



RESEARCH

COST ANALYSIS OF ELDERLY PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT AT A UNIVERSITY HOSPITAL IN TURKEY

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ABSTRACT

Introduction: The cost of the intensive care unit for geriatric patients may be high because of their increased incidence of organ failure due to age, the associated need for multiple drug use and the need for supportive treatments. Our study aimed to contribute to the improvement of intensive care unit costs and the development of new care strategies for patients aged over 65 years in the intensive care unit.

Materials and Method: Once we received ethics committee approval for the study, patients aged above 65 years admitted to the level 3 intensive care unit were divided into three groups. Reason for hospitalisation, duration of hospitalisation, disease severity scores, medication and additional costs and total cost of treatment in the intensive care unit were evaluated.

Results: 43.5% (n=212) of a total of 487 patients treated were over 65 years of age. The mean age of the 212 geriatric patients was 76.66±7.4 years, and 20.03% of them were admitted to the intensive care unit after a sepsis diagnosis. A total of 22.64% of the patients were discharged to home, and 52.36% were discharged to wards. The average stay duration was 12.32±14.86 days, and the cost of treatment in the intensive care unit was 25,231 Turkish liras, including the drug cost of 4,769 liras.

Conclusion: The rate of admission of geriatric patients to the intensive care unit has increased, but survival is still low. Health policies should be restructured to reduce hospitalisation costs for this fragile group.

Keywords: Intensive Care Unit; Hospitalization; Health Care Costs; Aged.



INTRODUCTION

Intensive care unit (ICU) treatments are among the top high-cost treatments, and their costs increase every day. A high patient/healthcare staff ratio is the primary reason for the high cost. Admission of elderly patients with complicated and severe diseases to the ICU increases costs even further. Relevant literature has indicated that 5% of patients admitted to the hospital need ICU. Although this rate seems low, ICU expenses constitute 8%–30% of total hospital expenses(1).

Elderly patients aged above 65 years are admitted to ICUs at an increasing rate. The ICU survival rate of patients in the elderly age group is low, and the likelihood of returning to normal life upon survival is also very low(2). Although previous studies have suggested that advanced age alone is not an obstacle to ICU admission, healthcare professionals might hesitate to decide in favour of ICU admission due to the low life expectancy of elderly patients during and after ICU treatment.

Although there is no major difference in terms of the cost of treatment in the ICU for elderly patients compared to that for younger patients, the treatment cost in the former patient group, which has low life expectancy, is a separate cause of concern(3). The cost of ICU treatment of elderly patients places an additional burden on the social security systems (SSS) in individual countries.

Our study aimed to contribute to the improvement of ICU patient admission strategies by examining the general characteristics and ICU costs of patients aged above 65 years.

MATERIALS AND METHOD

The study commenced upon receiving the approval of the hospital ethics committee (No:23;19.02.2019). The files and hospital bills of patients aged above 65 years and admitted to the general ICU of the Department of Anesthesiology, Eskişehir Osmangazi University Faculty of Medicine between January 1,

2018 and December 31, 2018 were retrospectively analysed. The patients were divided into three age groups as follows: 65–74 years, 75–84 years and 85 years and above. The reason for ICU admission, duration of ICU stay, sex, age, ICU death rate, and acute physiology and health evaluation score (APACHE 2) were retrieved from patient records.

In Turkey, the SSS covers health expenditures for all citizens. The payment system for ICU patients is calculated on a per calendar day basis, and the bed, all monitoring fees and medication fees are included in the package fees. The package fee was 1040,72 Turkish Lira (TL) for patients admitted to the 3rd level ICU during the study duration. Furthermore, fees for additional and special procedures (such as extracorporeal membrane oxygenation (ECMO), continuous renal replacement therapy, plasmapheresis, etc.) were separately paid in the form of Annex-2B payment. For our study, the ICU expenses, device and drug expenses, and Annex 2B expenses of the patients were recorded in TL currency.

Statistical Analysis

Continuous data are reported as mean \pm standard deviation. Categorical data are given in percent (%). Shapiro Wilk's test was used to examine the suitability of the data for normal distribution. A one-way analysis of variance (one-way ANOVA) was used for cases with three or more groups compared to normally distributed groups. The Kruskal-Wallis H test was used for the cases with three or more groups compared to the groups that did not conform to normal distribution. For the variables that did not conform to normal distribution, Spearman correlation coefficients were calculated to determine the direction and magnitude of the relationship (correlation) between the variables. Pearson Chi-Square and Pearson Exact Chi-Square analyses were used in analyzing the crosstabs produced. The program IBM SPSS Statistics 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) was used for

the analysis. A value of $p < 0.05$ was accepted as the criterion for statistical significance.

RESULTS

Of the 487 patients treated in the ICU, 43.5% ($n=212$) were over 65 years of age. The mean age of the 212 geriatric patients was 76.66 ± 7.4 years, and 20.03% of these patients were admitted to the ICU upon being diagnosed as having sepsis. A total of 52.36% of the patients died in the ICU, and the mortality rate decreased with increasing age (Table 1). The duration of the ICU stay was 12.32 ± 14.86 days, and the average cost of treatment in the ICU was 25,231 TL, including the medication cost of 4,769 TL. The cost of treatment in the ICU based on age group is given in Table 2. Thus, there was no significant statistical difference between the age groups' cost of treatment in the ICU. In addition, there was no correlation between the ICU costs and LOS, the APACHE 2 score, and age (Table 3).

DISCUSSION

In our study of patients over the age of 65 years receiving intensive care, we found that the mortality rate of the patient group above 85 years of age was statistically significantly lower than that of the other two age groups. In addition, we observed that there was no statistically significant difference in the

treatment costs reimbursed by the SSS across the three groups.

The increase in the elderly population causes a significant burden on the SSS in individual countries(4). The aging of the population leads to a decrease in the size of the workforce and ultimately results in a decrease in tax revenues. Furthermore, retirees are allotted inadequate funds, which are offset by tax revenues, reducing public revenues. In addition, the increase in medical care expenditures for elderly individuals also places an additional burden on the SSS(4). A study conducted in the USA found that, on average, a man would spend \$268,679 and a woman would spend \$361,192 for health care expenses during their lifetime. Moreover, the same study found that 60% of lifelong health expenditures were paid after the age of 65; accordingly, it was predicted that health expenditures in the USA would increase by 20% in the future due to the ageing of the population(5).

In our study on patients over 65 years of age admitted to the ICU, we found that the average ICU hospitalisation cost for the patients during the study period was 25,231 TL, of which 4,769 TL was the drug cost. In the same year (2018), the per capita gross national product (GNP) in Turkey was declared as 45,750 TL by the Turkish Statistical Institute (6). More than half of this amount was spent on treatment for any geriatric patient treated in the

Table 1. Mortality rates based on age group

Age groups (X^2)	Discharge Status		Total	p
	Discharged n/%	Death n/%		
65–74	53(52.5)	38 (34.2)	91	0.017
75–84	35 (34.7)	47 (42.3)	82	
≥85	13 (12.9)	26(23.4)	39	



Table 2. The expenditures of patients by age groups

	Age Groups			p
	65–74	75–84	85 and above	
Medical Equipment (TL)	446.22 (135.85–1945.30)	475.31 (196.50–1407.36)	392.80 (97.55–1125.89)	0.53
Drugs (TL)	1285.55 (407.02–6582.69)	1227.34 (327.53–3587.61)	1225.36 (373.19–4287.39)	0.79
Annex-2b (TL)	3651.56 (1631.89–12867.09)	4104.32 (1650.42–7964.28)	3998.17 (1575.25–8127.87)	0.74
SSS (total) (TL)	7519.64 (2697.35–22749.85)	6234.80 (2671.49–14331.24)	6045.59 (1981.50–17323.92)	0.47

SSS: Social Security System; TL: Turkish Liras

Table 3. The correlation analysis of expenditures and specific parameters

	Age	APACHE 2	ICU LOS
Medical Equipment	r:0.072 p:0.296	r:-0.007 p:0.917	r:0.05 p:0.470
Drug	r:-0.056 p:0.417	r:-0.025 p:0.720	r:-0.024 p:0.733
Annex 2B	r:-0.121 p:0.078	r:0.028 p:0.686	r:-0.031 p:0.653
SSS (total)	r:-0.131 p:0.057	r:0.036 p:0.607	r:-0.022 p:0.755

APACHE 2: Acute Physiologic and Chronic Health Evaluation 2 Score

SSS: Social Security System

Pearson correlation test ; Correlation is significant at 0.05 level

ICU for an average of 12 days. Faced with a similar situation, Denmark reduced its health expenditures through a regulation to the same level as that of the USA in 1997; as a matter of fact, Denmark's health expenditures were twice that of the USA in 1985(4). The most striking point of this regulation was the transition from a therapeutic approach to a preventive approach and a decrease in the duration of hospital stays to 3 days(4). A review of population distribution in Turkey suggested that the incidence

of the age group above 65 years in the total population, which was 8.76% in 2018, would increase to 10.2% in 2023 and to 20.8% in 2050(4). The results of the present study, which was conducted in a university hospital in a metropolitan city, suggest that the formulation and implementation of an action plan for improving elderly health and care in the 2020s is warranted.

The costs of treatment in the ICU constitute 30% of total hospital expenditures(1). In general, admis-

sion of patients to the ICU is decided by considering the severity of the disease, comorbidities and expected prognosis. Although only about 30% of patients admitted to the ICU are above 65 years of age, the cost of their ICU treatment constitutes a larger portion of total ICU costs(7,8). These high costs create ethical and practical issues in terms of the admission of elderly patients to and the treatment process in the ICU(9,10).

Elderly patients are admitted to the ICU in three ways. First, if the patient is conscious, a joint decision regarding admission can be made through discussion with the patient, relatives of the patient, and caregivers. In the second case, elderly patients are generally not available to give their consent. Therefore, based on the severity of the disease, caregivers and the family, along with the treating physician, decide whether ICU treatment is needed, taking into account the previous decisions made by the patient. In emergency cases, where there is no time to collect information, elderly patients are admitted to the ICU and treatment is initiated. In many countries, decisions regarding withdrawing life support treatments are then considered when possible(11). In contrast, in our country, which adopted the principle of "first come, first served," the decisions of patients regarding ICU admission are not or can not be made in advance, and after all patients are admitted to the ICU, acute treatment is provided, regardless of the benefit they would receive from the treatment.

Intensive care triage begins with the referring clinician- and consultant physician-focused process, but potential benefits can only be obtained if a decision to admit the patient to the ICU is made considering the input of clinicians, patients and their relatives(8). If the benefit of admission to the ICU is deemed low, other alternatives, such as intermediate ICU or palliative services, should be considered. Making end-of-life decisions during the decision process should not be avoided, nurses should be involved in the decision-making processes regard-

ing the patient and due sensitivity towards cultural and ethical issues should be shown (8).

A study found that most elderly patients reject admission to ICUs, and interestingly, the survival rate of patients admitted to ICU increased with age(12). Similarly, in our study, we found that the mortality rate in our patients admitted to the ICU was the highest in the 75–84 age group (42.3%); however, the same rate decreased to 23% in the group above 85 years of age.

In patients whose clinical symptoms do not improve, ICU treatment can be terminated earlier (13). In certain studies, different mortality rates were found (29%–93%)when the withholding and withdrawal approaches were adopted for ICU patients aged above 80 years. In another study where these approaches were not in place, the mortality rates varied between 56%–69%. The purpose of withholding or withdrawal approaches is to provide a comfortable death(11,14). The limitations of these approaches vary among countries in terms of religious beliefs and income levels(11). In our study, there was no statistical difference between the age groups in terms of ICU admission and costs. This was associated with the fact that the withholding and withdrawal approaches are not legally supported in Turkey and that clinicians refrained from adopting these approaches.

Advanced age alone does not constitute a contraindication for admission to the ICU(3). If there is a medical requirement, the indications for admission to the ICU for the elderly should be the same as those for young individuals(15). A study conducted in the United States reported that 29.7% of the 65–74 years age group, 27.9% of the 75–84 years age group, and 21.1% of the 85 years and above age group in need of ICU were admitted to the ICU(16). Regarding ICU hospitalisation indications in Turkey, it is known that age is not regarded, and the "first come, first served" system is adopted across the organization for facilities. Therefore, it is impossible to provide such statistics. During our study duration,



43.5% of the ICU admissions were patients above the age of 65 years.

The main reason for the high costs of elderly patients is the use of drugs and treatments to manage organ failures associated with chronic diseases. Although many studies reported an inverse relationship between advanced age and cost, Eren *et al.* suggested in their study that it was the duration of stay in the ICU rather than the age that increased the cost, yet they were not able to clearly reveal the reasons for prolonged hospitalisation(17,18). In a more comprehensive study by Kara *et al.* that compared the costs of treatment in different ICUs, it was found that the average age of their patients was 52.6; similarly, they concluded that the prolonged hospitalisation period, but not the advanced age, increased the cost(17). They also found that the mortality rate was 30%, and the average duration of stay in the ICU ranged between 6.6 and 8.6 days. In contrast to the results of the above study, there was no significant statistical correlation between LOS and costs in the present study. Kara *et al.* found a similar mortality rate of 51.2% in the thoracic ICU, where the relatively elderly population with a mean age of 62 ± 16 years were mostly treated (17). However, Kara *et al.* evaluate neonatal and pediatric intensive care patients in their study. It should be logical to think that the treatment and related cost results were different from our study in which was evaluated elderly patients. A study conducted in Turkey found a mortality rate of 54.9% in patients above the age of 65 years receiving intensive care(1,3,19). A study abroad evaluated the ICU costs of the geriatric group and found a mortality rate of 35% in patients above the age of 90 receiving intensive care(7). The most common reason for ICU admission was respiratory failure, and the cost of hospitalisation was lower for the geriatric age group than for the younger age groups(7).

In another cost-related study from Turkey, the relationship between the costs of the intensive care unit and the length of stay in the intensive care unit

was evaluated; Accordingly, the mean age of the patients was 53.8 ± 22 and the mean duration of the intensive care unit was 10 ± 12 days, similar to the results of our study(19). The results of this study suggest that the surgical devices and laboratory costs of patients receiving intensive care were the highest during the first three days and decreased thereafter, where as the cost of drugs increased to 43.6% in the subsequent days of hospitalisation. This was associated with the high treatment costs of hospital infections(19).

In the present study, the mortality rate of the 75–84 age group was statistically significantly higher than that of the other two age groups. However, there was no statistically significant difference in terms of the treatment costs reflected to SSS and the duration of stay in the ICU across the three age groups. The incidence of comorbidities in elderly patients increases compared with those in other patient groups. The comorbidity rate was found to be $2.6\% \pm 2.2\%$ in patients aged 65–84 years and $3.6\% \pm 2.3\%$ in those above 85 years of age. This leads to increased mortality, loss of physical independence and increased duration of stay(20). This is because the withholding and withdrawal approaches are not legally supported in Turkey and clinicians are afraid of adopting them.

A review of the reasons for admission to the ICU showed that sepsis (20%) was the most common, followed by respiratory failure (16%), pneumonia (12%) and pulmonary thromboembolism (4%). It was observed that respiratory system problems mostly resulted in admission to the ICU. According to the VIP 1 study, the most frequent reason for admission to the ICU was acute respiratory failure, with an incidence rate of 25%, whereas mechanical ventilation accounted for a substantial part of the ICU expenditures(21). However, in cases where the initial symptoms were delirium and cognitive impairment, the mortality rate was higher due to delayed diagnosis and treatment(22). The increased prevalence of secondary acute respiratory distress syndrome in sep-

tic elderly patients causes the need for prolonged mechanical ventilation and, ultimately, a prolonged ICU stay(23).

A total of 25% of our patients were discharged from the ICU and transferred to the wards. The process of discharging elderly patients from the ICU to the wards depends on the characteristics of the wards. It is known that experience with geriatric patients is inadequate in some of these services, and accordingly, the process of being discharged from the ICU is affected(24). Evaluation of elderly patients by a geriatrician before discharge to the wards and transferring postoperative patients to a geriatric unit may contribute to reducing mortality rates by reducing the rate of readmission to the ICU (24).

It was reported that the quality of life and recovery rate of elderly patients who needed mechanical ventilation for more than 7 days was low and that they had more cognitive disorders(25). The functional and mental competence of elderly patients during the post-ICU process should be examined, and the focus should be on achieving a better quality of life. In a study of 2,646 patients that included the elderly population in the ICU, it was found that only 1/3 of the subjects could have continued their lives independently during the 6-month survival period(25). This group of patients has functional loss, becomes bedridden, and needs a high level of home care. Moreover, their relatives may become socially, cognitively and functionally disabled as second victims while transitioning from the role of beloved ones to caregivers (8).

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Limitations of the study

The costs of the drugs used by the patients for their chronic illnesses, the hospital infections that occurred during their hospital stay, and the costs related to secondary organ failure were not recorded separately. Finally, due to the retrospective nature of the study and legal issues in Turkey, it was not possible to determine whether doctors had decided to withhold or withdraw.

In conclusion, ICU treatment expenditures for geriatric patients constitute a substantial part of the GNP, and considering the increase in the elderly population, it would be appropriate to develop cost-reducing strategies for the future. The costs of ICU can be reduced by effective communication between caregivers and family, active implementation of decisions about discontinuation of or pause in treatment in the ICU follow-up and treatment process and the involvement of caregivers in the treatment as a team. This kind of approach for this fragile patient group may be effective in reducing ICU costs.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

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