RESEARCH

PREVALENCE AND CLINICAL FEATURES OF CHRONIC CRITICAL ILLNESS IN THE ELDERLY POPULATION IN TURKEY

Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2020.188
2020; 23(4): 501-508

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Received: Aug 29, 2020
Accepted: Nov 24, 2020

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Abstract

Objectives: The definition of chronic critical illness in the elderly has not yet been determined. The aim of the study is to determine the prevalence and clinical features of chronic critical illness in the elderly population in Turkey.

Materials and Methods: Data from 16 intensive care units of public and private hospitals in Turkey were evaluated. Patients staying in the intensive care units for at least eight days between 2015 and 2017 and having at least one of the additional criteria were accepted as chronic critical illness and they were divided into two groups by age, those 65 and older and those under 65.

Results: The chronic critical illness patient rate in the intensive care units was 10.7%. Of chronic critical illness patients in the intensive care units, 60.9% were 65 years of age and older, and the mortality rate of patients 65 years and older was 70%. The frequencies of ischemic stroke and sepsis, the number of patients with comorbidities, and the mortality rate were higher in patients over 65 years of age, while the frequency of traumatic brain injury, presence of a major wound, tracheostomy, length of hospital stay and cost of care were higher in patients under 65 years of age.

Conclusion: We determined that prolonged mechanical ventilation, traumatic brain injury, tracheostomy and major wound presence in intensive care units patients 65 years and older increased hospital stay and costs. More work is needed to define chronic critical illness more clearly in elderly.

Keywords: Chronic Disease; Critical Illness; Intensive Care Unit; Aged; Turkey

INTRODUCTION

As a result of improvements in treatment in the intensive care unit (ICU), more patients survive acute critical illness. However, some of these patients have to live with long-term dependence on mechanical ventilation and other intensive care treatments (1). These patients who survive in the ICU and subsequently face a complex healing trajectory are described as chronic critical illness (CCI). It is increasingly recognized that patients with CCI are prone to psychological, physical, and cognitive dysfunction both during their stay in the hospital and after discharge (2). As a result of a recent consensus, patients who remained in the ICU for at least eight days and exhibited at least one of the following five conditions were defined as CCI: prolonged mechanical ventilation (PMV) >96 hours extended; tracheostomy; serious injuries and / or multiple organ failure; sepsis or others serious infections; ischemic stroke, intracerebral bleeding, or traumatic brain injury (TBI)(3).

The presence of various risk factors such as chronic kidney failure, frailty, repeated admissions to the ICU, and older age are indicators of poor prognosis in CCI patients (3). There has been an increase in the elderly population admitted to the ICU annually for the last two decades (4). The definition of CCI in the elderly has not yet been determined, thus preventing accurate analysis of elderly people with CCI.

Although there has been a comprehensive discussion of CCI in the elderly population worldwide, CCI in the elderly has not been studied much in Turkey. The aim of this multicenter study is to determine the prevalence, clinical features, and characteristics of CCI in the elderly population in Turkey.

MATERIALS AND METHODS

A retrospective crossectional study was conducted in five different regions of Turkey between July 2017 and June 2018. The study was approved by the Non-Interventional Van Yuzuncu Yil University Clinical Ethics Committee (June 20, 2017; No. 08). In addition, approval was obtained from the official administrations of the researchers they worked with who agreed to participate in the study. The medical records of patients treated in the ICU between 2015 and 2017 were evaluated. The study was registered at ClinicalTrials.gov (identifier: NCT03262883).

Patients staying in the ICU for at least eight days and having at least one of the additional criteria were accepted as CCI (PMV, tracheostomy, sepsis, major wound, stroke, or TBI). CCI patients included in the study were also divided into two groups, 65 years and older and under 65 years. Patients with illnesses other than CCI, length of ICU stay of ≤7 days, and age <18 years were excluded from the study.

Statistical Analysis

The data were evaluated in the IBM SPSS Statistics Standard Concurrent User V 25 (IBM Corp., Armonk, New York, USA) statistical program. For descriptive statistics, unit number (n), percent (%), mean ± standard deviation ($\bar{x}$ ± ss), median (M), smallest value (min), largest value (max), first quartile (Q1) and third quartile (Q3) and interquartile distance (IQR –Interquartile range) are given as values. Pearson Chi-square test was used to compare categorical variables between groups. In case of a difference in Pearson Chi-square test, two proportion z tests with Bonferroni correction were used. The normal distribution of data of numerical variables was evaluated by Shapiro–Wilk normality test and Q-Q graphs. Since the data did not show normal distribution, two groups were compared with Mann–Whitney U test and three groups were compared with Kruskal–Wallis analysis. A $p < .05$ value was considered statistically significant.

RESULTS

Among 23,272 patients admitted to ICUs during the study period, 2,493 (10.7%) were CCI. Demographic characteristics and the clinical features of the CCI patients are presented in Table 1.

PMV rate is high in both groups and shows similar distribution between groups ($p = .300$). The frequencies of ischemic stroke ($p < .001$) and sepsis ($p < .001$) in patients 65 years and older were significantly higher than in patients under 65 years (Table 2).

The number of patients with one, two, or three comorbid diseases in the 65 and older age group was significantly higher than in the under 65 age group. The mortality rate was higher in the 65 and older group (Table 3).

Comparison of PMV, TBI, major wound, sepsis and tracheostomy with mortality, duration of hospitalization and cost are given in table 4. The duration of hospitalization with PMV, sepsis and tracheostomy were significantly higher in both groups. The duration of hospital stay for those with TBI and major wound in the 65 and older age group was significantly longer. The mortality rate of patients with sepsis, tracheostomy and without TBI in the overall patient group were significantly higher.

DISCUSSION

There are no clear criteria for defining the transition of patients with CCI from the acute phase to the chronic phase (3). In this study, we have determined the CCI criteria as a stay in the ICU of eight or more days and at least one of the six clinical causes (major wound, sepsis, stroke, PMV, tracheostomy, or TBI) in accordance with the literature. Among 23,272 patients admitted to ICUs during the study period, 2,493 (10.7%) were CCI. The rate of CCI seen in our study is similar to the rates reported by other authors (5% to 15%) (5, 6). CCI-associated hospital mortality rates were 61% in the this study, 65% in a multicenter study in Brazil in 2015, and 50% in a study conducted in Mexico (7). The in-hospital mortality rate was 10% in a study conducted in New Zealand and Australia (8). In the US, which is a developed country, CCI-associated in-hospital mortality rate was 31% (9). Our mortality results are higher than those of developed countries and similar to those of developing countries.

Elderly patients account for 10 to 20% of all ICU admissions, and this number is growing steadily (10). In another study, the percent of patients over 65 years of age in the ICU was 53%, according to data from training hospitals (11). In our study, the rate of elderly CCI patients staying in the ICU was 60.9%, slightly higher than in other studies. PMV distribution was high in both groups and showed similar distribution between groups. The frequency of ischemic stroke and sepsis in patients 65 years and older was significantly higher than in patients under 65 years. The frequency of TBI, major wound presence, and tracheostomy was significantly higher in patients under 65 years of age. According to an observational study on the mortality rates of critically ill elderly patients admitted to the ICU, in-hospital mortality rates are between 24% and 40%, three-month mortality rates are between 39% and 41%, six-month mortality rates are between 37% and 51%, and one year mortality rates are between 44% and 68% (10). The one-year mortality rate was 73% in patients who had undergone mechanical ventilation for more than 14 days or underwent tracheostomy (12). In our study, the mortality rate of patients 65 years and older was 70%, and this rate was significantly higher than in those patients under 65 years old (47.6%).

PMV accounts for a large part of ICU costs (13). It is known that that elderly people are more sensitive to lung damage caused by PMV and the incidence of acute respiratory failure (ARF) increases significantly with age. Many studies have shown that age of patients requiring mechanical ventilation and ARF are independently associated with mortality (14, 15). In our study, the number of patients with chronic

Table 1. Chronic critical illness (CCI) Characteristics

Variables	n	%
Gender		
Male	1462	58.6
Female	1031	41.4
Age		
`x ± ss	65.5±18.7	
M (Q_1-Q_3)	70 (56-80)	
min-max	18-101	
Hospitalization year		
2015	557	22.3
2016	1071	43.0
2017	865	34.7
Number of Comorbid Diseases		
0	1354	54.3
1	777	31.2
2	299	12.0
3	56	2.2
4	7	0.3
Those with Comorbid Disease *		
COPD	426	17.1
DM	457	18.3
CHF	376	15.1
CLD	36	1.4
CRF	175	7.0
Cancer		
Solid Cancer	66	2.6
Hematological Cancer	6	0.2
Primary Hospital Diagnosis		
Respiratory Failure	472	18.9
Medical	696	27.9
Cardiac	395	15.8
Neurological disease	572	22.9
Surgery (post op)	141	5.7
Trauma	217	8.7
Chronic Disease Risk Factors *		
Prolonged Mechanical Ventilation	2369	95.0
Stroke		
Hemorrhagic Stroke	210	8.4
Ischemic Stroke	377	15.1
Traumatic Brain Injury	225	9.0
Major Wound	87	3.5
Sepsis	633	25.4
Tracheostomy	764	30.6
Undefined	39	1.6
Mediastinal	2	0.1
Permanent	195	7.8
Temporary	463	18.6

Discharge Status		
No	2146	86.1
Yes	347	13.9
Referral to a More Comprehensive Hospital		
No	2445	98.1
Yes	48	1.9
Referral to the Same Comprehensive Hospital		
No	2491	99.9
Yes	2	0.1
Transfer to Palliative Unit	2455	98.5
No	38	1.5
Yes		
Transfer to Service		
No	2466	98.9
Yes	27	1.1
Hospitalization Status In Intensive Care		
No	2438	97.8
Yes	55	2.2
Refuse Treatment		
No	2416	96.9
Yes	77	3.1
Survival		
Living	967	38.8
Died	1526	61.2
Time on Mechanical Ventilator (Days)		
`x ± ss	27.2±30.8	
M (Q_1-Q_3)	17 (10-33)	
min-max	0-355	
Time spent in intensive care (Days)		
`x ± ss	31.4±32.4	
M (Q_1-Q_3)	21 (13-37)	
min-max	8-384	
Length of hospital stay (Days)		
`x ± ss	34.9±36.4	
M (Q_1-Q_3)	23 (14-41)	
min-max	8-384	
Cost after the 8th day ($)		
`x ± ss	7774.8±12444.1	
M (Q_1-Q_3)	4104.6 (1655.9-9449.3)	
min-max	0.61-304252.9	
Money Paid by Insurance ($)		
`x ± ss	10116.2±11252.8	
M (Q_1-Q_3)	6358.6 (3753.4-12242.1)	
min-max	526.5-12242.1	

* Each disease was evaluated separately. COPD: Chronic Obstructive Pulmonary Disease, DM: Diabetes Mellitus, CHF: Chronic Heart Failure, CRF: Chronic Renal Failure, CLD: Chronic Liver Disease

Table 2. Comparison of Chronic Critical Illness Risk Factors, Hospitalization Times and Costs by Age.

	PMV n(%)		Stroke n(%)			TBI n(%)		MW n(%)		Sepsis n(%)		Tracheostomy n(%)		DHS	DHS in ICU	Cost
	No	Yes	No	HS	IS	No	Yes	No	Yes	No	Yes	No	Yes	M (Q_1-Q_3)	M (Q_1-Q_3)	M (Q_1-Q_3)
<65 (n=975)	43 (4.4)	932 (95.6)	791 (81.1)	87 (8.9)	97 (9.9)	841 (86.3)	134 (13.7)	924 (94.8)	51 (5.2)	767 (78.7)	208 (21.3)	643 (65.9)	332 (34.1)	25 (29)	22 (26)	4416.4 (9101.1)
≥65 (n=1518)	81 (5.3)	1437 (94.7)	1115[b] (73.5)	123[a] (8.1)	280[b] (18.4)	1427[b] (94.0)	91[b] (6.0)	1482[b] (97.6)	36[b] (2.4)	1093[b] (72.0)	425[b] (28.0)	1086[b] (71.5)	432[b] (28.5)	22 (26)	21(23)	3981.9 (9542.2)
χ^2, z	1.076		33.392			43.416		14.411		13.917		8.737		2.950	0.951	1.810
p	.300		<.001			<.001		<.001		<.001		<.001		.003	.341	.070

PMV, Prolonged Mechanical Ventilation; TBI, Traumatic Brain Injury; DHS, Duration of Hospital Stay (days); ICU, Intensive care unit; Cost, Cost after the 8th Day ($); HS, Hemorrhagic Stroke; IS; Ischemic Stroke. z: Mann–Whitney U test, χ^2: Chi-square test; The superscripts a and b indicate the difference of age groups between categories.

Table 3. Comparison of Number of Comorbidities, Types of Comorbidities, and Mortality by Age

	CD n(%)					COPD n(%)		DM n(%)		CHF n(%)		CLD n(%)		CRF n(%)		Cancer n(%)			Mortality n(%)	
	0	1	2	3	4	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	SC	HC	No	Yes
< 65 (n=975)	665[a] %68.2	221[a] %22.7	78[a] %8.0	10[a] %1.0	1[a] %0.1	870[a] %89.2	102[a] %10.8	855[a] %87.7	120[a] %12.3	904[a] %92.7	71[a] %7.3	959 %98.4	16 %1.6	931[a] %95.5	44[a] %91.4	937[a] %96.1	33[a] %3.4	5[a] %0.5	511[a] %52.4	464[a] %47.6
≥ 65 (n=1518)	689[b] %45.4	556[b] %36.6	221[b] %14.6	46[b] %3.0	6[a] %0.4	1197[b] %78.9	321[b] %21.1	1181[b] %77.8	337[b] %22.2	1213[b] %79.9	305[b] %20.1	1498 %98.7	20 %1.3	1387[b] %4.5	131[b] %8.6	1484[b] %97.8	33[a] %2.2	1[b] %0.1	456[b] %30.0	1062 %[b]70.0
χ^2	127.755					45.123		38.808		76.068		0.437		15.417		8.383			125.135	
p	<.001					<.001		<.001		<.001		.509		<.001		.015			<.001	

χ^2: Chi-square test; a and b superscripts show the difference between age groups between categories. COPD: Chronic Obstructive Pulmonary Disease. DM: Diabetes Mellitus. CHF: Chronic Heart Failure. CRF: Chronic Renal Failure, CLD: Chronic Liver Disease

obstructive pulmonary disease (COPD), longer PMV duration, and mortality were higher in the group over 65 years old. These findings confirm the results of previous studies.

Sepsis is common in ICUs and is associated with high morbidity rates. Development of sepsis is higher in patients with CCI remaining in the ICU (16). In our study, the cost values after the eighth day and the mortality rates of the patients with sepsis in both groups were significantly higher than for those without CCI. While the percentage of patients with sepsis younger than 65 years who died was 68.7%, this percentage was 84.2% in the 65 and older group.

It is known that the number of comorbid diseases increases with age. Patients with comorbidities in the ICU have higher in-hospital and long-term mortality rates (17). In our study, the number of patients with one, two, or three comorbid diseases in the 65 and older age group was significantly higher than in the group younger than 65 years old. The high mortality rate in the over 65 age group may be related to comorbid diseases as mentioned above. Studies have reported that PMV, age, presence of comorbidity, and sepsis increase mortality (18). The findings of this study reaffirm the results of previous studies.

In conclusion, this is the first study that describes the characteristics of CCI in the elderly population in Turkey. In this study, we observed that the mortality rate in ICU was high and mortality increased at the age of 65 and above. Moreover, we determined that

Table 4. Comparisons for Prolonged Mechanical Ventilation, Traumatic Brain Injury, Major Wound, Sepsis and Tracheostomy.

Variables	All patients				<65				≥65			
	No		Yes		No		Yes		No		Yes	
	M	IQR	M	IQR	M	IQR	M	IQR	M	IQR	M	IQR
Prolonged Mechanical Ventilation												
Hospital Duration (Days)	16.50	15	24.0	28	16.0	10	26.00	32	17	17	22	26
	z=6.157; p<.001				z=4.661; p<.001				z=4.177; p<.001			
Cost after the 8th day ($)	2211.2	6297.9	4202.2	7886.2	2355.1	4402.7	4524.1	9285.5	1774.2	6780.1	4016.9	7199.9
	z=4.742; p<.001				z=3.650; p<.001				z=3.161; p=.002			
	n	%	n	%	n	%	n	%	n	%	n	%
Survival												
Living	52	41.9	915	38.6	22	51.2	489	52.5	30	37.0	426	29.6
Died	72	58.1	1454	61.4	21	48.8	443	47.5	51	63.0	1011	70.4
	χ^2=0.544; p=.461				χ^2=0.028; p=.867				χ^2=1.994; p<.158			
Traumatic Brain Injury												
Hospital Duration (Days)	23	26	28	30	25	30	27.5	30	22	26	28	24
	z=1.645; p=.100				z=0.014; p=.989				z=2.005; p=.045			
Cost after the 8th day ($)	4016.9	7601.5	5429.1	8955.2	4324.8	8912.9	4777	9053	3942.8	7000.6	5965.8	8613.5
	z=2.473; p=.013				z=0.828; p=.408				z=2.413; p=.016			
	n	%	n	%	n	%	n	%	n	%	n	%
Survival												
Living	861	38.0	106	47.1	431	51.2	80	59.7	430	30.1	26	28.6
Died	1407	62.0	119	52.9	410	48.8	54	40.3	997	69.9	65	71.4
	χ^2=7.215; p=.007				χ^2=3.311; p=.069				χ^2=0.099; p=.753			
Major Wound												
Hospital Duration (Days)	23	27	24	27	25	31	22	30	22	26	31	26
	z=1.505; p=.132				z=0.226; p=.821				z=2.239; p=.025			
Cost after the 8th day ($)	4114.6	7791.1	4061.9	8125.5	4477.1	9119.5	3887.1	8348.1	3976.8	7069	4346.9	7950.0
	z=0.142; p=.887				z=0.349; p=.727				z=0.450; p=.653			
	n	%	n	%	n	%	n	%	n	%	n	%
Survival												
Living	921	38.3	46	52.9	478	51.7	33	64.7	443	29.9	13	36.1
Died	1485	61.0	41	47.1	446	48.3	28	35.3	1039	70.1	23	63.9
	χ^2=7.532; p=.006				χ^2=3.262; p=.071				χ^2=0.647; p=.421			
Sepsis												
Hospital Duration (Days)	23	26	24	28	24	30	26.5	30	22	26	22	27
	z=0.784; p=.433				z=1.171; p=.242				z=0.382; p=.703			
Cost after the 8th day ($)	3864.9	7240.3	4946.7	8264.5	4050.8	8401.1	5509.7	11864.2	3719.4	6715.1	4471.3	7626.2
	z=5.116; p<.001				z=4.092; p<.001				z=3.539; p<.001			
	n	%	n	%	n	%	n	%	n	%	n	%
Survival												
Living	835	44.9	132	20.9	446	58.1	65	31.3	389	35.6	67	15.8
Died	1025	55.1	501	79.1	321	41.9	143	68.7	704	64.4	358	84.2
	χ^2=114.949; p<.001				χ^2=47.466; p<.001				χ^2=57.232; p<.001			
Tracheostomy												
Hospital Duration (Days)	18	17	42	44	19	18	45	54	17	17	41	41
	z=24.241; p<.001				z=15.157; p<.001				z=18.787; p<.001			
Cost after the 8th day ($)	2807.5	4550.1	9805.9	12456.2	2733.4	4521.8	11052.1	14963.6	2870.2	4615.2	9081.7	11421.2
	z=22.804; p<.001				z=15.062; p<.001				z=17.006; p<.001			
	n	%	n	%	n	%	n	%	n	%	n	%
Survival												
Living	649	37.5	318	41.6	341	53.0	170	51.2	308	28.4	148	34.3
Died	1080	62.5	446	58.4	302	47.0	162	48.8	778	71.6	284	65.7
	χ^2=3.727; p=.054				χ^2=0.293; p<.588				χ^2=5.116; p=.024			

M: Median value. IQR: Distance between Quartiles. z: Mann–Whitney U test; χ^2: Chi-square test

PMV, TBI, tracheostomy, and major wound presence in the 65 and older age group increased hospital stay and costs. More work is needed to define CCI more clearly in elderly.

Acknowledgements

We would like to all clinician for this manuscript. There are no conflicts of interest in connection with this paper and the study was not use any sources of financial assistance.

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