Evaulation of the performance status of cancer patients admitted to the intensive care unit

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Abstract:
Background: Cancer significantly affects patients' physical and functional well-being, especially when complications require admission to the intensive care unit. Functional status, which reflects the ability to perform daily activities, is a crucial predictor of recovery, quality of life, and survival among critically ill oncology patients. **Aim:** This study aimed to evaluate the performance status of cancer patients admitted to the intensive care unit. **Design:** Descriptive correlational research design. **Setting:** The study was conducted at the ICU of Sohag oncology institute which is affiliated with Sohag governorate, Egypt. **Sample:** A convenience sample of 225 adult critically ill patients met inclusion criteria. **Tools:** Three main tools were used, **Tool (I):** Oncology patient assessment tool. **Tool (II):** Predictors mortality assessment tool. **tool (III):** Performance functional status assessment tool ,using karnofasky performance scale **Results:** The bulk of the studied individuals were female (56,9%) with age under fifty, and preliminary findings indicate that a significant proportion of oncology patients experienced a marked decline in functional status during their ICU stay (N=225). **Conclusion:** Cancer negatively influences the functional status of patients admitted to the ICU **Recommendations:** Implementing a routine schedule for functional assessment in critical care unit and encourage individualized rehabilitation plans for patients

Keywords: Cancer, Intensive care unit & Performance status.

Introduction:
Cancer continues to pose a significant challenge to global health, contributing heavily to both illness and death rates worldwide. Despite medical advancements that have enhanced survival prospects, many individuals with cancer still require ICU admission due to complications arising from the disease or its treatment. These patients are particularly susceptible to impairments caused by critical illness, such as a decline in functional ability, which may further compromise prognosis and quality of life **(Siegel et al., 2024)**.

Functional status, which reflects a person's capacity to carry out daily tasks and maintain independence, is a crucial indicator of general health. It has been consistently associated with key outcomes like hospital stay duration, discharge status, and survival among patients in intensive care settings **(Needham et al., 2023).** In cancer patients, functional capacity is especially fragile due to cancer-related symptoms like fatigue and cachexia, as well as the side effects of treatments **(Puthucheary & Hart, 2023)**.

Cancer patients admitted to the ICU often encounter a combination of stressors, where the underlying malignancy and the severity of critical illness together accelerate functional deterioration. Extended periods of immobility, reliance on mechanical ventilation, and use of sedatives contribute to muscle loss and physical decline, resulting in prolonged recovery times and difficulty returning to pre-illness activity levels after discharge **(Spruit, et al., 2022).**

Nurses in intensive care settings hold a central role in the timely recognition and monitoring of changes in functional status, particularly in oncology patients. Through their continuous interaction with patients, nurses are typically the first to detect subtle shifts in mobility, strength, or the ability to perform routine tasks. These functional evaluations, when conducted by nurses, offer valuable insights that support the development of interdisciplinary care plans and targeted rehabilitation interventions **(Shin et al., 2023).**

Significance of the study:
About 750 patients were admitted to general ICUs at Sohag oncology Institute in previous year (2023) and most of them often needed to be mechanically ventilated, **(Sohag Oncology Institute ICU records 2023).** So from the researcher point of view it is very important to identify factors predicting intensive care unit (ICU) mortality in cancer patients. Functional decline is a common and clinically significant outcome among oncology patients requiring intensive care. Recent multicenter data indicate that up to **44.5%** of patients with solid tumors experience deterioration in their performance status following ICU admission, with a median

decrease of **1.5** points in Eastern Cooperative Oncology Group scores **(soares et al., 2021)**.

According to recent global data, more than 50% of cancer patients admitted to ICUs experience a decline in their functional status, which affects their ability to recover and return to daily activities **(soares et al., 2021)**.

Aim of the study:
This study aimed to evaluate the performance status of cancer patients admitted to the intensive care unit

Patients and method:

Research design:
A descriptive correlational at research design was employed to conduct this study.

Research question:
What is the effect of cancer on performance status of patient admitted to intensive care unit?

Setting:
The study was conducted in the ICU of Sohag oncology institute which is affiliated with Sohag governorate, Egypt. the ICU is prepared and equipped with two rooms, each containing four beds for a total of eight beds

Sample:
A convenience sample of (225) adult cancer patients aged 18 years or more than, from both sex who were admitted to previous mentioned setting during period of six months from begging of October 2024 to end of March 2025 were included in the current study. The sample size was calculated based on the Epi info program according to the total population admitted per year to the Sohag oncology Institute ICUs (About 750 patients were admitted to general ICUs at Sohag oncology Institute in previous year (2023)) and the sample size was calculated as the following:

Z= confidence level 95%, d= Error proportion (0.05), P= population (80%), assuming total numbers of patient's admission.

Inclusion criteria:
Patients who met the following criteria was included:
- Adult patients aged ≥18 years.
- Patients with a definite diagnosis of cancer according to pathological results.

Tools:
Three tools were utilized to collect data after reviewing of recent and relevant literature include the following

Tool (I): Oncology patient's assessment tool:-
This tool developed by the researcher post reviewing the relevant literature **(Morton & fountain, 2023)**, **(Mendes, et al., 2021)**, and it include 2 main parts as the following

Part one: Oncology patient demographic characteristics:-it was used to assess personal data of patient which includes; patient's code, age, gender, marital status, educational level and occupation.

Part two: Patient clinical data which includes;
- Presence of comorbidities as (High blood pressure, cardiovascular diseases, COPD, DM, Chronic kidney failure and autoimmune diseases).
- Presence of past medical history including (renal disease ,respiratory disease cardiovascular disease, neurological disease, gastrointestinal (GIT) disease, and neuromuscular disease).

Tool (II): Mortality Predictors Assessment Tool:
This tool was adapted from (**Soares, et al 2010**) to assess patient risk for mortality
That include
- Type of tumor (Lung, GIT, Genitourinary, Gynecological, breast, Central nervous system or other tumor)
- Presence of metastasis (yes or no)
- Antineoplastic therapy administered (yes or no) if yes specify type of therapy (Chemotherapy, Radiotherapy, or combination of Chemotherapy and Radiotherapy)
- Need for vasopressor or support (yes or no)
- Need for invasive mechanical ventilation (IMV) support (yes or no)
- Need for Renal support (yes or no)
- Glasgow Coma Scale (GCS) score at discharge
- Length of stay in ICU
- Patient's condition at discharge

Tool (III): Performance Functional Status Assessment Tool. using karnofasky performance scale: This scale developed by (**Burchenal , 1948**) in order to assess functional impairment of oncology patient. it can be used to compare effectiveness of different therapies and to assess the prognosis in individual patients, KPS uses a scale of 0-100
100: Normal, no symptoms or evidence of disease
90: Minor symptoms, but able to carry on normal activities
80: Some symptoms, normal activity requires effort
70: Unable to carry on normal activities, but able to care for self
60: Able to care for most needs, some occasional assistance with self-care
50: Needs considerable assistance with self-care, frequent medical care
40: Disabled; needs special care and assistance
30: Severely disabled; possibly hospitalized
20: Very ill; significant supportive care is needed
10: Actively dying
0: Death

Methods
The study was conducted throughout two main phases, which are preparatory and implementation phases:

Preparatory phase:

1. Official Permission to conduct the study was obtained from the dean of Faculty of Nursing, Assuit university after explanation of the aim and nature of the study.
2. Development of the tools after reviewing the related literature.
3. The tools was reviewed by a jury of five experts to assess the clarity, feasibility, applicability, and the content validity
4. Reliability of study tool were tested using alpha cronbach test and ,It was 0.85 for first and third tool ,which indicated high reliability of study tool
5. **Tool validity :** was tested through a jury of five experts ,three specialists in field of critical care nursing and two specialists in field of critical care medicine from sohog university and sohog oncology institute ,and the necessary modifications were done.
6. **Pilot study:** Carried out before starting of data collection to test the feasibility and applicability of the study tools on 10% (about 22 patients)of patients' sample to ascertain that these tools are relevant, inclusive and covered what are supposed to be covered.
7. Data collected over a period of 6 months starting from the beginning of October 2024 to end of March 2025. the data were collected from the first day of admission until patient discharge

Ethical considerations:

1. The research proposal was reviewed and approved by the Ethical Committee of the Faculty of Nursing, Assuit university with date (26\8\2024) and number(1120240863),Ethical considerations were taken into account throughout the study, including obtaining informed written consent from participants, ensuring confidentiality, and maintaining the right to withdraw at any time without penalty.
2. There is no risk for study subject during application of the research.
3. The study was followed common ethical principles in the clinical research.
4. Written consent was obtained from patients or guidance who are willing to participate in the study after explaining the nature and purpose of the study.
5. Confidentiality and anonymity was assured.
6. Study subjects have the right to refuse to participate and/or withdraw from the study without any rational at any time.
7. Study subject privacy was considered during collection of data

Implementation phase:

- The implementation phase of this study was carried out in the Intensive Care Unit (ICU) of Sohag oncology Institute over a period of six months, Following ethical approval from the Faculty of Nursing Ethical Committee and administrative approval from hospital authorities, data collection commenced.
- Purpose and nature of the study was simply explained to the patients and their families in case of unconsciousness. and written consents were secured after informing the patients and\or their families that their confidentiality.
- Eligible patients included adult cancer patients (aged ≥18 years) who were newly admitted to the ICU with confirmed malignancies
- Personal and clinical data was assessed on day of admission by the researcher from patients sheet by using tool I
- Using tool II patient was assessed by the researcher for mortality risk and necessary data were recorded from patient sheet
- The conscious level of patient was assessed by the researcher using Glasgow Coma Scale on day of admission and subsequent days
- The Karnofsky Performance Status (KPS) scale was utilized to assess each patient's functional status .This score was obtained either through patient self-report (when feasible), or via caregiver/relative interviews and medical records, especially in cases where the patient was unconscious or unable to communicate
- Patients were followed throughout their ICU stay until discharge or death.
- Critical care nurses help in finishing data collection in case of absence

Statistical analysis:

Every patient's information was entered into a unique chart. The gathered information was coded, examined, and totaled. The statistical software program SPSS 26.0 was used for data entry and analysis. Descriptive statistics were used to display the data, with means and standard deviations for quantitative variables and frequencies and percentages for qualitative variables. Regression analysis, the Pearson correlation coefficient (r), and chi-squared comparison between categorical variables were employed. $P > 0.05$ was determined to be non-significant, $P < 0.05$ to be significant, and $P < 0.01$ to be highly significant (**Detering et al., 2017**)

Result:

Table (1): Distribution of cancer patients regarding their Personal characteristics (N=225)

Personal characteristics	No. (225)	%
Age: (years)		
< 50	144	64.0
≥ 50	81	36.0
Mean ± SD	44.72 ± 9.33	
Gender:		
Male	97	43.1
Female	128	56.9
Marital status:		
Single	5	2.2
Married	213	94.7
Widowed	7	3.1
Occupation:		
Student	5	2.2
Employer	74	32.9
Retired	22	9.8
Housewife	124	55.1
Level of education:		
Illiterate	6	2.7
Read and write	25	11.1
Basic education	33	14.7
Secondary	83	36.9
University	78	34.7
Smoking:		
Smoker	78	34.7
Non-smoker	147	65.3
Family history of cancer:		
Yes	15	6.7
No	210	93.3

Table (2): Distribution of cancer patients according to Presence of comorbidities (N=225)

Comorbidity status	No. (225)	%
With comorbidities	117	52.0
Without comorbidities	108	48%
Types of comorbidities		
Diabetes mellitus	100	44.4
Hypertension	35	15.6
Cirrhosis	8	3.6
Kidney failure	1	0.4

Table (3): Distribution of cancer patients according to previous history of disease(N=225)

Variable	No. (225)	%
Previous history of any disease		
Yes	50	22.2
No	175	77.8
Types of previous disease		
Renal disease	26	11.6
Respiratory disease	15	6.7
Cardiovascular disease	10	4.4
Neurological disease	7	3.1
GIT disease	2	0.9
Neuromuscular disease	1	0.4

Table (4): Distribution of performance status using karnofasky scale on 1st, 3rd and 7th day of ICU admission (N=225)

Karnofasky Score	1st day	3rd day	7th day	P-value[1]	P-value[2]
Mean ± SD	46.98 ± 14.32	45.16 ± 25.86	30.09 ± 36.04	0.042*	0.000*
Median (Range)	50.0 (10.0-80.0)	60.0 (0.0-90.0)	0.0 (0.0-100.0)		

Table (5): Relation between Karnofsky Performance Score on the first day of ICU Admission and Clinical Outcomes among Cancer Patients

	Karnofasky score 1st day		P-value
	Mean ± SD	Median (Range)	
State of patient at discharge:			
Alive	54.84 ± 8.60	50.0 (30.0-80.0)	0.000*
Dead	36.60 ± 13.76	40.0 (10.0-80.0)	
Presence of any complications:			
Yes	37.90 ± 14.05	40.0 (10.0-80.0)	0.000*
No	54.92 ± 8.79	50.0 (30.0-80.0)	
Metastasis:			
Yes	43.13 ± 16.62	50.0 (20.0-80.0)	0.281
No	47.27 ± 14.13	50.0 (10.0-80.0)	
Antineoplastic therapy:			
Yes	45.11 ± 12.91	50.0 (10.0-80.0)	0.000*
No	49.57 ± 15.79	50.0 (10.0-80.0)	
Need for vasopressor:			
Yes	32.00 ± 9.41	40.0 (20.0-40.0)	0.000*
No	48.05 ± 14.02	50.0 (10.0-80.0)	
Need for invasive mechanical ventilation support:			
Yes	29.67 ± 19.03	20.0 (10.0-80.0)	0.000*
No	49.64 ± 11.37	50.0 (20.0-80.0)	
Need for renal support:			
Yes	45.20 ± 7.70	50.0 (20.0-50.0)	0.149
No	47.20 ± 14.94	50.0 (10.0-80.0)	

Table (6): Relation between Karnofsky Performance Score on the Third day of ICU admission and Clinical outcomes among Cancer Patients

	Karnofasky score 3rd day		P-value
	Mean ± SD	Median (Range)	
State of patient at discharge:			
Alive	65.55 ± 8.77	60.0 (50.0-90.0)	0.000*
Dead	18.25 ± 13.15	20.0 (0.0-40.0)	
Presence of any complications:			
Yes	21.71 ± 17.57	20.0 (0.0-70.0)	0.000*
No	65.67 ± 8.96	60.0 (50.0-90.0)	
Metastasis:			
Yes	39.38 ± 26.70	40.0 (0.0-90.0)	0.196
No	45.60 ± 25.81	60.0 (0.0-90.0)	
Antineoplastic therapy:			
Yes	38.47 ± 23.45	40.0 (0.0-90.0)	0.000*
No	54.47 ± 26.30	70.0 (0.0-90.0)	
Need for vasopressor:			
Yes	15.33 ± 13.56	20.0 (0.0-50.0)	0.000*
No	47.29 ± 25.22	60.0 (0.0-90.0)	
Need for invasive mechanical ventilation support:			
Yes	16.33 ± 20.25	10.0 (0.0-70.0)	0.000*
No	49.59 ± 23.72	60.0 (0.0-90.0)	
Need for renal support:			
Yes	37.60 ± 22.60	20.0 (0.0-60.0)	0.056
No	46.10 ± 26.14	60.0 (0.0-90.0)	

Table (1): Shows that, near two third of the studied sample were under 50 years old (64.0%) and more than half were female (56.9%). In relation to marital status it was shown that most of study sample were married (94.7%) and more than half were housewives (55.1%). Regard level of education, it was found that more than one thirds of studied sample were secondary educated (36.9%), and in relation to smoking status the table documents that more than two third of studied patients were non-smokers (65.3%), and most of studied patient had no family history of cancer (93,3%)

Table (2): Illustrate that, more than half of studied patients have history of co-morbidities(52%) as diabetes mellitus ,hypertension ,cirrhosis and kidney failure .also show that D.M was the most common co-morbidity among them (44.4%) followed by hypertension (15.6%)

Table (3): Illustrate that, 22.2 of studied patients have history of medical disease also most common past medical history was renal disease (11.6%) followed by respiratory disease (6.7%)

Table (4): Shows that, there was a highly statistically significant decline in Karnofsky performance scores over time. The mean score decreased from (46.98 ±14.32) on the first day to (30.09± 36.04) on the seventh day. There was significant difference between the first and third days (P = 0.042) and highly significant difference between the first and seventh days P = 0.000.

Table (5): Illustrates positive correlation between KPS score on first day of ICU admission and overall patient clinical outcome except metastasis and need for renal support no statistical difference founded p-value(0.281&0.149). A statistically significant higher Karnofsky score was observed among patients who survived, did not experience complications, and did not require vasopressors or invasive mechanical ventilation (P < 0.001 for each).

Table (6): Shows that, the distribution of Karnofsky Performance Score (KPS) on the third day of ICU admission in relation to various clinical variables among cancer patients. A highly significant increase in KPS was observed among patients who survived, had no complications, and did not require vasopressors or invasive mechanical ventilation (P < 0.001 for all). Furthermore, patients who did not receive antineoplastic therapy exhibited significantly higher Karnofsky scores than those who did (P = 0.000), suggesting a potential association between ongoing cancer therapy and decreased functional reserve. No statistically significant differences were found regarding the presence of metastasis (P = 0.196) or renal support needs (P = 0.056)

Discussion:

Cancer significantly impacts the functional status of oncology patients admitted to the Intensive Care Unit .The disease itself, along with aggressive treatments such as chemotherapy, radiation, and surgery often leads to a decline in physical performance, muscle wasting, fatigue, and decreased ability to perform daily activities. In the ICU setting, this functional deterioration is further compounded by critical illness, immobility, and the effects of sedation or mechanical ventilation Poor functional status on admission is a strong predictor of worse ICU outcomes, including increased mortality, prolonged length of stay, and reduced quality of life post-discharge. Early identification and rehabilitation efforts are therefore essential in mitigating functional decline and improving recovery among cancer patients in critical care **Droney et al. (2022)**.

Regarding the personal characteristics of the studied sample :

In terms of age, the current study found that more than half of patients were younger than fifty years. This age distribution suggests that a significant proportion of cancer patients requiring intensive care are relatively young. Our findings align with those of **(Taccone et al. 2022)**, who found that younger cancer patients were more likely to be admitted to the ICU, possibly due to a more aggressive treatment approach and better baseline functional status .But disagree with **(Azoulay et al. 2022),** who highlighted that older age is more commonly associated with ICU admission among cancer patients due to the accumulation of comorbidities and treatment-related complications.

In term of gender, the current study demonstrated that more than half of the studied cancer patients were females .This finding is consistent with **(Sung, et al. 2024)**, who reported higher cancer prevalence among females in certain regions, particularly due to the high incidence of gender-specific cancers such as breast and gynecological malignancies. However, this finding contrasts with the broader evidence presented by (**Jackson et al. 2022**), which indicates that males generally have significantly higher incidence rates than females for most non-gender-specific cancers—including esophageal, laryngeal, gastric, and bladder cancers—with hazard ratios ranging from about 1.3 to 10.8 after adjustment for environmental and behavioral risk factors . The authors argue that intrinsic biological sex differences (e.g. genetic, immunological, hormonal) contribute substantially to male cancer susceptibility, beyond what lifestyle factors alone can explain .

In term of smoking history, the current study revealed that more than half of oncology patients were non-smokers, which is in line with findings of

(Raunkjaer, et al. 2022), who reported that approximately one-third of his studied sample had never smoked. and in contrast with **(Cui et al. 2021)** who reported a higher prevalence of smoking among cancer patients, with more than half of the participants identified as smokers in their study investigating the impact of time-updated resting heart rate on cancer-related and all-cause mortality.

Regard comorbidities, current study results illustrates that, more than half of the participants had one or more comorbid conditions. Among these, diabetes mellitus was the most prevalent, followed by hypertension. The high prevalence of diabetes and hypertension may be attributed to cancer-related metabolic disturbances and long-term effects of oncological therapies, in addition to lifestyle factors such as physical inactivity, high-fat diets, and stress. These comorbidities may contribute to poorer prognoses and prolonged ICU stays, particularly when compounded with immunosuppression and systemic inflammation associated with malignancy **(Cao et al., 2016).** These findings are in consistent with **(Kourtidou, et al. 2022)** who reported that diabetes and cardiovascular diseases were the most frequently observed comorbidities among ICU cancer patients, significantly influencing outcomes. Similarly, **(Lee, et al. 2023)** found that diabetic oncology patients had increased rates of sepsis and organ dysfunction, contributing to higher ICU mortality

Regarding to past medical history, the current study revealed that about quarter of the studied cancer patients had a prior history of other diseases, with renal diseases and respiratory diseases being the most commonly reported conditions. These findings are consistent with the study of **(Khan, et al. 2022),** who reported a significant burden of chronic kidney and respiratory illnesses among cancer patients, particularly those requiring critical care**.**

Regarding to functional status, the current study found a gradual decline in the Karnofsky Performance Score (KPS) over time among critically ill cancer patients during their ICU stay. The functional status showed a noticeable decrease between the initial days of admission and later stages, with statistically significant differences observed. This decline indicates a progressive deterioration in clinical condition and functional ability during the ICU stay. These findings come in agreement with **(Kangelaris, et al. 2021)**, who reported that a drop in performance status during the first week of ICU admission is closely associated with poor prognosis and reduced likelihood of recovery in cancer patients. But in contrast with some studies suggest that a temporary decrease in functional status may not necessarily indicate

irreversible deterioration. as **(Wright, et al. 2020)** reported that a subset of critically ill cancer patients with initially low or declining KPS scores during ICU stay demonstrated functional improvement after discharge, particularly when aggressive management of acute illness was coupled with a responsive underlying malignancy.

Regarding to relation between karnofasky performance score and clinical out come

In terms of state of patient at discharge, the current study demonstrates that , functional status—measured by the Karnofsky Performance Score (KPS)—was significantly associated with the clinical outcomes of critically ill cancer patients during their ICU stay. Also the results demonstrated that patients who survived had considerably higher KPS on both the first and third days of ICU admission. This findings are in agreement with **(Wunsch, et al. 2021)**, who reported that performance status is one of the most reliable predictors of ICU and hospital mortality among cancer patients. Additionally, **(Hui, et al. 2020)** emphasized that both Karnofsky and ECOG scores are valuable tools for assessing prognosis in patients with advanced malignancies .Moreover, the presence of complications was significantly related to lower KPS values. Patients who experienced complications had lower functional scores on Both first and third days, compared to those without complications . These findings come in line with **(Soares, et al. 2016),** who stated that acute complications, rather than tumor burden, are the primary drivers of clinical deterioration in ICU-admitted cancer patients. Furthermore, patients receiving antineoplastic therapy had significantly lower KPS compared to those not undergoing treatment, particularly by third Day. This findings align with **(Van Vliet, et al. 2022),** who reported a high prevalence of functional impairment among ICU cancer patients receiving active oncologic therapy.

Conclusion:

According to the findings of the current study, cancer affects the functional status of the patients, particularly those admitted to the ICU. Karnofsky scores showed a marked decline over time, indicating reduced physical performance. Younger age and non-smoking patients were associated with better functional outcomes, while comorbidities and previous illnesses contributed to further decline. These findings highlight the importance of early functional assessment and tailored care strategies to improve outcomes in critically ill cancer patients.

Recommendations:

For patients:

1. Assess of functional status of oncology patients admitted to ICU is recommended.
2. Provide early physical and psychological rehabilitation program for oncology patient admitted to ICU.
3. Implement individualized care strategy for each patient.

For nurses:

1. Educate critical care nurse about assessment tool of functional status of cancer patient should be utilized.
2. Manual of nursing guidelines for caring of functional disabilities of oncology patient admitted to ICU should be applied.

For research:

Further research on larger sample and other settings should be applied for generalization.

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