, toileting, ambulation

MATERIAL and METHODS

The study was approved by The Ethics Committee of Medical Faculty of Selcuk University (Date:13.06.2018, Number:2018/225). The study was conducted in general intensive care units of a state hospital. Data of the patients who were admitted between January 2016 and March 2018 were analyzed retrospectively. Patients aged 50 years or older and who were treated in intensive care at least for 24 hours were included in the study. A total of 1139 patients were included in the study, they were informed about their general condition for the last 6 months since the patient's consent was obtained. Demographic characteristics, CFS score, clinical data and results of the patients were recorded. Frailty was defined with the use of the Canadian Study on Health and Aging Clinical Frailty Scale, a well-validated 9-point assessment tool was designed to quantify frailty (6). Subsequently, the patients were divided into two independent groups, namely, non-frail and frail patients, on the basis of a CFS <5 or CFS≥5 and then evaluated.

Statistical Analysis

Data were statistically analyzed using SPSS Version 22.0 (Statistical Package for the Social Sciences Inc., Chicago, IL, USA). Descriptive statistics were performed in all patient groups; numerical data were expressed as median (quarter intervals) while categorical data were given as percentages. Patient features were compared using Chi-Square or Fisher's Exact Test for categorical variables and with Mann-Whitney U Test for numerical variables. To identify any independent risk factor associated with mortality, among the significant parameters of univariate analysis (Age, GCS score, Mechanical ventilation, Length of ICU stay, ICU cost and CFS≥5) were entered into multivariate linear regression analysis. P<0.05 value was accepted as statistically significant.

RESULTS

In our study, the frailty rate of 1139 patients aged 50 years and over was 54.7% and in patients with ≥65 and ≥75 years, these rates were 61.8% and 66.8% respectively (Table 2).

The median age of patients aged 50 years and older was 75(63-82) years and the age of the frail group was significantly higher (78 vs 69 year; p<0,0001). Acute Physiology and Chronic Health Evaluation II (APACHE II), mechanical ventilation rate, and length of ICU stay were significantly higher in the frail patient group (25 vs 22; p<0,0001 ve %69,8 vs %52; p<0,0001 ve 14 vs 11days; p=0,007, respectively). Median Glasgow Coma Score (GCS) values in the frail group were significantly lower than in the non-frail group (10 vs 12; p<0,0001). Intensive care costs were also significantly higher in the frail group (1540 vs 1242 US Dollar; p=0,019). The total mortality rate of intensive care patients was 39.9%, whereas this rate was significantly higher in the frail group than in the non-frail group (48,6% vs 29,3%; p<0,0001) (Table 3).

Logistic regression analysis was conducted to investigate the effects of CFS≥5 on mortality. GCS, mechanical ventilation and frailty (CFS≥5) were shown to be an independent risk factor for mortality (Respectively, p=0.003, OR 0.829, 95% CI 0.732-0.939 and p=0.002, OR 9.396, 95% CI 2.217-39.819 and p=0.014, OR 1.464, 95% CI 1.081-1.982) (Table 4).

Table 2. Clinical Frailty Scale values according to age groups of ICU patients

		CFS<5 (Nonfrail Group) n, (%)	CFS≥5 (Frail Group) n, (%)
Age ≥50 (year) (n:1139)		516 (45.3%)	623 (54.7%)
	CFS-1	32 (6.2%)	
	CFS-2	72 (14%)	
	CFS-3	155 (30%)	
	CFS-4	257 (49.8%)	
	CFS-5		258 (41.5%)
	CFS-6		150 (24.1%)
	CFS-7		121 (19.4%)
	CFS-8		90 (14.4%)
	CFS-9		4 (0.6%)
Age ≥65 (year) (n:828)		316 (38.2%)	512 (61.8%)
Age ≥75 (year) (n:576)		191 (33.2%)	385 (66.8%)

CFS: Clinical Frailty Score, ICU: Intensive Care Unit

Table 3. General characteristics of the patients aged 50 years and older in the Intensive Care Units

Patient features [Median, IQR], n(%)	CFS Total n: 1139 (100%)	CFS<5 (Nonfrail Group) n: 516 (45.3%)	CFS≥5 (Frail Group) n: 623 (54.7%)	P Value
Age (Year)	75 (63-82)	69 (57-79)	78 (69-84)	<0.001
Gender (male)	573 (50.3%)	274 (53.2%)	299 (47.9%)	0.074
APACHE II score	24 (18-30)	22 (16-28)	25 (20-30)	<0.0001
GCS score	10 (6-14)	12 (6-15)	10 (6-13)	<0.0001
CC Score	6.5 (4-8)	6 (4-8)	6.5 (4-9)	0.122
Mechanical ventilation	703 (61.7%)	268 (52%)	435 (69.8%)	<0.0001
Hemodialysis	359 (31.5%)	151 (29,3%)	208 (33.3%)	0.179
Chronic renal failure	47 (4.1%)	15 (2.9%)	32 (5.1%)	0.072
Acute renal failure	402 (35.3%)	183 (35,5%)	219 (35.1%)	0.852
Creatinine (mg/dl)	1.22 (0.6-2.87)	1.2 (0.6-3.06)	1.2 (0.6-2.87)	0.774
Albumin (g/L)	2.5 (2.2-2.9)	2,7 (2.2-3.1)	2.5 (2.2-2.9)	0.113
Sepsis or septic shock	534 (46.9%)	239 (46.4%)	295 (47.3%)	0.858
Length of ICU stay (days)	12 (6-25)	11 (5-21)	14 (6-30)	0.007
ICU cost (*US Dollar)	1372 (334-3927)	1242 (306-3142)	1540 (373-4620)	0.019
İnvoiced ICU cost (*US Dollar)	1764 (626-4710)	1719 (634-4688)	1792 (625-4711)	0.843
ICU outcome, Exitus	454 (39.9%)	151 (29.3%)	303 (48.6%)	<0.0001

CFS: Clinical Frailty Score, ICU: Intensive Care Unit, APACHE II: Acute Physiology and Chronic Health Evaluation II, GCS: Glasgow Coma Scale, CC: Charlson Comorbidity, US: United States, *Central Bank of the Republic of Turkey, Exchange Rates for March 30, 2018

Table 4. Independent risk factors affecting ICU mortality

Parameters	p value	OR (95% CI)
Glasgow Coma Scale Score	0.003	0.829 (0.732-0.939)
Mechanical ventilation	0.002	9.396 (2.217-39.819)
Clinical Frailty Score ≥5	0.014	1.464 (1.081-1.982)

Significant parameters of univariate analysis (Age, Glasgow Coma Scale score, Mechanical ventilation, Length of ICU stay, ICU cost and Clinical Frailty Score≥5) were entered into multivariate linear regression analysis

DISCUSSION

According to the results of our study, the elevated frailty rates were found to be associated with mortality rate with advancing age. Similarly, frailty rates were associated with increased levels of both length of ICU stay and ICU costs. Additionally, mechanical ventilation, APACHE II and GCS scores were higher in the frail patient group. We have finally found that frailty is an independent risk factor for mortality.

A systematic review has shown that frailty rates range between 4.0% to 59.1% (9). This rate was found high especially in the patients admitted in the hospitals due to various rationales (3). The difference between these rates may be resulting from the scoring methods used for this measurement (10). A study has evaluated 196 ICU patients aged 65 years and older in a 6-month period. The frailty rate was assessed by Frailty phenotype (FP) and the Clinical Frailty Score (CFS) in our patients. The frailty rate was detected 41% and 23% according to the threshold values of FP≥3 and CFS≥5, respectively (3). However, we determined a higher frailty rate of 54.7% according to CFS≥5 in the patients aged 50 years and older. This higher rate may be resulting from different factors such as study population, sampling size, ICU patient types and characteristics of the physician (ie: a geriatrician) who performed the scoring system.

Age is not solely mandatory for frailty, however, elderly patients have a risk for frailty (2). Several studies have evaluated different age groups regarding frailty. A study has analyzed 421 ICU patients older than 50 years old using CFS and frailty rate was found 32.8% (11). Another study determined a frailty rate of 56.6% by CFS in the patients aged over 75 years old (7). We have analyzed the frailty rates regarding different age groups in our study and determined higher rates of 61.8% and 66.8% in the age groups older than 65 and 75 years old compared with these studies, respectively.

A subject can maintain normal functionality in a stable state whereas that person cannot cope with an additional stressful state because of the declined physiological reserves as age advances. The definitions of primary and secondary frailty were established to state the presence of comorbidity accompanied with frailty. Even though,

frailty is associated with increased comorbidities and functional limitations according to geriatricians, it may also occur in the absence of comorbidity (1). Also no significant difference was found between the groups in terms of Charlson Comorbidity Score in our study. A study detected a combination of frailty, disability and comorbidity in 21.5% of the patients. However, frailty rate was encountered in 26.6% of the patients in absence of comorbidity and disability (12). From this point of view, the studies show more prominently the pathologies with similar etiological factors with frailty such as Alzheimer disease (13).

A study revealed a significantly higher APACHE II score in the frail patient group whereas no significant difference was found in terms of mechanical ventilation, renal replacement therapy and use of vasoactive medication. The presence of frailty in the survivors was attributed to prolonged admission durations both in the ICU and hospital ward (11). Another study has evaluated in terms of the Simplified Acute Physiology Score II (SAPS II) and Sequential Organ Failure Assessment scores (SOFA) and encountered no difference frail and non-frail patient groups (3). However, we have found frailty significantly correlated with high APACHE II and low GCS score as a component of this scale in our study. Additionally, also length of stay in the ICU were found longer in the frail patients. A study has analyzed the relationship between frailty and non-invasive mechanical ventilation (NIV) in the ICU patients. The application problems of NIV, NIV failure and mortality rates were found significantly higher (14). On the other hand, frail patients revealed a higher need for invasive mechanical ventilation in our study. Glasgow Coma Scale, CFS≥5 and mechanical ventilation were shown to be an independent risk factor for mortality.

Another important topic is the relationship between frailty and mortality. Frailty was the most common reason of mortality with a rate of 27.9% among the elderly subjects (15). A multivariable analysis performed in the context of another ICU study has determined CFS≥5 to be a risk factor for 6-month mortality. Increased CFS score was found significantly correlated with in-hospital mortality and 6-month mortality (3). A study has evaluated 2125 patients by CFS who were hospitalized due to an acute disease and reported as an outcome that frailty predicted in-hospital mortality, new nursing home placement, and length of hospital stay (8). Another study has reviewed 421 ICU patients aged over 50 years old and no significant difference was found between frailty and ICU mortality. However, in-hospital mortality rates was higher in the frail patients (32% vs 16%, respectively) and this parameter remained higher for one more year (48% vs 25%, respectively) (11). In contrast with this study, a higher ICU mortality rate was encountered in the frail patients in our study (48.6% vs 29.3%, respectively). Additionally, we have found that frailty is an independent risk factor for mortality.

Health problems of the subjects may accumulate in parallel with aging worldwide. As health problems accumulate, return to a healthy state becomes more difficult and risk for mortality increases. In these patients, healthcare services for the conditions such as senility and frailty become more complicated and need for ICU may increase (16). Frailty is associated with medical and social care of the patients and may also cause increased costs of healthcare services. The concept of frailty should be analyzed more comprehensively since healthcare burden may increase in these patients (2). Increased costs of the frail patient group in our study supports this conclusion.

Study limitations

The present study had some limitations. It was a small-sample, single-centre, retrospective study, which limits popularity.

CONCLUSION

The treatments of ICU patients may be predicted more precisely by assessment of frailty in the ICU. Additionally, it may be useful to guide expectations and predict mortality in ICU patients. Finally, we have concluded that CFS as a practical scale may be performed routinely in the ICU.

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