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Geriatric Oncology

Geriatric Assessment-Identified Deficits in Older Cancer Patients With Normal Performance Status

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Disclosures of potential conflicts of interest may be found at the end of this article.

Key Words. Geriatric assessment • Performance status • Cancer • Older

Abstract

Background. We investigated whether a brief geriatric assessment (GA) would identify important patient deficits that could affect treatment tolerance and care outcomes within a sample of older cancer patients rated as functionally normal (80%–100%) on the Karnofsky performance status (KPS) scale.

Methods. Cancer patients aged ≥65 years were assessed using a brief GA that included both professionally and patient-scored KPS and measures of comorbidity, polypharmacy, cognition, function, nutrition, and psychosocial status. Data were analyzed using descriptive statistics and multivariable logistic regression.

Results. The sample included 984 patients: mean age was 73 years (range: 65–99 years), 74% were female, and 89% were white. GA was conducted before (23%), during (41%), or after (36%) treatment. Overall, 54% had a breast cancer diagnosis (n = 528), and 46% (n = 456) had cancers at other sites. Moreover, 81% of participants (n = 796) had both professionally and self-rated KPS ≥80, defined as functionally normal, and those patients are the focus of analysis. In this subsample, 550 (69%) had at least 1 GA-identified deficit, 222 (28%) had 1 deficit, 140 (18%) had 2 deficits, and 188 (24%) had ≥3 deficits. Specifically, 43% reported taking ≥9 medications daily, 28% had decreased social activity, 25% had ≥4 comorbidities, 23% had ≥1 impairment in instrumental activities of daily living, 18% had a Timed Up and Go time ≥14 seconds, 18% had ≥5% unintentional weight loss, and 12% had a Mental Health Index score ≤76.

Conclusion. Within this sample of older cancer patients who were rated as functionally normal by KPS, GA identified important deficits that could affect treatment tolerance and outcomes. ***The Oncologist*** 2015;20:379–385

Implications for Practice: The optimal evaluation to guide treatment decisions for older cancer patients is not known. The Karnofsky performance status (KPS) scale is frequently used to guide oncology practice, whereas the standard in geriatric medicine is the comprehensive geriatric assessment (GA). Comprehensive GA is time and resource intensive and impractical in routine cancer care. This study shows that a brief, mostly patient-administered GA can identify deficits that could affect treatment tolerance and outcomes in patients assessed as functionally normal by KPS. A brief GA should be incorporated into routine oncology practice for timely identification of patient deficits that may be remediable before or during treatment.

Introduction

Cancer is a disease of aging. In the U.S., 53% of cancer incidence and 69% of cancer mortality occurs in persons aged ≥65 years [1]. With the aging of the U.S. population and the proportion of adults aged ≥65 years expected to double by 2060 (20%) [2], cancer incidence is projected to increase from 1.6 million in 2010 to 2.3 million in 2030 [3]. These trends underscore the pressing fact that care of the older patient will become an essential component of all oncology practices and a significant challenge for clinicians with limited expertise in geriatrics [4].

Evaluation of older patients can be especially challenging because traditional considerations of chronological age and tumor characteristics alone do not capture the range of fitness and frailty among those aged ≥65 years [5–7]. Instead, there is growing recognition that "functional age" is a more accurate

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indicator of cancer treatment tolerance because functioning varies widely among older cancer patients of similar chronological age [8, 9]. Introduced in 1948, the Karnofsky performance status (KPS) scale [10–13] was the earliest effort to introduce baseline functional status as a core consideration in treatment decisions for cancer patients, specifically with regard to chemotherapy. Traditionally, KPS was assessed by health professionals. KPS is a composite measure that takes into consideration the patient's physical ability to engage in normal activities of daily living (ADLs), work, and care of personal needs. Professionals rate patients on a global scale from 20 ("very sick, hospital admission necessary, active supportive treatment necessary") to 100 ("normal, no complaints, no evidence of disease"). Patients scored between 80 and 100 are considered functionally normal because they are "able to carry on normal activity and to work and no special care is needed," whereas scores between 50 and 70 describe patients who are "unable to work but able to live at home and care for most personal needs with varying amounts of assistance needed" [10–12]. In patients rated between 10 and 40, "disease may be progressing rapidly," and these patients are considered "unable to care for self" and likely require the equivalent of institutional or hospital care [10–12]. A patient-assessed KPS (Patient-KPS) that mirrors the professionally assessed KPS has been developed to provide independent prognostic information [14, 15]. Studies have found that patient self-assessments may differ from professional assessments, with patients reporting generally lower physical function [16, 17]. In a study of patients with advanced lung or colorectal cancer, for example, the authors reported 67% disagreement between KPS and Patient-KPS scores and concluded that physician overestimation of performance status may lead to treatment decisions that compromise survivorship [16].

In oncology practice, performance status has been shown to be a reliable and consistent determinant of prognosis in several major tumor types and among patients of all ages [11, 14, 15]. The currently accepted standard for the evaluation of older patients in general is the comprehensive geriatric assessment (GA), which covers multiple domains (medical, psychological, functional) and is traditionally performed by a multidisciplinary team that includes a geriatrician, a nurse, and a social worker [18–20]. The comprehensive GA includes assessment of functional status by determining a patient's ability to perform ADLs [21, 22], such as bathing, dressing, and toileting, and instrumental activities of daily living (IADLs) [21], such as shopping, financial management, and medication management. Baseline assessment of function using a variety of measures is particularly important for older cancer patients because they are likely to have functional deficits that could affect prognosis and survival, treatment tolerance, and quality of life during and after treatment and that may be modifiable before or during treatment [20, 23].

To encourage GA in clinical practice—and to address the dual issues of inadequate time (approximately 2 hours) and inadequate expertise (training in geriatrics) that would be required for comprehensive GAs to be conducted in busy oncology clinics—a brief GA has been developed and tested in clinical trials and oncology practice [20, 24]. This brief GA includes both the KPS and the Patient-KPS and other validated and reliable measures of function that are especially informative in assessing functional age and treatment tolerance of older cancer patients [25–27].

The primary goal of this study was to investigate whether GA measures beyond KPS and Patient-KPS would identify important patient impairments or deficits that could potentially affect treatment tolerance and care outcomes among patients who were rated as functionally normal based on a KPS rating of $\geq$80 by both the health care professional and the patient. We focused our analysis on this group with both self-rated and professionally rated KPS in the normal range to eliminate any confounding in GA results that may reflect disagreement in KPS scoring between patients and professionals.

Materials and Methods

Patients

This study includes patients who consented to enroll in Carolina Senior (Lineberger Comprehensive Cancer Center protocol 0916; ClinicalTrials.gov identifier NCT01137825), a registry of English-speaking cancer patients aged $\geq$65 years who completed a brief GA [24, 28, 29]. Participants were recruited from clinics at the North Carolina Cancer Hospital and the University of North Carolina at Chapel Hill (UNC) Cancer Network of affiliated clinics in the community [30]. Written informed consent was obtained from all study participants. The study protocol was approved by the UNC Lineberger Comprehensive Cancer Center protocol review committee and the UNC institutional review board.

Brief Geriatric Assessment

The GA used for Carolina Senior was developed by Hurria et al. and is composed of validated and reliable measures within domains typically assessed by geriatricians: function, comorbidity, cognition, nutrition, and psychosocial status [24, 28, 29]. Table 1 shows assessments conducted by trained research or clinical staff and measures reported by patients. The patient-reported component of the GA was completed either in clinic (46% of participants) or at home (54%), with the completed questionnaire mailed back to the data manager in a self-addressed, stamped envelope [30]. The average amount of time for completing the brief GA is 10 minutes for the professionally assessed items and 20 minutes (range: 15–28 minutes) for the patient-reported items [30].

The KPS [10–13] and the Patient-KPS [15] have been described. The Timed Up and Go (TUG) test asks the patient to stand up from a chair, walk a distance of approximately 10 feet, turn, walk back to the chair, and sit down; total seconds required to complete the test are recorded or "inability to complete" is noted [31, 32]. The Blessed Orientation-Memory-Concentration (BOMC) test [33, 34] assesses whether the patient knows the current year, month, and time of day and asks the patient to count backward from 20 to 1, to recite the months in reverse order, and to repeat a memory phrase. The IADL scale [21] inquires about the amount of assistance the patient requires in using the telephone, getting to places out of walking distance, shopping for groceries or clothes, preparing meals, doing housework, taking medications, and handling money, with response options of 2 ("without help"), 1 ("with some help"), and 0 ("completely unable"). The physical

Table 1. Brief geriatric assessment domains and measures

Domains	Measures	Score range	Dichotomized
Professionally assessed			
Function	Timed Up and Go [31, 32]	Timed (seconds); higher score → lower functioning	<14 seconds, ≥14 seconds, or unable to complete
	KPS [10]	0–100; higher score → better functioning	<60, 60–70, ≥80
Cognition	Blessed Orientation-Memory-Concentration test [33, 34]	0–28; higher score → lower cognition	<11, ≥11
Body composition	Body mass index [41]	No upper or lower limit	
Patient reported			
Function	Physical function [35]	0–20; 20 = not at all limited	<20, 20
	Instrumental activities of daily living [21]	0–14; 14 = can do without help	≤14, 14
	Patient-reported KPS [15]	30–100; higher score → better functioning	<60, 60–70, ≥80
	Number of falls in the past 6 months [42]		≥2, <2
Comorbidity	Number of medications [43]		≥4, <4
	Number of comorbidities [44]		≥9, <9
Psychological	Five-item Mental Health Index [38–40]	0–100; higher score → better mental health	≤76, >76
Social (MOS)	MOS Social Activity Limitation [37]	0–100; higher score → more limitations	
	MOS Social Support Survey [36] (Tangible and Emotional/ Informational Support subscales)	0–100; higher score → better support	
Nutrition	Unintentional weight loss in past 6 months [45]	More unintentional weight loss → poorer nutrition	≥5%, <5%

Abbreviations: KPS, Karnofsky performance status; MOS, Medical Outcomes Survey.

function scale [35] inquires about limitations in engaging in various activities (listed in Fig. 1), with response options of 2 ("not at all limited"), 1 ("limited a little"), and 0 ("limited a lot"). The social support measure [36] includes 12 items inquiring about whether the patient has someone who is supportive in a variety of ways, such as taking the patient to the doctor, helping with daily chores, providing good advice about a crisis, or listening when the patient needs to talk, with response options ranging from 0 ("none of the time") to 4 ("all of the time"). The full scale has 20 questions and 4 subscales; the tangible and emotional/information subscales were used for analysis. The social activity measure [37] consists of four items that inquire about how physical health or emotional problems or conditions have interfered with social activities (e.g., visiting with friends, relatives, neighbors, groups) over the past 4 weeks (two scales: "all of the time" to "none of the time" and "not at all" to "extremely"), have affected the patient's usual level of social activity over the past 6 months ("much less" to "much more" socially active), and have limited social activities compared with others of comparable age ("much more" to "much less" limited than others). The Mental Health Index (MHI-5) includes five items [38–40] that measure how much of the time the patient was happy, calm or peaceful, nervous, downhearted or blue, and "so down in the dumps that nothing could cheer you up." On a 6-point scale pertaining to "the past two weeks," MHI-5 response options range from "all of the time" to "none of the time." A total score was calculated based on the average of items answered, after reverse coding, and then converted to a scale of 0–100 points, with higher scores indicating better mental health.

For the purposes of our study, variables were dichotomized at cut points (Table 1) that signal patient impairments or deficits that should be considered in treatment decisions. All cut points were derived from a review of the literature, with references cited in the measures column of Table 1. A TUG score of ≥14 seconds, for example, is predictive of falls [33], and increased time to complete the TUG test is predictive of risk of early death among older patients receiving chemotherapy treatment [46]. Falls are of concern among adults aged ≥65 years because unintentional injury is the seventh leading cause of death and falls make up 54% of unintentional injuries [47]. A cut point of ≤76 indicates that a patient has poor mental health [40, 48], and a score ≥11 on the BOMC test is considered abnormal [49]. For this study, patients were considered either at risk or not at risk, depending on each cut point.

Statistical Analysis

Between October 2009 and August 2013, 1,088 cancer patients aged ≥65 years were enrolled in the Carolina Senior registry and completed the brief GA. Of these, 984 had data for both KPS and Patient-KPS, and they compose the final sample for this study. Descriptive statistics are provided as means and ranges or as frequencies and percentages, along with exact binomial 95% confidence intervals (CIs). For measures in which the total score was calculated as a sum (physical function, IADLs, BOMC, social support), only patients with complete

data received a score. For the MHI-5 and social activity limitations, scores were calculated if more than half of the items were answered [38–40]. A multivariable logistic regression model was used to evaluate the effect of demographic and clinical characteristics on the outcome of having any deficits compared with no deficits. SAS statistical software version 9.3 (SAS Institute Inc., Cary, NC, http://www.sas.com) was used for all analyses.

Results

Sample Characteristics, KPS Scores, and Patient-KPS Scores

Of the full sample of patients in the database ($n = 984$), 91% ($n = 893$) were professionally rated as functionally normal (KPS ≥80) and 84% ($n = 828$) rated themselves as functionally normal (Patient-KPS ≥80). For 81% of patients ($n = 796$), there was agreement between patients and health professionals on a KPS rating ≥80 (Table 2), and this subsample is the focus of all remaining analyses. Characteristics of the full sample ($n = 984$) and the subsample ($n = 796$) are compared in Table 3.

GA-Identified Deficits

To assess whether the GA identifies important deficits among patients rated as KPS ≥80, we calculated the proportion of study participants at clinically important cut points in seven functional domains: TUG scores ≥14 seconds, ≥2 falls in the past 6 months, decreased social activity, IADL score <14 (i.e., impairment of 1 activity or more), unintentional weight loss ≥5% in the past 6 months, BOMC score ≥11, and MHI-5 score ≤76. Our findings are presented in Figure 2. Among participants, 28% (95% CI: 25.3%–31.7%; $n = 225$) reported decreased social activity resulting from physical or mental health problems, 23% (95% CI: 19.9%–25.9%; $n = 180$) reported impairment in at least 1 IADL, 18% (95% CI: 15.5%–21.0%; $n = 144$) had TUG scores ≥14 seconds or were unable to complete, 7% (95% CI: 55.6%–9.4%; $n = 57$) had ≥2 falls, 18% (95% CI: 15.4%–20.9%; $n = 143$) reported ≥5% unintentional weight loss, and 12% (95% CI: 9.6%–14.6%; $n = 84$) had an MHI-5 score of ≤76. In addition to these GA-identified deficits, 43% (95% CI: 39.5%–47.4%; $n = 273$) reported taking ≥9 medications daily, and 25% (95% CI: 21.5%–27.9%; $n = 177$) had ≥4 comorbidities.

We calculated total GA-identified deficits per patient (Fig. 3), using the above-listed seven measures. Within our "normal" KPS subsample, 222 (28%; 95% CI: 24.8%–31.1%) had 1 GA-identified deficit, 140 (18%; 95% CI: 15.0%–20.4%) had 2 deficits, 114 (14%; 95% CI: 12.0%–16.9%) had 3 deficits, and 48 (6%; 95% CI: 4.5%–7.9%) had 4 deficits. Overall, 69% (95% CI: 65.8%–72.3%; $n = 550$) had at least 1 deficit.

Physical Function Limitations

Figure 1 shows the proportion of study participants who reported they were limited a lot in their ability to perform various physical functions. Overall, 41% (95% CI: 37.8%–44.8%; $n = 323$) reported they were very limited by their health in engaging in vigorous activities such as running, lifting heavy objects, or participating in strenuous sports. Moreover, 23% (95% CI: 19.7%–25.6%; $n = 178$) were limited by their health in walking >1 mile, 11% (95% CI: 8.9%–13.4%; $n = 87$) were limited in walking several blocks, and 13% (95% CI: 10.9%–15.7%; $n = 104$) were limited in climbing several flights of stairs.

Table 2. Agreement between professionally assessed and patient-rated KPS scores

	Professionally assessed KPS			
Frequency (%)	**≤50**	**60–70**	**80–100**	**Total**
Patient- rated KPS				
≤50	8 (0.8)	3 (0.3)	8 (0.8)	19 (2)
60–70	10 (1)	38 (4)	89 (9)	137 (14)
80–100	4 (0.4)	28 (3)	796 (81)	828 (84)
Total	22 (2)	69 (7)	893 (91)	984 (100)

Abbreviation: KPS, Karnofsky performance status.

Table 3. Patient characteristics

Variable	Total sample ($n = 984$)	KPS ≥80% subsample ($n = 796$)
Time of assessment, *n* (%)		
Before treatment	224 (23)	173 (22)
During treatment	407 (41)	312 (39)
After treatment	351 (36)	309 (39)
Female, *n* (%)	730 (74)	603 (76)
Age, mean (range)	73 (65–99)	72 (65–99)
Race, *n* (%)		
White	877 (89)	727 (91)
Black	100 (10)	64 (8)
Other	7 (1)	5 (1)
Education, *n* (%)		
Some high school	65 (7)	37 (5)
High school degree	413 (42)	318 (40)
Associate or bachelor degree	319 (32)	273 (34)
Advanced degree	185 (19)	166 (21)
BMI, mean (range)	27 (15–64)	27 (15–50)
Tumor type, *n* (%)		
Breast	528 (54)	452 (57)
Lung	99 (10)	67 (8)
Lymphoma	61 (6)	50 (6)
Leukemia	49 (5)	38 (5)
Colorectal	44 (4)	36 (5)
Head and neck	43 (4)	35 (4)
Other	159 (16)	117 (15)

Abbreviations: BMI, body mass index (no upper or lower limit); KPS, Karnofsky performance status.

Social Activity Limitations

When asked how their level of social activity during the past 6 months compared with their usual level of activity, 28% (95% CI: 25.3%–31.7%; $n = 225$) of participants reported being somewhat or much less socially active than before (Fig. 4). In addition 13% (95% CI: 10.8%–15.6%; $n = 103$) reported being "somewhat or much more limited" in their social activities because of their physical health or emotional problems compared with others of similar age.

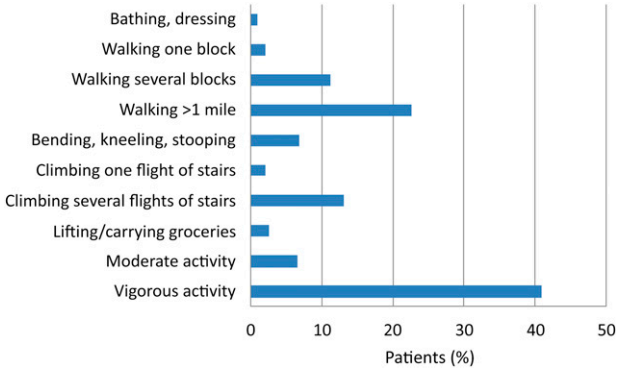

Figure 1. Karnofsky performance status ≥80, physical function for patients who scored 0 ("limited a lot").

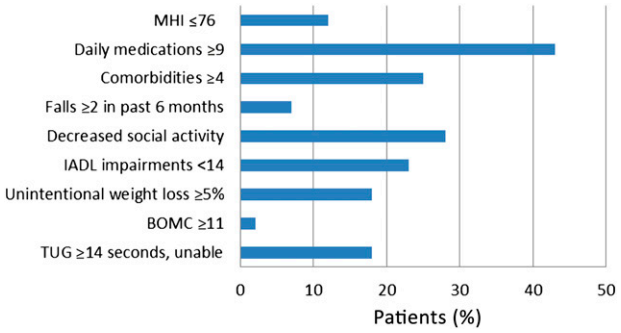

Figure 2. Karnofsky performance status ≥80, geriatric assessment-identified deficits.

Abbreviations: BOMC, Blessed Orientation-Memory-Concentration test; IADL, instrumental activities of daily living; MHI, Mental Health Index; TUG, Timed Up and Go.

Social Support

Fourteen percent (95% CI: 11.3%–16.2%; $n = 107$) of participants reported having little or no support "if confined to bed." Nine percent (95% CI: 7.2%–11.3%; $n = 72$) reported little or no support for preparing meals if they were unable to do so or help with daily chores if they were sick (9%; 95% CI: 7.4%–11.6%; $n = 74$). Seven percent (95% CI: 4.9%–8.4%; $n = 51$) reported limited support for "sharing your most private worries or fears," and 5% (95% CI: 3.9%–7.1%; $n = 42$) reported limited support with regard to "someone to turn to for suggestions about how to deal with a personal problem."

Mental Health

The mean score for the MHI-5 was 87.1 (SD: 10.5; range: 43.3–100), with higher scores indicating better mental health. Twelve percent of patients (95% CI: 9.6%–14.6%; $n = 84$) had MHI-5 scores ≤76, signifying suboptimal mental health (Fig. 2).

Multivariable Model

A multivariable model for the outcome of having any deficit included sex, age, race, education, cancer type (breast vs. other), and treatment stage as covariates. This model showed that increasing age ($p = .005$) and being in active treatment, ($p = .01$), which included chemotherapy, radiation, and other forms of cancer-directed therapy excluding endocrine therapy, were significantly associated with having a deficit. The odds ratio for each 5-year increase in age was 1.2 (95% CI: 1.06–1.38), suggesting that as age increases, so do the odds of having at least 1 deficit. The odds ratio for active treatment compared with pretreatment was 1.7 (95% CI: 1.13–2.64), suggesting that patients receiving active treatment were more likely to have at least 1 GA-identifiable deficit compared with patients who had not yet begun treatment.

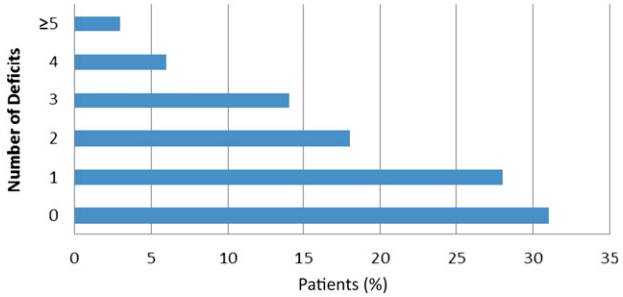

Figure 3. Karnofsky performance status ≥80, number of geriatric assessment-identified deficits.

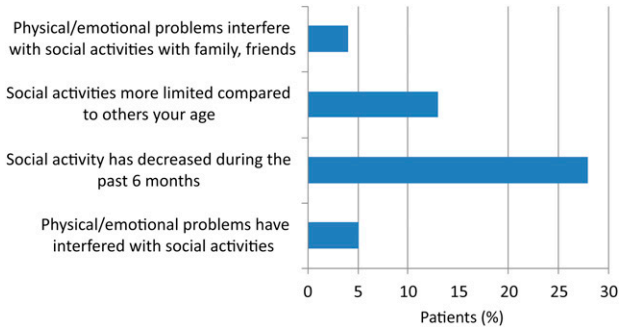

Figure 4. Karnofsky performance status ≥80, social activity limitations.

Discussion

This study analyzed KPS, Patient-KPS, and other GA variables within a sample of older cancer patients. The primary aim was to investigate the frequency of deficits in GA measures for patients with normal function performance status ratings of ≥80 on both the KPS and the Patient-KPS. Major impairments detected through GA in this group could affect treatment tolerance, outcomes, and health care utilization. Potentially modifiable deficits should be addressed through interventions because previous studies have shown that such impairments, including a high number of comorbidities, deficiencies in IADLs, and polypharmacy, can complicate cancer treatment and/or worsen during cancer therapy [50–52]. Examples of interventions include medication review in the event of excessive polypharmacy and physical or occupational therapy in the event of a recent history of falls.

In our sample of older cancer patients, a high proportion (81%) were both professionally and patient-rated as functionally normal (KPS ≥80). We focused our analyses on this subset because patients with high KPS scores are less likely to be queried by health care professionals about functional deficits that might affect goals of care, treatment selection, clinical trial participation, treatment tolerance, and treatment outcomes. We found major deficiencies in these patients, including high proportions of patients taking nine or more medications daily or having four or more comorbidities. Comorbidity is independent from functional status in older adults, and the particular comorbidity matters greatly in treatment decisions and overall prognosis for different types of cancer [50, 53–55]. In addition, 1

in 5 of our patients required ≥14 seconds to complete the TUG test or was unable to complete the test. Higher TUG scores are associated with higher risk for postoperative complications among older cancer patients and higher risk of death among older cancer patients receiving first-line chemotherapy [46].

We found that patients who completed the assessment during active treatment were more likely to report at least one functional deficit. This finding may reflect the observation that cancer therapies themselves can cause toxicities that may contribute to functional impairments in older cancer patients. Taxane-based chemotherapy, for example, can precipitate or worsen pre-existing peripheral neuropathy and result in gait impairment and falls. Cancer treatments may also exacerbate pre-existing medical conditions such as diabetes, leading to poorer overall outcomes [56]. These findings suggest that clinicians should evaluate and pay close attention to functional deficits in older cancer patients, especially during active treatment.

Our finding that GA provides important information on functional and other deficits beyond KPS and Patient-KPS is supported by prior studies [8, 57]. Our study is novel in that it focused exclusively on older cancer patients (aged ≥65 years) who were rated as high functioning, whereas other studies have focused largely on patients with advanced cancer. Our study underscores the importance of GA for older patients, even when they are rated as functionally normal with less sensitive measures such as KPS, because many have deficits that can be ameliorated by specific interventions or by tailoring treatment to lower the risk of further functional decline. Our findings both corroborate prior studies and contribute new insights regarding the importance of conducting GAs for all older cancer patients, even among those who appear functionally normal.

Our study has some limitations. We did not collect data on cancer patients who chose not to participate in the Carolina Senior registry (34% of the 1,830 patients who were approached declined to participate), so we were not able to investigate the potential for self-selection bias by comparing descriptive characteristics of participants and nonparticipants. Furthermore, the large proportion of breast cancer patients in our sample (54%) may limit the applicability of our findings to the general population of cancer patients in which breast cancer is less prevalent. This limitation does not diminish our overall message that GA is feasible in busy oncology clinics and has great value for identifying deficits in KPS-normal cancer patients. We did not collect information on the type of treatment planned, under way, or completed, although that information would have enhanced our investigation. A final limitation is that we collected data using the MHI-17, which has a "past two weeks" time frame, but we analyzed only the MHI-5 items [40, 48], which have a "past month" time frame, because we could find empirically justified cut points for the MHI-5 but not for the MHI-17.

Conclusion

The brief GA has been shown to be feasible within the time and personnel constraints of busy oncology clinics [5, 30] and can provide important additional prognostic information, even when KPS and Patient-KPS indicate functional normality. Only a third of our functionally normal sample had no GA-identified deficits. Among the 28% that had just one GA-identified deficit, that single deficit could have had important prognostic implications, such as TUG score ≥14 or ≥5% unintentional weight loss. Furthermore, the identification of potentially modifiable deficits provides an opportunity to refer patients to an allied health care professional or to occupational therapy (for ADL or IADL deficits), physical therapy (for falls, balance, gait, muscle strength), dieticians, social workers, or psychiatric services. Next steps are to investigate implementation of the brief GA in a variety of clinic settings (university and community-based clinics) and to evaluate how GA findings provided to oncologists can affect their treatment decisions and patient outcomes.

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Disclosures

The authors indicated no financial relationships.

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