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Original Article

# Functional outcomes of cancer patients in an acute inpatient setting at King Fahad Medical City

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**Abstract.** [Purpose] Cancer survivors have functional impairments that adversely affect patients' quality of life (QoL). Acute rehabilitation helps to reduce disability and improves QoL in cancer survivors. This study investigated the potential improvement in mobility levels and QoL of cancer patients during acute inpatient physical therapy (PT) from admission to discharge. [Participants and Methods] This was a cross-sectional study conducted at King Fahad Medical City, Riyadh. Acute inpatient cancer survivors (n=99) were assessed at their admission and discharge. The primary outcome measure was the AM-PAC "6-Clicks" Basic Mobility, Functional Assessment of Cancer Therapy-General (FACT-G7) and the Karnofsky Performance Scale (KPS). [Results] Overall, 82.8% of cancer patients were discharged home. There were significant improvements in all the three outcome measures for all the patients from admission to discharge. Patients who were discharged home exhibited significantly better improvement in all the scales. Factors that predicted discharge mobility and quality of life were discharge destination, number of PT sessions, and baseline admission scores. [Conclusion] The study found that acute inpatient cancer rehabilitation helps to improve mobility and QoL. Rehabilitation programs available in Saudi Arabia are limited, and it is important to integrate the cancer rehabilitation model into the oncology services.

**Key words**: Cancer, Mobility, Quality of life

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## INTRODUCTION

Cancer is among the most disabling diseases that affect individuals globally. The Global Burden of Disease Cancer Collaboration statistics reported 24.5 million incident cancer cases worldwide, (with a 33% increase between 2007 and 2017) and 9.6 million cancer deaths[1)]. A high burden of disease is observed in cancer survivors (an estimated 233.5 million disability-adjusted life-years in 2017)[1)]. Despite the high diagnosis rate, the cancer survival rate is relatively high (40%–80%)[2)]. In the Kingdom of Saudi Arabia (KSA), the incidence reached 16,210 cases in 2015. The overall cancer incidence was higher in females than in males (8,565 [52.8%] females vs. 7,645 [47.2%] males). Breast cancer was the most common cancer among Saudi adults (16.7%), followed by colorectal (12.2%), thyroid (8.5%), non-Hodgkin lymphoma (6.9%), leukemia (5.8%), Hodgkin lymphoma (3.6%), lung (3.5%), corpus uteri (3.3%), liver (3.1%), and prostate cancer (2.8%)[3)].

Early diagnosis and advances in cancer treatment have contributed to an increase in the number of cancer survivors[4)] however, lifelong physical and cognitive impairments in these patients significantly affect their quality of life (QoL)[5, 6)]. Studies have shown a higher probability of fair or poor health and psychosocial disabilities and physical and functional limitations in cancer survivors than in individuals without a history of cancer or other chronic illnesses[5)]. Many patients with cancer experience reduced muscle strength, flexibility, and endurance secondary to the effects of chemotherapy, radiation therapy, and surgery[7)].

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An increase in the number of cancer survivors has led to a greater need for physiotherapy (PT) to mitigate some of the treatment-induced adverse effects and comorbidities[8]. Cumulative evidence suggests that exercise-based rehabilitation can improve outcomes, including fitness, strength, fatigue, and mood and may guide positive health behavior in patients with cancer[6, 9–11]. A large population-based cohort study suggested that higher levels of physical activity and an active lifestyle that includes walking, or cycling (mean duration 30 min/day) are associated with reduced cancer incidence and mortality, and higher cancer survival[10]. A recent randomized controlled trial by Jonsson et al. investigated the effects of PT in patients who underwent lung cancer surgery and reported higher physical activity levels during the early postoperative period in those who received PT than in the control group[12].

Mobility is an integral component of physical functional independence[13] and is an important goal of physiotherapists who work with critically ill patients, including those with cancer[14, 15]. Early mobility in hospitalized patients is useful to improve patients' awareness and level of consciousness, activities of daily living, QoL, sleep hygiene, mood, and airway clearance and to decrease fatigue[14, 15]. Campbell et al. observed an association between mobility levels and cancer-induced medical comorbidities, abdominal bloating, fatigue, lack of appetite, numbness/tingling, and pain[16]. Notably, immobility negatively affects cancer survivors' QoL; therefore, improvement in QoL by maximizing physical and cognitive functioning is an important goal for PT in cancer survivors[17, 18].

Despite the well-known benefits of PT in patients with cancer, it remains underutilized in this patient population[19, 20]. Few structured cancer rehabilitation programs are available worldwide[21], and limited research has discussed mobility and QoL in patients with cancer in an acute setting, particularly in the Middle East and particularly in KSA. Therefore, this study aims to investigate acute inpatient referrals based on the type of cancer, improvements in mobility levels and QoL during acute inpatient PT, and gains in mobility level and QoL from admission to discharge. It also aims to examine the factors that may contribute to a better functional outcome at discharge. We hypothesized that acute PT intervention would positively affect mobility levels in patients with advanced cancer.

## PARTICIPANTS AND METHODS

This is a prospective cross-sectional observational study carried out at the King Fahad Medical City (KFMC) Comprehensive Cancer Center in Riyadh, SA included all patients referred for acute inpatient PT between December 2018 and July 2019. The Institutional Review Board of KFMC approved the study (IRB/18-302) and all the participants were informed regarding the study procedures and provided written informed consent. Of the 297 patients referred to acute inpatient PT during the study period, 157 were deemed eligible for study participation. However, 58 patients with incomplete data were excluded; therefore, eventually, we investigated 99 patients. Figure 1 shows the patient recruitment strategy after referral. Medically stable status, age ≥18 years, life expectancy >3 months, primary care treatment received from hematology or medical oncology specialties, and Karnofsky performance status scale (KPS) score ≥30%. Following were the exclusion criteria: age <18 years, diagnosis of cognitive impairment, KPS score <30%, life expectancy <3 months, and scheduled for discharge home within 2 days from admission.

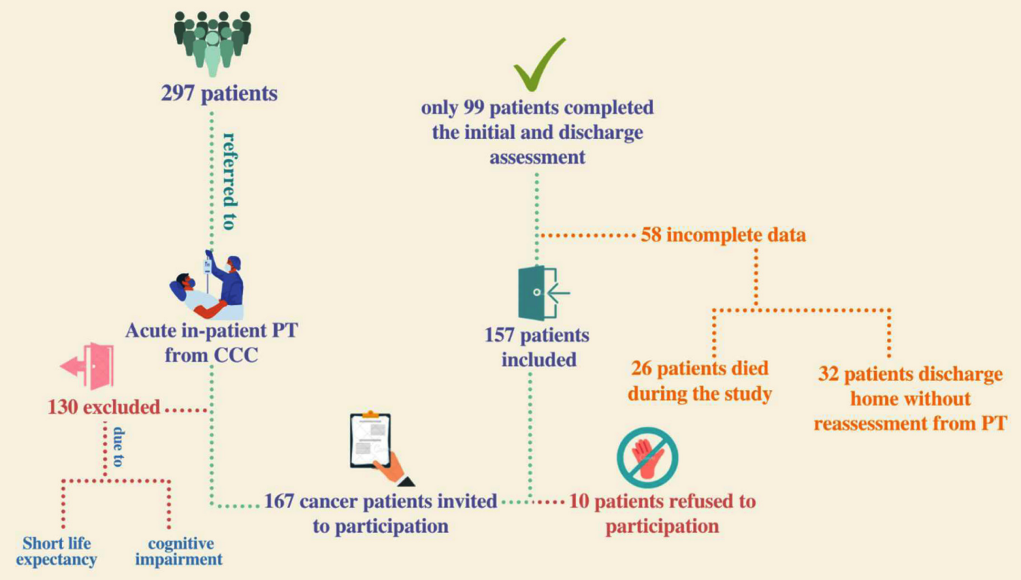


**Fig. 1.** Patient recruitment strategy distribution after referral to physical therapy.
CCC: comprehensive cancer center; PT: physical therapy.

Patients underwent standard PT, including individualized exercise, functional and gait training, and received instructions for an educational PT program at the time of discharge. A licensed physiotherapist evaluated patients 24 hours after their referral and before they were discharged home or transferred to another facility or palliative care unit.

Therapists used the following valid and reliable outcome measures: the Activity Measure for Post-Acute Care (AM-PAC) "6-Clicks" Basic Mobility instrument, KPS, and the Functional Assessment of Cancer Therapy-General (FACT-G7) tool.

(a) The AM-PAC "6-Clicks" Basic Mobility instrument: Physiotherapists used the newly developed AM-PAC instrument to evaluate mobility levels in patients hospitalized with various surgical and medical conditions[22]. Mobility is a valid and reliable outcome measure applicable to hospitalized patients with cancer[22–24] and includes three domains, essential mobility, daily activities, and applied cognition. Each item was scored between 1 and 4 based on the extent of a patient's difficulty in performing a task or the level of dependency in completing the task. Scores ranged between 6 and 24. Lower scores indicated a higher degree of limitation[22].

(b) The KPS instrument: This is an objective scale used to measure functional status in patients with cancer and is a known predictor of survival[25, 26]. The KPS is an 11-point rating scale with scores ranging from normal functioning (100) to death (0)[26].

(c) The FACT-G7 instrument: This self-reported comprehensive assessment tool for QoL used in patients with advanced cancer includes clinical and research tools comprising seven questions. It is a rapid method to determine QoL and symptoms in patients with advanced cancer. Previous studies in the literature have reported that the FACT-G7 demonstrates good internal consistency reliability and known-group validity[27]. In addition to primary patient demographics (gender and age), we recorded disease-specific data including the tumor site, metastatic site/sites, (bone, spine, and brain), coexisting thromboembolic complications, such as pulmonary embolism or deep vein thrombosis, as well as details regarding the number of therapies, visits, and reasons for discharge.

Sample size calculation was based on referral patterns to the acute inpatient PT. The precision of 95% was considered statistically significant; therefore, a sample size of 98 was determined using the Cochrane formula[28, 29].

All data were analyzed using the SPSS software (SPSS Inc., Chicago, IL, USA). Demographic, medical, and functional data were expressed using standard deviations (SD), medians, and ranges for continuous variables and frequency counts, and percentages for categorical variables. We used the Wilcoxon rank-sum test to confirm the statistical significance of differences between the initial and discharge scores. Furthermore, multiple linear regression models on total discharge AM-PAC and total discharge FACT-G7 scores controlling for various independent variables including age, gender, disease site, discharge destination, number of PT sessions, cancer metastasis, and initial total scores of AM-PAC and FACT-G7 at admission. Statistical significance was sought at values lower than 5%.

## RESULTS

The study included 99 patients; women constituted 76.8% of the study cohort. Patients' mean age was 53.85 years (range 18–88 years). We observed a wide variety of cancer types among patients; however, breast cancer was the most common (26.3%), followed by gastrointestinal cancer (21.2%). Hematological cancers and solid malignancies occurred in 26.3% and 73.7% of patients, respectively. The average number of PT sessions was 10.78 ± 10.1 (median=7). Based on their discharge destinations, patients were categorized into two groups, those who were discharged home (82.8%) and those transferred to another service (17.2%). The most prevalent cancer metastasis was spine metastasis (n=11, 11.1%) followed by bone metastasis (n=9, 9.1%) and DVT or PE and brain metastasis (n=6, 6.1%). Table 1 shows the baseline demographic data of the study participants.

The results revealed that the median total KPS at discharge (i.e., median=60%) has been reported to be higher than the median at admission (i.e., median=50%) by 10%. This gain was statistically significant (p-value <0.00) (Table 2). Alternatively, the decline in KPS scores was reported among 15 (15.2%) of 99 participants. Conversely, the increase in KPS scores was reported among 40 participants (40.4%) while 44 (44.4%) patients had reported no change in KPS scores at admission and discharge (Fig. 2). According to basic mobility six clicks (AM-PAC), the median total AM-PAC score at discharge (median=19) was higher as compared to its median total score at admission (median=14) indicating a statistically significant improvement (p-value <0.00) (Table 2). Thirteen respondents (13.1%) had reported a decrease in AM-PAC scores at discharge while 24 (24.2%) had exhibited no change in AM-PAC score from admission to discharge. However, 62 (62.6%) of them had reported an improvement in that score (Fig. 2). Regarding the FACT-G7 assessment tool, the results indicated that the median total FACT-G7 score at discharge was 17, which is higher than the median total FACT-G7 score at admission (median=14) indicating a highly statistically significant improvement from admission to discharge (p-value <0.00) (Table 2). Moreover, two-thirds of patients had reported an improvement in FACT-G7 scores from admission to discharge (n=66, 66.7%) while 24 (24.2%) of them had indicated a decline and 9 (9.1%) of them had no change from admission to discharge (Fig. 2).

We also test for subgroup differences in total scores of KPS, AM-PAC, and FACT-G7 by discharge destination and comorbidity. As for discharge destination, the results indicated that there were statistically significant improvements in total scores of the three scales for patients who were discharged home (p-values <0.00). However, the results suggested that there was a decline in total scores of all three scales from admission to discharge for patients who were transferred to other

services (palliative or surgery) but these declines were not statistically significant (p-values >0.05) (Table 3). Concerning cancer-related comorbidities, the results indicated there were positive improvements in total scores of all scales, but these improvements were not statistically significant (p-values >0.05) (Table 4).

**Table 1.** Demographic and clinical characteristics of study's participants

| Continuous variable | | Mean ± SD | Median (min, max) |
|---|---|---|---|
| Age (years) | | 53.8 ± 15.0 | 57 (16, 88) |
| Number of PT sessions | | 10.7 ± 10.1 | 7 (2, 58) |
| Categorical variables | | n | % |
| Gender | Male | 23 | 23.2 |
| | Female | 76 | 76.8 |
| Category diagnosis | Breast cancer | 26 | 26.3 |
| | Gastrointestinal cancer | 21 | 21.2 |
| | Lymphoma | 14 | 14.1 |
| | Leukaemia | 8 | 8.1 |
| | Gynaecologic cancer | 7 | 7.1 |
| | Other[a] | 23 | 18.2 |
| Type of service | Hematology | 26 | 26.3 |
| | Oncology | 73 | 73.7 |
| Discharge | Home | 82 | 82.8 |
| | Transferred to other services | 17 | 17.2 |
| Comorbidities | Spine metastasis | 11 | 11.1 |
| | Bone metastasis | 9 | 9.1 |
| | DVT+PE | 6 | 6.1 |
| | Brain metastasis | 6 | 6.1 |

[a]Sarcoma, neuroendocrine ca, multiple myeloma (MM), mixed, head and neck, genitourinary, lung cancer, brain cancer, and bladder cancer.

**Table 2.** Functional outcomes of cancer patients at admission and discharge

| | Mean ± SD | Median (min, max) |
|---|---|---|
| KPS admission | 52.2 ± 14.7 | 50 (30, 80) |
| KPS at discharge | 57.65 ± 16.8*** | 60 (30, 90) |
| Total mobility at admission (AM-PAC) | 14.57 ± 5 | 14 (6, 24) |
| Total mobility at discharge (AM-PAC) | 16.65 ± 5.6*** | 19 (6, 24) |
| FACT-G7 Total at admission | 13.92 ± 5.4 | 14 (2, 27) |
| FACT-G7 Total at discharge | 17.09 ± 5.8*** | 17 (2, 28) |

Wilcoxon Signed Ranks Test; ***p<0.001.

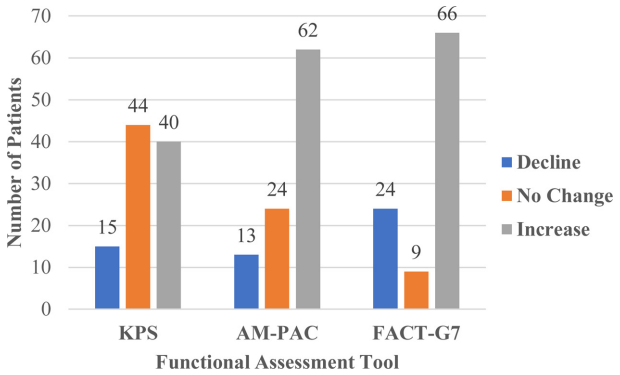


**Fig. 2.** Distribution of patients according to the changes in functional assessment tools (KPS, AM-PAC, and FACT-G7).

**Table 3.** Comparison of KPS, AM-PAC and FACT-G7 mean and median scores at admission and discharge by discharge destination

| | Home (n=82) | | Other (n=17) | |
|---|---|---|---|---|
| | Mean ± SD | Median (min, max) | Mean ± SD | Median (min, max) |
| KPS admission | 54.39 ± 14.3 | 50 (30, 80) | 41.76 ± 12.3 | 40 (30, 60) |
| KPS at discharge | 62.32 ± 14.2*** | 70 (30, 90) | 35.88 ± 9.3 | 30 (30, 60) |
| Total mobility at admission (AM-PAC) | 15.24 ± 4.7 | 16 (7, 24) | 11.29 ± 4.9 | 9 (6, 20) |
| Total mobility at discharge (AM-PAC) | 18.20 ± 4.6*** | 20 (9, 24) | 9.18 ± 3.6 | 8 (6, 18) |
| FACT- G7 (at admission) | 14.16 ± 5.4 | 14 (6, 24) | 12.76 ± 5.2 | 13 (3, 22) |
| FACT- G7 (at discharge) | 17.73 ± 5.6*** | 18 (2, 28) | 14.00 ± 6.0 | 16 (2, 24) |

Wilcoxon Signed Ranks Test; ***p<0.001.

**Table 4.** Comparison of KPS, AM-PAC and FACT-G7 mean and median scores at admission and discharge by disease metastasis

| | Spine metastasis (n=11) | | Bone metastasis (n=9) | |
|---|---|---|---|---|
| | Mean ± SD | Median (min, max) | Mean ± SD | Median (min, max) |
| KPS admission | 45.45 ± 18.0 | 40 (30, 80) | 44.44 ± 16.6 | 40 (30, 80) |
| KPS at discharge | 54.55 ± 19.1 | 60 (30, 80) | 46.67 ± 18.7 | 40 (30, 80) |
| | | | 0.793[a] | |
| Total mobility at admission (AM-PAC) | 12.82 ± 6.6 | 9 (6, 23) | 11.67 ± 5.6 | 10 (6, 23) |
| Total mobility at discharge (AM-PAC) | 15.91 ± 6.2 | 17 (6, 23) | 13.44 ± 6.6 | 12 (6, 23) |
| FACT-G7 Total at admission | 16.09 ± 4.7 | 17 (6, 24) | 15.33 ± 5.05 | 15 (6, 22) |
| FACT-G7 total at discharge | 18.00 ± 3.1 | 18 (13, 23) | 17.44 ± 5.3 | 17 (9, 26) |
| | DVT+PE (n=6) | | Brain metastasis (n=6) | |
| KPS admission | 51.67 ± 11.6 | 50 (40, 70) | 56.67 ± 13.6 | 60 (40, 70) |
| KPS at discharge | 58.33 ± 16.0 | 65 (30, 70) | 60.00 ± 10.9 | 60 (40, 70) |
| Mobility at admission (AM-PAC) | 16.0 ± 4.0 | 15.50 (11, 22) | 16.83 ± 5.1 | 18.5 (9, 22) |
| Mobility at discharge (AM-PAC) | 17.67 ± 6.1 | 19.50 (7, 23) | 18.83 ± 3.4 | 19 (13, 23) |
| FACT-G7 (at admission) | 13.83 ± 3.7 | 13 (10, 21) | 12.17 ± 3.4 | 13 (6, 16) |
| FACT-G7 (at discharge) | 14.33 ± 6.5 | 16 (2, 20) | 12.5 ± 3.1 | 13 (8, 17) |

Wilcoxon Signed Ranks Test.

The results of the multiple linear regression model on total scores of AM-PAC at discharge are shown in Table 5. It is found that the model had explained about 71.3% of the variability in average total score of AM-PAC at discharge (adjusted R-squared=0.71). Moreover, the factors associated with a higher discharge total AM-PAC score were higher admission total score of AM-PAC (b=0.45, p-value <0.00) and admission total FACT-G7 score (b=0.21, p-value=0.006), a greater number of sessions (b=0.91, p-value=0.00), discharge home destination (b=6.05, p-value <0.00), and Gastrointestinal (b=2.48, p-value=0.030), lymphoma (b=4.13, p-value=0.00) and leukaemia (b=2.45, p-value=0.032) cancers in comparison to other cancers. In the meantime, the presence of spine metastasis (b= −1.19, p-value=0.02), bone metastasis (b= −1.09, p-value=0.02), and DVT or PE (b= −1.5, p-value=0.03) comorbidities contributed to the lower discharge average total AM-PAC scores. However, age, gender, other cancer types (breast and gynaecologic), and brain metastasis comorbidity were not found to be statistically significant factors of discharge total score of AM-PAC (p-values >0.05).

Furthermore, the results of the multiple linear regression model on total discharge FACT-G7 score are presented in Table 6. The results of this model indicated that about 44.2% of the variability in average total discharge FACT-G7 score had been explained by the set of controls included in the model (adjusted R-squared=0.44). The results showed that factors including total admission FACT-G7 score (b=0.52, p-value <0.00), number of session (b=0.81, p-value=0.00), and discharge home destination (b=3.97, p-value=0.00) had contributed to the higher total discharge FACT-G7 score. Nevertheless, factors including total admission AM-PAC score, gender, age, cancer type, and comorbidities had no statistically significant effect on the average total discharge FACT-G7 scores.

## DISCUSSION

The main objective of this study was to investigate the improvement in functional outcome and quality of life PT intervention for acute inpatient settings, irrespective of the disease prognosis. The findings have demonstrated that cancer patients receiving inpatient PT improves functional outcomes across the three scales (i.e., KPS, AM-PAC, and FACT-G7). As for

**Table 5.** Results of multiple linear regression model on total AM-PAC score at discharge

| Variable | Coefficient (b) | Std. Error |
|---|---|---|
| Intercept | 2.05 | 2.80 |
| Total admission AM-PAC score | 0.45** | 0.09 |
| Total admission FACT-G7 score | 0.21 | 0.07 |
| Gender, Male | −1.51** | 0.93 |
| Age | −0.02 | 0.03 |
| Number of sessions | 0.91** | 0.04 |
| Cancer site (Ref. other cancers) | | |
| Breast cancer | 0.70 | 1.14 |
| Gastrointestinal cancer | 2.48 | 1.12 |
| Lymphoma cancer | 4.13 | 1.28 |
| Leukemia cancer | 2.45 | 1.19 |
| Gynecologic cancer | 0.25 | 1.58 |
| Discharge destination, home | 6.05** | 0.96 |
| Comorbidity | | |
| Spine metastasis | −1.19 | 0.25 |
| Bone metastasis | −1.09 | 0.21 |
| DVT+PE | −1.50 | 0.51 |
| Brain metastasis | −0.02 | 0.59 |

R-squared=0.752, adj-R-squared=0.713; F=13.74, **p<0.01.

**Table 6.** Results of multiple linear regression model on total FACT-G7 score at discharge

| Variable | Coefficient (b) | Std. Error |
|---|---|---|
| Intercept | 10.40 | 4.07 |
| Total admission AM-PAC score | 0.24 | 0.14 |
| Total admission FACT-G7 score | 0.52** | 0.11 |
| Gender, Male | −0.43 | 1.33 |
| Age | 0.01 | 0.04 |
| Number of sessions | 0.81** | 0.04 |
| Cancer site (Ref. other cancers) | | |
| Breast cancer | −1.02 | 1.65 |
| Gastrointestinal cancer | −2.27 | 1.63 |
| Lymphoma cancer | 1.16 | 1.86 |
| Leukemia cancer | 2.40 | 2.16 |
| Gynecologic cancer | 0.69 | 2.30 |
| Discharge destination, home | 3.97** | 1.39 |
| Comorbidity | | |
| Spine metastasis | 0.31 | 1.75 |
| Bone metastasis | −0.27 | 1.85 |
| DVT+PE | −1.00 | 2.25 |
| Brain metastasis | −2.57 | 2.31 |

R-squared=0.472, adj-R-squared=0.442; F=4.39, **p<0.01.

KPS, the functional impairment at admission indicated that patients required considerable assistance and frequent medical care (i.e., 50%) while the functional impairment had improved at discharge indicating that patients required occasional assistance but can care for most personal needs (i.e., 60%)[30]. Whereas, the majority of participants had no change or improvement from admission to discharge as measured by KPS (i.e., 44%). On the other hand, most participants had improvement and gain in basic mobility (i.e., 62.6%) and QoL outcomes (66.6%) as measured by AM-PAC and FACT-G7, respectively. Our findings were consistent with a recent study by Weeks et al., which reported that early mobilization in patients with cancer who received mechanical ventilation, improved their mobility, reduced bed-related complications, and QoL[30]. A systematic

review that investigated the effectiveness of physical activity in patients with cancer reported that exercise programs significantly improved mood, QOL, and function and reduced fatigue in survivors[6].

The univariate analysis of differences from admission to discharge in all scales by discharge destination showed that patients who were discharged home exhibited significant improvements, but this was not the case for those transferred to other services such as palliative or surgical ward. As for comorbidity, patients experienced an increase of total scores of all scales from admission to discharge but this increase was not statistically evident. A study by Tay et al. indicated that there are significant improvements of Functional Independence Measure (FIM) total scores from admission to discharge by cancer type, age, chemotherapy, and cancer patients with RT implying that the efforts expended in the rehabilitation at the hospital were valuable[21].

The current study also examined the factors associated with better discharge total mobility scores (AM-PAC) and showed that higher total admission mobility was associated with better mobility at discharge. Similarly, greater admission quality of life and number of sessions played the same role. Furthermore, patients with gastrointestinal, lymphoma, and leukemia cancer types had better improvements in total discharge basic mobility scores in comparison to other cancers. Meanwhile, patients with spine metastasis, bone, and DVT or PE metastasis had inverse impacts on total basic mobility scores as compared to those without these comorbidities despite that the univariate analysis showed insignificant positive improvements by these comorbidities. On the other hand, the only factors associated with better QoL scores (FACT-G7) at discharge were higher scores total admission FACT-G7 and number of sessions, and discharge home. Previous studies have indicated that successful rehabilitation is associated with discharge destinations[31, 32]; however, returning home after discharge is not possible for all patients and some need admission to long-term care facilities[31]. Everink et al. investigated factors that affect home discharge after inpatient rehabilitation in older patients and observed that home discharge was associated with better functional and cognitive status[31]. Our study results concur with those of the aforementioned study; we observed that patients who were discharged home showed higher mobility scores.

Nonetheless, this study showed that disease metastasis had not contributed to a better functional impairment and quality of life at discharge as measured by FACT-G7. Previous studies have shown that metastasis does not affect the efficiency of functional improvement during rehabilitation[33–36]. A recent study compared the functional gains achieved during inpatient rehabilitation in patients with and without metastatic disease and observed no significant differences in functional gains between these two patient categories[36]. Our study results concur with these findings; in our study, patients with bone, spine metastasis, or brain metastasis and thrombotic complications initially showed lower mobility scores but their mobility gain was higher at discharge but it was not statistically evident. The study results support our hypothesis that acute PT intervention positively affects mobility levels in patients with advanced cancer, in whom treatment prioritization is necessary.

Therefore, the current findings from this study should be considered when planning and implementing a PT program in acute inpatient PT. Furthermore, therapists must ensure that the program is implemented without compromising the spine metastasis and should follow all spinal precautions during evaluation and treatment[37]. Cancer and its treatment may limit patients' participation in PT programs[16]. Studies have reported that cancer-induced complications or symptoms negatively affected mobility in >50% of patients with ovarian cancer. Consequently, managing or preventing symptoms may alleviate patients' difficulties and improve their QOL[38, 39].

Despite the study revealed important findings, it was subject to some limitations. First, the lack of a control group had limited this study from comparing these outcomes with the general population or other patients. Second, this is a single-center study and may not be generalizable at the national level. Therefore, further studies are needed to compare the findings with other groups (e.g., non-cancer patients) and in a multi-center setting. Third, information regarding the types of PT received or the frequency or duration of therapy was unavailable, which might affect the accuracy of the results. Individual patients with cancer may receive fewer therapies owing to the possibility of disease progression. Types of therapy, as well as the frequency and duration, should be investigated in future studies; randomized controlled trials are warranted to study the effectiveness of specific PT interventions for patients with cancer. in both the short- and long term. Finally, the current study suffers from selection or inclusion bias that might affect the accuracy of the results since other patients with disabilities did not benefit from rehabilitation programs whereby only those patients who were deemed suitable participants for inpatient rehabilitation in the hospital were included.

This study suggested that rehabilitation interventions performed in hospitalized patients with cancer improve their QoL and maintain or improve mobility levels during different stages of the disease and in a setting of a variety of complications. The most important factors of better functional outcomes at discharge were higher initial values at admission, the higher number of PT sessions, and discharge destination. Limited cancer rehabilitation programs are available in KSA, and it is important to integrate a cancer PT model into the oncology services rendered to these patients. This program should be structured and refined for specific groups of patients with cancer, ranging from early- to advanced-stage cancer, and should be considered an essential component of specialized interdisciplinary care.

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*Conflict of interest*

The authors declare that they have no conflict of interest.

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