



Research Article

Evaluation of the G8 Screening Tool in Older Patients with Cancer: A Retrospective Analysis

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Key Summary Points

Aim: The aims of this study were to evaluate the results of the Geriatric 8 (G8) screening in patients aged 75 years and over. Findings: Of 2,294 patients screened, 177 were ≥ 75 years. 120 patients (68%) were vulnerable as defined by a G8 score ≤ 14 . Vulnerable patients showed worse outcomes than fit patients did. In binary logistic regression modeling, the G8 domains of nutritional intake and health status were predictive of hospitalization and of death, when controlling for all other variables. **Message:** The G8 screening is applicable and can discriminate between fit and vulnerable patients in oncology. Prospective use in treatment decisions might improve care for geriatric cancer patients.

Abstract

Purpose: To evaluate the results of the Geriatric 8 (G8) screening in patients aged 75 years and over. **Methods:** In this retrospective single-center study, we screened the medical records of 2294 patients referred to the Department for Medical Oncology in St. Gallen, a tertiary hospital in Switzerland, over a period of 29 days. For each patient aged 75 and older, the responsible oncologist completed the G8 questionnaire. The cohort was followed to obtain data on patient outcomes for the 4 months following the completion of the G8 assessment. Patients' charts were reviewed following a standardized approach. Information regarding given anticancer treatment, anticancer toxicity, date and reason for inpatient admission, date of inpatient discharge, and date of death was documented. Data were analyzed using the χ^2 test and binary logistic regression. **Results:** Of 2,294 patients screened, 177 were ≥ 75 years. 176 G8 assessments were completed on patients with various tumor types. 152 (86%) were outpatients and 112 (64%) males. Mean age was 79.9 years (SD 4.3). 120 patients (68%) were vulnerable as defined by a G8 score ≤ 14 . Vulnerable patients showed worse outcomes than fit patients did. In binary logistic regression modeling, the G8 domains of nutritional intake and health status were predictive of hospitalization and of death, when controlling for all other variables. **Conclusion:** The G8 screening is applicable and can discriminate between fit and vulnerable patients in oncology. Prospective use in treatment decisions might improve care for geriatric cancer patients.

Keywords: Geriatric assessment; Clinical oncology; Palliative medicine; Hospitalization; Death

Introduction

As the worldwide population ages, clinicians are often required to make difficult and complex decisions regarding the treatment of older people (aged 65 years and older) with cancer [1]. Therefore, the National Academy of Medicine (formally the Institute of Medicine), the American Society of Clinical Oncology (ASCO), the Cancer and Aging Research Group and the International Society of Geriatric Oncology (SIOG), have all called for improved care delivery that attends to aging-related conditions of older adults with cancer [2].

However, chronological age alone is often a poor indicator of the physiological and functional status of older adults, and thus should not be the main factor guiding treatment decisions in oncology [1]. By contrast, a geriatric assessment can provide a more comprehensive understanding of the functional and physiological age of an older person with cancer and it is also useful to understand which patients are at increased risk of hospitalization and mortality [3]. The geriatric assessment of older patients with cancer is usually based on use of a screening tool (such as G8) followed by comprehensive geriatric assessment (CGA). Although the SIOG [4] recommended the widespread use of the CGA as the gold standard for defining the presence and or the degree of frailty in older patients with cancer, it is time-consuming and many oncology teams cannot implement geriatric oncology management due to non-availability of geriatricians and the increasing number of older patients with cancer [5].

The current challenge lies within using the available resources well and developing care pathways to implement geriatric assessment in an efficient and effective way, especially outside specialized academic settings [2,6-8]. The objectives of this study were to assess a feasible [9] and effective G8 screening into standard practice [10] estimating the prevalence of vulnerable geriatric oncology patients over 65 years and to examine the relationship between a low G8 score and hospitalization, anticancer treatment toxicity, and death.

Material and Methods

Patient population and ethics procedures

This retrospective cohort study was conducted at the Department for Medical Oncology in St. Gallen, a tertiary hospital in Switzerland. The Ethics Commission of Eastern Switzerland approved the study on 18 May 2021 (ref: EKOS-21/078) and the study was performed according to the 1964 Declaration of Helsinki [11]. No consent from individual patients was required as the data were analyzed anonymously. Overall, the final treatment strategy was decided based on the patient's Eastern Cooperative Oncology

Group (ECOG) score, age and status of organ function, regardless of the G8 score.

Screening

Over a period of 29 days, from 15 August 2016 to 12 September 2016, the medical records of 2294 patients referred to our department were reviewed. Patients aged 75 and older were included in the analysis. Patients with a missing G8 score were excluded. All of these patients were screened for eligibility to participate in this study based on the presence of the inclusion criterion in their medical records. Inclusion criterion was patient age 75 and older with no upper limit. Those with the age younger than 75 (n=1882) and duplicates (n=235) were excluded. Finally, clinical data collection was incomplete for one patient. Thus, 176 patients were evaluated in the study (Figure 1).

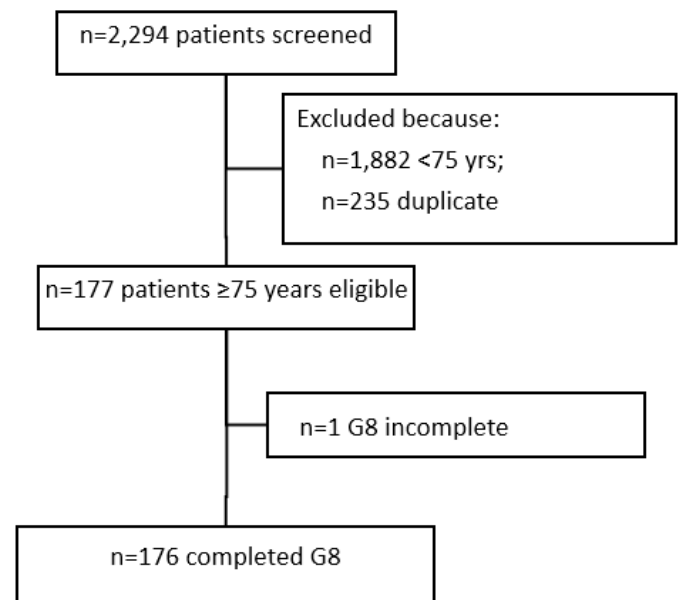


Figure 1: Screening of 176 patients.

G8 assessment

For each patient, the responsible oncologist completed the G8 questionnaire [12]. It issues seven items from the Mini Nutritional Assessment, which refer to nutritional status, weight loss, Body Mass Index [BMI], mobility, psychological status, number of prescribed medications (N3 per day), and self-perception of health, the eighth item groups patients into three age categories (<80; 80-85; >85). The total score ranges from 0 (heavily affected) to 17 points (not affected), and a score of ≤ 14 is defined as an impaired G8 score (7). The median duration for the completion of the assessment is reported to be 4 min [13]. G8 has been used as a screening tool for frailty, functional decline and impaired overall survival [14,15].

Data Collection

For the chart review, we followed the instructions from Vassar and colleagues [16], who provided a summary of ten considerations for designing retrospective chart reviews. In detail, data were abstracted from the patient’s medical records by a trained physician (FS) using a standardized, pre-developed paper data abstraction instrument in German, based on the study’s data abstraction procedural guideline which clearly defined the inclusion and exclusion criteria, the variables’ locations in the medical record, variable definitions, and treatment of missing data. Furthermore, the reliability of FS’ scoring was checked by double scoring 20 randomly selected patients for whom a G8 was provided by the responsible physician. Double scoring showing moderate yet sufficient agreement between FS and other physicians on overall G8 score ($\kappa = .500$; $p = .019$).

Outcomes

The primary outcomes are the results of the G8 screening. The secondary outcomes are the information on anticancer treatment, anticancer toxicity, date and reason for inpatient admission, date of inpatient discharge, and date of death.

Follow-Up

The cohort was followed up for four months until 15 January 2017 to obtain data on patient outcomes.

Statistical Analysis

Descriptive statistics were used to describe basic features of the data, continuous data presented as mean \pm standard deviation (SD) if normally distributed and median [interquartile range (IQR)] if distribution was skewed. The association between G8 score and patient characteristics was analyzed by the Fisher’s exact test. Determination of predictive factors for vulnerable patients was performed using binary logistic regression analysis. The comparison of outcomes for fit and vulnerable patients was conducted using χ^2 test. All statistical analyses were performed with Stata IC 12.1 (Statacorp, 4905, Lakeway Drive, College station, Texas, USA).

Results

Patient Characteristics

The study population of older patients with cancer had a mean age of 79.9 ± 4.3 years old (range, 75-94 years) and 64.0% were male. Genitourinary (22%), hematological (22%), thoracic (17%), and gastrointestinal (17%) cancers were most prevalent (Table 1). There were no significant differences for gender or tumor type.

	Frequency	Percent
Treatment mode at assessment		
Outpatient	152	86%
Inpatient	24	14%
Sex		
Female	64	36%
Male	112	64%
Tumor type		
Thoracic	30	17%
Gastrointestinal	30	17%
Ear Nose & Throat	5	3%
Gynecological	5	3%
Genitourinary	38	22%
Hematological	39	22%
Sarcoma	4	2%
Melanoma	10	6%
Other	6	3%
No tumor	6	3%
Multiple tumors	3	2%

Table 1: Demographic and Medical Characteristics of Geriatric Oncology Patients n=176.

G8 Screening Results

120 patients (68%) had an impaired score (≤ 14 points), mean score: 12.2, Standard Deviation (SD) 0.2. In detail, 96% of inpatients and 64% of outpatients had an impaired score ($\chi^2 (1, N=176) = 9.794, p = .002$). All G8 domains were found to be significantly associated with vulnerability in this sample except for the range age 80-85.

Outcomes

Cancer treatment was given at similar rates in vulnerable and non-vulnerable patients. No significant differences were observed in vulnerable and non-vulnerable patients’ experience of anticancer treatment toxicity, according to documentation in patient charts. Within the 4 months follow-up, 28 patients died. Of those, 27 were vulnerable, showing a significant difference between the groups ($\chi^2 (1, N=176) = 12.246, p < .001$). There was also a significant association between vulnerability and hospitalization within 4

months of the initial G8 assessment (χ^2 (1, N=174) = 18.231, $p < .001$), with 60 of the 69 patients who were eventually hospitalized classified as vulnerable. Table 2 provides details on the outcomes for vulnerable and fit patients (Table 2).

G8 Domains	Vulnerable patients		Fit patients		χ^2
	n=120	%	N=56	%	
Normal Nutritional Intake	63	53%	56	100%	$p < .001$
No Weight Loss	48	52%	52	93%	$p < .001$
Goes Outside	99	83%	56	100%	$p = .001$
No Neuropsychological Problems	88	73%	54	96%	$p < .001$
BMI \geq 23	62	53%	52	93%	$p < .001$
\leq 3 Prescription Drugs	22	18%	21	38%	$p = .006$
Better/Same Health Status	45	38%	39	70%	$p < .001$
Age					
<80	53	45%	39	70%	$p = .002$
80-85	40	34%	16	29%	$p = .482$
>80	25	21%	1	2%	$p = .001$
Outcomes Reported in Patient Chart					
Anticancer treatment	77	64%	35	63%	$p = .830$
Toxicity	50	42%	18	33%	$p = .243$
Hospitalization	60	50%	9	16%	$p < .001$
Death	27	23%	1	2%	$p < .001$

Table 2: G8 Domains and Outcomes in Vulnerable vs. Fit Patients.

G8 Items and Their Relationship to Outcomes

The data provided insight into which G8 questions are predictive of hospitalization or of death. Table 3 provides the results of the binary logistic regression for hospitalization. It shows that when controlling for all G8 items, for each point rise in Nutritional Intake score, patients were 26% less likely to be hospitalized ($p = .003$), and for each point rise in Health Status, patients were 47% less likely ($p = .008$) to be hospitalized. Table 4 provides the results of the binary logistic regression for death recorded within 4 months of initial G8 assessment. It shows that when controlling for all G8 items, for each point rise in Nutritional Intake score, patients were 24% less likely to die ($p = .006$), and for each point rise in Health Status, patients were 36% less likely ($p = .021$) to die. Regression models were also fitted for only vulnerable patients, but these models showed no substantial differences to the models presented in Tables 3 and 4.

G8 Item	Regression Coefficient	Standard Error	Odds Ratio	95% Confidence Interval	p-value
Nutritional Intake	-1.34	0.45	0.26	(0.11-0.64)	.003
Weight Loss	0.04	0.20	1.04	(0.71-1.54)	.827
Mobility	-0.01	0.46	0.99	(0.40-2.45)	.977
Neuropsychiatric Problems	0.82	0.46	2.27	(0.92-5.63)	.076
BMI	-0.32	0.21	0.73	(0.48-1.10)	.134

Medication	0.06	0.43	1.07	(0.46-2.48)	.881
Health Status	-0.75	0.28	0.47	(0.27-0.82)	.008
Age	-0.14	0.25	0.87	(0.53-1.43)	.584
Constant	1.78	0.98	5.95		.070

Table 3: Binary Logistic Regression Predicting Hospitalization n=170.

G8 Item	Regression Coefficient	Standard Error	Odds Ratio	95% Confidence Interval	p-value
Nutritional Intake	-1.41	0.51	0.24	(0.09-0.66)	.006
Weight Loss	0.19	0.25	1.21	(0.73-1.99)	.454
Mobility	-0.17	0.49	0.84	(0.32-2.18)	.721
Neuropsychiatric Problems	-0.37	0.49	0.69	(0.26-1.82)	.457
BMI	0.08	0.27	1.08	(0.64-1.82)	.765
Medication	-0.26	0.64	0.77	(0.22-2.71)	.683
Health Status	-1.03	0.45	0.36	(0.15-0.85)	.021
Age	-0.49	0.32	0.61	(0.32-1.15)	.125
Constant	2.16	1.06	8.64		.043

Table 4: Binary Logistic Regression Predicting Death n=172.

Discussion

In this retrospective analysis of older adults with cancer, we assessed the G8 questionnaire in 176 older patients with cancer over one month. We showed that 68% were vulnerable as defined by a G8 score ≤ 14 . Importantly, both fit and vulnerable patients received anticancer treatment on a same level (63% and 64% respectively). Similarly, our data on documented toxicity suggest that no profound overtreatment occurred, given that fit and vulnerable patients experienced anticancer treatment toxicity at relatively similar rates (33% and 42% respectively). These findings are in accordance with previous literature investigating chemotherapy-related toxicity in ageing populations [17-19].

Previously, Takahashi et al. performed another single institution retrospective study assessing the G8 in older patients with cancer [20]. Out of 264 enrolled patients, the median G8 score was 11 (range: 1.5 ± 17); 83.0% of patients had an abnormal score (≤ 14). More than 50% of patients had a low score in 5 items (food intake, weight loss, body mass index, prescription drug, and self-perception of health), whereas less than 25% of patients had a low score in mobility, neuropsychological problem, and age. Median prescription drug use assessed in item 6 was 5 (range: 0 ± 15), and 12.8% of patients were prescribed 10 or more drugs. Importantly, the enrollment of the patients required more than two

years (February 2014 to March 2016) whereas we were able to evaluate 176 patients within 4 weeks.

The logistic regression models demonstrate that decreased nutritional intake was a key predictor of hospitalization and death in this sample, whereas weight loss and BMI were not. Malnutrition and weight loss are associated with treatment complications and increased mortality in older people with cancer and has been identified as one of the most relevant factors taken into account by clinicians when modifying cancer treatment [1,21]. The current results are in line with a recent prospective Belgian multicenter ($n = 22$), observational cohort of 7763 patients. In multivariable analysis, predictive factors for unplanned hospitalizations in older patients with cancer and an abnormal G8 were female gender, absence of surgery, chemotherapy, ADL dependency, malnutrition and presence of comorbidities [22]. Therefore, a nutritional evaluation should always be integrated into the initial geriatric assessment of older patients with cancer, with repeated evaluation throughout the treatment period and there after [1].

There is increasing evidence supporting the use of G8 for evaluation and management of older patients with cancer to guide shared decision-making between older patients, caregivers, and oncologists [6, 23]. As highlighted in the ASCO geriatric oncology guidelines [6] and supported by systematic reviews [15,

24-27], G8 impairments are associated with chemotherapy toxic effects, lower treatment completion, functional decline, early mortality, and higher health care use [2]. Just recently, Garcia and colleagues performed a systematic review of four databases (MEDLINE, Embase, CINAHL [Cumulative Index to Nursing and Allied Health Literature], and PubMed) and found that the G8 and the Vulnerable Elders Survey-13 (VES-13) still have the most evidence to support their use in clinical practice [28]. (In detail, the G8 scored moderate to high sensitivity across different thresholds for geriatric vulnerability on the geriatric assessment, as well as across geriatric assessment reference standards of varying numbers of domains (range, 6-9 domains). Sensitivity ranged from 44.7% (95%CI not reported) to 97.0% (95%CI, 89.0%-98.0%). Overall, specificity ranged from 44.0% (95%CI, 30.0%-64.0%) to 100% (95%CI, 54.0%-100%). Accuracy was moderately high (range, 0.71 [95% CI, 0.60-0.82] to 0.95 [standard error, 0.30]) [28].)

Like others, we found that a majority of oncology patient's ≥ 75 years who were seen at our hospital over a four week-long period were vulnerable but still received anticancer treatment at rates equal to non-vulnerable patients. Since worse outcomes were observed among the vulnerable patient group, it is important to consider how palliative [29], supportive and geriatric care can improve quality of life for these patients by addressing the reversible causes of vulnerability, such as nutrition and polypharmacy [7].

Strengths of this study include the inclusion of a relatively large sample size of vulnerable older patients with cancer and it also demonstrates the feasibility [10] to conduct a single site study incorporating G8 screening in the community oncology setting.

When interpreting the results of this study it is important to consider several points. First, this aim of this feasibility study was to evaluate the results of the G8 screening in patients aged 75 years and over. Hence, only limited qualitative coding from a single researcher was possible. We did not systematically assess Chemotherapy Related Toxicities using the National Cancer Institute Common Terminology Criteria for Adverse Events. Furthermore, we did not assess patients' charts for formal measures of nutritional intake (i.e. protein, k cal). Second, findings may be subject to selection, implicit clinician and loss to follow up bias. For example, we enrolled a specific population of older patients; however, these are patients who are commonly seen in community oncology clinics and are underrepresented in research. Third, this cohort study was performed at a single institution, which limits the generalizability of our results. However, this was a study estimating the prevalence of vulnerable older patients with cancer in order to adapt the current treatment practices in our hospital. Fourth, we do not have data whether or not using the G8 screening resulted in an adjustment of treatment recommendations. Previous research shows that implementing an onco-geriatric care trajectory

resulted in an adjustment of treatment recommendations for a quarter of patients and thirteen percent needed subsequent referral to a geriatrician [30]. Finally, one could argue that there are some limitations due to its nature as a retrospective medical record review study. The investigators had no control over the quality of the data since it was primary clinical data, not originally recorded for research purposes but for patient care. However, in order to maximize the sensitivity and effectiveness of the chart review, we followed a rigorous approach avoiding typical mistakes by using a well-defined, clearly articulated research question with explicitly developed inclusion and exclusion criteria, training of the data abstractor, performing a pilot test, using a standardized data abstraction form and addressing the interrater reliability [16].

From a clinical point of view, some questions remain open in our population: could the presence of a geriatrician, working together with the oncologist team, make a difference in the clinical results? Is the decision-making based on the G8 screening better than the physician judgment and what will be the results of this G8 screening on the geriatric vulnerability in the long-term follow-up?

Further research should be directed towards improving objective patient selection for cancer treatment and identifying patients who are prone for unfavorable outcome, as well as optimizing treatment adjustments and supportive care during treatment to improve outcomes [5]. During the decision-making process, dedicated attention should be given to assess the patients' goals and preferences [30]. Shared decision-making should be pursued and the patients' thoughts on how to maintain and improve quality of life should be guiding. In addition, it is of importance to increase diagnostic accuracy of the G8 to predict the risk of unfavorable outcome.

Conclusion

In conclusion, this study demonstrated that the G8 screening tool is applicable to routine oncology care in a tertiary hospital. The G8 differentiated between fit and vulnerable patients. The use of tailored oncology geriatric and palliative oncology interventions in the future may contribute to the avoidance of both over- and under treatment of older patients with cancer.

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Availability of Data and Material

All data generated or analyzed during this study are included in this published article. Other information of this study is available from the corresponding author on reasonable request.

Author Contributions

Concept and Design: FS, FDB

Data Acquisition: FS, FDB

Analysis and Interpretation of Data: EBS, FS, MS, FDB, DB

Manuscript Preparation: MS, EBS, FS, FDB, DB

Manuscript Editing and Review: EBS, FS, FDB, DB

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