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Supportive Care

Limitation in Patient-Reported Function Is Associated with Inferior Survival in Older Adults Undergoing Autologous Hematopoietic Cell Transplantation



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Although the use of geriatric assessment (GA) in the allogeneic hematopoietic cell transplantation (HCT) setting has been reported, few studies have evaluated the impact of patient-reported function on autologous HCT (autoHCT) outcomes. In this study, GA, including the administration of Functional Assessment of Cancer Therapy–Bone Marrow Transplant (FACT-BMT) quality of life tool, was performed in 184 patients age ≥ 50 years (median age, 61 years; range, 50 to 75 years) before autoHCT. Associations among GA findings, quality of life metrics, and post-transplantation outcomes were evaluated using Cox regression. Indications for autoHCT included multiple myeloma (73%), non-Hodgkin lymphoma (20%), and other disorders (7%). The median progression-free survival (PFS) was 28 months, whereas the median overall survival (OS) was not reached. In unadjusted analysis, both PFS and OS were significantly associated with 5 GA components: limitation in instrumental activities of daily living, patient-reported Karnofsky Performance Status (KPS), and the Physical, Functional, and BMT subscale scores of the FACT-BMT. In multivariate analysis, 3 components—limitation in instrumental activities of daily living, patient-reported KPS, and FACT-BMT Physical subscale—remained predictive of both PFS and OS when adjusted for age, provider-reported KPS, disease status, and HCT comorbidity index. In older adults undergoing autoHCT, limitation in any 1 of 3 patient-reported measures of functional status was independently associated with inferior PFS and OS, even after adjusting for known prognostic factors.

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INTRODUCTION

Hematologic malignancies are more common in older adults, yet the use of hematopoietic cell transplantation (HCT) has historically been limited by patient age [1]. In the absence of guidelines, candidacy selection for HCT has relied largely on age, comorbidities, and performance status, a subjective assessment. Patient-reported measures, particularly patient-reported functional status, may provide additional predictive or prognostic information, but the optimal means of assessing this construct in older adults with hematologic malignancies is unknown.

The use of geriatric assessment (GA) to better characterize patient health status in the pre-allogeneic HCT setting has

been reported previously [2–5]. GA is a battery of assessments encompassing domains of function, cognition, medical comorbidities, mental health, nutrition, and polypharmacy aimed at uncovering vulnerabilities present in elderly patients. Studies have shown that GA captures geriatric syndromes missed by physician evaluation [6], and that a substantial number of patients deemed fit for HCT with preserved performance scores as measured by Karnofsky Performance Status (KPS) or the Eastern Cooperative Oncology Group scores have limitations in activities of daily living (ADL) or instrumental activities of daily living (IADL) [7] discernable on GA.

Few studies have evaluated the impact of patient-reported function on autologous HCT (autoHCT) outcomes [6,8,9]. In a report of 39 older patients with newly diagnosed multiple myeloma who were evaluated for autoHCT, geriatric syndromes were prevalent, and some GA components were associated with physician's determination of transplantation fitness [6]. In another study [8], 55 patients with multiple myeloma underwent GA before autoHCT. Physical function was

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predictive of hospital length of stay, both by objective and patient-reported metrics. However, it remains unclear to what degree pretransplantation GA is associated with post-transplantation outcomes independent of performance status assessments and comorbidities.

In this study, we aimed to investigate the ability of a well-validated GA to predict post-transplantation toxicity (as measured by nonhematologic serious adverse events, duration of hospitalization, and rate of rehospitalization) as well as progression-free survival (PFS) and overall survival (OS). In addition to the GA instrument, we used the FACT-BMT assessment, a patient-reported quality of life (QOL) tool. By adjusting for traditional clinical prognostic factors such as performance status and comorbidities, we aimed to analyze whether GA provides an additive benefit in prognostication.

METHODS

Patient Population and Study Design

Patients preparing to undergo autoHCT at the University of California San Francisco (UCSF) were eligible for this study. The suitability of each patient to undergo autoHCT for a malignant hematologic disorder was determined by the patient's physician. Other inclusion criteria for this study included age ≥ 50 years and fluency in written English, because validated survey tools were unavailable in other languages. All patients provided written consent. Subjects completed a baseline GA/QOL instrument before autoHCT. The HCT comorbidity index (HCT-CI [10]), baseline disease characteristics, and data on clinical outcomes were collected prospectively from the electronic medical record. Grade 3 or higher nonhematologic adverse events and adverse events resulting in hospitalization were considered serious adverse events (SAEs; Common Terminology Criteria for Adverse Events version 4.03) and were collected up to 100 days after transplantation or up to the time of death if sooner. GA/QOL results were not provided to the patient's treating physician, with the exception of a cognitive domain score indicative of gross cognitive impairment. This study was approved by UCSF's Institutional Review Board.

GA/QOL Assessment

This study used a cancer-specific GA [11], which has been previously validated in patients with solid tumors [12], with only minor modifications (Table 1). Five items were completed by trained research staff, and the remainder of the assessment was self-administered by patients. The Functional Assessment of Cancer Therapy Bone Marrow Transplant (FACT-BMT) [13] survey, a 47-item measure of 5 domains of QOL in HCT recipients encompassing 4 subscales (physical, social, emotional, and functional well-being), as well as a BMT-specific subscale, was also administered.

Statistical Analysis

Continuous variables were summarized by mean, median, and range, as appropriate, and were compared using the Wilcoxon rank-sum test. Binary outcomes were summarized by proportion and binomial exact confidence interval (CI) and compared using Fisher's exact tests. Associations between continuous variables were evaluated using Spearman's correlation coefficient (ρ). Cohen's κ was used to measure the agreement between patient- and provider-reported KPS. PFS was defined as the time from transplantation to disease progression or death from any cause, and OS was defined as the time

from transplantation to death from any cause. For OS and PFS, the median survival time and the event-free probabilities at selected time points were estimated using a Kaplan-Meier curve, with 95% CI calculated using the Brookmeyer-Crowley method and Greenwood method, respectively. OS and PFS were compared between subgroups using log-rank tests. Unadjusted and adjusted covariate effects on post-transplantation clinical outcomes were evaluated using logistic, linear, Poisson, and Cox regressions, as appropriate. All P values were 2-sided and were not adjusted for multiple comparisons. $P < .05$ was considered statistically significant. Statistical analyses were performed using R version 3.4.4 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Between October 2011 and April 2016, 184 patients provided consent, completed the pretransplantation GA, and underwent autoHCT. The median patient age was 61 years (range, 50 to 75 years). The median number of days between completion of the GA and autoHCT was 21 days (interquartile range [IQR], 4 to 41 days). Indications for autoHCT included multiple myeloma (73%), non-Hodgkin lymphoma (20%), and other disorders (7%). All conditioning regimens were chemotherapy-based and did not contain total body radiation (TBI). Baseline patient and disease characteristics are displayed in Table 2.

Pretransplantation GA Results

Baseline GA findings are summarized in Table 3. A significant proportion of this population already deemed fit for autoHCT had quantifiable limitations in function. Forty-nine patients (27%) self-reported a KPS < 80 , while only 21 patients (12%) had a provider-reported KPS < 80 . Patient- and provider-reported KPS had only weak agreement (Cohen's $\kappa = .18$) and moderate correlation (Spearman's $\rho = .51$; $P < .001$). Impairment in IADL was reported by 66 patients (36%), and 162 patients (89%) reported impairment in the Medical Outcomes Study (MOS) Physical Health scale. Both patient- and provider-reported KPS were significantly associated with IADL score ($\rho = .62$ and $.4$, respectively; $P < .001$ for both). Patients in first complete remission or first partial remission at the time of transplantation had similar rates of IADL deficits as those who were more heavily pretreated (40% versus 35%; $P = .59$). The Timed Up and Go test score was ≥ 13.5 seconds, a threshold associated with increased risk of falling, in 27 patients (15%).

The median age of patients with any IADL restriction and those without IADL restriction did not differ significantly (59.9 years versus 61.9 years; $P = .07$, Wilcoxon rank-sum test), and age did not correlate with the number of IADL deficits ($\rho = -.14$; $P = .07$) or IADL total score ($\rho = .14$; $P = .07$). Age also did not significantly correlate with provider-reported KPS

Table 1
Components of the GA

Domain	Measures	No. of Items	Score Range
Functional status	MOS Physical Health scale [16]	10	0-100; higher scores indicate better function
	IADL [17]	7	0-100; higher scores indicate better function
	KPS, physician-reported [18]	1*	0-100; higher scores indicate better function
	KPS, patient-reported [19]	1	30-100; higher scores indicate better function
	TUG test [20]	1*	
	Number of falls in last 6 mo [21]	1	
Comorbidity	Physical Health subscale of OARS [22]	48	
Cognition	BOMC [23]	6*	0-28; higher scores indicate greater impairment
Nutrition	Body mass index [24]	1*	
	Percent unintentional weight loss in last 6 mo [24]	1*	
Psychologic	MHI-5 [25]	5	0-100; higher scores indicate better mental health
Social	MOS Social Support Survey [26]	12	0-100; higher scores indicate better social support

TUG indicates Timed Up and Go; OARS, Older Americans Resources and Services; BOMC, Blessed Orientation-Memory-Concentration test; MHI-5, Mental Health Inventory-5.

* Administered by trained research staff.

Table 2
Baseline Patient and Disease Characteristics

Characteristic	N (%)
Number of patients	184 (100)
Age group, yr	
50–59	78 (42)
60–69	92 (50)
≥70	14 (8)
Sex	
Male	124 (67)
Female	60 (33)
Primary disease	
AML	5 (2.7)
ALL	1 (.5)
NHL	36 (19.6)
Hodgkin lymphoma	3 (1.6)
Myeloma	134 (72.8)
Amyloid	5 (2.7)
Disease status	
CR1, PR1	139 (76)
All others	45 (24)
CIBMTR risk status	
Low	136 (74)
Intermediate	18 (10)
High	20 (11)
Other/unknown	10 (5)
Conditioning regimen	
Single-agent melphalan	139 (76)
All other	45 (24)

AML indicates acute myelogenous leukemia; ALL, acute lymphoblastic leukemia; NHL, non-Hodgkin lymphoma; CR1, first complete remission; PR1, first partial remission; CIBMTR, Center for International Blood and Marrow Transplant Research.

($\rho = .03$; $P = .73$) and only weakly correlated with patient-reported KPS ($\rho = .15$; $P = .05$).

Mental Health Inventory-5 scores indicating clinical anxiety or depression were reported by 65 patients (35%). The 2 instruments used in this study to evaluate psychological status—Mental Health Inventory-5 and the FACT-BMT emotional well-being subscale—were found to be moderately correlated ($\rho = .54$; $P < .001$).

Post-Transplantation Clinical Outcomes

The median number of nonhematologic SAEs observed during the first 100 days post-transplantation was 0 (range, 0 to 7). The median duration of hospitalization, including

conditioning chemotherapy, was 18 days (range, 0 to 68 days). Fifteen patients (8%) had 1 readmission, and 4 patients (2%) had 2 readmissions within the first 100 days post-transplantation; thus, readmissions were analyzed as a categorical variable (any versus no readmissions). The median duration of follow-up for OS was 23 months (range, .5 to 62 months). Thirty-one patients died during follow-up, including 2 without disease relapse and 29 after disease relapse. Given this low rate of death before relapse, further analysis of nonrelapse mortality was not pursued. The median PFS was 28 months (95% CI, 24.9 to 38.6 months), with 58% of patients (95% CI, 50% to 66%) alive and progression-free at 2 years. The median OS was not reached, with 87% (95% CI, 82% to 93%) alive at 2 years.

Univariate Analysis of Pretreatment Characteristics

The effect of each GA/QOL metric on multiple clinical outcomes post-transplantation was analyzed. All results with $P \leq .05$ are displayed in Table 4.

The strongest predictors of short-term toxicities—number of non-hematologic SAEs and number of readmissions in the first 100 days post-transplantation, as well as duration of hospitalization for transplantation—were traditional clinical variables and not GA/QOL metrics. The only GA parameter significantly associated with short-term toxicity was cognition, as measured by the Blessed Orientation-Memory-Concentration test. Worse cognition pretransplantation was significantly associated with an increased number of SAEs (incident rate ratio, 1.08; $P = .01$) and increased probability of readmission in the first 100 days (odds ratio, 1.16; $P = .02$). The MOS Physical Health scale limitation and FACT-BMT Physical subscale score were of only borderline significance in association with readmission post-transplantation.

IADL limitation was strongly associated with decreased PFS and OS. This association remained significant when IADL was analyzed as a binary variable (any limitation versus none; hazard ratio [HR], 1.94 for PFS and 2.99 for OS; $P < .01$ for both) and as a continuous variable (HR, 1.02 for PFS and 1.04 for OS; $P < .01$ for both) (Figure 1). In contrast, the MOS Physical Health scale was of only borderline significance in association with PFS whether binary or continuous (HR, 3.16 and 1.01, respectively; $P = .05$ for both). The MOS Physical Health scale score was associated with OS (HR, 1.02; $P = .02$). Other GA variables in addition to IADL that were significantly associated

Table 3
Results of Pretransplantation GA and FACT-BMT

Parameter	Median (Range)	Impairment Threshold	Patients Impaired, n (%)
MOS Physical Health scale	75 (0–100)	<100	162 (89)
IADL	100 (35.7–100)	<100	66 (36)
KPS, physician-reported	90 (40–100)	<80	21 (1)
KPS, patient-reported	90 (50–100)	<80	49 (27)
TUG test, s	9.8 (5–26)	≥13.5	27 (15)
Falls	0 (0–5)	≥1	38 (21)
HCT-CI	2 (0–8)	≥3	61 (33)
Cognition (BOMC)	2 (0–18)	≥11	6 (3)
Body mass index	26.4 (16–56.6)	<18.5	2 (1)
		≥30	36 (20)
6-mo % weight change	-.1 (-18.5 to 20.5)		
MHI-5	80 (20–100)	<76 [27]	65 (35)
MOS Social Support Survey	95 (8.3–100)	None established	
FACT-BMT		None established	
Physical	22 (5–28)		
Social	24 (2.8–28)		
Emotional	19 (2–24)		
Functional	18 (3–28)		
BMT	28.9 (9–40)		

Table 4
Univariate Regression Analysis of Pretreatment Characteristics on Post-Transplantation Clinical Outcomes, with $P \leq .05$

Outcome	Pretreatment Characteristics	IRR/Coefficient/OR/ HR (95% CI)	P Value
Number of SAEs within 100 days*		IRR	
	Cognitive impairment (BOMC)	1.08 (1.02-1.14)	.01
	Female sex	1.58 (1.04-2.39)	.03
	Higher HCT-CI score	1.14 (1.03-1.26)	.02
	Not in CR1/PR1 at transplantation	2.00 (1.32-3.03)	<.01
Increase in duration of hospitalization (in days)		Coefficient	
	Lower provider-reported KPS (per decile)	1.15 (.14-2.17)	.03
	Female	2.38 (.02-4.74)	.05
	Higher HCT-CI score	1.06 (.47-1.66)	<.01
	Not in CR1/PR1 at transplantation	4.39 (1.86-6.91)	<.01
Readmissions (yes/no)		OR	
	Non-myeloma	6.58 (4.25-8.90)	<.01
	MOS Physical Health score decrease	1.02 (1.00-1.03)	.05
	FACT-BMT Physical score decrease	1.08 (1.00-1.16)	.05
	Cognitive impairment (BOMC)	1.16 (1.02-1.32)	.02
PFS		HR	
	IADL, any limitation	1.94 (1.25-2.99)	<.01
	IADL score decrease	1.02 (1.01-1.04)	<.01
	MOS Physical Health, any limitation	3.16 (1.00-10.00)	.05
	MOS Physical Health score decrease	1.01 (1.00-1.02)	.05
	Lower patient-reported KPS (per decile)	1.25 (1.08-1.45)	<.01
	Lower provider-reported KPS (per decile)	1.30 (1.08-1.56)	.01
	FACT-BMT score decrease		
	Physical	1.06 (1.02-1.10)	<.01
	Functional	1.05 (1.01-1.09)	.02
	BMT	1.04 (1.01-1.08)	.02
	Not in CR1/PR1 at transplantation	2.63 (1.69-4.17)	<.01
	OS		HR
IADL, any limitation		2.99 (1.45-6.18)	<.01
IADL score decrease		1.04 (1.02-1.06)	<.01
MOS Physical Health score decrease		1.02 (1.00-1.03)	.02
Lower patient-reported KPS (per decile)		1.45 (1.12-1.85)	<.01
Lower provider-reported KPS (per decile)		1.52 (1.18-1.96)	<.01
FACT-BMT score decrease			
Physical		1.10 (1.04-1.15)	<.01
Functional		1.10 (1.02-1.16)	.01
BMT		1.08 (1.02-1.14)	.01
Not in CR1/PR1 at transplantation	3.45 (1.67-7.14)	<.01	

IRR indicates incidence rate ratio; OR, odds ratio.

The table shows the IRR of SAEs within 100 days after transplantation, with SAEs analyzed as count data and Poisson regression applied. For continuous variables, statistics listed are for each 1 unit change in the predictor unless specified otherwise. The analysis excludes 1 patient who was lost to follow-up before day +100.

with both PFS and OS included patient-reported KPS and FACT-BMT Physical, Functional, and BMT subscales (Table 4). This analysis was repeated in the disease-specific subset of patients

with multiple myeloma and amyloidosis (n = 139), and all 5 GA measures remained predictive of both PFS and OS (data not shown).

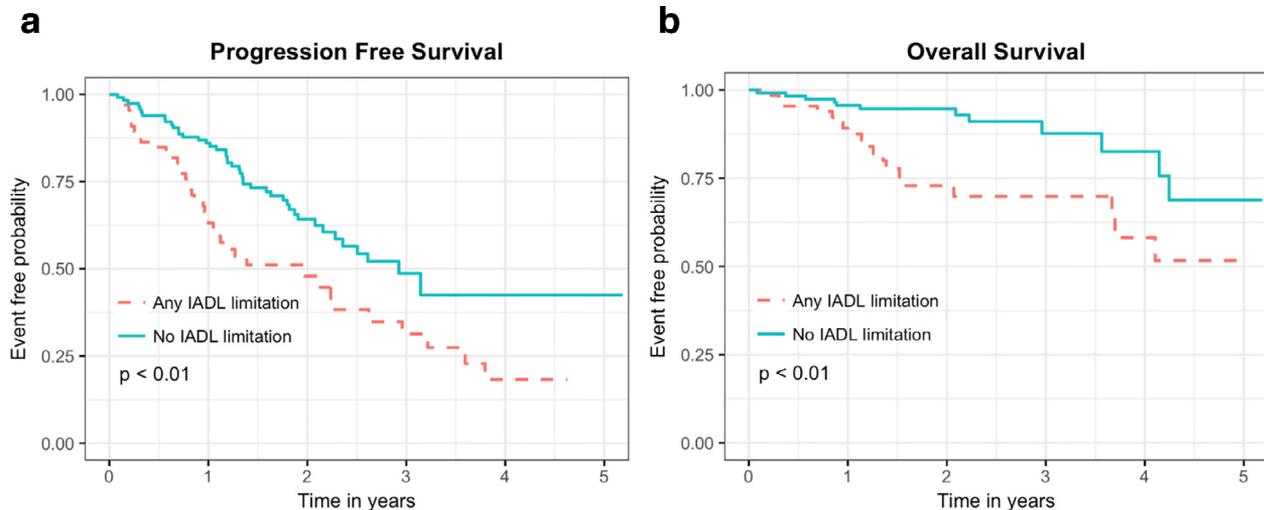


Figure 1. PFS (A) and OS (B) by the presence of limitations in IADL.

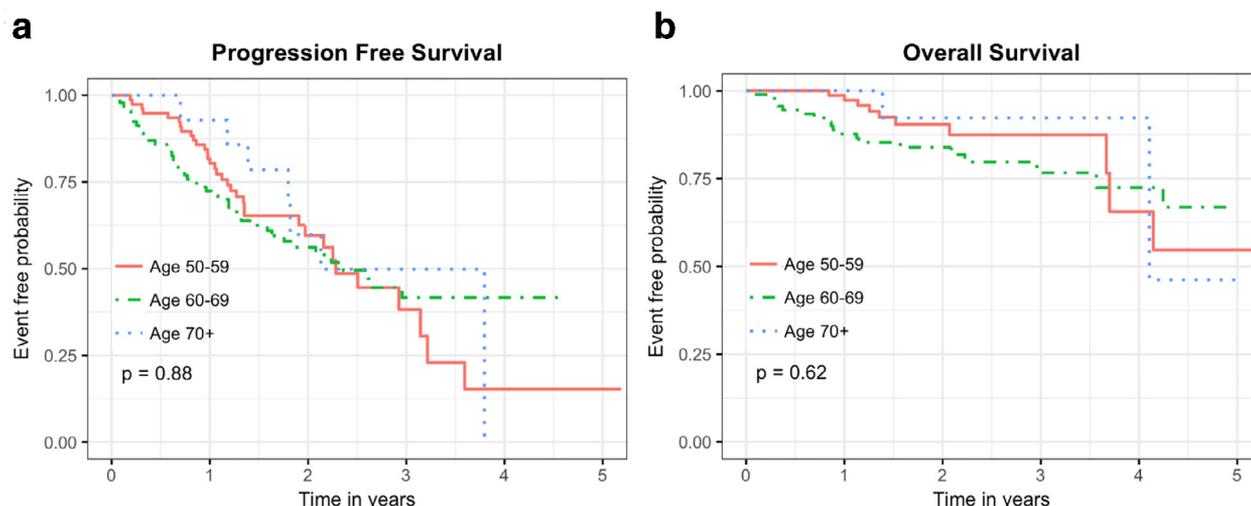


Figure 2. PFS (A) and OS (B) by age category.

Notably, age was not associated with any post-transplantation outcome, whether analyzed as a continuous variable or stratified into binary (50 to 59 years versus 60+ years) or ternary (50 to 59 years versus 60 to 69 years versus 70+ years) categories (Figure 2).

Higher HCT-CI score did not correlate with PFS and was of borderline statistical significance in predicting OS (HR, 1.2; $P = .06$). However, higher HCT-CI score was significantly associated with longer duration of hospitalization (difference, 1.06; $P < .01$) and a greater number of nonhematologic SAEs within 100 days of transplantation (HR, 1.14; $P = .02$).

Multivariate Analysis for PFS and OS

Each GA/QOL component identified as statistically significant in univariate analyses was adjusted for 4 traditionally used prognostic factors: age, provider-reported KPS, disease status at transplantation (first complete remission, first partial remission versus others), and HCT-CI score. Three GA/QOL metrics—IADL independence, patient-reported KPS, and FACT-BMT Physical subscale score—remained significantly predictive of both PFS and OS (Table 5), with the exception of patient-reported KPS with regard to OS, which was borderline significant (HR, 1.35; 95% CI, .99 to 1.82; $P = .06$). Of note, when these 3 components were placed in a multivariate model together, none of them retained significance, reflecting their strong statistical correlation with one another ($\rho = .51$ to $.7$ for each pair; each $P < .001$).

DISCUSSION

Although the use of GA in the HCT setting is being increasingly reported in the allogeneic HCT literature [2–5], few

studies have focused on autoHCT [6,8,9]. To our knowledge, this study represents the largest sample of older autoHCT recipients with baseline GA correlated with post-transplantation outcomes.

In a study of patients with multiple myeloma undergoing autoHCT in which a different GA instrument was used, physical function was most predictive of hospital length of stay, both by self-report and by objective testing [8]. In our study, length of stay was most strongly associated with traditional clinical variables, such as being in first remission and having few comorbidities; no GA/QOL variables were predictive of this outcome. This difference may arise from the different instruments used to assess physical function, or from differences in patient populations. Our study results do mirror those reported in the allogeneic HCT setting, in that we identify significant functional deficits in a population of patients deemed “fit” for transplantation [2–4,7] and demonstrate the prognostic utility of IADL limitation [5]. Our results also echo previous findings of the importance of IADL in elderly patients with multiple myeloma unfit for transplantation [14].

In multivariate analysis of PFS and OS, 3 GA/QOL variables were predictive of these outcomes independent of traditional prognostic factors: any IADL limitation, patient-reported KPS, and FACT-BMT Physical subscale. These 3 GA/QOL variables were no longer significantly prognostic when adjusted for one another and, as expected, were statistically significantly correlated with one another. This suggests that these 3 variables may be different measures of the same underlying conceptual domain, namely patient-reported functional status. It is worth noting that the FACT-BMT Functional subscale, which was not independently predictive of post-transplantation outcomes, contains questions regarding quality of life, quality of sleep, and enjoyment of life. In contrast, the FACT-BMT Physical subscale contains questions regarding energy level, time spent in bed, and ability to meet needs of family in light of one's physical condition—questions that capture functional impairment more similarly to IADL and KPS.

Our findings suggest that the measurement of patient-reported functional status can add prognostic information beyond traditional clinical variables, including provider-reported KPS. Any of 3 metrics—IADL, patient-reported KPS, and FACT-BMT Physical subscale—appear likely to be sufficient. The choice of metric might vary from one study or population to the next; obvious advantages and disadvantages of the

Table 5
Multivariate Analysis of Pretreatment Characteristics on PFS and OS

Parameter	PFS, HR (95% CI); P Value	OS, HR (95% CI); P Value
Any IADL limitation	1.76 (1.08–2.88); .02	2.68 (1.16–6.17); .02
Inferior patient-reported KPS (per decile)	1.28 (1.05–1.56); .01	1.35 (.99–1.82); .06
Inferior FACT Physical score	1.05 (1.01–1.09); .02	1.08 (1.01–1.15); .03
Inferior FACT Functional score	1.04 (.99–1.09); .11	1.06 (.99–1.15); .11
Inferior FACT BMT score	1.03 (.99–1.08); .17	1.04 (.97–1.11); .22

Multivariate models are adjusted for age, provider-reported KPS, disease status at autoHCT (CR1, PR1 versus other), HCT-CI. Statistics for FACT scores are reported per 1 unit decrease in score.

instruments relative to one another include brevity, descriptiveness, and susceptibility to language barriers. Patient-reported KPS may be the simplest metric of the 3 and thus may have the biggest impact, although IADL offers more information about types of functional impairments. A larger confirmatory study could evaluate these 3 metrics to validate our findings or determine which is most predictive in the autoHCT setting. Future studies should also investigate the impact of guided interventions targeting baseline impairments in patient-reported function on post-transplantation outcomes.

The particular value added by having the patient report his or her own functional status is highlighted by comparing patient-reported KPS with provider-reported KPS. In our study, these measures were rarely in agreement and were only moderately correlated ($\rho = .51$). Although both measures were similarly predictive of both PFS and OS in univariate analysis, when they were placed together into the multivariate model, patient-reported KPS retained an independent predictive ability even when adjusted for provider-reported KPS.

It is unclear from this study why IADL and other patient-reported functional status measures are associated with PFS. Because only 2 deaths occurred before relapse in this cohort, the vast majority of PFS events were disease relapse. The mechanism underlying this association cannot be elucidated from this study, but possibilities include (1) patients with more aggressive underlying disease may have been treated more aggressively before transplantation, resulting in both inferior functional status and an increased risk of relapse; (2) patients with increased functional deficits at baseline may have been relatively undertreated either before or after transplantation, resulting in increased risk of relapse; and (3) there may be unknown tumor-host interactions such that the physiological correlates of frailty may affect tumor biology, possibly through tumor microenvironment changes, inflammation, or modulation of the immune system.

Our study has some limitations. It is a single-institution study with a relatively small and heterogeneous sample. There were small numbers of survival and other outcome events, limiting our statistical power for more extensive multivariate analysis including multiple GA components. Findings will require validation in a separate dataset for confirmation. Patients in this study were not enrolled consecutively; 246 additional patients age ≥ 50 years underwent autoHCT at our institution during the study period. These patients were not consented owing to inadequate staffing and funding resources, which should not be expected to bias results; nonetheless, we cannot rule out unanticipated bias. Inclusion of subjects age ≥ 50 yielded a median age of 61 years, which is younger than what is traditionally considered geriatric. SAE collection was based on review of the electronic medical record, and we cannot rule out the possibility that some clinically significant adverse events were not captured in documentation. Our GA included a patient-reported instrument to assess for polypharmacy; however, owing to considerable variability in the medications reported (eg. inclusion or exclusion of over-the-counter medications) and in patients' accuracy of reporting, these data ultimately were not used in our analyses, thereby omitting an important GA domain. Post-transplantation GA/QOL data were collected but will be reported separately, to explore how GA/QOL metrics change over time in this population.

A striking finding in this study is the lack of association of age with any post-transplantation outcome. The mean age of patients with and without IADL limitation also did not differ significantly, reflecting the fact that older patients were more

selectively screened for transplantation than younger patients. However, despite this selection, older adults might still be expected to have inferior outcomes. The lack of association between age and post-transplantation outcomes in those who were ultimately selected supports the use of functional and performance status metrics, rather than simply chronologic age, in determining eligibility for transplantation.

Our findings, once validated, suggest that measurement of patient-reported function should be incorporated into routine clinical care. Moreover, geriatrics referral or guided interventions to improve functional status in older autoHCT recipients should not be guided merely by age. Future studies of intensification of physical and occupational rehabilitation could be targeted at patients with baseline impairments in IADL or other functional deficits, with a goal of improving survival outcomes. Our study adds to the growing body of literature demonstrating the prognostic value of patient-reported outcomes and QOL metrics in HCT populations [15], because these metrics add information to, and in some cases perform better than, provider-reported performance status and other traditional prognostic variables.

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