ORIGINAL ARTICLE

INTENSIVE CARE UNIT OUTCOMES AND MORTALITY IN ELDERLY ONCOLOGY PATIENTS

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Abstract

Introduction: Rising life expectancy has increased elderly admissions to intensive care units. With age, comorbidity risks rise. Intensive care units' hospital mortality for elderly patients stands at 24% to 40%. Oncology patients often require intensive care units care, stemming from cancer-related conditions, treatment complications, or other health issues. However, intensive care units' mortality remains higher among cancer patients.

Materials and Method: Ethics committee-approved retrospective analysis covered oncology patients aged 65+ in intensive care units from Jan 2020 to Dec 2021. We categorized patients into two age groups, reviewing demographic data, admissions' reasons, cancer types, recent treatments, APACHE II and SOFA scores, ventilator use, renal replacement therapy need, intensive care units /hospital durations, mortality rates, primary diseases, and comorbidities.

Results: Among 706 intensive care units' patients, 25% were over 65 with similar mortality across age groups. Lung/colon tumors and acute leukemias were common. Hematological cancer had higher APACHE II scores but similar mortality. Vasoactive drugs and mechanical ventilation significantly affected intensive care units and hospital mortality. Mortality increased in patients without vasoactive drugs/ventilation during hospitalization. Recent surgery correlated with lower hospital mortality in cancer patients. Mechanical ventilation and vasoactive drugs doubled mortality risk. Surgical admissions showed lower mortality. Renal replacement therapy correlated with higher mortality. No significant survival difference existed between cancer types.

Conclusion: In conclusion, treatments impact elderly oncology patients' survival in intensive care units /hospitals. Intensive care units' care's effectiveness in older groups, especially those 75+, suggests potential benefits. Non-surgical admissions and life support contribute to higher mortality. Further studies on pre- intensive care unit treatment and admission timing are essential.

Keywords: Neoplasms; Critical Care; Aged.

INTRODUCTION

Due to increased life expectancy, the number of elderly patients taken to intensive care units (ICUs) is gradually increasing (1). As people get older, they have an increased risk of developing comorbidities (2). According to studies, the hospital mortality rate for elderly critically ill patients in ICUs was found to be between 24% and 40% (3). Cancer is a disease whose incidence increases with advanced age. According to UK data, 65.5% of newly diagnosed cancer patients are people over the age of 65, and people between the ages of 85 and 89 have the highest incidence of cancer (4).

Oncology patients may need care in ICUs for conditions caused by cancer, treatment-related conditions, or other health problems that occur. Cancer patients constitute 13.5% to 21.5% of all ICU admissions (5). A growing number of studies have shown that critically ill patients with cancer may benefit from ICU treatment (6). Nevertheless, ICU mortality is higher for cancer patients than for patients without cancer (7). Among the reasons for this are clinical conditions such as immunosuppression and neutropenia due to cancer or its treatment (8).

The aim of our study was to reveal the ICU outcomes and mortality rate for oncology patients over 65 years of age, to document the predisposing factors that cause mortality for these patients, and to discuss the measures that can be taken to improve their overall care and outcomes.

MATERIALS AND METHOD

After approval from the ethics committee was obtained, the data of oncology patients over the age of 65 who were treated in the oncology hospital ICU between 1 January 2020 and 31 December 2021 were retrospectively analyzed. Patients were divided into two groups: a group with people 65–74 years of age and a group with people over 75 years of age. The demographic data of the patients, the reason for their admissions to the ICU, the types of cancer they had, whether they had received chemotherapy or radiotherapy within six months before the, their recent surgical status, their Acute Physiology and Chronic Health Evaluation II (APACHE II) and The Sequential Organ Failure Assessment (SOFA) scores, whether they were on mechanical ventilators, and whether they were receiving renal replacement therapy were examined. Their ICU and hospitalization days and mortality rates were also evaluated. Disease scores, ICU and hospitalization days, and mortality rates were examined based on the hematologic and solid tumor statuses of the patients. In addition, the patients' primary diseases and concomitant diseases were evaluated.

The data were evaluated with the Statistical Package for the Social Sciences version 24.0 on a personal computer. The normal distribution of continuous data was assessed using the Kolmogorov–Smirnov test, and homogeneity was assessed using the one-way ANOVA test. Independent t-tests and Mann–Whitney tests were applied for the analysis of independent variables. A chi-square test was used for categorical data. A p-value less than 0.05 was considered statistically significant for all tests.

RESULTS

A total of 706 patients were treated in the ICU during the date range examined. Of these patients, 174 (25%) were oncology patients over 65 years of age. It was observed that the patients were admitted to the ICU mostly from the ward. The demographic data, concomitant diseases, APACHE II and SOFA scores, total ICU and hospitalization days, and mortality rates of the patients are shown in Table 1. There were 98 people (56.3%) in the 65-74 years of age range and 76 people over the age of 75 (43.7%). The differences in comorbidities, APACHE II and SOFA scores, ICU and hospitalization days, and mortality rates between these two age groups are shown in Table 2. The incidence of

Table 1. Demographic data, comorbidities, scores on day of admission and mortality.

		Total, n=174, (%), [SD]
Gender	**Male**	112 (64.4)
	Woman	62 (35.6)
Comorbidity		137 (78.7)
Hypertension		88 (50.6)
Diyabetes mellitus		55 (1.6)
Coronary artery disease		33 (19.0)
COPD		29 (16.7)
Thyroid disease		11 (6.3)
Atrial Fibrillation		6 (3.4)
Heart failure		7 (4.0)
Psychiatric illness		14 (8.0)
Chronic kidney disease		13 (7.5)
Cerebrovascular event		3 (1.7)
Other		20 (11.5)
APACHE II		26.1 [9.4]
SOFA		8.0 [3.6]
ICU LOS		14.1 [15.6]
Hospital LOS		24.3 [19.8]
ICU mortality		123 (70.7)
Hospital mortality		136 (78.2)

COPD; chronic obstructive pulmonary disease, APACHE II; the acute physiology and chronic health evaluation, SOFA; sequential organ failure assessment, ICU; intensive care unit, LOS; length of stay

hypertension and chronic obstructive pulmonary disease increased with age. Although the APACHE II scores were slightly higher for patients over 75 years of age, their mortality rates were similar to those of patients under 75 years of age. When the distribution of cancer types was examined, it was found that the most common solid tumors were lung and colon tumors and that the most common hematologic tumors were acute leukemias (Table 3). The differences between ICU mortality rates and organ failure scores, ICU days and hospitalization days, and the mortality rates of solid cancers and the mortality rates of hematological cancers are shown in Table 4. Although the APACHE II scores were higher for patients with hematological cancers, both ICU and hospital mortality rates for these patients were similar to those for patients with solid tumors. Among the factors affecting ICU and hospital mortality rates, the most significant were the use of vasoactive drugs at any time and invasive mechanical ventilation support (Table 5). The average APACHE II score was calculated

Table 2. Comorbidity, disease scores, intensive care and hospitalization day, mortality according to age groups of patients

	Age range		p
	65-74 years, n=98 (%), [SD]	>75 years n=76 (%), [SD]	
Comorbidity	74 (75.5)	63 (82.9)	0.320b
Hypertension	43 (43.9)	45 (59.2)	0.045b
Diabetes mellitus	27 (27.6)	28 (36.8)	0.253b
Coronary artery disease	15 (15.3)	18 (23.7)	0.229b
COPD	11 (11.2)	18 (23.7)	0.047b
Thyroid disease	7 (7.1)	4 (5.3)	0.429c
Atrial fibrillation	3 (3.1)	3 (3.9)	0.533c
Heart failure	2 (2.0)	5 (6.6)	0.131c
Psychiatric illness	6 (6.1)	8 (10.5)	0.436b
Chronic kidney disease	7 (7.1)	6 (7.9)	1.000b
Cerebrovascular event	1 (1.0)	2 (2.6)	0.405c
Other	15 (15.3)	5 (6.6)	0.121b
APACHE II	24.9 [9.2]	27.7 [9.3]	0.051
SOFA	8.0 [3.7]	8.0 [3.5]	0.980
ICU LOS	13.4 [15.4]	15.0 [16.0]	0.526
Hospital LOS	24.1 [20.6]	24.5 [18.8]	0.883
ICU mortality	68 (69.4)	55 (72.4)	0.794b
Hospital mortality	75 (76.5)	61 (80.3)	0.685b

a; pearson chi-square, b; yates chi-square, c; fisher's exact

COPD; chronic obstructive pulmonary disease, APACHE II; the acute physiology and chronic health evaluation, SOFA; sequential organ failure assessment, ICU; intensive care unit, LOS; length of stay

as 26.82 for patients receiving vasoactive drugs and 23.47 for those not receiving them (p=0.018). Similarly, the mean SOFA score was 8.81 for patients receiving vasoactive drugs and 5.26 for those not receiving them (p<0.001).

While the ICU mortality rate for patients who neither received vasoactive drugs nor required invasive mechanical ventilator treatment ranged from 15.8% to 20.5%, the hospital mortality rate increased significantly to between 39.5% and 41.0% for these patients. Hospital mortality was found to be lower for cancer patients who had undergone surgery within six months before the study than for patients who had not undergone surgery. The average APACHE II scores of patients who underwent surgery and those who did not in the last six months were found to be 26.59 and 27.79, respectively, with a calculated p-value of 0.586. Similarly, the average SOFA scores of the same groups of patients were found to be 7.84 and 8.15, respectively, with a calculated p-value of 0.597.

Table 3. Distribution of cancer types

	Age range		
	65-74 years n=98 (%)	**>75 years n=76 (%)**	**Sum n=174 (%)**
Solid tumor	80 (81.6)	55 (72.4)	135 (77.6)
CNS	2 (2.0)	1 (1.3)	3 (1.7)
Esophageal	4 (4.1)	1 (1.3)	5 (2.9)
Stomach	9 (9.2)	4 (5.3)	13 (7.5)
Liver	2 (2.0)	2 (2.6)	4 (2.3)
Pancreas	4 (4.1)	4 (5.3)	8 (4.6)
Lung	12 (12.2)	11 (14.5)	23 (13.2)
Colon	10 (10.2)	12 (15.8)	22 (12.6)
Bladder	6 (6.1)	4 (5.3)	10 (5.7)
Prostate	1 (1.0)	11 (14.5)	12 (6.9)
Renal	4 (4.1)	1 (1.3)	5 (2.9)
Breast	4 (4.1)	2 (2.6)	6 (3.4)
Gynecologic	6 (6.1)	0	6 (3.4)
ENT	10 (10.2)	1 (1.3)	11 (6.3)
Skin	1 (1.0)	0	1 (0.6)
Malignant mesenchymal tumor	3 (3.1)	1 (1.3)	4 (2.3)
Malignant melanoma	1 (1.0)	0	1 (0.6)
Gallbladder	1 (1.0)	0	1 (0.6)
Hematological	14 (14.3)	20 (26.3)	34 (19.5)
AML-ALL	4 (4.1)	9 (11.8)	13 (7.5)
KML-KLL	4 (4.1)	2 (2.6)	6 (3.4)
NHL	3 (3.1)	5 (6.6)	8 (4.6)
HL	1 (1.0)	0	1 (0.6)
MM	1 (1.0)	4 (5.3)	5 (2.9)
MDS	1 (1.0)	0	1 (0.6)
Unknown	4 (4.1)	1 (1.3)	5 (2.9)

CNS; central nervous system, ENT; otorhinolaryngology, AML; acute myeloid leukemia, ALL; acute lymphoblastic leukemia, CML; chronic myeloid leukemia, CLL; chronic lymphoblastic leukemia, NHL; non-Hodgkin lymphoma, HL; Hodgkin's lymphoma, MM; multiple myeloma, MDS; myelodysplastic syndrome

Table 4. Intensive care processes of solid and hematological cancers

	Solid tumor n=135 (%), [SD]	**Hematological cancer n=34 (%), [SD]**	**p**
APACHE II	25.4 [8.7]	29.0 [9.7]	0.037
SOFA	7.9 [3.6]	8.8 [3.5]	0.171
ICU LOS, days	14.5 [16.4]	12.2 [12.8]	0.445
Hospital LOS, days	23.6 [19.8]	27.8 [20.7]	0.269
Intensive care mortality, n	96 (71,1)	22 (64,7)	0.604b
In-hospital mortality, n	104 (77,0)	27 (79,4)	0.947b

a; pearson chi-square, b; yates chi-square, c; fisher's exact, APACHE II; the acute physiology and chronic health evaluation SOFA; sequential organ failure assessment, ICU; intensive care unit, LOS; length of stay

Table 5. Factors affecting intensive care and hospital mortality.

		Intensive care mortality, n (%)	p	RR	In-hospital mortality, n (%)	p	RR
Gender, n (%)	Male, 112 (64)	77 (68.8)	0.561[b]	0.91	84 (75.0)	0.244[b]	0.84
	Female, 62 (36)	46 (74.2)			52 (83.9)		
Comorbidity, n (%)	Yes, 137 (79)	99 (72.3)	0.501[b]	1.08	108 (78.8)	0.851[b]	1.04
	None, 37 (21)	24 (64.9)			28 (75.7)		
Chemotherapy, radiotherapy treatment in the last 6 months, n (%)	Yes, 66 (38)	47 (71.2)	1.000[b]	1.03	55 (83.3)	0.271[b]	1.40
	None, 108 (62)	76 (70.4)			81 (75.0)		
Surgery in the last 6 months, n (%)	Yes, 64 (37)	42 (65.6)	0.344[b]	0.79	43 (67.2)	0.013[b]	0.57
	None, 110 (63)	81 (73.6)			93 (84.5)		
Vasoactive medication, any time of treatment in intensive care, n (%)	Yes, 136 (78)	117 (86.0)	<0.001[b]	2.55	121 (89.0)	<0.001[b]	2.25
	None, 38 (22)	6 (15.8)			15 (39.5)		
Invasive mechanical ventilation, n (%)	Yes, 135 (78)	115 (85.2)	<0.001[b]	2.38	120 (88.9)	<0.001[b]	2.24
	None, 39 (22)	8 (20.5)			16 (41.0)		
Renal replacement therapy, n (%)	Yes, 35 (20)	28 (80.0)	0.252[b]	1.66	29 (82.9)	0.601[b]	1.35
	None, 139 (80)	95 (68.3)			107 (77.0)		

a; pearson chi-square, b; yates chi-square, c; fisher's exact

RR; relative risk

DISCUSSION

In this retrospective study, it was found that the mortality rate among oncological patients over 65 years of age who were treated in the ICU was over 70%. The study revealed that the mortality risk of patients requiring invasive mechanical ventilation and vasoactive drugs was more than two times higher than those who had no such requirements. No difference in mortality rates was found between solid and hematological cancers.

Invasive mechanical ventilation therapy is a factor that increases mortality in patients with cancer. Although the overall mortality rate in elderly solid tumor patients in France was 33.6%, the mortality rate was 92.1% in patients treated with mechanical ventilation, and the 90-day mortality risk rate for those on mechanical ventilation was 5.96 (95% confidence interval [CI] [3.91–9.10]; p < 0.0001) (8). In another study in which solid and hematological tumors were evaluated together, the one-month mortality rate was 67.6% and the mortality risk rate for those on mechanical ventilation was 2.873 (95% CI 1.352–6.104, p=0.006) (9). Considering that the proportion of patients who underwent invasive mechanical ventilation was higher in our study, ICU and hospital mortality rates are expected to be higher than those reported in the literature.

The 90-day mortality risk ratio in oncology patients receiving vasopressor therapy ranges from 2.14 (95% CI 0.97–4.73, p=0.05) to 3.68 (95% CI 2.54–5.33, p<0.0001) (9,10). In one study, the odds ratio was 16.839 (95% CI 3.98–71.235, p=0001) (11). In the current study, 78% of the patients used vasopressors, and the contribution of vasopressor use to mortality was found to be significant. Additionally, in our study, the calculated APACHE

II and SOFA scores during ICU admission were found to be significantly higher in patients receiving vasoactive drugs compared to those not receiving them. The higher predicted mortality rates during ICU stay indicate an increased likelihood of mechanical ventilation and vasopressor use among these patients. Furthermore, the elevated APACHE II and SOFA scores in patients receiving vasoactive drugs underscore the severity of their condition and the need for intensive monitoring and management strategies. These findings highlight the importance of early identification and intervention in critically ill patients to optimize outcomes and reduce mortality rates in the intensive care setting.

The high mortality rate in patients undergoing mechanical ventilation or vasopressor therapy is an expected outcome. However, it was not feasible to assess the relationship between tumor stage and frailty scores in our study. A recent study revealed a high prevalence of frailty among patients aged 50 and older, with an increased frailty score associated with higher mortality within 30 days (12). A meta-analysis on frailty and ICU mortality showed an increase in intensive care unit mortality with increasing frailty scores among individuals aged 65 and older(13).

The contribution of anti-cancer treatment received by elderly cancer patients with solid tumors before they were admitted to the ICU mortality was not found to be significant (p=0.18), and the 90-day mortality risk ratio was calculated as 1.07 (10). In a study conducted by Xia assessing the prognosis in solid tumors, receiving chemotherapy and radiotherapy treatment before ICU did not make a difference in mortality (14). In our study, although the relative risk ratio for mortality in patients who underwent chemotherapy and radiotherapy in the last six months before ICU was 1.40, we did not find a significant difference.

Previous studies have shown that mortality is lower in patients admitted to the ICU for surgical reasons (15). In a study of elderly cancer patients, the odds ratio for hospital mortality in those admitted to the ICU due to emergency surgery was found to be 0.71 (95% CI 0.52–0.96) (16). In our study, we grouped patients with a history of surgery in the last six months before ICU admission and calculated the relative risk ratio for hospital mortality for these patients as 0.79. The average APACHE II scores were found to be similar between patients who underwent surgery and those who did not. While the estimated mortality rate for non-surgical patients with an APACHE II score between 25-29 was 55%, it was 35% for surgical patients (17). It is known that patients with a SOFA score between 7-9 have an expected mortality rate of 15-20% (18). The SOFA score in surgical patients was calculated to be lower compared to non-surgical patients. Although the lower mortality rate in surgical patients in our study was not statistically significant, we consider it to be consistent with the calculated APACHE II and SOFA scores. We lack sufficient data to assess the relationship between tumor type, origin, surgical resectability, and intensive care unit mortality, and this issue warrants further investigation with studies involving more comprehensive data.

The incidence of acute kidney injury in ICU ranges from 27% to 67% and is associated with increased mortality (19,20). Renal replacement therapy is one of the treatment options available for kidney injury, with an estimated 23.5% of patients with acute kidney damage potentially needing this treatment (21). Mortality was found to be higher in ICU patients who underwent renal replacement therapy (22). In our study, we observed that ICU and hospital mortality rates were higher in patients who underwent renal replacement therapy, similar to the findings in literature.

Some studies also indicate both similarities and differences in mortality rates between solid and hematological cancers. Studies by Na S et al. in Korea and Van Der Zee E et al. in the Netherlands found that ICU and hospital mortality were higher in hematological cancers than in solid tumors (23,24).

In the study conducted by Nassar A et al., hospital mortality odds ratios of metastatic solid tumors and hematological cancers were similar (16). In a review of studies on elderly cancer patients, the mortality rates of solid and hematological cancers in ICU processes were found to be similar (25). In our study, although the APACHE II score of hematological cancers was higher than that of solid tumors, there was no difference between ICU and hospital mortality. Additionally, the numerical distribution of solid tumors is not conducive to detailed analysis. Hematological tumors comprise only a quarter of the number and distribution of solid tumors. Due to the numerical discrepancy between the two groups, making a valid comparison is challenging. Therefore, this assertion remains open to discussion.

The fact that our study is a single-center retrospective study is regarded as an important limiting factor. Therefore, we think it would be inappropriate to generalize the results. Other limiting factors include the lack of cancer staging for the patients examined and the inability to obtain frailty score data, which is an important prognostic factor for the elderly.

In conclusion, the treatments administered can have a significant impact on the survival periods of elderly oncology patients in ICUs and hospitals. However, the number of patients who survive holds significant importance and should not be underestimated. Especially in patients aged 75 and older, their similarity in survival rates to those between 65 and 75 years underscores the effectiveness of intensive care treatment within this age group. Moreover, this information suggests that patients aged 75 and older may benefit from intensive care treatment, and avoiding treatment might not be appropriate. Non-surgical hospitalization and life-supporting treatments are factors that contribute to increased mortality. There is no significant difference in survival between hematological cancers and solid tumors. We advocate for studies that encompass pre-intensive care treatment options and underscore the importance of timely admission to the ICU to mitigate mortality in this patient group.

The authors of this study do not have any conflict of interest.

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