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Functional Outcomes by Age for Inpatient Cancer Rehabilitation: A Retrospective Chart Review

Elizabeth G. Hunter[1] and **Julie Baltisberger**[2]

[1]Cardinal Hill Rehabilitation Hospital, Lexington, KY, USA

[2]Eastern Kentucky University, Richmond, KY, USA

Abstract

Cancer-related impairments result in disabilities similar to those typically encountered in inpatient rehabilitation settings; however, the use of rehabilitation services by cancer survivors is low. This is particularly important for older adults as they are at higher risk for cancer. This retrospective study collected data from medical records from 215 charts of patients admitted to an inpatient physical rehabilitation hospital, within a 5-year period, with a primary diagnosis of cancer. Mean age was 61 years ($SD = 15.7$) for 109 (51%) females and 106 (49%) males. Regardless of age, patients achieved significant functional improvement, as shown by their FIM scores ($t = 23.06$, $p < .0001$), from admission to discharge. The results have several important implications related to cancer survivorship among older adults. With a push toward aging in place, maintaining optimal physical functioning is crucial. Physical rehabilitation benefited the functional outcomes of this group of cancer survivors regardless of age.

Keywords

cancer rehabilitation; comorbidities; rehabilitation outcomes; aging; cancer survivorship

Cancer has been called the disease of elderly people; advancing age is associated with an increased risk of cancer (Ershler, 2003). By 2030, the number of Americans aged 65 or above is expected to reach 71 million (Center for Disease Control and Prevention, 2007). Nearly 60% of cancer diagnoses and 70% of cancer deaths occur in individuals aged 65 or above (Ries et al., 2007). The incidence of cancer in older adults is expected to multiply, so that by 2030, approximately 70% of all cancer diagnoses will be for older adults (Smith, Smith, Hurria, Hortobagyi, & Buchholz, 2009). Despite the disproportionate burden of cancer among older adults, when compared with younger adults, older adults experience multiple disparities in cancer care. For example, they are treated less aggressively (Schrag, Cramer, Bach, & Begg, 2001). Although older cancer survivors suffer losses in all functional domains, the most profound are in the area of physical functioning (Demark-Wahnefried, Morey, Sloane, Snyder, & Cohen, 2009). In 1996, the National Cancer Institute (NCI) established the Office of Cancer Survivorship with a mission to improve the length and quality of life of all people diagnosed with cancer (NCI website). The direct effects of cancer and its treatment often result in physical impairments that can substantially decrease quality of life (Marciniak, Sliwa, Spill, Heinemann, & Semik, 1996). Although cancer related impairments result in disabilities similar to those frequently encountered in inpatient

Corresponding Author: Elizabeth G. Hunter, Cardinal Hill Rehabilitation Hospital, 2050 Versailles Road, Lexington, KY 40504, USA, egh1@cardinalhill.org.

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rehabilitation settings, the use of rehabilitation services by cancer survivors is low (Cheville, Troxel, Basford, & Kornblith, 2008; Movsas et al., 2003, Vargo, 2008; Warfel, Lachmann, & Nagler, 1993). The low utilization of services is clearly associated with a lack of effective systems for recognizing the need for rehabilitation (Vargo, 2008).

Many cancer survivors report declines in their physical functioning, including basic body mobility and engagement in work and leisure activities (Kroenkeet al., 2004; Nomori, Watanabe, Ohtsuka, Naruke, & Suemasu, 2004). Across cancer diagnoses and types of treatment, adult survivors report that they have not fully regained their precancer levels of physical functioning or engagement in social, work, or leisure activities (Fialka-Moser, Crevenna, Korpan, & Quittan, 2003; Ganz et al., 2003; Lehmann et al., 1978). Treating older adults with cancer requires the ability to differentiate between the influences of aging, comorbidities, and the acute and late effects of cancer and cancer treatment (Bond, 2010). Age-related physiological changes not only contribute to the development of cancer in older adults but also affect treatment tolerance and response (Bond, 2010).

Providers do not often offer rehabilitation services for a cancer diagnosis, even though these services seem to be a viable opportunity to optimize functional restoration (Feuerstein, 2009). Lack of referral to physical rehabilitation combined with age and possible multiple comorbidities may combine to foster lower quality of life and functional outcomes for cancer survivors. The loss of independence among older survivors results in rapidly escalating health care costs (Arozullah et al., 2004).

The purpose of this project was to review and describe the characteristics and functional outcomes of people with a primary diagnosis of cancer who receive inpatient physical rehabilitation. There is a need to explore the general use of physical rehabilitation for cancer survivors. A key question is does age affect functional outcomes for this group. Older cancer survivors are at risk for losses in physical function related to aging, cancer, and its treatments and progressive incapacity (Drouin, 2004). This brief report provides a description of the makeup and the functional outcomes of one population of people, by age, who accessed inpatient rehabilitation for a cancer diagnosis.

Method

This is a retrospective review. Retrospective reviews are useful to build a foundation for future prospective research. This methodology can help focus future study questions, clarify hypothesis, and identify feasibility issues for a prospective study (Hess, 2004).

Sample

The charts of adult patients (18 and above), admitted to an inpatient physical rehabilitation hospital within a 5-year period (January 2004 to December 2008) with a primary diagnosis of cancer, were reviewed. Records were excluded ($n = 45$) from further analysis if the patient had cancer as a secondary diagnosis and/ or if the patient received rehabilitation services other than inpatient rehabilitation (i.e., home health, outpatient). The charts of 215 patients met inclusion criteria and were used in our analysis. Of the 215, 94 (44%) were 65 and older, 121 (56%) were 64 and younger.

Measures

Demographic variables (age, gender), and common comorbidities (COPD, hypertension, diabetes) were recorded for each patient. Length of stay (LOS) and functional status were also collected during the chart review. Functional status was measured at admission and discharge using the Functional Independence Measure (FIM).

The FIM instrument assesses physical and cognitive disability in terms of burden of care. It has been used to monitor patient progress and to assess outcomes of rehabilitation. It is a rating scale applicable to patients of all ages and diagnoses, by clinicians or by nonclinicians, and has been widely adopted by rehabilitation facilities in the United States and Europe. FIM includes items related to self-care (eating, grooming, upper and lower body dressing, and toileting), mobility (bed, chair or wheelchair, toilet, and tub or shower transfers), locomotion (wheelchair skills or ambulation and stair climbing), sphincter control (bowel and bladder management), communication (comprehension and expression), and social cognition (social interaction, problem solving, and memory; Hamilton, Granger, Sherwin, Zielezny, & Tashman, 1987). The FIM is scored on a 7-point scale, from 1 (*dependent*) to 7 (*independent*) with a total score ranging from 18 (*totally dependent*) to 126 (*totally independent*).

Interrater tests conducted on patients from 25 facilities by physicians, nurses, and therapists produced intraclass correlation (the 4-point rating version) of .86 for 303 pairs of clinical assessments at admission and .88 for 184 pairs at discharge. Kappa indices of agreement for the 18 items averaged .54. The 7-point rating version, intraclass correlations for pairs of clinicians rating 263 patients ranged from .93 (locomotion subscale) to .96 (self-care and mobility). The mean kappa index of agreement between ratings for each items was .71. Alpha coefficients of .93 (admission) and .95 (discharge) were also found in 11,102 rehabilitation patients. The internal consistency of the locomotion subscale was lower, .68 (Granger, 1982; Granger, & McNamara, 1982).

Content validity has been assessed. A Rasch analysis supported the division into motor and cognitive components; contrasting patterns of responses of different patient groups reflected the types of disability to be expected. Granger examined the predictive validity of the FIM™ in multiple sclerosis patients over a 7-day period. The FIM™ items predicted the time required to provide help for personal care tasks ($R2 = .77$); correlations for several items exceeded .80; a change of one point on the FIM™ total score represented 3.8 min of care per day. Similar analyses for stroke patients ($N = 21$) yielded an $R2$ of .65. Of 11,102 patients, Dodds, Martin, Stolov, and Deyo (1993), found that FIM™ scores improved between admission and discharge and reflected the patients' destinations. Scores also reflected the presence of coexisting conditions and the severity of impairments.

Burden of care can be approximated using the FIM instrument. An average FIM instrument item rating of 3 or a total-FIM instrument rating of 60 is equivalent to the patient's needing help from another person for approximately 4 hr per day, each and every day of the year, just to perform basic personal care activities. Generally, a total-FIM instrument rating of 80 to 90 is equivalent to a need for 1 to 2 hr of help each day from another person to perform personal care activities (Granger, Deutsch, Russell, Black, & Ottenbacher, 2007).

The FIM Efficiency Index is a standard outcome measure that has been reported by the Uniform Data System for Medical Rehabilitation (UDSMR) since the 1980s. It is widely reported by researchers in medical rehabilitation (Granger & Hamilton, 1990). FIM efficiency scores are calculated by dividing the total improvement in FIM score by LOS. FIM efficiency is an important calculation that describes compares outcomes with the length of time in therapy that change took (Greenberg, Treger, & Ring, 2006).

Appropriate patients were identified through the hospital database using International Classification of Disease, Ninth Revision (ICD-9) codes. All patients received a comprehensive rehabilitation program, including medical and nursing management and 3 hours a day of physical, occupational, and/or speech therapies. This study was approved by the hospital's institutional review board.

Statistical Analysis

Data were analyzed using SPSS version 18 for Windows. Descriptive statistics were calculated and univariate statistical analyses were used to determine relationships among variables. Differences in group means were calculated using *t* tests to determine if there were significant differences ($\alpha \leq .05$) between group means for continuous variables. Significant differences in categorical variables were calculated using Pearson chi-square statistics. Functional gains were analyzed using paired *t* tests to determine if there was a significant improvement in FIM scores from admission to discharge.

Findings

Patient characteristics

Two hundred fifteen patients were discharged after receiving inpatient physical rehabilitation for functional loss resulting from cancer or its treatment from 2004 through 2008.

Characteristics and outcomes of all participants

Table 1 illustrates the data related to the total cancer rehabilitation participant population. The mean age was 61.5 years (*SD* = 15.8) with a range from 18 to 90 years. Gender was evenly distributed with 109 (51%) females and 106 (49%) male. The mean LOS was 16 days (*SD* = 1.5) with a range of 2 to 24 days. The most common comorbidities were diabetes (23%), COPD (16%) and hypertension (60%). Often there were multiple comorbidities, with 22% having no comorbidities, 40% having one, 28% with two, and 9% with all three. Significant functional motor gains ($p < .0001$) were made from admission (mean motor FIM = 34) to discharge (mean motor FIM = 54) as well as cognitively (admission cognitive FIM = 25, discharge FIM = 28, $p < .0001$). Regardless of age, patients achieved significant functional improvement, as shown by their total FIM scores ($t = 23.06$, $p < .0001$), from admission (FIM = 61) to discharge (FIM = 85). Finally the mean LOS efficiency score, average gain in FIM score per day, was 1.9 (*SD* = 1.5) with a range from –2.6 to 7.4.

Characteristics and outcomes by age groups

Data from the chart reviews were also analyzed by age group. The findings are presented in Table 2. Stratifying by age, 121 (56%) were 64 and younger, 94 (44%) were 65 and older.

There were very few significant differences between the age groups (<65 and ≥65). The only significant differences emerged in the area of comorbidities. As shown in Table 2, there was a significant difference in the number of patients with hypertension by age group (51%, <65, and 70%, ≥5.057, $p = .025$). The younger group had a significantly higher chance of having no comorbidities as compared with the older group. There was no significant difference between the age groups in terms of those who did have comorbidities by type or number. In addition, there was no significant difference in the FIM admission or discharge scores by age group (Table 2). There were no significant differences in LOS or LOS efficiency. Table 2 shows that both age groups made significant gains in motor, cognitive, and total FIM scores after treatment.

Descriptively, Table 3 shows the outcomes according to the FIM score by functional level. Broken down by age category and as a total of all cancer patients, there were significant gains in functional level in all three categories. The <65 years group had a 33.9% decrease in maximum assistance category, a 13.2% decrease in the moderate assistance category and a 47% increase in minimal to no assistance category ($p < .0001$). The ≥65 group had a 28.7% decrease in maximum assistance category, a 14.9% decrease in the moderate assistance category, and a 43.6% increase in minimal to no assistance category ($p < .0001$).

In total, all the cancer rehabilitation participants had a 32% decrease in maximum assistance category, a 14% decrease in the moderate assistance category, and a 46% increase in minimal to no assistance category ($p < .0001$).

Discussion

Cancer in an inpatient rehabilitation setting is not generally a primary diagnosis in terms of treatment, and little has been written on functional improvement after rehabilitation for cancer patients (Guo, Shin, Hainley, Bruera, & Palmer, 2011; Marciniak, Sliwa, Spill, Heinemann, & Semik, 1996). As of this time, there are no known care pathways for cancer survivors or cancer rehabilitation, although this was a priority set forth by the Institute of Medicine (Hewitt, Greenfield, & Stovall, 2006). This project allows for the description of one population of cancer survivors who received inpatient rehabilitation. Similar to other research findings these patients displayed multiple comorbidities frequently seen in the rehabilitation setting (Lehmann et al., 1978). However, also similar to other studies, this population showed functional gain after receiving inpatient rehabilitation (Deitz, 1969; Phillip, Ayyangar, Vanderbilt, & Gaebler-Spira, 1994).

Previous studies have shown that 40% to 50% of cancer patients who receive rehabilitation do so because of deconditioning, asthenia, or general weakness (Cole, Scialla, & Bednarz, 2000; Tang, Harvey, Park Dorsay, Jiang, & Rathborn, 2007). Brennan and Warfel (1993) evaluated 50 cancer patients referred to rehabilitation, and on average the patients had 1.7 functional impairments. These included deconditioning (56%), central nervous system dysfunction (36%), and peripheral neurological problems (28%).

Although the chart documentation was too variable in this study to quantitatively demonstrate it, it appears that a number of the patients in this project did indeed come to inpatient rehabilitation related to deconditioning and general weakness. Motor dysfunction seemed to be more prevalent, although cognitive issues would emerge in brain cancer cases as well as potentially related to age; again, we cannot say this conclusively. Motor FIM improvement can be linked to improved quality of life and decreased care burden (Granger, Divan, & Fiedler, 1995). Past studies have evaluated patients with neoplastic brain injuries or spinal cord compressions, who reportedly achieved functional gains comparable with those of patients who did not have cancer (Marciniak, Sliwa, Heinemann, & Semik, 2001; McKinley, Huang, & Tewksbury, 2000; Tang et al., 2007). While the outcomes are crucial, there needs to be more focus on potential differences in the actual therapeutic interventions when comparing a cancer rehabilitation patient with non-cancer rehabilitation patient. This is an area for in-depth future research.

A one-point decrease in total FIM score is equivalent to about 4.1 fewer minutes of caregiver help for people with stroke for people with stroke (Granger et al., 1995). The 24-point improvement of the participant group as a whole in this study translates into approximately 98 min of caregiver time saved per day. When looking at the functional categories (0–60 maximum assistance, 61–90 moderate assistance, and 91–126 minimal to no assistance), the potential for even greater cost savings is illustrated. Granger et al. (2007) state that a score of 60 requires a minimum of 4 hr per day help to perform basic personal care activities. A score of 90 drops that to 1 to 2 hr and more than 91 may result in no personal care help being required. If a person's functional ability increases from the maximum assistance category to the moderate assistance category, there is the potential for savings of approximately US $17,472 a year if the hourly care is valued at US $12 an hour. This is a significant burden of either time or money for care giving. The inpatient rehabilitation clearly helped move the patients up the scale of independence.

The FIM efficiency number is a useful tool for comparing rehabilitation outcomes. In past studies, the FIM efficiency score has been reported as 1.5 for people with brain tumors (Greenberg et al., 2006), 1.8 in younger patients with traumatic brain injury (Granger et al., 2010), and 1.6 in older patients who have had a stroke (Granger et al., 2009). Our group of cancer patients had a LOS efficiency number of 1.9, not far off from the other diagnoses.

The LOS, which leads to the analysis of cost of stay and rehabilitation efficiency, was not significantly different between these groups either. Perhaps the most startling similarity of the two age groups was the incidence of comorbidity and the number of comorbidities the patient presented with. The assumption might have been that the older group would potentially be sicker, with more comorbodities which would in turn result in longer lengths of stay and poorer functional outcomes. None of those assumptions held true in the population reviewed in this project. In fact, it can be hypothesized that, in this situation, the people who are referred to inpatient cancer rehabilitation are less healthy younger people and healthier older people. This would be one of many questions surrounding this topic that could be better understood through future research.

While cancer rehabilitation is underused by all, there is a risk that older cancer survivors may receive less rehabilitation due to the mistaken belief that they have less of a chance for functional improvement. This project shows that there was little difference as a whole and no functional difference between those younger than 65 years old and those 65 years old and above. Both age groups improved with rehabilitation care pointing toward the importance of rehabilitation services for cancer survivors regardless of age.

Our study was limited in several ways. First, it was a retrospective study and therefore patients were preselected for admission because they were regarded as likely to benefit from rehabilitation. As a retrospective chart review, the sample is a convenience one. Second, the types of cancer represented in this study do not reflect the distribution of cancer types in the United States. Referral patterns certainly influenced these findings. Finally, there is no follow-up in terms of more long-term functional outcomes, quality of life, and satisfaction with inpatient rehabilitation for patients with a primary diagnosis of cancer. The goal of this project is to bring awareness to cancer rehabilitation and to raise questions for future research.

As this is a retrospective chart review, no conclusions can be made, but questions for future research can be raised. A major consideration is how inpatient rehabilitation treatment affected overall quality of life for these patients, which is a question that cannot be answered from these data but may interact with the need and effect of rehabilitation services regardless of future length of life.

Future research into the quality-of-life impact of inpatient rehabilitation for cancer diagnoses needs to be considered to determine this relationship. A second question that emerges is “who does not receive cancer rehabilitation and why.” A cost-to-benefit ratio also needs to be further evaluated to determine how such services contributed to the survival and quality of life of these patients. In terms of evidence-based practice, much of cancer rehabilitation is in its infancy; without doubt, age is a variable that needs to be further explored and better understood.

Conclusion

In this retrospective chart review, people who receive inpatient rehabilitation for a primary diagnosis of cancer made significant functional improvements. This held true regardless of age. The results of this study have important implications for health care practitioners working with aging cancer survivors. Physical rehabilitation should be on the menu of

treatment for appropriate cancer survivors. The connection between oncology and rehabilitation needs to be strengthened. As that partnership is developed, it is important to know that age may not be a factor in whether a cancer survivor is a good candidate for rehabilitation.

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Biographies

Elizabeth G. Hunter, PhD, is the Director of Research at Cardinal Hill Rehabilitation Hospital in Lexington, Kentucky. Her research interests include clear health communication, rural health and cancer.

Julie Baltisberger, MS, OTR/L 2, is a faculty member in the Eastern Kentucky University Occupational Therapy department. Her research interest is related to functional performance and cancer survivorship.

Table 1

Characteristics of All Cancer Participants (N=215)

			Admission	**Discharge**	***P*- value**
Age		61.5±15.8			
Gender					
	Male	106 (49%)			
	Female	109 (51%)			
MeanLength of Stay		16±9 (2–64)			
Mean LOS Efficiency		1.9±1.5 (−2.6–7.4)			
Comorbidities					
	Diabetes	50 (23%)			
	COPD	34 (16%)			
	Hypertension	129 (60%)			
Multiple Comorbidities					
	0	47 (22%)			
	1	85 (40%)			
	2	61 (28%)			
	3	19 (9%)			
Mean Total FIM Score			61±17 (18–115)	85±22.5(18–122)	<.0001
Mean FIM Motor Score			34±12.6(11–75)	54±17(12–81)	<.0001
Mean FIM Cognitive Score			25±7.5(5–40)	28±9(5–97)	<.0001

NOTE: Note: LOS = length of stay, COPD = Chronic Obstructive Pulmonary Disease, and FIM = functional independence measure. Values are *M* ± *SD* (range).

Table 2

Characteristics of Cancer Rehabilitation Patients Compared by Age

		<65 years (N=121)	≥65 years (N=94)	*P*-value
Gender				0.292
	Male	64(52.9%)	42(44.7%)	
	Female	57 (47.1%)	52 (55.3%)	
Mean Length of stay		17±10 (2–64)	15±7.9 (2–37)	0.171
LOS Efficiency		1.8±1.5 (−2.6–7.4)	1.9±1.6 (−2.57–6.6)	0.517
Comorbidities				
	Diabetes	24(19.8%)	26(27.7%)	0.204
	COPD	15(12.4%)	19(20.2%)	0.134
	Hypertension	62(51.2%)	66(70.2%)	0.005
Multiple Comorbidities				
	0	34(28.1%)	17(18.1%)	0.025
	1	48(39.7%)	45(47.9%)	0.875
	2	29(24%)	30(31.9%)	0.124
	3	10(8.3%)	2(2.1%)	0.770
Mean Total FIM Admission Score		61±18(18–101)	60±17(27–115)	0.632
Mean Total FIM Discharge Score		85±23(18–116)	85±22(27–122)	0.904
Total FIM Change Score		24±16.5(−27–60)	25±14(−18–60)	0.329
Mean FIM Admission Motor Score		35.2±12.7 (11–62)	34.7±12.5 (12–75)	0.723
Mean FIM Discharge Motor Score		53.8±17.5 (12–81)	55.1±17.2 (12–81)	0.690
Mean FIM Admission Cognitive Score		25.1±8.0 (5–40)	24.5±7.0 (8–40)	0.574
Mean FIM Discharge Cognitive Score		28.3±8.5 (5–67)	27.9±9.6 (8–97)	0.662

Note: LOS = length of stay. Values are $M \pm SD$ (range).

Table 3

FIM Functional Category Outcomes by Age

	Total FIM Functional Score Admission		**Total FIM Functional Score Discharge**	**% Change**	***P*-Value**
<65 (N=121)					<0.0001
	0–60 Max Assist	58(47.9%)	17(14%)	↓33.9%	
	61–90 Mod Assist	58(47.9%)	42(34.7%)	↓13.2%	
	91–126 Min to No Assist	5(4.1%)	62(51.2%)	↑47%	
≥65(N=94)					<0.0001
	0–60 Max Assist	41 (43.6%)	14(14.9%)	↓28.7%	
	61–90 Mod Assist	49 (52.1%)	35(37.2%)	↓14.9%	
	91–126 Min to No Assist	4 (4.3%)	45(47.9%)	↑43.6%	
Total (N=215)					<0.0001
	0–60 Max Assist	99 (46%)	30 (14%)	↓32%	
	61–90 Mod Assist	107 (50%)	78(36%)	↓14%	
	91–126 Min to No Assist	9 (4%)	107(50%)	↑46%	