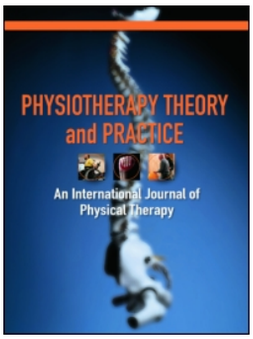

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Can assessment of disease burden and quality of life based on mobility level in patients with end-stage cancer provide an insight into unmet needs? An exploratory cross-sectional study

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ABSTRACT

Purpose: The purpose of this study was to: 1) investigate the differences in the needs of end-stage cancer who can move independently, using mobility aids (MA), or are bedridden; and 2) determine the effects of these different mobility levels on the patients' current quality of life (QoL), fatigue, and mental conditions.

Methods: The study employed an exploratory prospective cross-sectional study design, which was carried out in two hospitals. The study included 99 end-stage cancer. The mobility levels of the patients were evaluated in three groups: Group 1: bedridden; Group 2: mobile with MA; and Group 3: ambulatory (under supervision or fully independent). A core cancer-specific questionnaire-integrating system for assessing health-related QOL (EORTC-QLQ-C15-PAL), the Piper Fatigue Scale (PFS), and the Hospital Anxiety-Depression scale were utilized.The median age was 60years (31–83). Cancer types were as follows: gastrointestinal (45.5%), lung (38.4%), breast (4%), genitourinary system (4%), and others (8%). Forty-two percent of the patients were completely bedridden, 42.2% used MA, and 15.2% were independently ambulatory. The EORTC QLQ-C15-PAL physical (=.000) and emotional function values (=.029) differed among mobilization statuses. There was a significant difference among mobilization groups, in terms of behavioral values, in the PFS (=.006). The depression rate in the independent ambulatory group was lower than in the bedridden and MA groups (=0.011; =0.004). *p p p p1 p2*

Conclusion: Health-related QoL, fatigue level, and emotional state vary in end-stage cancer who undergo evaluations according to their mobility levels. These patients should be assessed comprehensively, and treatment plans should be organized carefully, with a multidisciplinary approach.

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Cancer; end-stage; palliative care; rehabilitation

Introduction

Cancer is one of the major health problems that can cause serious disability. Patients with cancer face a great variety of physical and psychological problems resulting from either the disease itself or its treatment process (Kelley and Kelley, 2017). In the later stages of the disease, symptoms such as pain, fatigue, nausea, dyspnea, and sleep disorders are experienced more frequently and severely. Decline in physical functions, which leads to a decrease in mobility and loss of independence, is considered to be one of the most unpleasant symptoms that negatively affects the quality of life (QoL) of end-stage cancer (Funch et al., 2019; Kelley and Kelley, 2017; Kim, 2014; Lin, 2015; Okamura, 2011). The treatment process of cancer usually significantly diminishes patients' participation in physical activities, causing the physical activity level among cancer survivors to remain below recommended level. Conversely, many studies have associated higher levels of physical activity during and after cancer treatment with improved physical performance, reduced fatigue levels, and improved QoL (Bahar-Ozdemir, Akyuz, Kalkandelen, and Yumuk, 2020; Okamura, 2011). This issue of utmost importance for advanced cancer patients, as physical functioning and physical condition are among the most prominent determinants of QoL in the palliative population (Sheill, Guinan, Hevey, and Hussey, 2018).

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Regular physical activity can provide many benefits for patients with cancer, such as improvement of QoL and cardiopulmonary function, increase in skeletal muscle endurance, and reduction in fatigue (Brekke et al., 2019; Lin, 2015). Most patients with advanced cancer experience cancer-related fatigue and cachexia, which make them dependent on others even for the simplest of daily tasks. For the advanced cancer population, the main purpose of physical activity is to contribute to their being independent individuals within their own limitations and to improve their quality of life by reducing symptoms. In this context, the first step to be taken is adherence to physical activity. Consequently, improvement in fatigue and QoL will increase patient's independence and well-being (Navigante and Morgado, 2016).

Activities of daily living (ADLs) consist of basic activities an individual should be able to perform on his/her own to be able to live independently in society. However, cancer and its treatment process can negatively affect patients' ability to perform ADL performances, ultimately reducing their QoL. Fatigue, pain, depression, low aerobic capacity, and lack of strength related to cancer and its treatment are associated with decreases in physical function (Sheill, Guinan, Hevey, and Hussey, 2018; Zucchetti et al., 2018). During the terminal stage, there are conditions that result in more physical impairments and consequently, patients experience activity limitations and participation restrictions that may negatively affect their QoL. To overcome physical impairments, patients usually need to use mobility aids (MA) such as canes, crutches, walkers, rollers, or wheelchairs.

Functionally, MA help improve stability by reducing pressure on the lower limbs and increase the support base and the amount of somatosensory information received. In this way, MA can be useful for regulating patients' ADL performances, improving their QoL, and making them feel better (Bertrand et al., 2017; Funch et al., 2019). However, it has been shown that MA come with some disadvantages as well. For example, using a cane or walker can have destabilizing effects, interfere with movement while improving balance, and create metabolic and physiological problems during the movement (Bateni and Maki, 2005; Bertrand et al., 2017; Funch et al., 2019). Although there are studies investigating the advantages and disadvantages of using MA in geriatric populations and patients with chronic diseases (Funch et al., 2019), use of MA by end-stage cancer patients is understudied in the literature and the studies on this subject have some limitations in terms of generalizability of their findings (Funch et al., 2019).

As a patient is diagnosed with cancer at advanced and incurable stage, reducing the symptoms and improving his/her QoL should be the main focus of medical intervention (Kim, 2014). Therefore, it is essential to maintain the mobility and independence of patients with end-stage cancer as much as possible, provide them with palliative care, and determine their rehabilitation needs (Funch et al., 2019; Kelley and Kelley, 2017; Kim, 2014; Okamura, 2011). While it is accepted in the literature that physical activity is a therapeutic approach that reduces fatigue and is effective in increasing the functional capacity of patients with cancer, it should also be noted that the studies on the subject have mostly been conducted with early-stage or recovered cancer patients (Navigante and Morgado, 2016). Thus, the physical functional capacities and expectations of patients in the terminal stage who need rehabilitative palliative care is yet to be understood (Lowe, Watanabe, Baracos, and Courneya, 2010). In this context, it is important to assess and evaluate impairments that affect patients' QoL the most and prevent them from doing the activities they wish to perform. Common impairments accompanying cancer, such as fatigue and mental conditions, should be evaluated in detail. The need for social and psychological support should be considered, and patients' preferences should be respected (Dy, Isenberg, and Al Hamayel, 2017). In this regard, this study aims to determine the association of different mobility levels (i.e. ambulatory, using MA, or bedridden) with end-stage cancer patients' QoL, fatigue, and mental conditions and to investigate potential differential impact.

Methods

Design

This study utilized an exploratory prospective cross-sectional study design, which was carried out in two hospitals. Participants included were 99 cancer patients in the terminal period (27 women, 72 men; average age 59.97 ± 11.03 years) who presented to the Medical Oncology Department of the Marmara University School of Medicine and the Palliative Care Department of the Sureyyapasa Chest Diseases and Thoracic Surgery Training and Research Hospital. The average life expectancy of these patients was 6 months or greater, and they were receiving inpatient or outpatient treatment. Institutional review board approval was obtained from the Ethics Committee of Marmara University Medical School (protocol number: 09.2018.100). Oral and written informed consent were obtained from all participants. The study was conducted following the principles of the Declaration of Helsinki. The inclusion

criteria were as follows: 1) male and female patients aged 18–80 years who received their primary treatment in the Department of Medical Oncology and were receiving inpatient (in palliative unit) or outpatient follow-ups; 2) an incurable cancer diagnosis was made by the oncologist; and 3) have an average life expectancy of 6 months or greater. These patients' treatments (i.e. chemotherapy or radiotherapy) either have been terminated or are still ongoing, even though full recovery cannot be achieved. Those who did not want to respond to the surveys or were not capable of taking part in the examination and clinical tests, and patients with mental disorders preexisting or due to cancer treatment were not included in the study.

Patient selection and measures

Before completing the surveys, information such as type of cancer, main treatment, current symptoms, comorbidities, and treatment complications was collected from the patients. The medical information obtained from the patients was verified by scanning with a medical record review. General characteristics of the participants, including age, gender, weight, height, educational level, marital status, smoking, and alcohol consumption information were obtained and body mass indexes were calculated. Patients were also asked about their current mobility and weekly physical activity. Their functional capacities were graded out of 100, using the Karnofsky Performance Scale (KPS). A grade close to 100 indicates that the patient has normal functions while a grade close to 0 indicates that the patient is close to death (Maltoni et al., 1994). The current mobility level of the patients was evaluated in three groups: 1) bedridden; 2) mobile with assistance (using MA); 3) and independent ambulatory under supervision or fully independent. Physical activity status was labeled in two groups: 1) sedentary (i.e. no participation in any physical activity); and 2) physically active (i.e. intermittent walking and/or doing isometric exercises in bed). Information about QoL, fatigue levels, and mental conditions of the patients was obtained through surveys. The researchers provided necessary explanations of confusing questions in the tests. All questionnaires applied were orally directed to the patients.

Quality of life is the most important parameter for the follow-up of the patients in the palliative stage (Lee et al., 2014). The EORTC QLQ-C30 questionnaire, developed and standardized to assess the quality of life of cancer patients by the European Organization for Research and Treatment (EORTC) (Guzelant et al., 2004), has been appropriately shortened in order to make it more easily applied to patients with advanced cancer. This version has been renamed EORTC-QLQ-C15 PAL and contains 15 questions (Groenvold et al., 2006). The scale including: two functional scales (i.e. physical and emotional functioning); seven symptom scales (i.e. fatigue, pain, nausea/vomiting, dyspnea, insomnia, appetite loss, and constipation); and an item regarding QoL (i.e. global health status). Patients with higher scores on the functional and global health status scale and lower scores on the symptom scale have been accepted as having a high QoL (Beernaert et al., 2016). The validity and reliability study of the survey in Turkish was conducted by Ozcelik et al. (2016) with values of Cronbach's α values = -0.93–0.98.

Piper, Lindsey, and Dodd (1987) developed the Piper Fatigue Scale (PFS) to evaluate the multidimensional measurement of fatigue. Consisting of 22 items, the PFS assesses the patient's subjective perception of fatigue with four sub-dimensions (behavioral/severity, affective, sensory, and cognitive/mood). Higher scores indicate higher fatigue levels. The Turkish validity and reliability of the scale was conducted and the Cronbach's α for the 22-item scale was 0.97 (Can, Durna, and Aydiner, 2004; Demiralp, Oflaz, and Komurcu, 2010).

The Hospital Anxiety Depression Scale (HADS) was used to evaluate the depression and anxiety levels of the patients. The HADS was developed to determine the risk level of anxiety and depression, as well as to measure the change in their severity. The validity and reliability study of the scale in Turkish was performed and the Cronbach's α was found as 0.92 for the total scale. Cutoff scores for the anxiety subscale of 10 and 7 for the depression subscale have been accepted (Gulec et al., 2017).

The power of the study was performed using the GPower V.3.1 (University of Kiel, Kiel, Germany). It was calculated as 0.99, with noncentrality parameter λ of 108.2, critical F value of 9.55 and type-I error rate of 0.05 according to KPS scores in three groups.

Statistical analysis

When evaluating the findings obtained in this study, the IBM SPSS Statistics 22 (IBM Corp., Armonk, NY, USA) program was used for statistical analysis. The Shapiro Wilks test was used to determine whether the parameters were suitable for normal distribution. In addition to the descriptive statistical methods (i.e.

average, standard deviation, and frequency) the one-way ANOVA test was used for comparison of the quantitative data and the Kruskal Wallis test was used for intergroup comparisons of the parameters that did not show normal distribution. The Mann-Whitney U test was used in pairwise comparisons to determine the group that caused the difference with the Bonferroni correction. According to the one-way ANOVA test, the Tukey HSD test was used to determine the group that caused the difference. For the comparison of qualitative data, the Chi-Square test, Fisher's Exact test, and Fisher Freeman Halton test were used. In all analyses, a p-value lower than 0.05 was considered statistically significant. In cases in which Bonferroni correction was applied, the p-value was accepted as 0.017.

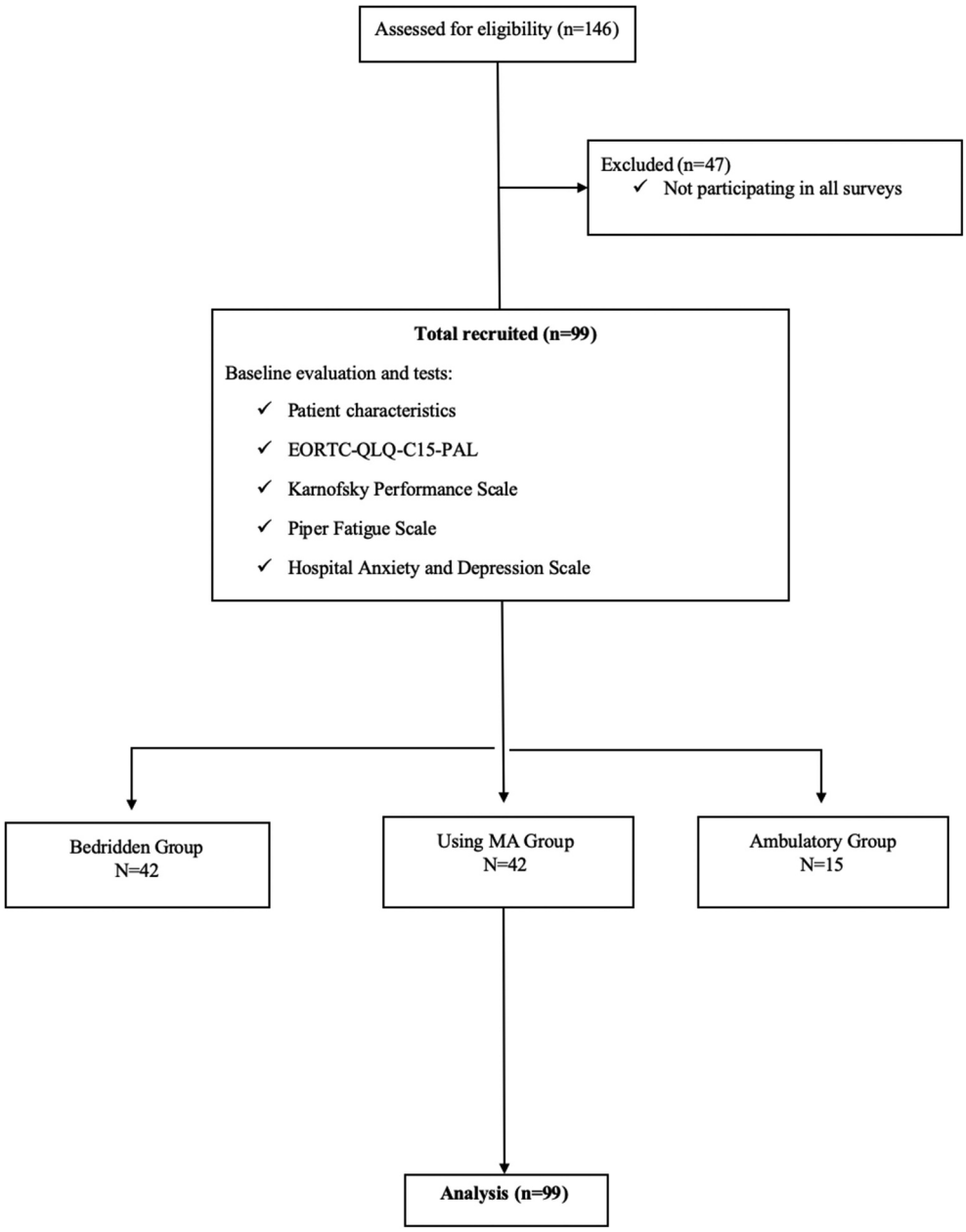
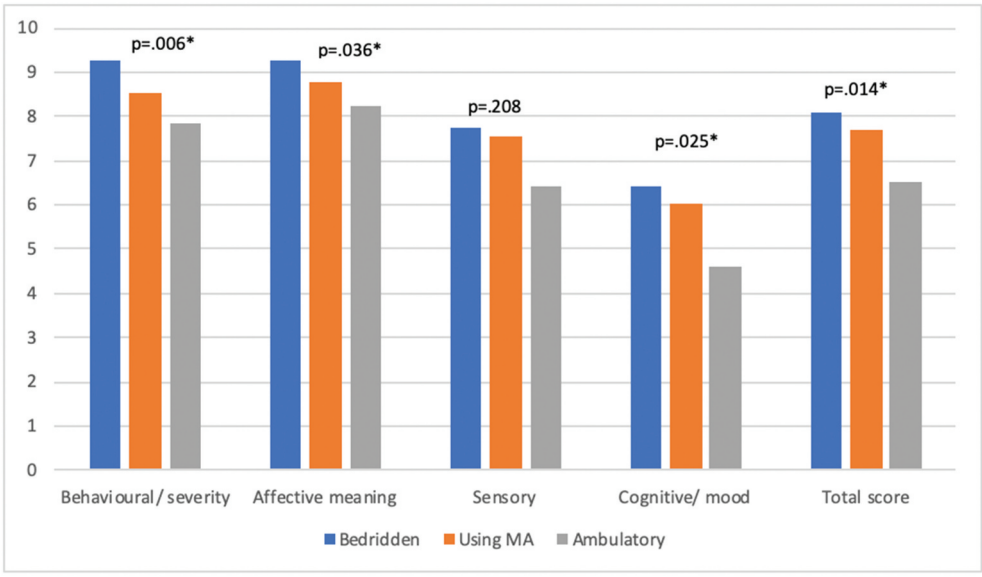
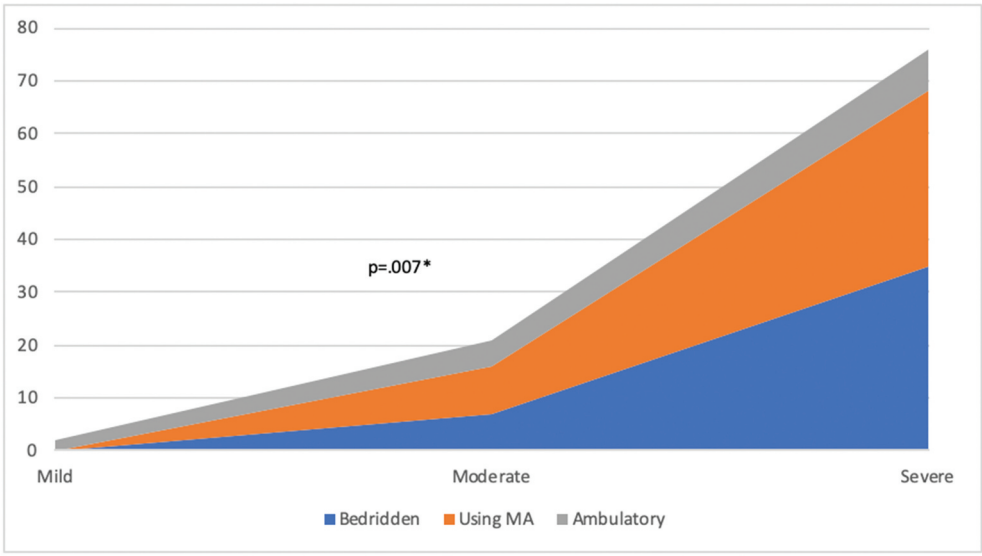


Figure 1. Flow chart of the study.



a) Piper fatigue score subscales and total score by mobility level



b) Piper fatigue score survey results by mobility level

Figure 2. (a) Piper fatigue score subscales and total score by mobility level. (b) Piper fatigue score survey results by mobility level.

Results

Patient characteristics

The total number of patients evaluated was 146. However, after 47 patients were excluded from the study for not participating in all surveys, the study was completed with 99 patients (Hospital #1: 65 patients, 65.7%; and Hospital #2: 34 patients, 34.3%). The main reason for non-participation was lack of energy or other reasons related to the patients' state of health. The study flow chart is in Figure 1. Most of the patients were over 65 years old (65.7%), male (72.7%), and had a normal BMI (54.5%; range of BMI, 18.5–24.9). The majority of participants were married (89.8%) and primary school graduates (50.5%). The three most common cancer types were gastrointestinal malignancies (45.5%), lung cancer (38.4%), and breast cancer (4%). When evaluated according to their current mobility level, 42.4% of the patients were bedridden, 42.4% were assisted by MA, 15.2% were ambulatory. When questioned about their physical activity, 74.7%

Table 1. Patient demographic and medical characteristics.

		Overall (n = 99)	
Age $_{Mean\pm SD}$		59.97 ± 11.03	
Body Mass Index (BMI) $_{Mean\pm SD}$		21.83 ± 3.73	
Gender $_{n,\%}$	Female	27	27.3
	Male	72	72.7
Education level $_{n,\%}$	Literate	7	7.1
	Until high school	70	70.7
	High school and university	22	22.2
Marital status (n = 98) $_{n,\%}$	Married	64	65.3
	Single	34	34.7
BMI $_{n,\%}$	Low (BMI <18.5)	24	24.2
	Normal (BMI 18.5–24.9)	54	54.5
	Overweight and obese (BMI≥25)	21	21.2
Smoking $_{n,\%}$	No	42	42.4
	Yes	57	57.6
Alcohol use $_{n,\%}$	No	85	85.9
	Yes	14	14.1
Primary malignancy $_{n,\%}$	Gastrointestinal	45	45.5
	Breast	4	4
	Lung	38	38.4
	Urinary tract	4	4
	Gynecological	2	2
	Head/neck	3	3
	Hematologic	1	1
	Soft tissue	2	2
Surgery $_{n,\%}$	No	57	57.6
	Yes	42	42.4
Radiotherapy $_{n,\%}$	No	40	40.4
	Yes	59	59.6
Chemotherapy $_{n,\%}$	No	14	14.1
	Yes	85	85.9
Data of mobility level and physical activity			
Mobility level $_{n,\ \%}$	Bedridden	42	42.4
	MA	42	42.4
	Ambulatory	15	15.2
Physical activity $_{n,\ \%}$	Sedentary	74	74.7
	Physically active	25	25.3

n Number of patients; MA Mobility aids.

of the patients were sedentary and 25.3% were physically active. The demographic and medical characteristics of the patients are summarized in Table 1.

Evaluation of the patients' QoL, performance, and mental conditions according to their mobility level

When the patients were divided into three groups - bedridden, MA, and ambulatory- no statistical difference among the groups in terms of socio-demographic characteristics and medical status was observed (Table 2). The results of the EORTC-QLQ-C15-PAL and PFS subgroups, HADS anxiety and depression evaluations, and KPS are shown in Table 3.

The EORTC QLQ-C15-PAL physical function and emotional function scores differed among the groups. The physical and emotional function subscale scores were highest in the ambulatory group ($p < .001$, $p = .029$, respectively). In the post-hoc analysis, the physical function subscale was lower in the bedridden group than in the MA and ambulatory groups ($p1 < 0.001$, $p2 < 0.001$). Also, the emotional function subscale score was significantly lower in the bedridden group than the ambulatory group ($p = .017$). No significant difference was observed among the groups in terms of global health status and symptom scales ($p > .05$) (Table 3).

The scores of the KPS significantly increased as independence increased ($p = .001$). In the post-hoc analysis, the KPS value of the bedridden group was considerably lower than the values of the MA and ambulatory groups ($p1 = 0.003$, $p2 = 0.002$, respectively).

When evaluated among the groups in terms of behavioral, affectivity, cognitive subscales and total values in PFS, the lowest scores were in the ambulatory group ($p = .006$, $p = .036$, $p = .025$, $p = .014$, respectively). According to the post-hoc analysis, behavioral and affectivity subscales were found to be significantly higher in the bedridden group when compared with the MA group ($p1 = 0.002$, $p2 = 0.016$, respectively). The cognitive subscale and total scores were higher in the bedridden group compared to the ambulatory group ($p1 = 0.009$, $p2 = 0.015$, respectively). When the degree of fatigue was graded as mild, moderate, or severe, according to the PFS total score, there was a difference between the groups ($p = .007$). The severity of fatigue in the ambulatory group (53.3%) was significantly lower than in the bedridden (83.3%) and the MA (78.6%) groups ($p1 = 0.017$, $p2 = 0.036$, respectively) (Table 3, Figure 2a, b).

When the anxiety and depression was investigated, there were differences between the three groups in terms of anxiety and depression values, according to the HADS total score ($p = .008$, $p = .003$, respectively). In the Tukey HSD test, the anxiety score was higher in the bedridden group than the MA and the ambulatory groups ($p1 = 0.044$, $p2 = 0.018$, respectively). In the post-hoc analysis, evaluating the depression score, the ambulatory group score was significantly lower than the bedridden and MA groups ($p1 = 0.001$, $p2 = 0.002$, respectively). When the presence of anxiety and depression was investigated according to the cutoff values, the presence of anxiety did not show any difference between the groups. However, there was a significant difference among the three groups according to presence of depression ($p = .002$). The depression rate in the ambulatory group (66.7%) was lower than in the bedridden (95.2%) and MA (97.6%) groups ($p1 = 0.011$, $p2 = 0.004$, respectively) (Table 4).

Discussion

This study was conducted to investigate the QoL, fatigue levels, performance status, and mental conditions of end-stage cancer, according to their mobility level. Another objective was to investigate whether there is an additional rehabilitation need for patients who are bedridden, in comparison with patients who use MA or are independently ambulatory. Our findings show that as the status of end-stage cancer changes from independent to assisted mobile or bedridden, a decrease is observed in terms of physical and emotional functions, while an increase is observed in terms of fatigue severity, depression, and anxiety. On the other hand, no difference was observed between groups in terms of global health status (total QoL) and symptom subscales.

Brekke et al. (2019) demonstrated a statistically significant relationship between high ADL motor ability and high QoL among people with advanced cancer. Cancer-related fatigue is the most common symptom seen in end-stage cancer and limits activity that affects functional capacity, and therefore, has a strong effect on QoL (Farkkila et al., 2014). Physical activity and therapeutic exercise applied to keep ADLs at a high level will ensure the continuity of skeletal muscle activity and improve well-being by reducing fatigue (Navigante and Morgado, 2016). In addition, it has been shown that physical activity and therapeutic exercise is safe, feasible, and leads to an improvement in the QoL in advanced cancer patients (Farris et al., 2017; Quist et al., 2012). Similarly, in our study, an increase in physical and emotional functions in QOL was observed with the increase in the mobility level and the decrease in cancer-related fatigue.

The EORTC QLQ-C15-PAL, which is used to assess the QoL of patients with end-stage cancer, is considered to be an independent prognostic factor for survival (Lee et al., 2014). In addition, the survey has a complementary role of examining specific clinical variables by measuring a patient's general well-being, emotions, and functions (Lee et al., 2014). Apart from a reduced QoL, the deterioration in physical functions has proved to be associated with a decrease in the physical function, role function, and social function parameters in the EORTC-QLQ-C30 survey (Farkkila et al., 2014; Pandya et al., 2016). When the results of the previous studies on cancer patients are taken as a reference (Ataman and Erbaydar, 2017) in the current study, lower general health status and functional scale scores, as well as higher symptom scores, were obtained. Accordingly, there are more functional limitations and symptoms in the end stage than in the other stages. For this reason, it is vital to examine the rehabilitation needs of patients in this sensitive term.

In this study, patients were divided into three groups: bedridden, using MA, and ambulatory. The physical and emotional function scores of the bedridden group in the EORTC QLQ-C15-PAL were significantly lower than the scores of the other two groups. This suggests that the decrease in mobility is an essential cause of and effect on the deterioration in the functional scale, in addition to the disease burden in the end-stage period. Among the end-stage cancer, those with poorer mobility demonstrated lower scores in terms of QoL (Kim, 2014). Interestingly, in the current study no difference was observed between the three groups in terms of global health status and symptom subscales in the EORTC QLQ-C15-PAL. Similarly, Funch et al. (2019) examined advanced cancer patients who used and did not use assistive device and could not detect a difference in QoL. While QoL was found to be similar, ADL ability was better in the group that did not use an assistive device. It may be that the use of walking aids did not affect QoL as in both studies, due to the fact that this evaluation depends on multiple factors such as fatigue, pain, and mental conditions. On the other hand, the difference in physical function subscale and KPS scores between the groups showed that they were related to mobility level.

The etiology of cancer-related fatigue is complex and multidimensional and includes many potential contributing factors (Koornstra et al., 2014). Fatigue increases with the progression of the disease, and with the addition of other causes, such as anemia, side effects of the medical treatments, cognitive dysfunction and malnutrition (Koornstra et al., 2014). It becomes more evident in patients who are nearing death. In this study, the fact that severe fatigue levels observed in bedridden patients were not established in the patients who using MA or were ambulatory suggests that regardless of the stage of the disease, limited physical activity may increase fatigue level. Although Koornstra et al. (2014) suggested that a decrease in physical activity may cause fatigue, they did not provide precise data to explain this situation. Another cause of fatigue in this group is depression. In a study conducted by Huang, Blackwood, Godoshian, and Pfalzer (2018) levels of depression and anxiety were found to be lower in the patient group able to walk independently than in those who used MA or were bedridden.

It has been shown that the physical activities of cancer patients performed during and after treatment have a positive effect on fatigue, physical/emotional functions, and general QoL (Koornstra et al., 2014; Lowe et al., 2014). Although the benefits of physical activity on patients diagnosed with cancer have been demonstrated, the specific effects on end-stage cancer have not yet been clearly understood. The sequelae of cancer are

Table 2. Comparison of patient characteristics according to mobility level.

		Mobility level			
		Bedridden (n = 42)	MA (n = 42)	Ambulatory (n = 15)	p-value
Age $_{Mean\pm SD}$		61.14 ± 8.91	61.07 ± 11.46	53.6 ± 13.55	[1].055
Body Mass Index (BMI) $_{Mean\pm SD}$		20.95 ± 3.58	22.56 ± 3.9	22.27 ± 3.32	[1].122
Gender $_{n,\%}$	Female	10 (23.8%)	13 (31%)	4 (26.7%)	[2].762
	Male	32 (76.2%)	29 (69%)	11 (73.3%)	
Education level $_{n,\%}$	Literate	3 (7.1%)	4 (9.5%)	0 (0%)	[2].284
	Until high school	26 (61.9%)	31 (73.8%)	13 (86.7%)	
	High school and university	13 (31%)	7 (16.7%)	2 (13.3%)	
Marital status (n = 98) $_{n,\%}$	Married	29 (69%)	23 (56.1%)	12 (80%)	[2].200
	Single	13 (31%)	18 (43.9%)	3 (20%)	
BMI $_{n,\%}$	Low (BMI < 18.5)	14 (33.3%)	7 (16.7%)	3 (20%)	[2].181
	Normal (BMI 18.5–24.9)	23 (54.8%)	22 (52.4%)	9 (60%)	
	Overweight and obese (BMI ≥ 25)	5 (11.9%)	13 (31%)	3 (20%)	
Smoking $_{n,\%}$	No	16 (38.1%)	16 (38.1%)	10 (66.7%)	[2].119
	Yes	26 (61.9%)	26 (61.9%)	5 (33.3%)	
Alcohol use $_{n,\%}$	No	35 (83.3%)	36 (85.7%)	14 (93.3%)	[2].634
	Yes	7 (16.7%)	6 (14.3%)	1 (6.7%)	
Primary malignancy $_{n,\%}$	Gastrointestinal	20 (47.6%)	18 (42.9%)	7 (46.7%)	[2].993
	Breast	2 (4.8%)	2 (4.8%)	0 (0%)	
	Lung	15 (35.7%)	17 (40.5%)	6 (40%)	
	Urinary tract	2 (4.8%)	1 (2.4%)	1 (6.7%)	
	Gynecological	1 (2.4%)	1 (2.4%)	0 (0%)	
	Head/neck	1 (2,4%)	1 (2.4%)	1 (6.7%)	
	Hematologic	0 (0%)	1 (2.4%)	0 (0%)	
	Soft tissue	1 (2.4%)	1 (2.4%)	0 (0%)	
Surgery $_{n,\%}$	No	24 (57.1%)	24 (57.1%)	9 (60%)	[2].979
	Yes	18 (42.9%)	18 (42.9%)	6 (40%)	
Radiotherapy $_{n,\%}$	No	17 (40.5%)	19 (45.2%)	4 (26.7%)	[2].453
	Yes	25 (59.5%)	23 (54.8%)	11 (73.3%)	
Chemotherapy $_{n,\%}$	No	4 (9.5%)	9 (21.4%)	1 (6.7%)	[2].195
	Yes	38 (90.5%)	33 (78.6%)	14 (93.3%)	

[1]Oneway Anova Test; [2] Chi-Square Test; n Number of patients, MA Mobility aids.

Table 3. Evaluation of the EORTC- QLQ-C15-PAL, Karnofsky performance scale, and Piper fatigue scale according to mobility level.

		Overall	Bedridden(I)	MA(II)	Ambulatory(III)	p-value	p_1 value* I–II	p_2 value* I–III	p_3 value* II–III
EORTC-QLQ-C15-PAL	Global health status $_{Mean \pm SD}$	26.93 ± 20.98	23.01 ± 19.46	27.77 ± 20.71	35.56 ± 24.29	[1].116			
	Physical function $_{Mean \pm SD}$	6.67 ± 11.27	1.91 ± 5.76	7.94 ± 11.61	16.45 ± 14.88	[1].000	.000[3]	.000[3]	
	Emotional function $_{Mean \pm SD}$	42.69 ± 30.37	34.73 ± 30.51	45.05 ± 28.09	58.34 ± 30.85	[1].029		.017[3]	
	Fatigue $_{Mean \pm SD}$	88.11 ± 21.13	90.48 ± 20.32	88.9 ± 17.69	79.27 ± 29.95	[1].231			
	Nausea/vomiting $_{Mean \pm SD}$	42.1 ± 42.14	44.45 ± 43.19	46.04 ± 43.21	24.46 ± 33.25	[1].336			
	Pain $_{Mean \pm SD}$	69.78 ± 33.37	75.4 ± 34.58	68.45 ± 29.88	57.78 ± 37.73	[1].063			
	Dyspnea $_{Mean \pm SD}$	58.92 ± 38.64	61.11 ± 40.27	54.76 ± 38.83	64.44 ± 34.43	[1].553			
	Insomnia $_{Mean \pm SD}$	68.35 ± 35.76	68.25 ± 35.27	69.05 ± 37.82	66.67 ± 33.33	[1].873			
	Loss of appetite $_{Mean \pm SD}$	78.11 ± 33.05	78.57 ± 31.94	83.33 ± 30.58	62.22 ± 39.58	[1].067			
	Constipation $_{Mean \pm SD}$	45.9 ± 41.38	53.44 ± 40.94	46,03 ± 42.26	24,44 ± 34.43	[1].085			
Karnofsky Performance Scale $_{Mean \pm SD}$		42.12 ± 11.18	37.62 ± 10.55	44.05 ± 8.85	49.33 ± 13.87	[1].001	.003[3]	.002[3]	
Piper Fatigue Scale	Behavioral $_{Mean \pm SD}$	8.73 ± 1.51	9.25 ± 1	8.52 ± 1.22	7.86 ± 2.65	[1].006	.002[3]		
	Affectivity $_{Mean \pm SD}$	8.89 ± 1.35	9.26 ± 1.08	8.77 ± 1.17	8.23 ± 2.13	[1].036	.016[3]		
	Sensory $_{Mean \pm SD}$	7.44 ± 2.2	7.72 ± 2.27	7.53 ± 1.8	6.41 ± 2.85	[1].208			
	Cognitive $_{Mean \pm SD}$	5.98 ± 2.02	6.43 ± 2.13	6.01 ± 1.67	4.6 ± 2.13	[1].025		.009[3]	
	Total score	7.68 ± 1.47	8.1 ± 1.23	7.67 ± 1.01	6.5 ± 2.38	[1].014		.015[3]	
Fatigue status	Mild $_{n,\%}$	2 (2%)	0 (0%)	0 (0%)	2 (13.3%)				
	Moderate $_{n,\%}$	21 (21.2%)	7 (16.7%)	9 (21.4%)	5 (33.3%)				
	Severe $_{n,\%}$	76 (76.8%)	35 (83.3%)	33 (78.6%)	8 (53.3%)	[2].007		.017[2]	.036[2]

[1]Kruskal Wallis Test [2]Chi-Square Test [3]Mann-Whitney U Test**; * In post-hoc test, only the cases where the p value is significant are indicated; **According to Bonferroni correction p-value: 0.05/3 = 0.017.

determined according to the type of cancer; therefore, they will have different impacts on the patients' walking abilities. In a study of patients with brain metastasis, Lowe et al. (2014) showed the relationship between spending most of one's time sitting or lying in bed and depression, anxiety, numbness, and perceived well-being. Patients with lower QoL scores were found to be more sedentary. By participating in physical activity, a cancer patient should be able to spend the final stages of his or her life as an independent individual within his

Table 4. Evaluation of mental conditions according to mobility level.

		Overall	Bedridden(I)	MA(II)	Ambulatory(III)	p-value	p_1 value*	p_2 value*	p_3 value*
							I–II	I–III	II–III
HADS-Anxiety score $_{Mean\pm SD}$		10.08 ± 4.48	11.6 ± 4.43	9.31 ± 4.21	8 ± 4.23	[1].008*	.044[5]	.018[5]	
HADS-Depression score $_{Mean\pm SD}$		15.31 ± 4.3	16.17 ± 4.27	15.81 ± 3.52	11.53 ± 4.66	[2].003*		.001[6]	.002[6]
HADS, presence of anxiety $_{n\ (\%)}$	No	36 (36.4%)	11 (26.2%)	16 (38.1%)	9 (60%)	[3].062			
	Yes	63 (63.6%)	31 (73.8%)	26 (61.9%)	6 (40%)				
HADS, presence of depression $_{n\ (\%)}$	No	8 (8.1%)	2 (4.8%)	1 (2.4%)	5 (33.3%)	[4].002*		.011[7]	.004[7]
	Yes	91 (91.9%)	40 (95.2%)	41 (97.6%)	10 (66.7%)				

[1]Oneway Anova Test [2]Kruskal Wallis Test[3]Chi-Square Test [4]Fisher Freeman Halton Test [5]Tukey HSD Test [6]Mann-Whitney U Test** [7]Fisher's Exact test; * In post-hoc test, only the cases where the p value is significant are indicated; **According to Bonferroni correction p-value: 0.05/3 = 0.017.

or her own boundaries. Accordingly, an increase in the physical activity of the patient and, as a secondary outcome, an improvement in the QoL and a decrease in fatigue and mental distress should be targeted. Physical function is the primary determinant of health-related QoL (Brown, Harhay, and Harhay, 2018), and should be one of the main tasks in the prevention of loss of physical activity in patients. Motivating patients to perform physical activities, preventing inactivity, and ensuring the implementation of the exercise program are essential components of a palliative care in the end-stage cancer (Koornstra et al., 2014; Navigante and Morgado, 2016)

Regarding the average age of the participant groups, bedridden and MA groups were similar but ambulatory group was younger. Although this was not statistically significant, the difference is small but cannot be excluded.

There are several limitations to this study that should be mentioned. First, medical laboratory results that may affect outcomes, such as the QoL and fatigue, and comorbid diseases were not included in the study. Second, questions related to detailed usage of MA duration of use and frequency and patient satisfaction were not asked. Although the physical performance was evaluated with the KPS and the physical function parameter by the EORTC QLQ-C15-PAL, the physical activity and mobility levels of the patients were not evaluated with an objective test (e.g. International Physical Activity Questionnaire or Functional Ambulation Classification). This can be considered another limitation. However, considering the length of the other tests applied, it was thought that it would be more appropriate to use classification scales that consisted of a small number of items investigating patient characteristics. On the other hand, the main strength of this study is that it was conducted on a relatively high number of patients with end-stage cancer. Furthermore, this study is valuable in that it included QoL, survival, mood, and functional status of end-stage cancer and investigated the relationship between physical skills and other parameters. In addition, this is one of the pioneer studies investigating the physical rehabilitation needs of end-stage cancer.

Conclusion

In this study, the QoL, fatigue, and mood changes of patients with end-stage cancer were investigated. As a result, the bedridden group demonstrated lower scores in terms of QoL. In the independent ambulatory group, lower depression and fatigue levels were observed. Therefore, keeping physical activity and functional skills at the highest possible level in the terminal period is essential for the rehabilitation approach. To provide continuance in patients who can still walk independently, ensure that patients with reduced mobility use MA, and determine the needs of patients in terms of QoL, fatigue and mood should be among the main goals of palliative rehabilitation.

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References

Ataman G, Erbaydar T 2017 Unmet home healthcare needs and quality of life in cancer patients: A hospital-based Turkish sample. Health & Social Care in the Community 25: 1347–1354. doi:10.1111/hsc.12435.

Bahar-Ozdemir Y, Akyuz G, Kalkandelen M, Yumuk PF 2020 The effect of therapeutic exercises on balance, quality of life, and pain in patients who were receiving neurotoxic chemotherapy. American Journal of Physical Medicine & Rehabilitation 99: 291–299. doi:10.1097/PHM.0000000000001324.

Bateni H, Maki BE 2005 Assistive devices for balance and mobility: Benefits, demands, and adverse consequences. Archives of Physical Medicine and Rehabilitation 86: 134–145. doi:10.1016/j.apmr.2004.04.023.

Beernaert K, Pardon K, Van Den Block L, Devroey D, De Laat M, Geboes K, Surmont V, Deliens L, Cohen J 2016 Palliative care needs at different phases in the illness trajectory: A survey study in patients with cancer. European Journal of Cancer Care 25: 534–543. doi:10.1111/ecc.12522.

Bertrand K, Raymond MH, Miller WC, Martin Ginis KA, Demers L 2017 Walking aids for enabling activity and participation: A systematic review. American Journal of Physical Medicine & Rehabilitation 96: 894–903. doi:10.1097/PHM.0000000000000836.

Brekke MF, La Cour K, Brandt Å, Peoples H, Waehrens EE 2019 The association between ADL ability and quality of life among people with advanced cancer. Occupational Therapy International 2019: 2629673. doi:10.1155/2019/2629673.

Brown JC, Harhay MO, Harhay MN 2018 Self-reported major mobility disability and mortality among cancer survivors. Journal of Geriatric Oncology 9: 459–463. doi:10.1016/j.jgo.2018.03.004.

Can G, Durna Z, Aydiner A 2004 Assessment of fatigue in and care needs of Turkish women with breast cancer. Cancer Nursing 27: 153–161. doi:10.1097/00002820-200403000-00009.

Demiralp M, Oflaz F, Komurcu S 2010 Effects of relaxation training on sleep quality and fatigue in patients with breast cancer undergoing adjuvant chemotherapy. Journal of Clinical Nursing 19: 1073–1083. doi:10.1111/j.1365-2702.2009.03037.x.

Dy SM, Isenberg SR, Al Hamayel NA 2017 Palliative care for cancer survivors. Medical Clinics of North America 101: 1181–1196. doi:10.1016/j.mcna.2017.06.009.

Farkkila N, Torvinen S, Roine RP, Sintonen H, Hanninen J, Taari K, Saarto T 2014 Health-related quality of life among breast, prostate, and colorectal cancer patients with end-stage disease. Quality of Life Research 23: 1387–1394. doi:10.1007/s11136-013-0562-y.

Farris MS, Kopciuk KA, Courneya KS, Mc Gregor SE, Wang Q, Friedenreich CM 2017 Associations of post-diagnosis physical activity and change from prediagnosis physical activity with quality of life in prostate cancer survivors. Cancer Epidemiology, Biomarkers and Prevention 26: 179–187. doi:10.1158/1055-9965.EPI-16-0465.

Funch A, Kruse NB, La Cour K, Peoples H, Waehrens EE, Brandt A 2019 The association between having assistive devices and activities of daily living ability and health-related quality of life: An exploratory cross-sectional study among people with advanced cancer. European Journal of Cancer Care 28: e13002. doi:10.1111/ecc.13002.

Groenvold M, Petersen MA, Aaronson NK, Arraras JI, Blazeby JM, Bottomley A, Fayers PM, de Graeff A, Hammerlid E, Kaasa S, et al.; EORTC Quality of Life Group 2006 The development of the EORTC QLQ-C15-PAL: A shortened questionnaire for cancer patients in palliative care. European Journal of Cancer 42: 55–64. doi:10.1016/j.ejca.2005.06.022.

Gulec G, Gulec S, Ceyhan D, Bahar M, Ozdemir S 2017 Anxiety, depression and coping behaviors with pain in cancer patients who are aware or unaware of their cancer. Agri 29: 109–116. doi:10.5505/agri.2017.56688.

Guzelant A, Goksel T, Ozkok S, Taskaban S, Aysan T, Bottomley A 2004 The European Organization for research and treatment of cancer QLQ-C30: An examination into the cultural validity and reliability of the Turkish version of the EORTC QLQ-C30. European Journal of Cancer Care 13: 135–144. doi:10.1111/j.1365-2354.2003.00435.x.

Huang MH, Blackwood J, Godoshian M, Pfalzer L 2018 Factors associated with self-reported falls, balance or walking difficulty in older survivors of breast, colorectal, lung, or prostate cancer: Results from surveillance, epidemiology, and end results-medicare health outcomes survey linkage. PLoS One 13: e0208573. doi:10.1371/journal.pone.0208573.

Kelley GA, Kelley KS 2017 Exercise and cancer-related fatigue in adults: A systematic review of previous systematic reviews with meta-analyses. BMC Cancer 17: 693. doi:10.1186/s12885-017-3687-5.

Kim KU 2014 Measurement of quality of life in patients with end-stage cancer. Cancer Nursing 37: 44–49. doi:10.1097/NCC.0b013e31827b5bdc.

Koornstra RH, Peters M, Donofrio S, Van Den Borne B, De Jong FA 2014 Management of fatigue in patients with cancer - A practical overview. Cancer Treatment Reviews 40: 791–799. doi:10.1016/j.ctrv.2014.01.004.

Lee YJ, Suh SY, Choi YS, Shim JY, Seo AR, Choi SE, Ahn HY, Yim E 2014 EORTC QLQ-C15-PAL quality of life score as a prognostic indicator of survival in patients with far advanced cancer. Supportive Care in Cancer 22: 1941–1948. doi:10.1007/s00520-014-2173-8.

Lin CC 2015 Does physical activity have value in end-of-life cancer care? Cancer Nursing 38: 251–252. doi:10.1097/NCC.0000000000000271.

Lowe SS, Danielson B, Beaumont C, Watanabe SM, Baracos VE, Courneya KS 2014 Associations between objectively measured physical activity and quality of life in cancer patients with brain metastases. Journal of Pain and Symptom Management 48: 322–332. doi:10.1016/j.jpainsymman.2013.10.012.

Lowe SS, Watanabe SM, Baracos VE, Courneya KS 2010 Physical activity interests and preferences in palliative cancer patients. Supportive Care in Cancer 18: 1469–1475. doi:10.1007/s00520-009-0770-8.

Maltoni M, Nanni O, Derni S, Innocenti MP, Fabbri L, Riva N, Maltoni R, Amadori D 1994 Clinical prediction of survival is more accurate than the Karnofsky performance status in estimating life span of terminally ill cancer patients. European Journal of Cancer 30A: 764–766. doi:10.1016/0959-8049(94)90289-5.

Navigante A, Morgado PC 2016 Does physical exercise improve quality of life of advanced cancer patients? Current Opinion in Supportive and Palliative Care 10: 306–309. doi:10.1097/SPC.0000000000000238.

Okamura H 2011 Importance of rehabilitation in cancer treatment and palliative medicine. Japanese Journal of Clinical Oncology 41: 733–738. doi:10.1093/jjco/hyr061.

Ozcelik H, Guzel Y, Sonmez E, Aksoy F, Uslu R 2016 Reliability and validity of the Turkish version of the EORTC QLQ-C15-PAL for patients with advanced cancer. Palliative & Supportive Care 14: 628–634. doi:10.1017/S1478951516000195.

Pandya C, Magnuson A, Dale W, Lowenstein L, Fung C, Mohile SG 2016 Association of falls with health-related quality of life (HRQOL) in older cancer survivors: A population based study. Journal of Geriatric Oncology 7: 201–210. doi:10.1016/j.jgo.2016.01.007.

Piper BF, Lindsey AM, Dodd M 1987 Fatigue mechanisms in cancer patients: Developing nursing theory. Oncology Nursing Forum 14: 17–23.

Quist M, Rørth M, Langer S, Jones LW, Laursen JH, Pappot H, Christensen KB, Adamsen L 2012 Safety and feasibility of a combined exercise intervention for inoperable lung cancer patients undergoing chemotherapy: A pilot study. Lung Cancer 75: 203–208. doi:10.1016/j.lungcan.2011.07.006.

Sheill G, Guinan E, Hevey D, Hussey J 2018 Physical activity and advanced cancer: The views of chartered physiotherapists in Ireland. Physiotherapy Theory and Practice 34: 534–541. doi:10.1080/09593985.2017.1422821.

Zucchetti G, Rossi F, Chamorro Vina C, Bertorello N, Fagioli F 2018 Exercise program for children and adolescents with leukemia and lymphoma during treatment: A comprehensive review. Pediatric Blood & Cancer 65: e26924. doi:10.1002/pbc.26924.