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REVIEW ARTICLE

Are Gold Standard Depression Measures Appropriate for Use in Geriatric Cancer Patients? A Systematic Evaluation of Self-Report Depression Instruments Used With Geriatric, Cancer, and Geriatric Cancer Samples

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ABSTRACT

Purpose
Geriatric issues in cancer are becoming prominent. Depression is a significant concern for both the elderly and patients with cancer, yet identifying depression in these patients is difficult and often leads to under-recognition. We conducted a systematic review to determine which depression instruments are appropriate for use in geriatric patients with cancer.

Methods
We identified the most commonly used self-report depression instruments. We then used the criteria established in the US Food and Drug Administration Draft Guidance on Patient-Reported Outcome Measures to determine the extent of validation evidence of these measures in geriatric cancer populations. Finally, we determined which instruments captured depressive symptoms that are common among elderly patients with cancer.

Results
Eight measures were selected as the most commonly used instruments. These were the Beck Depression Inventory-II, Brief Symptom Inventory-18, Center for Epidemiologic Studies–Depression Scale, Geriatric Depression Scale-15, Hospital Anxiety and Depression Scale, Patient Health Questionnaire-9, Profile of Mood States–Short Form, and Zung Self-Rating Depression Scale. Many have been validated for use with geriatric adults and patients with cancer; however, data addressing content validity and responder definition were lacking. To date, there is no validation information for geriatric patients with cancer. Furthermore, symptom profile analysis revealed that these measures do not identify many symptoms signaling depression in geriatric patients with cancer.

Conclusion
The validation evidence for use of common depression instruments in geriatric patients with cancer is lacking. This, and the possibility that these measures may not assess common depressive symptoms in geriatric patients with cancer, questions the adequacy of these scales in this population.

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INTRODUCTION

Cancer and Depression

Depression is among the most common psychiatric symptoms experienced by patients with cancer,[1-4] and prevalence estimates are as high as 25%.[5,6] Depression, throughout the spectrum from isolated depressive symptoms to major depressive disorder, is associated with decreased quality of life, significant deterioration in physical activities, relationship difficulties, sleep impairment, more rapidly progressing cancer symptoms, and greater pain.[7]

Depression is extremely challenging to diagnose in patients with cancer.[8] The primary source of difficulty lies in the overlap of many cancer symptoms and adverse effects of treatment with the diagnostic criteria for depression. Significant weight loss, abnormal sleep, fatigue/anergia, diminished concentration, psychomotor disturbance, feelings of worthlessness or guilt, and thoughts of death or suicide may result from depression, from the cancer itself, from treatment adverse effects, or from some combination of the three.

Cancer and Depression in the Elderly

Cancer prevalence increases sharply with age. Between the ages of 40 to 44 years, an estimated 1.4% of the US population has a history of cancer, and the prevalence at ages 80 to 84 years is 19.3%.[9] Of the

greater than 10 million cancer survivors in the nation today, nearly two thirds are older than 65 years,[10] and this figure will increase as the population ages. In 1989, 12.5% of the population was older than 65 years; it is estimated that, by 2030, that figure will have increased to 22%.[11]

Depression is one of the most frequent causes of emotional distress in the aged.[12,13] Estimates of significant depressive symptoms in community samples of elderly adults range from 8% to 16%[14-17]; in addition, previous findings reveal that up to 23%[18-20] of physically healthy elderly and 25% of medically ill geriatric patients[21] have some form of depression.

Yet, elderly patients are far less likely to be diagnosed or treated for major depression or dysthymia than patients of any other age group.[13,22-24] Older patients less commonly present with, or disclose, affective symptoms, such as sadness, anhedonia, and worthlessness, and there is a tendency for physicians and patients alike to assume that symptoms are merely related to old age. The impact of depression should not be overlooked in this population. Depression has devastating consequences to quality of life and is associated with poor health outcomes and increasing costs of health care.[13,25] Individuals who are depressed are two to three times more likely to access medical services (not necessarily for treatment of depression) than those who are not depressed,[26-29] and the caregivers of the depressed elderly spend significant time in caregiver roles, which increases the societal cost of this condition.[25]

Clinicians and researchers confront a multifaceted challenge when evaluating depression in elderly patients with cancer, as this population combines the challenges of diagnosing depression in patients who have cancer with the unique difficulties of assessing depression in the elderly. When screening for depression with commonly utilized, patient-reported outcomes, estimates of the prevalence of depression in the elderly with cancer range from 17% to 25%.[30-35] Although the hallmark symptoms of depressed mood and anhedonia come to the fore in the identification of depression in cancer, these are precisely the symptoms less frequently endorsed by the elderly. Research has suggested a variety of additional symptoms that may better differentiate depression in the elderly with cancer; these include general malaise or dissatisfaction, diffuse somatic complaints, general aches and/or stomachaches, hopelessness, late insomnia, variation in mood throughout the course of a day, and loss of sexual interest (Weinberger et al[36] for more complete discussion).[36,37]

These observations highlight the importance of proper assessment tools for the geriatric patient with cancer.[38] Self-report instruments represent an efficient, cost-effective way to identify individuals who should be evaluated additionally for the presence of a depressive disorder. In the early 1980s, measures were developed specifically to account for the unique depression assessment needs of medically ill populations and for the elderly. For example, the Geriatric Depression Scale (GDS) was created specifically for the purpose of assessing depression in older populations. The Hospital Anxiety and Depression Scale (HADS) was designed for a hospital population; as such, it eliminated physically confounded symptoms. These scales, as well as more general depression scales that were based on the depressive symptoms identified in the Diagnostic and Statistical Manual, have been used in various populations, but it is unclear whether the unique intersection of geriatric patients and patients with cancer requires a more tailored approach for depression assessment.

Given the complexities of classifying depression in an elderly patient with cancer, it is crucial to ascertain that such instruments are valid in this group. In general, validation is a process by which a measure is evaluated for its scientific rigor and the acceptability of its psychometric properties: validity (ie, the extent to which a measure assesses the construct which it purports to measure) and reliability (ie, the extent to which a measure is stable and consistent in its measurement properties). The specific types of validity and reliability statistics assessed in this review are delineated in the Methods section. This article seeks to review the psychometric properties of depression instruments in geriatric, cancer, and geriatric cancer populations.

METHODS

Identification and Selection of Scales for Review

A search for the term depression was first performed in the Health and Psychosocial Instruments database. Searches for combinations of the terms depression, depression scale, depression index, depressed mood, validation, validity, and psychometric were performed on PubMed, PsycINFO, the Cumulative Index to Nursing and Allied Health Literature, the Science Citation Index/Social Sciences Citation Index, and the Ovid Evidence-Based Medicine Reviews databases. To be considered for inclusion, instruments had to be designed for self-report; available in English; and designed expressly to measure depressive symptoms or contain a discrete depression subscale. A total of 53 depression scales were identified.

Next, those scales most commonly cited in the literature were selected. Using the ISI Web of Science database, we determined the number of subsequent papers that cited each of the 53 scales' initial development or validation report, and we omitted papers whose authors contributed to the original report. To reinforce the findings, and in cases for which the initial reports were not indexed in the Web of Science (eg, in cases for which initial reports appeared as stand-alone publications rather than in journals), we found the total number of citations via Google Scholar. We found that all scales had either been cited few times (ie, 10 or fewer times per year) or numerous times (generally ranging from 50 to several hundred citations). Taking those that fell into the latter category, we arrived at a preliminary list of eight depression scales. If a scale had undergone a substantial revision of item content since its initial publication, the most recent version was considered. For scales currently used in a variety of lengths, we selected the most widely cited unless one version had been devised to be of particular use in a geriatric or cancer population. To corroborate our findings with expert opinion, the list of instruments was reviewed independently by seven expert researchers and clinicians in psychooncology who confirmed that our list comprised the most relevant to contemporary research and practice.

Review of Development and Validation

Identification of relevant literature. A systematic review of validation studies was conducted for each of the eight commonly used depression scales. In addition to the studies found during the initial literature search described in the Methods section, searches were performed on PubMed and PsycINFO for the name of each scale; for the associated scale acronyms; and for the terms validity, validation, and psychometric. Studies validating each scale in a geriatric, cancer, or geriatric cancer population, as well as validation studies among general medical or community samples, were chosen for review. The reference lists of the collected articles were reviewed to identify additional studies not detected in the electronic bibliographic search.

We then compared the reported psychometric data available on each scale with those measurement properties enumerated by the US Food and Drug Administration draft guidance, as described in the Methods section. In addition to determining whether the applicability of each scale to an ethnically diverse population had been considered in the literature, we also noted

whether the reported sample population of each validation study either reflected US demographics per the most recent census, defined as 24.9% nonwhite (in the US Census Bureau 2001) ± 5% or focused explicitly on a specific ethnic minority sample.

Review according to US Food and Drug Administration Patient-Reported Outcomes Guidelines. A review was conducted on the development procedures and validation data reported in the collected studies, with close attention to those recommendations set forth in the US Food and Drug Administration Draft Guidance on Patient-Reported Outcome Measures.[39] In light of the likelihood that the US Food and Drug Administration recommendations will become the gold standard in reviewing self-report measures, we framed our survey of depression scales according to these guidelines, as follows.

- Conceptual framework: A fundamental step in the construction of a patient-reported instrument should be the determination of "whether the instrument's conceptual framework is appropriate and clearly defined."[39(p7)] The US Food and Drug Administration guidance defines the conceptual framework process as the identification of concepts and domains of the construct to be measured, followed by hypothesizing the expected relationships among these concepts and domains. The literature on each measure was evaluated to determine whether a conceptual framework was identified by the author or could be surmised from the articles.
- Instrument development: To create an overall synopsis of the scales' suitability, we assembled information on general properties indicative, per the US Food and Drug Administration guidelines of acceptability to patients and feasibility as defined by the following criterion: 1) Recall period: US Food and Drug Administration guidance recommends that the disease, condition, and patient population characteristics be considered when defining an appropriate recall period, with the caveat that it is generally better to ask patients about their current states as opposed to asking them to recall previous times. Given the potential memory problems involved in aging, depression, and cancer illness and treatment, we looked for recall periods that either encapsulated the current moment or the past 24 hours, with anything within the past week defined as acceptable. We felt that recall periods longer than 1 week would compromise data accuracy in this population. 2) Reading level as reported or, if no report was available, as calculated by the Microsoft Word Flesch Kincaid function: The US Food and Drug Administration guidance warns of items with literacy levels too high for their intended population. We set an upper limit of an eighth grade reading level as appropriate on the basis of the mandate for informed consent reading levels as defined by the Memorial Sloan-Kettering Cancer Center Institutional Review Board. 3) Estimated time required for completion and number of items: The US Food and Drug Administration notes that a lengthy measure could result in respondent and/or administrator burden. Turning to item development, we again looked to the US Food and Drug Administration criteria for evaluating the adequacy of item generation procedures, which include the use of the following: expert opinion, as consensus from experienced individuals who attest to the appropriateness of concepts and domains to be measured; patient interviews, as input from patient interviews or focus groups, with evidence that adequate numbers of patients have supported the opinion that the specific items in the instrument are adequate and appropriate to measure the concept; and cognitive debriefing interviews, by the use of cognitive interviewing procedures to determine instruments' aptness and readability and to determine the need for refinement of items and/or their wording. As an additional gauge of applicability, we determined whether non–English-language versions of each instrument had been published and, if so, if they were created using back-translation techniques.
- Measurement properties, which include the following: 1) test-retest reliability, as stability of scores over time in the absence of change between test administrations. We looked for a test-rest reliability coefficient of 0.7 or greater according to commonly cited minimal standards[40]; 2) internal consistency, for degree of intercorrelation among items in a domain, as measured by a coefficient α. We used an α score of 0.70 or greater as the threshold for acceptable results.[41] 3) Content-related validity, for confirmation that the items and response options are relevant and comprehensive measure of the domain being assessed, as determined by face validity and the input of patients from the target population; 4) construct validity, as verification of discriminant, convergent, and known-groups validity; 5) predictive validity, per the US Food and Drug Administration draft guidance assessment of "[w]hether PRO scores predict subsequent events or outcomes accurately"; and 6) ability to detect change, as capacity of an instrument to accurately reflect change in patient condition. In addition to validity criteria, the US Food and Drug Administration guidelines recommend examination of the interpretability of any patient-reported instruments utilized in the clinical trial setting. The guidelines define tests of interpretability as follows: minimum important difference, as difference in mean score between treatment groups that provides convincing evidence of a treatment benefit, or scores that suggest any detectable difference between groups, such as clinical and nonclinical anchors; and responder definition, as change in score that would be clear evidence that an individual patient experienced a treatment benefit.
- Instrument modification: Under the rubric of instrument modification, the US Food and Drug Administration acknowledges revised measurement concepts; application to a new population or condition; changed item content or instrument format; changed mode of administration; and changed culture or language.

Symptom Profile Analysis

A symptom profile analysis was performed to determine whether each of the eight instruments addressed those specific symptoms that provide aid in distinguishing depression in patients with geriatric cancer. Depressive symptoms common in late life have been reported by Alexopoulos[36] and have included general aches and pains, stomach aches, diffuse somatic complaints, general malaise, and hopelessness about the future. Guo et al[42] indicated specific symptoms that offer evidence for a diagnosis of depression in patients with cancer, including late insomnia, mood variation, and loss of sexual interest. According to Weinberger et al,[37] we combined these two symptom profiles and removed items that were also typical of cancer and/or of cancer treatment adverse effects (eg, fatigue, weight loss, cognitive impairment), as these can confound the diagnosis of depression. To ensure a comprehensive domain analysis, three of the authors (C.N., C.C., and A.B.) independently analyzed the symptoms and then conferred to reach consensus, thereby minimizing individual bias as well as group think.

RESULTS

Primary Result

The eight depression scales selected for review are listed in Table 1. We could not locate any validation or psychometric information of these measures specifically in elderly patients with cancer. To provide guidance in selecting a depression measure for this population, we review the general properties as well as the psychometric properties in patients with cancer and in geriatric patient samples (Table 2 and 3).

General Properties: Conceptual Framework

Beck Depression Inventory-II. The Beck Depression Inventory-II (BDI-II) scale assesses 21 symptoms related to depression, and the overall score yields the level of severity of depression. There are no subscales or domains.

Brief Symptom Inventory-18. The Brief Symptom Inventory-18 (BSI-18) scale provides a total score of all items, the Global Severity Index (GSI). The GSI provides an overall summary of the respondent's current level of psychological distress. There are three domains (six questions each): somatization, depression, and anxiety.

Table 1. Selected Self-Reported Instruments to Measure Depression

Name of Scale	Scale Abbreviation	Author	Year of Publication
Beck Depression Inventory-II[7,43-46]	BDI-II	Beck et al	1996
Brief Symptom Inventory-18[47-50]	BSI-18	Derogatis et al	2000
Center for Epidemiologic Studies–Depression Scale[7,51-60]	CES-D	Radloff	1977
Geriatric Depression Scale-15[24,57,61-69]	GDS-15	Sheikh and Yesavage	1986
Hospital Anxiety and Depression Scale[70-83]	HADS	Zigmond and Snaith	1983
Patient Health Questionnaire-9[84-86]	PHQ-9	Kroenke et al	2001
Profile of Mood States–Short Form[87-90]	POMS-SF	Shacham	1983
Zung Self-Rating Depression Scale[66,67,91-93]	Zung SDS	Zung	1965

Center for Epidemiologic Studies–Depression Scale. The Center for Epidemiologic Studies–Depression Scale (CES-D) contains 20 symptom items that are associated with a clinical diagnosis of depression. Factor analysis has revealed four domains: depressed affect, positive affect, somatic-retarded activity, and interpersonal relations.[51] However, later work found that the items measured two factors: depressed affect and positive affect.[94]

GDS-15. The GDS-15 has dichotomously coded (yes/no) questions that result in an overall depression severity scale. A factor analysis of the GDS-15 in elderly primary-care patients suggested two factors or domains: depression and positive affect.[61]

Hospital and Anxiety Depression Scale. The Hospital and Anxiety Depression Scale (HADS) consists of 14 items. Seven items contribute to an anxiety subscale, and seven items contribute to a depression subscale.

Patient Health Questionnaire-9. The Patient Health Questionnaire-9 (PHQ-9) is comprised of the nine depressive disorder items from the full Patient Health Questionnaire that assesses eight separate DSM-IV diagnoses. The PHQ-9 does not contain any additional subscales or domains, so a diagnosis is rendered on the basis of the number of the symptoms that have been endorsed.

Profile of Mood States–Short Form. The Profile of Mood States–Short Form (POMS-SF) matches the domain structure of the full POMS measure. It includes six domains (ie, anger, confusion, depression, vigor, fatigue, and tension) as well as a total mood disturbance score.

Zung Self-Rating Depression Scale. The Zung Self-Rating Depression Scale (SDS) has 10 positively worded and 10 negatively worded items that cover affective, psychologic, and somatic symptoms. The overall score represents the severity of the depressive symptoms.

Instrument Development

There was an overall lack of reported patient involvement in the development of items for all the instruments. Other methods were used to develop these scales; for example, the BSI-18 and CES-D are based on processes of item reduction; the BSI-18 consists of a shortened revision of the 90-item Hopkins Symptom Checklist; and the CES-D represents a collection of relevant items from the BDI, the

Table 2. General Properties of Eight Self-Reported Instruments to Measure Depression

Property	Instrument							
	BDI-II	BSI-18	CES-D	GDS-15	HADS	PHQ-9	POMS-SF	Zung SDS
Acceptability								
Recall period for items	2 weeks	1 week	1 week	1 week	1 week	2 weeks	Right now	Past several days
Reading level of questions and response options	13 years	Grade 6	Grade 3	Grade 4	Grade 3	Grade 8	Grade6	Grade6
Estimated time to complete measure	5 minutes	4 minutes	5 minutes	2-3 minutes	2-5 minutes	1-2 minutes	3-7 minutes	5-10 minutes
No. of items	21	18	20	15	14	9	37	20
Item generation/revision process								
Experts consulted	○			○				
Patients interviewed								
Cognitive interviewing performed								
Instrument modification								
Modification of previously published instrument	●	●					●	
Translation into languages other than English	●	●	●	●	●	●	●	●
Use of back-translation techniques	●	●	●	●	●	●	●	●

NOTE: Open circle indicates that data were not found for listed instrument; however, data were found for parent instrument that met guidelines for acceptability (as defined in Methods section).
Filled circle indicates that data found for listed instrument met guidelines for acceptability (as defined in Methods section).
Abbreviations: BDI-II, Beck Depression Inventory-II; BSI-18, Brief Symptom Inventory-18; CES-D, Center for Epidemiologic Studies–Depression Scale; GDS-15, Geriatric Depression Scale-15; HADS, Hospital Anxiety and Depression Scale; PHQ-9, Patient Health Questionnaire-9; POMS-SF, Profile of Mood States–Short Form; Zung SDS, Zung Self-Rating Depression Scale.

Table 3. Reported Validation and Psychometric Properties of Eight Self-Report Instruments to Measure Depression in Geriatric, Cancer, and Geriatric Cancer Populations

Property	Instrument							
	BDI-II	BSI-18	CES-D	GDS-15	HADS	PHQ-9	POMS-SF	Zung SDS
Validation in geriatric population								
Extent of validation								
Validation study conducted	●	○	●	●	●		○	●
Age ranges of geriatric populations in validation study conducted, years	≥ 55	56-88	60-96	65-100	60-92	≥ 60	55-94	60-97
Validation in sample representative of US population	●		●	○				●
Validation in specific ethnic minority sample			●	●				
Validity statistics								
Test-retest reliability	○			○		●	○*	
Internal consistency	●		●	●			○	●
Content validity								
Convergent validity	●	○	●	●	●		○	●
Discriminant validity	●	○		○	●		○	●
Known-groups validity	●		●	○			○	●
Predictive validity								
Ability to detect change					●			
Interpretability statistics								
Recommended cut-off scores	●	●		●	●	●		
Minimum important difference						●		
Responder definition								
Validation in cancer population								
Extent of validation								
Validation study conducted	●	●	●	●	●	●†	●	●
Age ranges of cancer populations in validation study conducted	n/p	30 to ≥ 80	n/p	n/p	16-86	n/p	18-65	n/p
Validation in sample representative of US population			●					
Validation in specific ethnic minority sample		●‡	●					
Validity statistics								
Test-retest reliability			●§	●				
Internal consistency	●	●	●	●	●		●	●
Content validity								
Convergent validity	●	●	●	●	●	●†	●	●
Discriminant validity		○	●	●		●†	●	●
Known-groups validity	●	●	●		●		●	
Predictive validity								
Ability to detect change								
Interpretability statistics								
Recommended cut-off scores	●	●	●		●			
Minimum important difference								
Responder definition								
Validation in geriatric cancer population								
Validation study conducted								

NOTE: Filled circle indicates that data found for listed instrument met guidelines for acceptability (as defined in Methods section).
Open circle indicates that data were not found for listed instrument; however, data were found for parent instrument that met guidelines for acceptability (as defined in Methods section).
Abbreviations: BDI-II, Beck Depression Inventory-II; BSI-18, Brief Symptom Inventory-18; CES-D, Center for Epidemiologic Studies–Depression Scale; GDS-15, Geriatric Depression Scale-15; HADS, Hospital Anxiety and Depression Scale; PHQ-9, Patient Health Questionnaire-9; POMS-SF, Profile of Mood States–Short Form; Zung SDS, Zung Self-Rating Depression Scale; n/p, not published.
*One of the subscales for the POMS showed a test-retest reliability coefficent of only 0.68 in a geriatric population; however, the majority of its subscales demonstrated coefficients greater than 0.7.
†Data found for a computer-based administration of the PHQ-9 only.
‡The study sample comprised only 27 patients.
§For the CES-D, the reported test-retest reliability coefficient in a cancer population was 0.57, which was below the minimum threshold of 0.7 that we established for inclusion.

Minnesota Multiphasic Personality Inventory, the Gardner Symptom Checklist, the Raskin Depression Rating Scale, and the Zung SDS. The GDS-15 and HADS have been tailored to specific populations—the elderly and the medically ill, respectively—with removal of items that might confound diagnosis (specifically somatic symptoms) as well as attention to reducing cognitive or physical burden. None of the scales are based on a conceptual model of the definition of depression in the elderly or medically ill.

The majority of the scales reported generally acceptable recall periods by asking about the patient's symptoms right now, within the past 24 hours, or within the past week. The only exceptions were the PHQ-9 and BDI-II, which each have a recall period of the last 2 weeks that may be too long for a geriatric patient with cancer to accurately recall. Reading levels were rarely indicated, but we determined that all of the measures when calculated fell within the eighth grade and lower guidelines. Estimated completion times were rarely reported for the scales, but none exceeded 10 minutes when calculated. The number of items ranged widely, from nine (PHQ-9) to 37 (POMS-SF), with all scales except the latter containing less than 21 items.

Instrument modification. The BDI-II was created to account for changes made to DSM criteria for depressive disorders since the publication of the original BDI. Two scales under consideration, the BSI-18 and the POMS-SF, are revised versions of longer parent instruments—the BSI and the POMS, respectively— designed specifically for use in cancer or medically ill populations; both have been validated among patients with cancer. All eight of the scales are available in foreign-language versions that have been devised by using back-translation techniques.

Validation and Psychometric Properties

All of the measures that reported test-retest and internal consistency statistics met the minimum thresholds for acceptability as defined in the Methods section, with two exceptions (Table 3). The CES-D in a cancer population reported test-retest reliability at 0.57, which was less than the 0.7 threshold. However, because there was a 2-week lapse between the test administrations, and because physical and emotional states of patients with cancer can vary widely in this time period, we allowed this modest yet significant correlation as acceptable for our purposes. In addition, the POMS, which is the parent instrument for the POMS-SF, reported test-retest reliability coefficients for its various subscales in a geriatric population that range from 0.68 to 0.83. However, because the majority of subscales had test-retest reliability coefficients of 0.75 or greater, we considered the POMS to have sufficiently demonstrated stability over time for our purposes.

Among all populations, there was an absence of reported content validity; that is, there were no instances in which the measures were evaluated by patients and investigators for their relevance and comprehensiveness in assessing the domains being assessed. Also frequently lacking were data on predictive validity—found only for the Zung SDS. All of the scales considered here have been well validated in multiple studies. In particular, the CES-D and the PHQ-9 were validated in the most ethnically diverse samples and to have extensive published information on their psychometric stability in general samples. Although the CES-D has been validated in both geriatric and cancer populations, the paper-and-pencil PHQ-9 has been validated only in a geriatric population[95] (although a computer-based version has been tested in a group of patients with cancer). Additionally, interpretability statistics, such as minimum important difference or responder definitions, were not reported for any of the scales, although there were some investigations into optimal cutoff scores.

Among geriatric samples, we found that the BDI, CES-D, and Zung SDS were the most extensively validated. Surprisingly, there were fewer reported data on the GDS-15 in an elderly population, though more data do exist on its parent instrument, the 30-item GDS. The POMS-SF had no validation information among elderly patients, but geriatric validity data is available on its parent instrument, the POMS. All scales had been validated among samples of patients with cancer, and the CES-D had the greatest degree of psychometric data available.

Symptom Profile Analysis

The results of our symptom analysis are listed in Table 4. Of the eight instruments, the BDI-II (three of seven symptoms), BSI-18 (four of seven symptoms), and Zung SDS (four of seven symptoms) appeared to capture the greatest number of our specified symptoms, as described in the Methods section. Only the BDI-II and the Zung SDS contained items addressing sexual function complaints, and only the BSI-18 and the BDI-II contain items assessing physical complaints. Of the psychological symptoms, most measures assessed hopelessness and/or general malaise; however, mood variation was assessed by one measure (Zung SDS).

Table 4. Symptom Profile Analysis of Eight Self-Report Instruments to Measure Depression: Inclusion of Symptoms Commonly Reported in Geriatric Patients With Cancer

	Instrument							
Symptom	BDI-II	BSI-18	CES-D	GDS-15	HADS	PHQ-9	POMS-SF	Zung SDS
Physical functioning								
General aches and pains/stomachaches		●						
Diffuse somatic complaints		●						
Late insomnia	●							
Psychological functioning								
General malaise		●	●	●	●		●	●
Hopelessness	●	●	●	●		●	●	●
Mood variation*	●							
Sexual functioning								
Change/loss of sexual interest	●							●

NOTE: Filled circle indicates that data found for listed instrument met guidelines for acceptability (as defined in Methods section).
Abbreviations: BDI-II, Beck Depression Inventory-II; BSI-18, Brief Symptom Inventory-18; CES-D, Center for Epidemiologic Studies–Depression Scale; GDS-15, Geriatric Depression Scale-15; HADS, Hospital Anxiety and Depression Scale; PHQ-9, Patient Health Questionnaire-9; POMS-SF, Profile of Mood States–Short Form; Zung SDS, Zung Self-Rating Depression Scale.
*Zung SDS mood variation reported as follows: "Morning is when I feel best."

DISCUSSION

There is a vast amount of literature describing and validating the depression scales considered in this review, but the dearth of validation in the geriatric oncology context represents a neglected area of investigation. The absence of any study validating a depression scale specifically among the elderly with cancer, coupled with the absence of domains capturing those depressive symptoms that are commonly reported among these patients, raises questions as to whether the self-report instruments currently in wide use are appropriate for a group of patients among whom obstacles to proper diagnosis already abound.

In addition, a number of scale attributes should be considered when using these in a geriatric cancer setting. For example, the 2-week period for the BDI-II and the PHQ-9 might be slightly too long for elderly patients with cancer to recall accurately. In addition, attention should be given to completion time and item length when selecting a scale for this population. For example, the question as to whether scales that can easily be completed by general populations become overly burdensome to elderly patients with cancer occurs in light of the comparatively high number of items (ie, 37) for the POMS-SF. It should be noted that two of the lengthier scales, the POMS-SF and the BSI-18, assess multiple mood symptoms as opposed to only depression, and the relatively higher number of items must be considered against the higher number of symptoms assessed. In addition, the concern about scale length must be considered in combination with a scale's other properties, and it is not necessarily a reason to exclude an instrument from use.

Item generation procedures also appeared lacking in the light of the US Food and Drug Administration Draft Guidance on Patient-Reported Outcome Measures. Specifically, none of the scales surveyed reported the use of cognitive debriefing interviews. It also may be beneficial to perform cognitive debriefing retroactively on existing scales to confirm their hypothesized properties, and this is doubly true in the process of applying any existing self-report scale to a new population, such as geriatric patients with cancer.

In our analysis of psychometric properties, content-related validity evaluations were available for none of the instruments. Predictive validity information was also largely absent, with data available for only one scale, the Zung SDS. Finally, none of the eight scales reported US Food and Drug Administration–recommended minimum important difference or responder definitions, with the exception of the PHQ-9 in a geriatric population, although several of the other scales included investigations into optimal cutoff scores.

Although this review elucidated the need for additional examination of measures used to assess depression in geriatric cancer populations, some tentative conclusions relative applicability to these patients did occur. Among the elderly, the most complete validation information has been reported for the BDI-II, CES-D, and Zung SDS. Taken together, the 30-item GDS and the GDS-15 have been well validated in older patients; however, much of the psychometric data on the GDS-15 have been extracted from data obtained on administration of the 30-item parent instrument.

In patients with cancer, the CES-D has been the most comprehensively validated. The Brief Symptom Inventory-18, GDS-15, and POMS-SF also have been well validated in oncology samples, albeit to a slightly lesser degree. Of note, the GDS-15 has been evaluated in patients with cancer receiving palliative care[62]; most of whom may have been older patients; however, this study reported no age range of its sample, and inclusion criteria consisted of those age 18 years or older, which rendered it impossible for us to determine whether this was indeed so.

The extensive validation of the CES-D in both geriatric and cancer populations suggests it is potentially the most reliable in measuring depression in a geriatric cancer population. However, our domain analysis revealed that the CES-D included only two depressive symptoms common among these individuals, one of which is hopelessness. The phrasing of the CES-D item capturing hopelessness (ie, You felt hopeful about the future) might be less applicable in older patients living with cancer, for whom the meaning of the word future might be profoundly altered. Raising additional concern is evidence that hopelessness, although one of the most common symptoms of depression in the medically ill, is also one of the most confounded. In a study among terminally ill patients with cancer, Abbey et al[96] refer to a general "lack of understanding regarding the construct of hopelessness."[96pXXXX] Although none of the instruments evaluated here capture all of the symptoms distinguishing depression in geriatric cancer, the BDI-II, BSI-18, GDS-15, CES-D, POMS-SF, and Zung SDS each include more than one relevant domain.

It is necessary to recognize some methodologic limitations of this review. We formed our conclusions on the basis of only published reports, rather than contacting scale authors directly to obtain information on their measure development and validation procedures. It is possible, therefore, that more data exist on these scale validity in geriatric patients and in diverse populations than is reflected in our results. In addition, although we have indicated published validation information for each scale, we have not reviewed the quality of this validation information. We believe that providing a quality assessment of this data is beyond the scope of this review, and instead we have included sources for validation papers to assist researchers and clinicians in evaluating its quality.

Despite these limitations, the need for additional research in the use and validity of patient-reported scales to screen for depression in the elderly with cancer is wholly apparent. The results of this analysis suggest that the field would benefit from the development of a new measure, created in accordance with the US Food and Drug Administration guidelines and designed specifically to assess cancer in this unique population. More thorough examination of both the nature and proper measurement of depression in the elderly with cancer is required to optimize the ability of researchers and clinicians to identify and to devise effective treatments for this growing body of afflicted individuals.

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The author(s) indicated no potential conflicts of interest.

AUTHOR CONTRIBUTIONS

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