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ASCO SPECIAL ARTICLE

# Practical Assessment and Management of Vulnerabilities in Older Patients Receiving Chemotherapy: ASCO Guideline for Geriatric Oncology

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Editor's note: This American Society of Clinical Oncology (ASCO) Clinical Practice Guideline provides recommendations, with comprehensive review and analyses of the relevant literature for each recommendation. Additional information, including a Data Supplement with additional evidence tables, a Methodology Supplement, slide sets, clinical tools and resources, and links to patient information at www.cancer.net, is available at www.asco.org/supportive-care-guidelines

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## ABSTRACT

### Purpose
To provide guidance regarding the practical assessment and management of vulnerabilities in older patients undergoing chemotherapy.

### Methods
An Expert Panel was convened to develop clinical practice guideline recommendations based on a systematic review of the medical literature.

### Results
A total of 68 studies met eligibility criteria and form the evidentiary basis for the recommendations.

### Recommendations
In patients ≥ 65 years receiving chemotherapy, geriatric assessment (GA) should be used to identify vulnerabilities that are not routinely captured in oncology assessments. Evidence supports, at a minimum, assessment of function, comorbidity, falls, depression, cognition, and nutrition. The Panel recommends instrumental activities of daily living to assess for function, a thorough history or validated tool to assess comorbidity, a single question for falls, the Geriatric Depression Scale to screen for depression, the Mini-Cog or the Blessed Orientation-Memory-Concentration test to screen for cognitive impairment, and an assessment of unintentional weight loss to evaluate nutrition. Either the CARG (Cancer and Aging Research Group) or CRASH (Chemotherapy Risk Assessment Scale for High-Age Patients) tools are recommended to obtain estimates of chemotherapy toxicity risk; the Geriatric-8 or Vulnerable Elders Survey-13 can help to predict mortality. Clinicians should use a validated tool listed at ePrognosis to estimate noncancer-based life expectancy ≥ 4 years. GA results should be applied to develop an integrated and individualized plan that informs cancer management and to identify nononcologic problems amenable to intervention. Collaborating with caregivers is essential to implementing GA-guided interventions. The Panel suggests that clinicians take into account GA results when recommending chemotherapy and that the information be provided to patients and caregivers to guide treatment decision making. Clinicians should implement targeted, GA-guided interventions to manage nononcologic problems. Additional information is available at www.asco.org/supportive-care-guidelines.

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## INTRODUCTION

This clinical practice guideline for older patients with cancer provides recommendations on the appropriate implementation of validated and standardized clinical assessment tools and decision-making models for this vulnerable and prevalent demographic group. It provides information on how these tools can be integrated into clinical oncology care to efficaciously evaluate and manage age-related conditions associated with adverse outcomes in older patients with cancer.

ASCO believes that to improve the quality of care, oncologists and patients should carefully weigh the risks and benefits of cancer-directed therapy for patients with a low performance status, who are ineligible for a clinical trial, and for whom there is no strong evidence supporting the clinical value of standard cancer treatment.[1,2] These conditions apply most often to older patients.

ASSOCIATED CONTENT

Appendix
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Data Supplement
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## THE BOTTOM LINE

### Practical Assessment and Management of Vulnerabilities in Older Patients Receiving Chemotherapy: American Society of Clinical Oncology Guideline for Geriatric Oncology

#### *Overarching Guideline Purpose*

To improve treatment outcomes for older patients with cancer through recommendations for appropriate application of validated decision-making models and standardized clinical assessment tools and recommendations for management of common age-related conditions that may impact the care of older patients with cancer undergoing chemotherapy.

#### *Target Population*

Vulnerable older patients with cancer

#### *Target Audience*

Medical oncologists, pharmacists, oncology nurses, patients, caregivers, palliative care specialists, advanced practice providers, geriatricians, primary care physicians, social workers, physical therapists, occupational therapists, nutritionists/dieticians

#### *Methods*

An Expert Panel was convened to develop clinical practice guideline recommendations based on a systematic review of the medical literature.

#### *Recommendations*

1. In patients age 65 and older receiving chemotherapy, geriatric assessment (GA)—the evaluation of functional status, physical performance and falls, comorbid medical conditions, depression, social activity/support, nutritional status, and cognition—should be used to identify vulnerabilities or geriatric impairments that are not routinely captured in oncology assessments (Type: Evidence-based, benefits outweigh harms; Evidence quality: high; Strength of recommendation: strong).
2. While many tools are appropriate for assessment of each domain, the Expert Panel based its recommendations on evidence supporting their utility for predicting adverse outcomes and for ease of administration. In patients aged 65 and older receiving chemotherapy, validated and practical geriatric assessment (GA)-based tools can be used to predict adverse outcomes.
    a. The evidence supports, at a minimum, assessment of function, comorbidity, falls, depression, cognition, and nutrition.
    b. The Expert Panel recommends instrumental activities of daily living (IADLs) for function, a thorough history or validated tool to assess comorbidity, a single question for falls, the Geriatric Depression Scale (GDS) to screen for depression, the Mini-Cog or the Blessed Orientation-Memory-Concentration test (BOMC) to screen for cognitive issues, and assessment of unintentional weight loss to evaluate nutrition.
    c. Either the Cancer and Aging Research Group (CARG) or Chemotherapy Risk Assessment Scale for High-Age Patients (CRASH) tool is best used to obtain specific estimates on risk of chemotherapy toxicity, while short tools such as Geriatric-8 or Vulnerable Elders Survey-13 (VES-13) can help to predict mortality. Table 1 also provides alternatives to these options.

(Type: evidence-based, benefits outweigh harms; Evidence quality: high that GA tools predict chemotherapy toxicity and mortality; Evidence quality: moderate to recommend specific tools to evaluate GA domains such as function, comorbidity, depression, cognition, and nutrition. Strength of recommendations: moderate.).

3. Based on the best clinical opinion of the Expert Panel, clinicians should use one of the validated tools listed at ePrognosis (https://eprognosis.ucsf.edu) to estimate life expectancy (LE) $\geq$ 4 years.
    a. The Expert Panel especially recommends either the Schonberg or Lee Index (https://eprognosis.ucsf.edu/leeschonberg.php). The most common variables considered in these indices include age, sex, comorbidities (eg, diabetes, chronic obstructive pulmonary disease), functional status (eg, activities of daily living [ADLs], instrumental activities of daily living [IADLs], mobility), health behaviors and lifestyle factors (eg, smoking status, body mass index), and self-reported health.[89-91,127,128]

(continued on following page)

  

**THE BOTTOM LINE (CONTINUED)**

b. Several indices have "presence of cancer" as a relevant variable, and answering no to this question will allow for estimation of "noncancer" life expectancy to consider competing risks of mortality.

(Type: informal consensus, benefits outweigh harms; Evidence quality: high that it predicts mortality, insufficient that it improves outcomes or improves decision making; Strength of recommendation: strong that it predicts mortality; weak that it improves outcomes or improves decision making).

4. Delphi consensus panels of experts have established approaches for implementing GA-guided care processes in older adults with cancer.[22,32]

   a. The Expert Panel recommends that clinicians apply the results of GA to develop an integrated and individualized plan for patients that informs treatment selection by helping to estimate risks for adverse outcomes (see Recommendation 2) and to identify nononcologic problems (see Recommendation 1) that may be amenable to intervention.
   b. Based on clinical experience and the results of formal expert consensus studies,[22,32] the Expert Panel suggests that clinicians take into account GA results when recommending treatment and that the information be provided to patients and caregivers to guide decision making for treatment.[6] In addition, clinicians should implement targeted, GA-guided interventions to manage nononcologic problems.
   c. Consistent with the results of formal modified Delphi consensus studies, the Expert Panel supports the specific high-priority GA-guided interventions outlined in Table 2.

(Type: informal consensus; Evidence quality: moderate; Strength of recommendation: moderate).

***Additional Resources:***

More information, including a Data Supplement with additional evidence tables, a Methodology Supplement with information about evidence quality and strength of recommendations, slide sets, and clinical tools and resources, is available at www.asco.org/supportive-care-guidelines. Patient information is available at www.cancer.net.

**ASCO believes that cancer clinical trials are vital to inform medical decisions for older patients with cancer and improve cancer care and that all older patients should have the opportunity to participate.**

Approximately 70% of patients with cancer are aged 65 and older.[3] The number of patients with cancer over the age of 65 is projected to significantly increase over the next 20 years.[3] The lifetime probability of developing cancer in men and women aged 70 and over is one in three and one in four, respectively.[4] Although the majority of patients with cancer and who die of cancer are older, there is less evidence to guide chemotherapy treatment decisions for this population because older patients, especially those with age-associated conditions, are under-represented in clinical trials. Less than 25% of patients enrolled in National Cancer Institute (NCI) Cooperative Group Clinical Trials are aged 65 to 74 years, and less than 10% are 75 years or older.[5] Consequently, older patients are especially vulnerable to "overtreatment," ie, less fit patients being provided with cancer treatment with low likelihood of benefit and high likelihood of complications/toxicity, or "undertreatment," ie, fit older patients who are not provided with standard, evidence-based chemotherapy regimens.[6-8] Older patients from minority backgrounds are the most vulnerable to disparities in survival.[8] Studies have shown that traditional oncology performance measures, such as the Karnofsky performance status (KPS) or Eastern Cooperative Oncology Group (ECOG) performance status (PS) scores, do not accurately predict which older adults are at highest risk of adverse outcomes from chemotherapy.[9,10] Implementing evidence-based approaches to the evaluation and management of aging-associated conditions in older patients could help to inform decisions for chemotherapy and improve outcomes.[2] Given the rapidly aging population, it is important that all oncology clinical teams are equipped to prevent, assess, and manage issues for older adults that could affect outcomes, including complications and toxicities from chemotherapy. Older patients undergoing chemotherapy often visit more frequently with the oncology clinical team than with other clinical teams, including primary care, giving oncologists the best opportunity to avoid, detect, and manage potential complications.[11]

The cancer care delivery gaps for older patients with cancer were highlighted in a recent Institute of Medicine committee report, Delivering High-Quality Cancer Care.[12,13] This report stated that "the current care delivery system is poorly prepared to address the care needs of this population, which are complex due to altered physiology, functional and cognitive impairment, multiple coexisting diseases, increased side effects from treatment, and greater need for social support."[174]

These knowledge gaps were also highlighted in a series of Cancer and Aging Research Group (CARG) U13 conferences held in collaboration with NCI and the National Institute on Aging.[5,7,14] The conferences highlighted that chemotherapy can worsen age-related conditions. Research has demonstrated that there can be considerable variation in how oncologists make decisions about

chemotherapy for older patients with other comorbid health conditions.[15-17] In addition, there is considerable variation in how oncology teams intervene on underlying health problems that are negatively impacted by chemotherapy.[18-21] Geriatric assessment (GA) consists of a compilation of validated tools that assess specific domains (eg, function, cognition) that are known to be associated with adverse outcomes in older patients; evidence has been increasing for use of GA for evaluation and management of vulnerabilities in older patients with cancer to help guide shared decision making for treatment and GA-guided interventions among patients, caregivers, and oncologists.[22,23] While caregiver input about a patient's functioning is essential and caregivers can provide critical support to older patients with cancer by facilitating GA-guided interventions, evidence-based interventions that also attend to caregiver burden are necessary.[14,24-26]

This guideline facilitates the translation of available evidence into practical recommendations for oncology clinical practice and thereby improves the quality of care for older patients being treated for cancer with chemotherapy. While GA has been shown to potentially be beneficial for older patients undergoing different cancer treatments (eg, surgery, radiation), this guideline focuses on evidence for patients undergoing chemotherapy due to the robustness of data in this area.

## GUIDELINE QUESTIONS

This ASCO clinical practice guideline addresses four questions:

1. Should geriatric assessment (GA) be used in older adults with cancer to predict adverse outcomes from chemotherapy?
2. For older patients who are considering undergoing chemotherapy, which GA tools should clinicians use to predict adverse outcomes (including chemotherapy toxicity and mortality)?
3. What general (ie, noncancer-specific) life expectancy data for community-dwelling patients should clinicians consider to estimate mortality and best inform treatment decision making for older patients with cancer?
4. How should GA be used to guide management of older patients with cancer?

## METHODS

### Guideline Development Process

This systematic review-based guideline product was developed by a multidisciplinary Expert Panel (Appendix Table A1, online only), which included a patient representative and an ASCO guidelines staff with health research methodology expertise. The Expert Panel met in person and via teleconference and corresponded through e-mail. Based upon the consideration of the evidence and expert opinion, the authors were asked to contribute to the development of the guideline, provide critical review, and finalize the guideline recommendations. Members of the Expert Panel were responsible for reviewing and approving the penultimate version of the guideline, which was then circulated for external review and submitted to *Journal of Clinical Oncology* for editorial review and consideration for publication. All ASCO guidelines are ultimately reviewed and approved by the Expert Panel and the ASCO Clinical Practice Guideline Committee prior to publication.

The recommendations were developed by the Expert Panel based on a systematic review of the relevant literature. The systematic review involved searches of PubMed to identify systematic reviews and randomized clinical trials (RCTs) of GA-based allocation of chemotherapy and treatment outcomes for elderly individuals with cancer; RCTs of geriatric evaluation and management (GEM) of age-related medical conditions, psychological morbidity, and functional abilities among community-dwelling older individuals; prospective cohort studies that evaluated the association of GA-based tools with outcomes of older patients with cancer receiving chemotherapy; and studies of life expectancy.

Articles were excluded if they were (1) meeting abstracts not subsequently published in peer-reviewed journals; (2) editorials, commentaries, letters, news articles, case reports, and narrative reviews; or (3) published in a non-English language. Among candidate prospective cohort studies, articles were included if they addressed chemotherapy, included $\geq$ 100 patients, and focused on outpatient GA or factors that are associated with treatment and/or functional outcomes among older persons with cancer. Similar inclusion criteria were applied to studies of life expectancy. Studies were included that had a sample size of at least 100 patients, included older individuals/patients in the nonhospitalized setting (either outpatient or community), and had overall mortality as the primary outcome of interest. Additional information about the results of the literature search and search strategy strings and results is available at www.asco.org/supportive-care-guidelines in the Data Supplement, which also includes QUORUM diagrams of the literature searches.

An additional review focused on practical considerations for use of the guideline in outpatient community oncology settings. Based on this review, revisions were made to clarify recommended actions for clinical practice. The draft guideline recommendations were sent for open comment for a period of about 2 weeks, allowing the public to review and comment on the recommendations after submitting a confidentiality agreement. These comments were taken into consideration while finalizing the recommendations. Ratings for the type and strength of recommendations, evidence strength, and potential biases are provided with each recommendation. Further information regarding the methods used to develop this guideline is available in the Methodology Supplement at www.asco.org/supportive-care-guidelines. The ASCO Expert Panel and guidelines staff will work with co-chairs to keep abreast of any substantive updates to the guideline. Based on formal review of the emerging literature, ASCO will determine the need to update. Information about ASCO's approach to guideline updating is provided in the Methodology Supplement.

This is the most recent information as of the publication date. All funding for the administration of the project was provided by ASCO.

### Guideline Disclaimer

The Clinical Practice Guidelines and other guidance published herein are provided by the American Society of Clinical Oncology, Inc. (ASCO) to assist providers in clinical decision making. The information herein should not be relied upon as being complete or accurate, nor should it be considered as inclusive of all proper treatments or methods of care or as a statement of the standard of care. With the rapid development of scientific knowledge, new evidence may emerge between the time information is developed and when it is published or read. The information is not continually updated and may not reflect the most recent evidence. The information addresses only the topics specifically identified therein and is not applicable to other interventions, diseases, or stages of diseases. This information does not mandate any particular course of medical care. Further, the information is not intended to substitute for the independent professional judgment of the treating provider, as the information does not account for individual variation among patients. Recommendations reflect high, moderate, or low confidence that the recommendation reflects the net effect of a given course of action. The use of words like "must," "must not," "should," and "should not" indicates that a course of action is recommended or not recommended for either most or many patients, but there is latitude for the treating physician to select other courses of action in

  

### Guideline and Conflicts of Interest

The Expert Panel was assembled in accordance with ASCO's Conflict of Interest Policy Implementation for Clinical Practice Guidelines ("Policy," found at http://www.asco.org/rwc). All members of the Expert Panel completed ASCO's disclosure form, which requires disclosure of financial and other interests, including relationships with commercial entities that are reasonably likely to experience direct regulatory or commercial impact as a result of promulgation of the guideline. Categories for disclosure include employment; leadership; stock or other ownership; honoraria, consulting or advisory role; speaker's bureau; research funding; patents, royalties, other intellectual property; expert testimony; travel, accommodations, expenses; and other relationships. In accordance with the Policy, the majority of the members of the Expert Panel did not disclose any relationships constituting a conflict under the Policy.

## RESULTS

A total of 68 studies met eligibility criteria and form the evidentiary basis for the guideline recommendations. The identified studies include 30 prospective cohort studies; 17 RCTs evaluating the effects of GEM on medical, psychological, and functional abilities among community-dwelling older individuals; two RCTs of GA-based allocation of chemotherapy and treatment outcomes for elderly individuals with cancer; 10 studies and two systematic reviews of life expectancy; and seven systematic reviews or pooled analyses of GA studies. The study objectives, study population, outcomes measures and results, and conclusions of the included studies are summarized in Tables A to F in the Data Supplement. Table G in the Data Supplement summarizes the relationship of specific GA tools with outcomes of interest, and Table H of the Data Supplement includes case examples that describe how the practice recommendations can be used to inform clinical care for older patients with cancer. Because there are robust data for GA in patients aged 65 and over, especially with regard to the use of GA to predict outcomes (see Tables A to E in the Data Supplement), the age of 65 was used as the cutoff for the age of patients to be considered for GA in oncology clinical practice.

## RECOMMENDATIONS

### Clinical Question 1

Should geriatric assessment (GA) be used in older adults with cancer to predict adverse outcomes from chemotherapy?

*Recommendation 1.* In patients age 65 and older receiving chemotherapy, geriatric assessment (GA)—the evaluation of functional status, physical performance and falls, comorbid medical conditions, depression, social activity/support, nutritional status, and cognition—should be used to identify vulnerabilities or geriatric impairments that are not routinely captured in oncology assessments (Type: Evidence-based, benefits outweigh harms; Evidence quality: high; Strength of recommendation: strong).

**Literature review, analysis, and clinical interpretation.** GA can uncover problems that would not otherwise be identified by a routine history and physical or by oncology PS tools. GA can predict the risk of chemotherapy toxicity, functional decline, and mortality.

A GA comprises several domains, including functional status (such as activities of daily living and instrumental activities of daily living [ADLs/IADLs], performance-based measures of mobility), comorbidity, cognition, depression, social activity/support, and nutritional status.[23] GA identifies clinically significant aging-related problems, such as risk for falls and cognitive impairment, that are not uncovered during a routine oncology history and physical. In addition, the GA provides information regarding geriatric-specific domains beyond those captured by standard oncology assessment tools, the KPS and the ECOG PS.[10,27-29] For example, Repetto et al[28] found that GA added substantial information regarding the functional status of older patients with cancer, including those with a good PS. Similarly, Serraino et al[29] found that a GA "can help to better identify the specific needs of each patient with a poor PS among the whole set of functional status parameters."(p272) GA can identify other health problems that may not be uncovered during a routine history and physical, such as the need for assistance with daily function, malnutrition, and comorbidities.[30,31] Kenis et al[31] showed that a GA detected unknown geriatric problems in 51.2% (n = 931) of 1,820 patients, most commonly related to function (40.1%) and nutrition (37.6%). Two studies utilizing Delphi methodology found that geriatric oncology experts agreed that all domains of GA were important to consider when assessing older patients with cancer.[22,32]

Several studies have demonstrated that GA can identify older adults with cancer at increased risk for mortality.[33-52] In a study of 660 women age ≥ 65 with breast cancer, Clough-Gorr et al[33] provided longitudinal evidence that GA domains—sociodemographic, clinical, functional, and psychosocial—are predictive of 7-year mortality. Further, Aaldriks et al[34] found that a three-item Geriatric Prognostic Index comprising two items from the Mini-Nutritional Assessment (MNA) and one from the Groningen Frailty Indicator may help to identify elevated risk for mortality in older adults with cancer. Decreased food intake in the past 3 months, use of more than three prescription drugs, and dependence in shopping independently predicted for mortality, with an increasing hazard ratio (HR) of 1.58, 2.32, and 5.58 for one, two, or three positive items, respectively (all $P < .001$).[34] Palumbo et al[52] developed a scoring system based on age, comorbidities, and functional status to identify three categories of fit, intermediate fitness, and frail; the 3-year overall survival was 84%, 76%, and 57%, respectively, among older adults with multiple myeloma. Systematic reviews of geriatric oncology studies have confirmed the association between GA domains and mortality.[30,53-55]

GA has been shown to identify patients aged ≥ 65 at increased risk for experiencing chemotherapy toxicity.[10,27,56-58] Hurria and colleagues[10,27] from CARG developed (N = 500) and validated (N = 250) a predictive model for chemotherapy toxicity consisting of 11 items, of which five are GA questions (falls in the past 6 months,

need for assistance with daily medications, ability to walk one block, limitations in social activities, and hearing ability). This predictive model can discriminate chemotherapy toxicity risk in older adults with solid tumors better than the physician-rated KPS.[10,27] Extermann et al[57] developed (N = 331) and validated (N = 187) the Chemotherapy Risk Assessment Scale for High-Age Patients (CRASH) score for patients aged ≥ 70 years, which integrates results from GA tools (function, nutrition, and cognition) to predict the risk of hematologic and nonhematologic toxicity in older patients. Systematic reviews of geriatric oncology studies confirmed the association between GA domains and the risk of chemotherapy toxicity in a majority of studies,[30,53-55] with functional status and geriatric syndromes (such as impaired hearing) as the most significant predictors of toxicity risk.[53] Luciani et al[59] evaluated the Vulnerable Elders Survey-13 (VES-13) and found that patients who were vulnerable were at significantly increased risk of hematologic and nonhematologic toxicity.

Additionally, GA has been shown to predict completion of chemotherapy,[34,58,60] with one study by von Gruenigen et al showing that the likelihood of completing four cycles of therapy was associated with better functional, quality of life, and social activities scores[58] and another study by Aaldriks et al[34] showing that the feasibility of chemotherapy can be predicted by three items of the MNA. Risk of hospitalization could also be predicted using GA measures.[56]

Furthermore, GA items[61,62] and brief GA-based screening tools[62,63] are predictive of functional decline among older adults receiving chemotherapy. Hoppe et al[61] showed that depression and IADLs are associated with early functional decline during chemotherapy. Owusu et al[62,63] showed that the VES-13 can identify older women with breast cancer at risk for functional decline. Patients who experienced functional decline were more likely to have had lower baseline ADL scores than those who did not functionally decline (5.0 *v* 5.8; $P < .0001$), have lower IADL scores (5.8 *v* 7.6; $P < .0001$), be African American (49% *v* 29%; $P = .02$), and have a high school education or less (71% *v* 36%; $P = .0001$).[63] In a subsequent study, these researchers also showed that gait speed, Short Physical Performance Battery (SPPB), grip strength, and VES-13 were predictive of functional decline among older women with breast cancer.[62]

In light of the above evidence, the Panel recommends the use of GA instead of or in addition to standard oncology assessment tools (KPS, ECOG PS) to best identify patients at increased risk for chemotherapy toxicity, mortality, functional decline, and other adverse outcomes. Refer to the case in Box 1 for an example of how to implement this recommendation; additional cases are available in the Data Supplement.

### *Clinical Question 2*

For older patients who are considering undergoing chemotherapy, which GA tools should clinicians use to predict adverse outcomes (including chemotherapy toxicity and mortality)?

*Recommendation 2.* While many tools are appropriate for assessment of each domain, the Expert Panel based its recommendations on evidence supporting their utility for predicting adverse outcomes and on ease of administration. In patients aged 65 and older receiving chemotherapy, validated and practical GA-based tools can be used to predict adverse outcomes. The evidence supports, at a minimum, assessment of function, comorbidity, falls, depression, cognition, and nutrition. The Expert Panel recommends IADLs for function, a thorough history or validated tool to assess comorbidity, a single question for falls, the Geriatric Depression Scale (GDS) to screen for depression, the Mini-Cog or the Blessed Orientation-Memory-Concentration (BOMC) test to screen for cognitive issues, and assessment of unintentional weight loss to evaluate nutrition (Box 2). Either the CARG or the CRASH tool is best used to obtain specific estimates on risk of chemotherapy toxicity, while short tools such as Geriatric-8 (G8) or VES-13 can help to predict mortality. Table 1 also provides alternatives to these options, including the use of objective physical performance measures (eg, SPPB, Timed Up and Go, gait speed) for the clinical settings that have the resources (time and staff) to do this (Type: evidence-based, benefits outweigh harms; Evidence quality: high that GA tools predict chemotherapy toxicity and mortality; Evidence quality: moderate to recommend specific tools to evaluate GA domains such as function, comorbidity, depression, cognition, and nutrition. Strength of recommendations: moderate.).

**Literature review, analysis, and clinical interpretation.** The Expert Panel reviewed the literature to determine which validated tools have the strongest data for identifying older patients at highest risk for adverse outcomes from chemotherapy. The Expert Panel then reviewed the data through the lens of practicality, that is, length of the tool, patient and/or staff burden, and value. A number of high-quality prospective observational studies of ≥ 100 patients have examined the use of specific GA items or tools for predicting chemotherapy toxicity; treatment tolerance; and hospitalizations, mortality, and functional decline (Data Supplement).

**Chemotherapy toxicity.** Several tools that combine GA and clinical variables have shown high predictive value for chemotherapy toxicity and are able to better identify older patients at risk for chemotherapy toxicity than standard oncology tools. The CARG toxicity tool includes questions about prior falls (one or more *v* none), hearing problems (deaf to excellent), limitations in walking one block (limited a lot, limited a little, not limited), interference of social activities by physical health and/or emotional problems (all of the time to none of the time), and ability to take own medications (independently to completely unable) as well as about age, gender, height and weight, cancer type (GI *v* genitourinary *v* other), dosage (standard *v* dose reduced), number of chemotherapy agents (mono *v* poly), hemoglobin level, and creatinine clearance.[10,27] This tool takes < 5 minutes to complete and is freely available online for use on the CARG Web site (www.mycarg.org/Chemo_Toxicity_Calculator). The tool calculates the estimated risk of any grade 3 to 5 toxicity. Similarly, the CRASH score incorporates validated GA tools as well as clinical variables and adjusts for chemotherapy intensity.[57] This score provides estimates separately for grade 3 hematologic toxicity (which includes risk factors of diastolic blood pressure [> 72 mm Hg], IADL score [< 26], and lactate dehydrogenase [> 459 U/L]) as well as grade 3 to 4 nonhematologic toxicity (which includes risk factors of ECOG PS, Mini-Mental State Examination [MMSE] score [< 30], and MNA score [< 28]). While the CRASH tool's administration time is longer than that of the CARG tool (20 to 30 minutes), it can be considered in and of itself a complete GA as it includes several GA tools (ie, IADLs, MMSE, MNA). The CRASH score is freely

  

## Box 1. Application of Guideline Recommendations 1 to 4: Assessment and Management of an Older Patient Considering Adjuvant Chemotherapy

### Case 1

A 75-year-old man with coronary artery disease (status post recent coronary artery bypass surgery), hypertension, hyperlipidemia, and osteoarthritis. He describes his own health as "good." Medications include aspirin, atenolol, and lovastatin. Laboratory examination reveals a mild microcytic anemia. Colonoscopy revealed a sigmoid mass. Computed tomography scans are without evidence of metastatic disease. The patient undergoes hemicolectomy. Pathologic examination reveals a T3N2 (four nodes positive) tumor. Stage is IIIC. Your assessment of his Eastern Cooperative Oncology Group performance status is 1, and he reports mild fatigue. He lives alone. He has a daughter with him at the visit who works during the day.

#### *Workflow*

The patient completed a survey in the waiting room that included instrumental activities of daily living (IADLs), one question about falls, and the Geriatric Depression Scale. Additional self-reported questions required for the Cancer and Aging Research Group (CARG) toxicity and e-Prognosis tools are also included in the survey. The total time for survey completion by the patient, with assistance from his daughter, took less than 10 minutes. When the patient was taken to the examination room, the medical assistant took vital signs and provided the survey results to the oncology nurse. The nurse reviewed comorbidities, weighed the patient, and performed a Mini-Cog in 3 minutes as part of the intake assessment. The nurse (can also be done by advanced practice provider or the oncologist) completed and calculated the CARG toxicity tool and ePrognosis tool online (3 minutes).

#### *Geriatric Assessment (GA) Results*

The patient requires assistance with IADLs (daughter fills pill box each week for him and manages finances, difficulty with household chores), has had several recent falls without injury, and has no significant life-limiting comorbidities or medication issues. In addition, his Mini-Cog is abnormal (unable to perform three-word recall), Geriatric Depression Scale score is normal ($< 5$), and he has had no significant weight loss (body mass index, 29 kg/m$^2$).

#### *CARG Toxicity Score*

CARG toxicity score is 12, with an 82% risk of grade 3 to 5 toxicity with full-dose monotherapy based on inputted age (over 72), height and weight (180 cm, 80 kg), GI cancer type, full dosage chemotherapy, monotherapy, hemoglobin $\geq$ 10 g/dL, excellent hearing, one or more falls, requirement for some help with medications, limited a little with walking one block, no limitations with social activities, and normal creatinine clearance.

#### *Life Expectancy, Noncancer (ePrognosis Calculator for Patients Over 65)*

Schonberg Index score is 12, corresponding to a 5-year noncancer mortality of 37% based on age (75); sex (male); body mass index ($\geq$ 25 kg/m$^2$); self-reported health ("good"); no chronic obstructive pulmonary disease, congestive heart failure, or diabetes; and no prior cancer history (to estimate noncancer life expectancy). He has never smoked, has difficulty with walking 1/4 mile without help, has had no hospitalizations in the past 12 months, requires help with handling everyday household chores, has difficulty managing money, has no difficulty with bathing or showering, and has difficulty pushing or pulling large objects.

#### *Shared Treatment Decision Making and Targeted Interventions*

Active shared discussion took place with patient and daughter (who is designated health care proxy) about the risks and benefits of adjuvant chemotherapy. The patient's noncancer 5-year mortality risk is estimated by Schonberg Index to be 37%, and his cancer has a high risk of recurrence, so adjuvant chemotherapy may still be worthwhile in prognostic terms. However, grade 3 to 5 toxicity risk is over 80% according to CARG.

In the assessment of decision-making capacity, he has mild cognitive impairment, and while he is able to remain independent at home, he requires assistance from his daughter with managing medications, finances, and household chores. He is able to communicate his cancer history, choices for treatment (none *v* fluorouracil monotherapy), and implications of each treatment choice. He is able to communicate his preferences, stating that he understands there is a high risk of toxicity and that there are limited data for the benefits of adjuvant chemotherapy in patients with cognitive impairment, but he would like to try treatment. It was discussed that having someone stay with him would be important; the daughter decided to arrange time off from work and enlist the help of family to stay with him. Frequent follow-up visits to assess for toxicity and worsening of function/cognition during the first cycle of treatment were arranged. Due to fall risk, the patient was prescribed physical therapy to assess balance and the need for an assist device. Home care was arranged for a safety evaluation and medication management assistance.

### Case 2

#### *A Different Patient Who Is 85 Without Any GA Impairments*

A robust 85-year-old presents with a similar cancer history but is without GA impairments, including comorbidities or cognitive issues; in "excellent" self-reported health; and with no IADL deficits.

#### *CARG Toxicity Score*

CARG toxicity score is 6, with a 44% risk of grade 3 to 5 toxicity with full-dose monotherapy.

#### *Life Expectancy (ePrognosis for Patients Over 65)*

Schonberg Index score is 7, with an estimated (noncancer) 5-year noncancer mortality risk of 12%.

#### *Treatment Decision Making and Targeted Interventions*

This physically fit, cognitively intact 85-year-old is recommended to undergo full-dose monotherapy chemotherapy with no GA-based interventions recommended.

**Box 2: Summary of a Minimum Data Set for Practical Assessment of Vulnerabilities in Older Patients With Cancer**

See Table 1 for more details and rationale.

1. Predict chemotherapy toxicity (if clinically applicable): Cancer and Aging Research Group or Chemotherapy Risk Assessment Scale for High-Age Patients tools
2. Estimate (noncancer) life expectancy (if clinically applicable): ePrognosis
3. Functional assessment: instrumental activities of daily living
4. Comorbidity assessment: medical record review or validated tool
5. Screening for falls, one question: how many falls or falls with an injury have you had in the previous 6 months (or since your last visit)?
6. Screening for depression: Geriatric Depression Scale or other validated tool
7. Screening for cognitive impairment: Mini-Cog or Blessed Orientation-Memory-Concentration test
8. Screening for malnutrition: weight loss/body mass index

available online on the Web site for the Senior Adult Oncology Program at Moffitt Cancer Center (https://moffitt.org/for-healthcare-providers/clinical-programs-and-services/senior-adult-oncology-program/senior-adult-oncology-program-tools). Of note, while the CARG toxicity tool has been developed and validated for patients aged ≥ 65, the CRASH tool is validated for patients aged 70 and over.

Other studies have demonstrated that impaired IADL score is associated with increased grade 3 to 5 toxicity in older patients with metastatic colorectal cancer[56] and ovarian cancer.[60] Low MMSE scores have also been shown to be significantly associated with increased grade 3 to 5 toxicity in older patients with advanced colorectal cancer.[56] In a study of 648 patients aged ≥ 65 years with solid or hematologic malignancies, the VES-13, a tool that includes age, self-rated health, and functional impairments, was independently associated with grade 3 to 5 hematologic toxicity (odds ratio, 2.15; $P < .001$) and nonhematologic toxicity (odds ratio, 1.55; $P = .04$).[59]

**Treatment tolerance and hospitalizations.** Studies have found that impaired IADL score,[60] items from the MNA[34] (psychological distress, neuropsychological problems, and use of more than three prescription drugs), Charlson comorbidity score (≥ 1),[33] and poor mental health (Mental Health Inventory-15 score < 15)[33] are independently associated with early discontinuation of chemotherapy or poor chemotherapy tolerance. Low MMSE score and GDS score are independently associated with unexpected hospitalization in older patients with advanced colorectal cancer[56] and ADL/IADL scores are independently associated with unplanned admissions to the hospital among patients with ovarian cancer.[60]

**Mortality and functional decline.** Short GA-based screening tools are independently associated with mortality in several multivariable models and, therefore, may have value in identifying those patients at risk for early death in clinical practice. These studies have examined the predictive value of GA tools in heterogeneous populations (eg, any patient with cancer aged 70+) and within specific cancer populations. The G8 is an eight-item tool derived from a more-comprehensive nutritional measure, the MNA.[64] It includes questions related to food intake, weight loss, mobility, neuropsychological problems, body mass index, medication use (more than three per day), self-rated health, and age. In a study of 937 patients aged ≥ 70 with a malignant tumor, 74.4% had an abnormal score of ≤ 14, and this was strongly prognostic for functional decline on ADLs/IADLs at 2 to 3 months after a cancer treatment decision and for overall survival (HR for G8 normal *v* abnormal, 0.38; 95% CI, 0.27 to 0.52).[37] Similarly, other studies have demonstrated that G8[38] and MNA are independently associated with early mortality (6 months[46] and 1 year[35]). A six-item modified version of the G8 showed a similar ability to predict 1- and 3-year survival in 1,333 patients aged ≥ 70 with newly diagnosed solid or hematologic malignancies (adjusted HR, 4.9 and 2.6 for 1- and 3-year survival, respectively).[65] This study included patients receiving adjuvant treatment and those with metastatic disease. The VES-13 has been shown to be associated with functional decline and overall survival in older patients with early-stage breast cancer[62] as well as in patients aged ≥ 70 with other early-stage solid tumors.[66] Both the G8 and VES-13 take a median of 5 minutes to administer.[38]

GA tools that measure the domains of function (IADLs,[46,58,60,67] SPPB,[67] Timed Up and Go,[46] gait speed[67]), nutrition (MNA[35,46]), and depression (GDS,[44] Mental Health Inventory[33]) have all been shown to independently predict mortality. Many studies have demonstrated that a frailty index guided by GA[36,68-72] and frameworks where GA variables risk stratify older patients into fit, vulnerable, or frail groups can also predict mortality.[42,73-75]

**Assessment of falls, comorbidity, cognition, and depression.** Given the high prevalence of age-related health conditions (eg, falls, comorbidities, cognitive issues, depression) and the potential for chemotherapy to worsen these conditions, the Panel recommendations include assessing these conditions for all patients aged ≥ 65 receiving chemotherapy.

In older patients, a current or previous cancer diagnosis confers close to a 20% greater odds of suffering a fall.[76] A systematic review by Wildes et al[77] reported that falls occur at a rate of 20% to 30% in older patients with cancer over time periods of 3 to 12 months. In 20% to 30% of older patients who fall, the falls lead to significant injury, such as fractures, head trauma, and erosion of self-confidence, all of which can interfere with a patient's ability to live independently.[78,79] Older patients have a greater risk of hospitalization and long-term institutional confinement after a fall, and falls rank as the sixth leading cause of death in older people.[78,79] Falls have been shown to be associated with chemotherapy toxicity in older patients with cancer.[10] A simple one-item screening tool is recommended by the Panel: "How many falls have you had in the previous 6 months (or since your last visit)?"[80] The American Geriatrics Society recommends screening for falls in all community-dwelling older adults aged 65 and over.[81]

Comorbidity, defined as a medical condition that exists along with an index condition, is common in older patients.[17] In Medicare

  

**Table 1.** Recommended Geriatric Oncology Tools

| Assessment of the Below GA Domains Recommended for All Patients Aged 65+ | Recommended Tool and Score Signifying Impairment | Evidence to Support Recommendation | Administration Characteristics | Considerations and Other Evaluation Options |
|---|---|---|---|---|
| Function | IADLs: dependence on any task signifies impairment. | Large prospective studies of older patients with cancer show that IADLs predict chemotherapy toxicity, mortality, hospitalizations, and functional decline. Advocated by experts in Delphi consensus panels. | PRO; < 5 minutes | Consider ADLs. Any ADL deficit is used for characterization of frailty. Consider objective measure of physical performance such as SPPB, TUG, or gait speed. |
| Falls | Single item: "How many falls have you had over the last 6 months (or since the last visit)?" One or more recent falls. | Falls are common in older adults with cancer and can lead to serious injury. Falls have been associated with chemotherapy toxicity. Assessment for falls is recommended by geriatric oncology expert panels and the American Geriatrics Society for all older adults. | PRO; < 1 minute | |
| Comorbidity | Robust review of chronic medical conditions and medications through routine history: three or more chronic health problems or one or more serious health problems. | Comorbidity is associated with poorer survival, chemotherapy toxicity, mortality, and hospitalizations. | Part of routine history | Consider validated tools such as CIRS-G or Charlson. History, CIRS-G, and OARS comorbidity recommended by experts. |
| Cognition | Mini-Cog: an abnormal test is defined by zero words recalled OR one to two words recalled + abnormal clock-drawing test. This screening test for cognitive impairment and abnormal scores requires further follow-up and decision-making capacity assessment. OR BOMC test: a score of 6 or greater identifies patients who have moderate deficits, and a cut point of 11 or greater identifies patients with severe cognitive impairment. | Growing data show that cognitive impairment is associated with poorer survival in older patients with cancer and increased chemotherapy toxicity risk. Mini-Cog has been shown to have high sensitivity and specificity for identifying cognitive impairment when compared with longer tools. BOMC scale is practical and is included in the cancer-specific GA developed by Hurria et al.[9] | Administered; ≤ 5 minutes | Multiple tools are available for cognitive assessment. The MMSE has more robust data for prediction of outcomes in older patients with cancer and has been shown to predict chemotherapy toxicity; it is included in the CRASH tool developed by Extermann et al.[57] The MOCA is also used by geriatricians. Both MMSE and MOCA are considerably longer than Mini-Cog and BOMC. |
| Depression | GDS 15 item: a score of > 5 suggests depression and requires follow-up. | Depression has been associated with unexpected hospitalizations, treatment tolerance, mortality, and functional decline in older adults with cancer receiving chemotherapy; these studies primarily assessed depression with the GDS. | PRO; ≤ 5 minutes | GDS recommended also by ASCO guidelines for depression. The Patient Health Questionnaire-9 is an alternative and is also recommended by ASCO guidelines for depression. The mental health inventory is an option and has been associated with outcomes in older patients with breast cancer. |
| Nutrition | Unintentional weight loss; > 10% weight loss from baseline weight); BMI < 21 kg/m$^2$. | Poor nutrition is associated with mortality in older patients with cancer. | PRO; < 1 minute | Consider G8 and MNA as alternatives; both are associated with mortality in older patients with cancer. |

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**Table 1.** Recommended Geriatric Oncology Tools (continued)

| Tools That Can Provide Estimates of Risk for Chemotherapy Toxicity | Items | Study Population | Administration Characteristics | Considerations |
|---|---|---|---|---|
| CARG toxicity tool: provides estimates for overall risk of grade 3 to 5 chemotherapy toxicity. | Eleven items; prior falls (one or more *v* none), hearing problems (deaf to excellent), limitations in walking one block (limited a lot, limited a little, not limited), difficulties with taking medications, interference of social activities by physical health and/or emotional problems (all of the time to none of the time) as well as age, height, weight, gender, cancer type (GI *v* genitourinary *v* other), dosage (standard *v* dose reduced), number of chemotherapy agents (mono *v* poly), hemoglobin level, and creatinine clearance. | Patients aged 65+ with a solid tumor malignancy or lymphoma starting a new chemotherapy regimen (any line). | PRO/administered; 5 minutes<br>Available online: www.mycarg.org/Chemo_Toxicity_Calculator | Can ask GA variables as part of history or include as part of PRO assessment. |
| CRASH tool: provides estimates separately for risk of grade 3 hematologic and grade 3 to 4 nonhematologic toxicity. | Assessment of risk of hematologic toxicity includes diastolic blood pressure (> 72 mm Hg), IADL score (< 26), and LDH (> 459 U/L). Assessment of risk of nonhematologic toxicity includes ECOG PS, MMSE (< 30), and MNA (< 28). Chemotherapy intensity is assessed with MAX2 index. | Patients aged 70+ years with histologically proven cancer who were starting chemotherapy. | PRO/administered; estimated time to completion is on par with full GA (20-30 minutes).<br>Available online: https://moffitt.org/for-healthcare-providers/clinical-programs-and-services/senior-adult-oncology-program/senior-adult-oncology-program-tools | The CRASH scale includes GA measures known also to predict other adverse outcomes, such as mortality, functional decline, and hospitalizations: IADLs, MMSE, and MNA. |
| **Screening Tools That Have Been Independently Associated with Adverse Outcomes in Older Patients with Cancer Receiving Chemotherapy** | **Items** | **Study Population and Evidence** | **Administration Characteristics** | **Considerations** |
| G8 | Eight items covering appetite, weight loss, neuropsychological problems, BMI, number of medications, patient self-rated health, and age. Score of ≥ 14 signifies impairment. Derived from the MNA. | Several large studies have been conducted that include patients aged 70+, which included patients with both solid and hematologic malignancies starting a new chemotherapy agent. G8 is independently associated with mortality (1 year and 3 years), even when controlling for ECOG PS and stage of cancer. | Administered; 5-10 minutes | G8 can also be used as a screening tool to identify older patients who need more comprehensive GA. |
| VES-13 | Thirteen items including age, self-rated health, common functional tasks, and ability to complete physical activities. Score of ≥ 3 is associated with mortality and chemotherapy toxicity in older patients with cancer. A score of ≥ 7 has been shown to be associated with functional decline. | VES-13 score has been shown to be associated with mortality, chemotherapy toxicity, and functional decline. | Administered or PRO (but errors are common with PRO administration); 5-10 minutes | VES-13 can also be used as a screening tool to identify older patients who need more comprehensive GA. |

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**Table 1.** Recommended Geriatric Oncology Tools (continued)

| If Resources Available, Consider Assessment of These Domains | Items | Study Population | Administration Characteristics | Considerations |
|---|---|---|---|---|
| Objective physical performance: SPPB, TUG, or gait speed | SPPB includes three tests (balance, chair stands, and gait speed); a score of < 9 is associated with increased functional decline, nursing home use, and mortality in community-dwelling older adults. TUG measures ability for a patient to get out of a chair and walk 3 m or 10 ft and back; a score of > 12 seconds is associated with an increased risk of falling. | Low SPPB score is associated with increased mortality in older women with gynecologic malignancies. TUG and gait speed have been shown to be associated with early mortality (6 months) in older patients with cancer receiving chemotherapy. SPPB and gait speed associated with functional decline in patients with nonmetastatic breast cancer receiving chemotherapy. | All administered; 1-5 minutes depending on test | |

Abbreviations: ADL, activity of daily living; BMI, body mass index; BOMC, Blessed Orientation-Memory-Concentration; CARG, Cancer and Aging Research Group; CIRS-G, Cumulative Illness Rating Score-Geriatrics; CRASH, Chemotherapy Risk Assessment Scale for High-Age Patients; ECOG PS, Eastern Cooperative Oncology Group performance status; G8, Geriatric-8; GA, geriatric assessment; GDS, Geriatric Depression Scale; IADL, instrumental activity of daily living; LDH, lactate dehydrogenase; MMSE, Mini-Mental State Examination; MNA, Mini Nutritional Assessment; MOCA, Montreal Cognitive Assessment; OARS, Older Americans Resources and Services; PRO, patient-reported outcome; SPPB, Short Physical Performance Battery; TUG, Timed Up and Go; VES-13, Vulnerable Elders Survey-13.

beneficiaries aged 65 and over, more than two thirds have at least one comorbidity, and nearly one fourth have four or more.[82] In older patients with cancer, comorbidity can complicate the diagnosis and treatment of cancer, mediate treatment effects, and present competing risks for morbidity and mortality.[17] Older adults from minority backgrounds have a higher prevalence of comorbidities than others.[8] Comorbidities have been shown to be associated with poorer survival in patients with cancer,[83,84] increased severe chemotherapy toxicity and hospitalizations,[85-87] and early discontinuation of cancer treatment.[88] Comorbidities such as congestive heart failure, diabetes, and pulmonary disease are known to strongly influence life expectancy.[89-91] A robust review of the literature as well as a discussion of the most appropriate measurement tools for comorbidity for older patients with cancer was undertaken by experts as part of a U13-funded collaboration among CARG, the National Institute on Aging, and NCI.[17] The experts concluded that in clinical practice, comorbidities should be measured and considered in treatment decision making. Both the experts from the U13 collaboration and a Delphi consensus of geriatric oncology experts[22] advocated for a robust review of health conditions and medications to be undertaken as part of a routine history of a patient with cancer and/or a validated tool.[17] Geriatric oncology experts in a Delphi consensus attributed the highest utility to the Cumulative Illness Rating Scale-Geriatrics, which classifies comorbidities by organ system and rates severity between 0 and 4.[92] Reducing the number of medications and eliminating high-risk medications for all older adults is advocated by the American Geriatrics Society.[93-95] While it is known that older patients with cancer have a high prevalence of polypharmacy and use of potentially inappropriate medications, there continues to be limited information on how polypharmacy affects outcomes of older patients with cancer, and more evidence is needed on how to best incorporate medication guidelines into the care of older adults with cancer.[96-100]

An assessment of cognition and depression using validated screening tools is a routine part of GA and has been advocated by experts and prior guidelines.[22,23,32,101,102] The prevalence of dementia is 13.9% in patients over 70.[103] Additionally, an estimated 22.2% of Americans have cognitive impairment without overt dementia.[104] Data on outcomes of patients with cognitive impairment and cancer are limited mainly because these patients are routinely excluded from research.[105,106] Population-based studies have shown that Medicare beneficiaries with dementia are less likely to receive treatment and have worse overall survival than those who do not.[107-109] In addition, several studies have shown that poor cognition is associated with chemotherapy toxicity.[56,57] In fact, the MMSE is included as part of the CRASH tool that provides an estimate for chemotherapy toxicity.[57] While several longer validated tools such as the MMSE and Montreal Orientation Cognition Assessment are advocated by geriatric oncology experts,[22] shorter screening tools such as the Mini-Cog and BOMC scales are more practical for use in busy oncology clinics.[106,110] The BOMC test consists of only six questions and can discriminate among mild, moderate, and severe cognitive deficits.[111] It has been included as part of the cancer-specific GA and has demonstrated feasibility for use in clinical oncology practices and trials.[9,112] A score of 6 or greater identifies patients who have moderate deficits, and a cut point of 11 or greater identifies patients with severe cognitive impairment.[113,114] The Mini-Cog, which takes 3 minutes to administer, combines a delayed recall item and a clock-drawing test.[110] When compared with the MMSE, an abnormal Mini-Cog demonstrates similar sensitivity and specificity for identifying dementia.[115] The Mini-Cog has been compared with the MMSE in older adults and found to have a sensitivity of 80.7% and specificity of 83.8% for identifying cognitive impairment.[116] Because of the ease of administration, the Mini-Cog and BOMC are reasonable choices for assessing cognition in older patients with cancer. Of note, the Mini-Cog has demonstrated feasibility and utility for screening for cognitive impairment in multiethnic samples and those who have low education and literacy levels.[115,117] While screening for cognitive impairment can guide interventions (see Clinical Question 4), more research that includes older patients with cancer and cognitive impairment is necessary to understand the association of cognitive impairment with outcomes.

A previous ASCO guideline has recommended that all patients should be screened for depression.[118] Clinically significant depression has been reported in 10% to 15% of older adults, with a higher prevalence being reported in older adults with cancer.[119]

Depression has been associated with unexpected hospitalizations,[56] treatment tolerance,[33] mortality,[33,44] and functional decline[61] in older adults with cancer receiving chemotherapy. The GDS is a short, reliable, and valid tool and is commonly incorporated into recommendations and guidelines for screening for depression for older adults with cancer.[18,22,119]

While objective physical performance measures have been shown to be associated with adverse outcomes in older patients with cancer, this guideline does not include a recommendation to evaluate all patients aged 65+ with a physical performance test due to the perceived increased resource need, training, and time this requires. However, the Panel strongly encourages the use of these tests when time permits and specific concerns about physical performance arise, so we have included these measures in Table 1 as optional. In addition, the Guideline Panel was not able to recommend specific screening questions for social support due to lack of evidence on the most appropriate measures. Assessing social support, especially including the presence (or not) of caregivers, is imperative for facilitating GA-guided interventions, and engaging caregivers in this process is further discussed in Clinical Question 4.

**Feasibility.** GA has been shown to be feasible to use in both clinical trials (including those in the community) and clinical care. In 2005, Hurria et al[9] published the initial feasibility data for a cancer-specific GA in 43 patients (mean age, 74 years; range, 65 to 87 years). The mean time to completion of the GA was 27 minutes (range, 8 to 45 minutes); most were able to complete the assessment without assistance (78%) and were satisfied with questionnaire length (90%). Subsequently, CALGB-360401 found the assessment to be feasible for use with older patients entering into a cooperative group clinical trial.[112] In addition, several studies have demonstrated feasibility of integration of GA into oncology care. In 2007, Hurria et al[120] demonstrated that 245 of 250 patients at two sites (an academic tertiary care center and a community-based satellite clinic) completed the patient portion of the GA with a mean time to completion of 15 minutes (range, 2 to 60 minutes); 78% of patients completed the questionnaire on their own.[120] From 2009 to 2013, Williams et al[121] administered the cancer-specific GA to 1,088 patients, including 339 from seven community clinics across North Carolina. The median time to complete the entire GA was 23 minutes in the academic center (19 minutes for the patient portion) and 30 minutes in the community (22 minutes for the patient portion). More patients in the community required assistance than patients in academic centers (24% *v* 14%) but most patients required no assistance (76%). A comprehensive systematic review by Puts et al[54] in 2012 addressing feasibility of GA found that for six studies using self-administered surveys for GA, very few patients declined completing the GA, the majority were able to complete it without assistance (> 75%), and the majority (> 90%) were satisfied with the length of the questionnaires and content. Caregivers may provide a different perspective when asked to complete the GA for older patients with cancer; in one study by Hsu et al,[25] caregivers rated patients as having poorer function, poorer mental health, and more social support than patients reported themselves. More research on how best to obtain dyadic input from both patients and caregivers on health status is necessary.

Although previous studies have used a paper-and-pencil approach for capturing GA, more-recent studies have demonstrated feasibility of electronic capture. McCleary et al[122] showed that a touchscreen computer could be used to capture the GA developed by Hurria et al[9]; in 38 patients with GI malignancies, 97% completed the GA using the touchscreen computer (51% independently), with a mean time of 23 minutes (standard deviation, 8.4 minutes). Hurria et al[123] compared multiple methods to capture GA (REDCap and SupportScreen for electronic data capture, paper and pencil) in 100 patients and found that electronic data capture was feasible, reliable, and valid and was preferred over paper and pencil. While the above reports on the feasibility of a GA that captures all relevant domains, the Expert Panel provides recommendations on the highest-priority tools and information on administration characteristics in Box 2 and Table 1; these recommendations will lead to even shorter administration times than required for a more comprehensive GA.

In summary, the Expert Panel identified from the literature practical, feasible tools that can be incorporated into clinical oncology practice for identifying older patients at high risk of adverse outcomes (Box 2; Table 1). A Delphi consensus of geriatric oncology experts stressed that all domains within a GA should be assessed and that for each domain, several tools could be used.[22] The evidence supports, at a minimum, assessment of function, comorbidity, falls, depression, cognition, and nutrition. While many tools are appropriate for assessment of each domain, the Expert Panel based recommendations on evidence supporting their utility for predicting adverse outcomes and for ease of administration. The combination of these tools and questions is practical and short and can be integrated easily into oncology clinical practice. Table 1 also provides alternatives to these options, including objective physical performance measures known to be associated with outcomes in older patients with cancer.

The information gained from GA-based tools should help to guide discussions about the risks and benefits of treatment.[6,124,125] In addition, they can help to guide interventions (see Clinical Question 4). Hamaker et al[126] noted that GA was much less costly or time consuming than other predictive tools used to establish the risk of progression and mortality in patients with cancer (eg, $28/h for nurse's salary *v* $50/h for a carcinoembryonic antigen *v* $3,416 for breast cancer genomic testing). The evidence suggests that GA can help to "spare" from harm older patients who are at high risk of toxicity if used in a discussion of risks and benefits to guide shared decision making for chemotherapy initiation. The cost of managing toxicities and hospitalizations directly related to chemotherapy should not be considered more feasible than incorporating GA into clinical practice.[126] Refer to the illustrative case in Box 1 for an example of how to implement this recommendation; additional cases are available in the Data Supplement.

### *Clinical Question 3*

What general (ie, noncancer-specific) life expectancy (LE) data for community-dwelling patients should clinicians consider to estimate mortality and best inform treatment decision making for older patients with cancer?

*Recommendation 3.* Based on the best clinical opinion of the Expert Panel, clinicians should use one of the validated tools listed at ePrognosis (https://eprognosis.ucsf.edu) to estimate noncancer life expectancy to determine if patients have adequate life

  

expectancy beyond 4 years to expect benefits from specific cancer interventions, including chemotherapy. The Expert Panel especially recommends using either the well-validated Schonberg Index or Lee Index. The input for calculating both of them is presented as the Lee Schonberg Index on ePrognosis (https://eprognosis.ucsf.edu/leeschonberg.php), with separate estimates produced for each. The databases upon which the indices have been created and validated are from separate large US-based populations. (There are minor differences in the specific variables used for each index, and the estimates differ slightly in the underlying databases used. For example, Schonberg is based on people over 65 years, while Lee includes those over 50.) The most common domains included in indices developed to predict mortality in community-dwelling older adults are age, sex, health conditions (eg, diabetes, chronic obstructive pulmonary disease [COPD]), functional status (eg, ADLs, IADLs, mobility), health behaviors and lifestyle factors (eg, smoking status, body mass index), and self-reported health.[89,90-92,127,128] Several indices have "presence of cancer" as a relevant variable, and answering "no" to this question will allow for estimation of "noncancer" life expectancy to consider competing risks of mortality (Type: informal consensus, benefits outweigh harms; Evidence quality: high that it predicts mortality, insufficient that it improves outcomes or improves decision making; Strength of recommendation: strong that it predicts mortality, weak that it improves outcomes or improves decision making).

**Literature review, analysis, and clinical interpretation.** When making treatment decisions for older adults with cancer, prognosis is a fundamental concept. Both physicians and patients need to estimate overall prognosis reasonably accurately to make the most appropriate treatment decisions. Choosing treatments for cancer involves important trade-offs. For many cancer treatments, there is a time lag to benefit in which patients receive a treatment earlier to reduce their chance of a poor outcome later. The time lag to benefit is defined as the amount of time between receipt of a treatment until benefits (eg, mortality reduction) are seen. For many older adults, the time lag to benefit from some cancer treatments may be beyond their life expectancy based on their general health and competing risks for mortality (eg, other conditions).[129]

There are two general types of life expectancy estimations that must be conducted: (1) prognosis based on treatment of the cancer the patient has or is at-risk for (in the case of screening) and (2) prognosis based on the competing mortality risks from noncancer causes. This literature review is focused on #2, estimation of noncancer prognosis, derived from studies of older adults without cancer and based on known risk factors more prevalent at older ages, such as major comorbidities, functional status, and self-assessed health status (see Data Supplement 4). This prognostic information is then extrapolated and applied to patients who have cancer. Most of these indices can be found on the easy-to-use ePrognosis Web site (https://eprognosis.ucsf.edu), which is also referenced as a source of life expectancy estimation in the National Comprehensive Cancer Network guidelines. This section focuses on the best evidence regarding life expectancy estimation based on noncancer factors (described further below).

The types of clinical scenarios that are especially relevant for life expectancy estimation involve patients with longer-term survival prospects from treatment of the primary tumor. One example is screening for cancer when there are important time-to-benefit concerns to consider and potential harms that may occur at the time of screening (eg, bowel perforation during a screening colonoscopy). Another important clinical situation is consideration of the use of adjuvant therapies for small absolute survival benefits, for example, with breast and colon cancer. We focused our evaluation on tools that predict longer-term prognosis to evaluate if a patient with health conditions other than cancer is estimated to live long enough to experience survival benefits from cancer treatment. Existing prognostic tools for estimating such longer-term prognosis focus on 4 to 14 years. The specific variables that estimate prognosis varies across studies, but many are included in a GA (see Recommendations 1 and 2), self-reported, readily available in databases, and/or exist in claims data.

The majority of prognostic indices are based on data from community-dwelling older adults without cancer, which predict overall mortality based on a limited set of variables. In several situations, an index was updated in the literature periodically, with each update extending the time period over which the index was validated up to 14 years. The most common domains included in these prognostic indices are age, sex, health conditions (eg, diabetes, chronic obstructive pulmonary disease), functional status (eg, ADLs, IADLs, mobility), health behaviors and lifestyle factors (eg, smoking status, body mass index), and self-reported health. Another approach focuses on using comorbidities as the primary stratification factor. Specifically, Cho and colleagues[130,131] estimated life expectancy in people over the age of 65 from the SEER-Medicare database based on their age, race, sex, and presence and absence of various Charlson comorbidities.

There are several important caveats to consider, including whether the prognostic variables are self-reported, readily available in databases, or exist in claims data. While the online ePrognosis calculators make estimation straightforward, they do require that all the elements be present, and these elements may not always be readily available in real time and/or may require additional data collection. For this reason, it is best to know in advance which index one intends to use and have that information available in advance of discussing prognosis with patients; many relevant variables are captured within GA tools so that GA variables can inform both risk of toxicity and life expectancy estimation. In addition, as several indices have "presence of cancer" as a relevant variable, our strong recommendation is to answer "no" to this question if this is the patient's first cancer diagnosis, since the life expectancy estimation is specifically to indicate prognosis as if the patient did not have cancer, to consider competing risks of mortality. If a patient has a history of another cancer (whether the same type of cancer or not), it would be appropriate to answer "yes" to this question.

**ePrognosis.** The ePrognosis Web site (https://eprognosis.ucsf.edu) is an excellent starting point for estimating prognosis using the indices available there. The indices are strong in estimating mortality over the timelines listed, but they apply to populations of older adults and not to specific individuals.[127,132] Therefore, using them for decision making for individual patients, as recommended here, requires care and clinical judgment. In addition, it is not yet known if using these indices do, in fact, change the decision making of providers or improve overall outcomes.

The Panel considered the following database studies of community-dwelling older adults. One group, led by Lee and Cruz and colleagues,[127,128,130,133] uses a 12-variable index from the Health and Retirement Survey population for patients over 50 years old to estimate 4- and 10-year survival. It does so with high reliability at both time points, and it was possible to convert the mortality index into a more general life expectancy calculator.[128] Of note, the index included a diagnosis of cancer, which would have to be excluded for assessing noncancer-based life expectancy. In another study, Suemoto et al[134] developed an index with an individual-level meta-analysis for individuals over 60 years old using data across five large cohorts, and included 13 variables typically available during an outpatient clinic visit. Reasonable calibration and discrimination for the index was found at 10 years.

A well-validated prognostic index for older adults is reported in a series of articles by Schonberg et al[89-91] based on the National Health Interview Survey population in community-dwelling individuals over 65 years old ($n > 20,000$). An 11-item index was created and validated at 5-, 9-, 10-, and 14-year follow-up and included both development and validation cohorts. The index had strong calibration and discrimination at all time points. It has not yet been tested in a strictly clinical population, and it includes a cancer diagnosis among its variables, which would have to be answered as no for patients newly diagnosed with a first primary cancer to estimate noncancer life expectancy.

Of note, there is one disease-specific study of older patients with prostate cancer that otherwise met our review inclusion criteria. Kent et al[135] assessed a large prostate cancer cohort of men from the Prostate Cancer Outcomes Study for 10- and 15-year mortality, stratified by comorbidities. The index accurately predicted mortality at 15 years, except for patients with highest-risk cancer. These men with prostate cancer were found to have longer life expectancies than age-matched cohorts of men without prostate cancer, providing important context for the aggressive treatment of comorbid diseases.

**Common elements across indices.** Each index uses a somewhat different set of predictor variables, but there is substantial overlap among many data elements, and many variables are captured as part of a routine GA. One should use one of the validated tools listed at ePrognosis (https://eprognosis.ucsf.edu) to estimate life expectancy $\geq 4$ years. The Expert Panel especially recommends either the Schonberg Index or the Lee Index, available as the Lee Schonberg Index at ePrognosis (https://eprognosis.ucsf.edu/leeschonberg.php), where following a common input screen, the prognostic estimates from each index are provided separately.

**Review/Meta-analysis articles.** Two systematic reviews and/or meta-analyses of prognostic indices in older adults were identified.[136,137] Links to those reviews are provided in the Data Supplement. Both concluded that while there are many articles of reasonably high quality, there is not one index that can be considered ready for widespread clinical use for individual-level prognostication, including for use in patients with cancer, primarily due to a lack of external validity. Nevertheless, the Expert Panel is recommending using the above-referenced indices when prognostication is appropriate. Refer to the illustrative case in Box 1 for an example of how to implement this recommendation; additional cases are available in the Data Supplement.

### *Clinical Question 4*

How should GA be used to guide management of older patients with cancer?

*Preamble to Recommendation 4: The GA-guided care processes framework.* In patients 65 and older, GA can help to guide treatment decision making and interventions. Recommendation 4 utilizes a GA-guided care processes framework.[18,22] GA-guided care processes refer to the use of GA to (1) inform cancer treatment decisions (eg, modification of chemotherapy dosing in patients with functional impairments) and (2) select targeted interventions that could be implemented to address GA-identified vulnerabilities (eg, mobility deficits). While there are not yet completed RCTs that demonstrate that GA-guided care, or "GA with management,"[18,22] definitively improves outcomes of older patients with cancer, this care model has been shown to improve outcomes in older noncancer populations and thus, are likely applicable to older patients with cancer. Delphi consensus panels of experts have established approaches for how to implement clinically GA-guided care processes in older adults with cancer.[22,32] The GA-guided care processes framework offers a heuristic approach to translating information obtained through GA to treatment decisions and interventions, pending the publication of the results from ongoing research designed to more definitively identify the utility of GA-guided interventions to improve outcomes of older patients with cancer.

*Recommendation 4.* Delphi consensus panels of geriatric oncology experts have established approaches for how to implement clinically GA-guided care processes in older adults with cancer.[22,32] The Expert Panel recommends that clinicians apply the results of GA to develop an integrated and individualized plan for patients that informs treatment selection by helping to estimate risks for adverse outcomes (see Recommendation 2) and to identify nononcologic problems (see Recommendation 1) that may be amenable to intervention.

Based on clinical experience and the results of formal expert consensus studies,[22,32] the Expert Panel suggests that clinicians take into account GA results when recommending treatment and that the information should be provided to patients and caregivers to guide decision making.[6] In addition, clinicians should implement targeted, GA-guided interventions to manage nononcologic problems. Consistent with the results of formal modified Delphi consensus studies, the Expert Panel supports the specific high-priority GA-guided interventions outlined in Table 2 (Type: informal consensus; Evidence quality: moderate; Strength of recommendation: moderate).

**Literature review, analysis, and clinical interpretation.** There is increasing evidence on how GA can best influence management of older patients with cancer. Several recent systematic reviews and prospective observational studies have demonstrated that GA results can influence cancer treatment decision making. In addition, expert consensus statements provide information on how GA can help to guide interventions for older patients with cancer. RCT data are available for community-dwelling older adults without cancer; these demonstrate the benefits of GA on outcomes. RCTs of GA-based interventions (ie, GEM) for older patients with cancer are currently under way (Table 3).

Problems identified by GA can impact decision making for cancer treatment.[23] In a systematic review by Hamaker et al,[138] the initial cancer treatment plan was modified in 39% of patients based on GA evaluation. Two thirds of these modifications resulted in

  

less-intensive treatment, likely an attempt to adjust treatment in patients who have GA impairments. In a study by Chaïbi et al,[139] 45 (28%) of 161 patients received more-intensive cancer treatment as a result of GA. In another large study by Kenis et al,[31] patients aged ≥ 70 with cancer at one of 10 hospitals were screened with G8. A full GA was performed if the G8 score was abnormal (≤ 14 of 17). The physicians reported that the GA influenced the treatment decision in 25.3% of patients. In two hospitals, Decoster et al[140] found that for 56% of patients (N = 902), physicians consulted the GA, and in these patients, the GA influenced treatment decisions in 44.2%. The ELCAPA study evaluated 375 consecutive older patients with cancer assessed by geriatricians using GA.[141] The initial treatment plan was modified in 20.8% of patients (80.0% of these to decrease treatment intensity), and ADL score and malnutrition were independently associated with changes in cancer treatment. Farcet et al[142] evaluated 217 older patients with cancer with GA and found that GA led to adaptation of treatment regimens in 47% of patients and a more supportive or palliative treatment plan in 40.6%. While ECOG PS was associated with final treatment recommendations in univariable analysis, only increasing frailty markers on GA (nutrition, physical activity, energy, mobility, strength) and ADL deficits were significantly associated with final treatment recommendations in multivariable analysis.

Similarly, Marenco et al[143] evaluated 571 older patients with cancer over 6 years and found that ADL and IADL deficits, low body mass index, increasing age, and living alone were associated with an increased likelihood of receiving less-intensive therapies. In essence, in large cohorts of older patients with cancer who undergo GA, GA influences cancer treatment decisions 20% to 47% of the time, primarily toward less-intensive therapy. In the only RCT of GA being used to guide management, Corre et al[144] randomly assigned 494 older patients with non–small-cell lung cancer to an experimental strategy on the basis of GA versus a standard strategy of chemotherapy allocation. Patients in the GA-guided treatment arm, compared with standard-arm patients, experienced significantly less all-grade toxicity (85.6% *v* 93.4%; $P = .015$) and fewer treatment failures as a result of toxicity (4.8% *v* 11.8%; $P = .007$), with no differences in survival.

In community-dwelling older adults who undergo GA, the benefits of nononcologic GA-guided interventions include prevention of geriatric syndromes, recognition of cognitive deficits, prevention of hospitalizations and nursing home admissions, and overall improvement of quality of life.[145-148] Although results are mixed, the majority of RCTs of GEM in community-dwelling older adults (see Table C in Data Supplement) have shown benefits in mortality[149-151]; functional decline[148,152,153]; health care utilization including hospital admissions;[149,150,153-155] medication management;[156] mobility;[157] attainment of goals;[158] and patient satisfaction,[155] without significantly increased overall costs.[148,149,151,153,159] Studies in frailer individuals were the least likely to show benefit,[160-162] likely due to decreased adherence to the interventions.

A number of studies have shown that GA can guide nononcologic interventions for older patients with cancer.[9,141,163,164] The systematic review from Hamaker et al[138] reported that in the 10 observational cohort studies that met the inclusion criteria (sample sizes 15 to 1,967), there was a high prevalence of impairment in all GA domains. Nononcologic GA-guided interventions were common (> 70% in all but one study) and included social interventions (38%), medication management (37%), and nutritional interventions (26%). Psychological, mobility, and comorbidity interventions were recommended for approximately 20% of patients. The ELCAPA study found that geriatric consultation led to other nononcologic interventions, including a change in prescribed medications (31%), social support assistance (46%), physiotherapy (42%), nutritional care (70%), psychological care (36%), and memory evaluation (21%).[141] However, Kenis et al[31] reported the prevalence of nononcologic interventions to be only 25.7% when these recommendations were provided to treating physicians, ranging from 20.6% for social status to 56.6% for nutrition. Although each of the above studies reported a general approach to care influenced by GA, it is not clear if any specific algorithm was followed that guided interventions for impairments.

**Table 2.** Geriatric Assessment–Guided Interventions

| Geriatric Assessment Measure | Geriatric Assessment–Guided Interventions |
|---|---|
| Function and falls | |
| Instrumental activities of daily living deficit<br>History of falls | Physical therapy and/or occupational therapy referrals to prescribe strength and balance training, assist device evaluation, home exercise program, and safety evaluation<br>Fall prevention discussion<br>Home safety evaluation |
| Comorbidity domain | |
| Comorbidity and polypharmacy considerations | Involve caregiver in discussions to assess risks of therapy and management of comorbidities<br>Involve primary care physician and/or geriatrician in decision making for treatment and management of comorbidities; consider referral to geriatrician<br>Review medication list and minimize medications as much as possible; consider involving a pharmacist<br>Assess adherence to medications; have patient bring in medications to review |
| Cognition | |
| Screen positive on validated cognitive screen | Assess decision-making capacity and ability to consent for treatment<br>Identification of health care proxy and involve proxy in decision making for treatment, including signing consent forms with patient<br>Delirium risk counseling for patient and family<br>Medication review to minimize medications with higher risk of delirium<br>Consider further work-up with geriatrician or cognitive specialist |
| Depression | |
| Geriatric Depression Scale > 5 | Consider referral for psychotherapy/psychiatry<br>Consider cognitive-behavioral therapy<br>Social work involvement<br>Consider pharmacologic therapy |
| Nutrition | |
| Weight loss > 10% | Nutrition counseling<br>Referral to nutritionist/dietician<br>Assess need for extra support for meal preparation and institute support interventions if necessary (eg, caregiver, Meals-on-Wheels) |

**Table 3.** Randomized Controlled Trials of Geriatric Assessment Under Way

| First Author and Location | Design | Population | Intervention Delivery | Management Strategy | Outcomes |
|---|---|---|---|---|---|
| Hurria, City of Hope | 2:1 patient randomization (n = 600) | Age 65+ with any stage solid tumor Malignancies starting a new chemotherapy regimen (any line) | Study nurse practitioner in collaboration with the primary oncologist and clinic nurse | Established protocol for referral to the multidisciplinary team based on multidisciplinary team input and triggers based on geriatric assessment results | Four primary end points: chemotherapy toxicity (grade 3+), rate of hospitalization, change in functional status, change in psychosocial status |
| Soubeyran, 28 regional coordination units for geriatric oncology (mix of sites) | Patient randomization (n = 1,200) | Age 70+ with most solid tumor malignancies candidate for first-/second- line medical treatment | Geriatrician with nurse follow-up | Established protocol based on expert input | Coprimary end point of overall survival and dimensions of quality of life, response, progression-free survival, other quality of life, chemotherapy toxicity, health care utilization |
| Puts, multicenter study of centers in Canada | Patient randomization (n = 350) | Aged 70+ with most solid tumor malignancies starting first-/second-line chemotherapy | Geriatric oncology with nurse follow-up | Established protocol based on Delphi consensus and guidelines | Quality of life cost-effectiveness, function, chemotherapy toxicity, satisfaction, cancer treatment changes, survival |
| Mohile, community oncology practices affiliated with the University of Rochester NCORP Research Base | Two studies: cluster randomization by oncology practice (n = 700) and (n = 528) | Aged 70+ with advanced solid tumor malignancies | Study 1: chemotherapy toxicity (grade 3+), survival, function<br>Study 2: communication, satisfaction, patient and caregiver quality of life, health care utilization | Established protocol based on Delphi consensus panel and guidelines | Chemotherapy toxicity (grade 3+), survival, function<br>Communication, satisfaction, patient, and caregiver quality of life, health care utilization |

Abbreviation: NCORP, National Cancer Institute Community Oncology Research Program.

Two studies of experts using Delphi consensus methodology have described interventions that could be used for each impaired domain on GA, and this information can guide clinical care.[22,32] High-priority recommendations for GA-guided interventions are outlined in Table 2. Experts recommend partnering with caregivers to ensure the safety and well-being of older patients with cancer, especially those with significant functional and cognitive impairment. These interventions are supported also by other guideline panels, including ASCO,[118,165] the National Comprehensive Cancer Network,[166] the Society of International Geriatric Oncology,[23,101] and the American Geriatrics Society.[94,95,167,168]

The uptake of GA-driven interventions by the oncologic team can vary depending on the infrastructure available to implement the intervention. For example, one study identified that over 50% of patients had an impairment identified by GA; however, only 26% of patients received the recommended intervention when implementation was dependent upon the treating oncologist.[31] On the other hand, some studies have shown a higher intervention implementation rate based on the GA results when an infrastructure is in place to execute the interventions.[138] Studies are under way to identify the utility of GA-guided interventions to improve outcomes of older patients with cancer (Table 3). These studies will provide a better understanding of how GA-guided interventions can be best integrated into routine oncology care. More research is needed for evidence on how to best partner with caregivers to facilitate GA-guided interventions.[14] While evidence is growing that shows that the functional impairment, depression, and distress of an older patient with cancer increases caregiver burden and lowers caregiver well-being,[24,169,170] more research is also needed to show if GA can improve caregiver outcomes. Refer to the case in Box 1 for an example of how to implement this recommendation; additional cases are available in the Data Supplement.

## PATIENT AND CLINICIAN COMMUNICATION

Over 50% of older patients with advanced cancer experience severe toxicity in the first 3 months of chemotherapy.[10] Where data are limited and risk from treatment is high, older patients with advanced cancer and their caregivers must understand how cancer treatment (specifically chemotherapy) can affect quality of life in light of underlying health status. In this regard, the assessment of the values and preferences of older patients with cancer is critical to informed treatment decision making. Is the patient willing to consider chemotherapy? Is the patient willing to accept treatment-related toxicities in exchange for the potential survival benefit the treatment affords? How important to the patient is maintaining quality of life and functional independence during treatment?[125]

Older adults with cancer and their caregivers are presented with complex information regarding the risks and benefits of chemotherapy for advanced cancer, but age-related concerns and outcomes are not usually discussed. Incorporating the GA recommended by this ASCO guideline into the clinical decision-making

  

process for older patients with cancer is feasible and helps to identify conditions that are normally overlooked in routine oncology care but that are rated as very important to older patients and caregivers. Providing older patients with cancer and their caregivers and oncologists with a summary of GA information may improve communication about age-related health concerns, patients' quality of life, and satisfaction with care, although there is as yet no evidence-based approach for the use of GA to improve communication during the chemotherapy decision-making process. This is a rich area for ongoing and future research. For recommendations and strategies to optimize patient-clinician communication, see Patient-Clinician Communication: American Society of Clinical Oncology Consensus Guideline.[171]

## HEALTH DISPARITIES

Although ASCO clinical practice guidelines represent expert recommendations on the best practices in disease management to provide the highest level of cancer care, it is important to note that many patients have limited access to medical care. Racial and ethnic disparities in health care contribute significantly to this problem in the United States. Patients with cancer who are members of racial/ethnic minorities suffer disproportionately from comorbidities, experience more substantial obstacles to receiving care, are more likely to be uninsured, and are at greater risk of receiving care of poor quality than other Americans. Many other patients lack access to care because of their geographic location and distance from appropriate treatment facilities. Awareness of these disparities in access to care should be considered in the context of this clinical practice guideline, and health care providers should strive to deliver the highest level of cancer care to these vulnerable populations.

With respect to older persons with cancer, in particular, there is a clear need for research on interventions to optimize the health of older patients with cancer, especially those who have medical problems other than cancer or are in the "older-old" (70 to 80 years) and "oldest-old" ($\geq$ 80 years) subgroups. In addition, improved models of care need to be identified and implemented so that best practice interventions can be delivered to older adults. Gaps in knowledge resulting in disparities of care are even more significant for older adults from under-represented backgrounds due to race, ethnicity, socioeconomic status, or disability. Older adults are less likely to be referred for expertise-centered consultation, diagnostic evaluation, and/or treatment than younger patients. This factor may negatively influence overall cancer outcomes for this population. Older patients are also particularly vulnerable to problems that interfere with access to care and outcomes, such as socioeconomic status (due to being on fixed incomes and high costs of medical care). Older patients from under-represented racial groups have even higher disparities in cancer care delivery, which ultimately lead to poorer outcomes.

The ASCO Health Disparities Committee recently established the Task Force on Addressing Cancer Health Disparities Among Older Adults to extend and expand the expertise of the Health Disparities Committee and to provide strategic guidance on issues related to older adults who are at risk for cancer, patients with cancer, and cancer survivors. This task force has since developed a report that summarizes key challenges contributing to cancer health disparities among older adults and recommended actions to address these needs. In identifying priority areas for ASCO, the task force has given special consideration to the needs of older patients who are particularly vulnerable to poorer outcomes, including those with multiple chronic conditions, those at lower socioeconomic status, and those from under-represented ethnic and racial backgrounds.

## EXTERNAL REVIEW

The draft recommendations were released to the public for open comment from January 3, 2017, through January 24, 2018. In a targeted solicitation, the ASCO Older Adults Work Group members and Health Disparities Committee members were sent an e-mail that called their attention to this opportunity to comment on the draft recommendations. Response categories of "agree as written," "agree with suggested modifications," and "disagree, see comments" were captured for every proposed recommendation, with 17 total written comments received across draft recommendations.

A total of 100% of the nine respondents agreed (66.67%) or agreed with suggested modifications (33.33%; three written comments offered) with the draft GA recommendation. For the recommendation concerning which GA tools should be used, 100% of respondents either agreed (33.33%) or agreed with suggested modifications (66.67%; five written comments) with the draft recommendation. For the draft life expectancy assessment recommendation, 88.89% of respondents either agreed (33.33%) or agreed with suggested modifications (55.56%; four written comments); 11.11% (one written comment) of respondents disagreed with the draft recommendation. Finally, for the GA implementation draft recommendation, 88.89% of respondents either agreed (55.56%) or agreed with suggested modifications (33.33%; three written comments); 11.11% (one written comment) of respondents disagreed with the draft recommendation.

The Update Committee co-chairs reviewed comments from all sources and determined whether to maintain the original draft recommendations, to revise with minor language changes, or to consider major recommendation revisions. Any changes were incorporated prior to Clinical Practice Guidelines Committee final review and approval.

## GUIDELINE IMPLEMENTATION

ASCO guidelines are developed for implementation across health settings. Barriers to implementation include the need to increase awareness of the guideline recommendations among frontline practitioners and survivors of cancer and caregivers and to provide adequate services in the face of limited resources. The guideline Bottom Line Box was designed to facilitate implementation of recommendations. The illustrative cases in Box 1 provide examples for how the recommendations can be implemented; additional cases are available in the Data Supplement. This guideline will be distributed widely through the ASCO Practice Guideline Implementation Network. ASCO guidelines are posted on the ASCO Web site and most often published in *Journal of Clinical Oncology* and *Journal of Oncology Practice*.

## CONCLUSION AND SUMMARY

GA identifies risk factors for adverse outcomes in older patients and adds information to standard oncology performance measures.[172] Well-designed prospective observational studies have found that items included in a GA can identify older patients at greatest risk for chemotherapy toxicity and mortality.[27,44,57,173] GA has been found to be feasible in community oncology clinics.[9,27,112] Consensus panels of geriatric oncology experts have found that several validated tools are able to identify older patients receiving chemotherapy at highest risk of adverse outcomes and are practical for use, even in busy oncology clinics.[22,32] These results are consistent with the growing geriatric oncology literature and other expert guideline panels.[18,23,54,55] Ultimately, the choice of which tools to use depends on the question being asked, how GA results will be used, and the resources available for implementation. In this ASCO guideline, the Expert Panel proposes that, for all patients aged 65+, at a minimum, IADLs to assess function, comorbidity assessment through history or a validated tool, a one-item fall question, screening for depression and nutrition, and a brief cognitive screening tool (such as Mini-Cog) should be administered (Box 2). In addition, for older patients at risk for or having cancer, clinicians can use one or more of the validated prediction tools listed at ePrognosis to reliably estimate life expectancies when making testing or management decisions. GA-based tools are available that provide specific estimates for chemotherapy toxicity (CARG and CRASH) and can help to identify those patients at highest risk for early mortality (G8 and VES-13).

### Related ASCO Guidelines

- Integration of Palliative Care Into Standard Oncology Practice (http://ascopubs.org/doi/10.1200/JCO.2016.70.1474)
- Patient-Clinician Communication (http://ascopubs.org/doi/10.1200/JCO.2017.75.2311)
- Antiemetics (http://ascopubs.org/doi/10.1200/JCO.2017.74.4789)

## AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Disclosures provided by the authors are available with this article at jco.org.

## AUTHOR CONTRIBUTIONS

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## REFERENCES


1. Schnipper LE, Smith TJ, Raghavan D, et al: American Society of Clinical Oncology identifies five key opportunities to improve care and reduce costs: The top five list for oncology. J Clin Oncol 30:1715-1724, 2012
2. Hurria A, Levit LA, Dale W, et al: Improving the Evidence base for treating older adults with cancer: American Society of Clinical Oncology statement. J Clin Oncol 33:3826-3833, 2015
3. Smith BD, Smith GL, Hurria A, et al: Future of cancer incidence in the United States: Burdens upon an aging, changing nation. J Clin Oncol 27:2758-2765, 2009
4. Siegel RL, Miller KD, Jemal A: Cancer statistics, 2017. CA Cancer J Clin 67:7-30, 2017
5. Hurria A, Dale W, Mooney M, et al: Designing therapeutic clinical trials for older and frail adults with cancer: U13 conference recommendations. J Clin Oncol 32:2587-2594, 2014
6. Mohile S, Dale W, Hurria A: Geriatric oncology research to improve clinical care. Nat Rev Clin Oncol 9:571-578, 2012
7. Dale W, Mohile SG, Eldadah BA, et al: Biological, clinical, and psychosocial correlates at the interface of cancer and aging research. J Natl Cancer Inst 104:581-589, 2012
8. Zeng C, Wen W, Morgans AK, et al: Disparities by race, age, and sex in the improvement of survival for major cancers: Results from the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER) Program in the United States, 1990 to 2010. JAMA Oncol 1:88-96, 2015
9. Hurria A, Gupta S, Zauderer M, et al: Developing a cancer-specific geriatric assessment: A feasibility study. Cancer 104:1998-2005, 2005
10. Hurria A, Mohile S, Gajra A, et al: Validation of a prediction tool for chemotherapy toxicity in older adults with cancer. J Clin Oncol 34:2366-2371, 2016
11. Klabunde CN, Ambs A, Keating NL, et al: The role of primary care physicians in cancer care. J Gen Intern Med 24:1029-1036, 2009
12. Nekhlyudov L, Levit L, Hurria A, et al: Patient-centered, evidence-based, and cost-conscious cancer care across the continuum: Translating the Institute of Medicine report into clinical practice. CA Cancer J Clin 64:408-421, 2014
13. Hurria A, Naylor M, Cohen HJ: Improving the quality of cancer care in an aging population: Recommendations from an IOM report. JAMA 310:1795-1796, 2013
14. Mohile SG, Hurria A, Cohen HJ, et al: Improving the quality of survivorship for older adults with cancer. Cancer 122:2459-2568, 2016
15. Boureau AS, Bourbouloux E, Retornaz F, et al: Effect of burden of comorbidity on optimal breast cancer treatment in older adults. J Am Geriatr Soc 60:2368-2370, 2012 [Erratum: J Am Geriatr Soc 61:675, 2013]
16. Pal SK, Hurria A: Impact of age, sex, and comorbidity on cancer therapy and disease progression. J Clin Oncol 28:4086-4093, 2010
17. Williams GR, Mackenzie A, Magnuson A, et al: Comorbidity in older adults with cancer. J Geriatr Oncol 7:249-257, 2016
18. Magnuson A, Allore H, Cohen HJ, et al: Geriatric assessment with management in cancer care: Current evidence and potential mechanisms for future research. J Geriatr Oncol 7:242-248, 2016
19. Magnuson A, Dale W, Mohile S: Models of care in geriatric oncology. Curr Geriatr Rep 3:182-189, 2014
20. Magnuson A, Lemelman T, Pandya C, et al: Geriatric assessment with management intervention in older adults with cancer: A randomized pilot study. Support Care Cancer, 26:605-613, 2018
21. Baitar A, Kenis C, Moor R, et al: Implementation of geriatric assessment-based recommendations in older patients with cancer: A multicentre prospective study. J Geriatr Oncol 6:401-410, 2015 [Erratum: J Geriatr Oncol 7:142-143, 2016]
22. Mohile SG, Velarde C, Hurria A, et al: Geriatric assessment-guided care processes for older adults: A Delphi consensus of geriatric oncology experts. J Natl Compr Canc Netw 13:1120-1130, 2015
23. Wildiers H, Heeren P, Puts M, et al: International Society of Geriatric Oncology consensus on geriatric assessment in older patients with cancer. J Clin Oncol 32:2595-2603, 2014
24. Hsu T, Loscalzo M, Ramani R, et al: Factors associated with high burden in caregivers of older adults with cancer. Cancer 120:2927-2935, 2014
25. Hsu T, Loscalzo M, Ramani R, et al: Are disagreements in caregiver and patient assessment of patient health associated with increased caregiver burden in caregivers of older adults with cancer? Oncologist 22:1383-1391, 2017
26. Flannery M, Mohile SG, Dale W, et al: Interventions to improve the quality of life and survivorship of older adults with cancer: The funding


  

landscape at NIH, ACS and PCORI. J Geriatr Oncol 7: 225-233, 2016

**27.** Hurria A, Togawa K, Mohile SG, et al: Predicting chemotherapy toxicity in older adults with cancer: A prospective multicenter study. J Clin Oncol 29:3457-3465, 2011

**28.** Repetto L, Fratino L, Audisio RA, et al: Comprehensive geriatric assessment adds information to Eastern Cooperative Oncology Group performance status in elderly cancer patients: An Italian Group for geriatric oncology study. J Clin Oncol 20:494-502, 2002

**29.** Serraino D, Fratino L, Zagonel V: Prevalence of functional disability among elderly patients with cancer. Crit Rev Oncol Hematol 39:269-273, 2001

**30.** Caillet P, Laurent M, Bastuji-Garin S, et al: Optimal management of elderly cancer patients: Usefulness of the comprehensive geriatric assessment. Clin Interv Aging 9:1645-1660, 2014

**31.** Kenis C, Bron D, Libert Y, et al: Relevance of a systematic geriatric screening and assessment in older patients with cancer: Results of a prospective multicentric study. Ann Oncol 24:1306-1312, 2013

**32.** O'Donovan A, Mohile SG, Leech M: Expert consensus panel guidelines on geriatric assessment in oncology. Eur J Cancer Care (Engl) 24:574-589, 2015

**33.** Clough-Gorr KM, Stuck AE, Thwin SS, et al: Older breast cancer survivors: Geriatric assessment domains are associated with poor tolerance of treatment adverse effects and predict mortality over 7 years of follow-up. J Clin Oncol 28:380-386, 2010

**34.** Aaldriks AA, Maartense E, Nortier HJ, et al: Prognostic factors for the feasibility of chemotherapy and the Geriatric Prognostic Index (GPI) as risk profile for mortality before chemotherapy in the elderly. Acta Oncol 55:15-23, 2016

**35.** Bourdel-Marchasson I, Diallo A, Bellera C, et al: One-year mortality in older patients with cancer: Development and external validation of an MNA-based prognostic score. PLoS One 11:e0148523, 2016

**36.** Brunello A, Fontana A, Zafferri V, et al: Development of an oncological-multidimensional prognostic index (Onco-MPI) for mortality prediction in older cancer patients. J Cancer Res Clin Oncol 142: 1069-1077, 2016

**37.** Kenis C, Decoster L, Van Puyvelde K, et al: Performance of two geriatric screening tools in older patients with cancer. J Clin Oncol 32:19-26, 2014

**38.** Soubeyran P, Bellera C, Goyard J, et al: Screening for vulnerability in older cancer patients: The ONCODAGE prospective multicenter cohort study. PLoS One 9:e115060, 2014

**39.** Klepin HD, Geiger AM, Tooze JA, et al: Geriatric assessment predicts survival for older adults receiving induction chemotherapy for acute myelogenous leukemia. Blood 121:4287-4294, 2013

**40.** Aaldriks AA, Giltay EJ, le Cessie S, et al: Prognostic value of geriatric assessment in older patients with advanced breast cancer receiving chemotherapy. Breast 22:753-760, 2013

**41.** Aaldriks AA, Maartense E, le Cessie S, et al: Predictive value of geriatric assessment for patients older than 70 years, treated with chemotherapy. Crit Rev Oncol Hematol 79:205-212, 2011

**42.** Arnoldi E, Dieli M, Mangia M, et al: Comprehensive geriatric assessment in elderly cancer patients: An experience in an outpatient population. Tumori 93:23-25, 2007

**43.** Clough-Gorr KM, Thwin SS, Stuck AE, et al: Examining five- and ten-year survival in older women with breast cancer using cancer-specific geriatric assessment. Eur J Cancer 48:805-812, 2012

**44.** Kanesvaran R, Li H, Koo KN, et al: Analysis of prognostic factors of comprehensive geriatric assessment and development of a clinical scoring system in elderly Asian patients with cancer. J Clin Oncol 29:3620-3627, 2011

**45.** Koroukian SM, Xu F, Bakaki PM, et al: Comorbidities, functional limitations, and geriatric syndromes in relation to treatment and survival patterns among elders with colorectal cancer. J Gerontol A Biol Sci Med Sci 65:322-329, 2010

**46.** Soubeyran P, Fonck M, Blanc-Bisson C, et al: Predictors of early death risk in older patients treated with first-line chemotherapy for cancer. J Clin Oncol 30:1829-1834, 2012

**47.** Wedding U, Röhrig B, Klippstein A, et al: Age, severe comorbidity and functional impairment independently contribute to poor survival in cancer patients. J Cancer Res Clin Oncol 133:945-950, 2007

**48.** Winkelmann N, Petersen I, Kiehntopf M, et al: Results of comprehensive geriatric assessment effect survival in patients with malignant lymphoma. J Cancer Res Clin Oncol 137:733-738, 2011

**49.** Aparicio T, Gargot D, Teillet L, et al: Geriatric factors analyses from FFCD 2001-02 phase III study of first-line chemotherapy for elderly metastatic colorectal cancer patients. Eur J Cancer 74:98-108, 2017

**50.** Pamoukdjian F, Aparicio T, Zelek L, et al: Impaired mobility, depressed mood, cognitive impairment and polypharmacy are independently associated with disability in older cancer outpatients: The prospective Physical Frailty in Elderly Cancer patients (PF-EC) cohort study. J Geriatr Oncol 8:190-195, 2017

**51.** Engelhardt M, Dold SM, Ihorst G, et al: Geriatric assessment in multiple myeloma patients: Validation of the International Myeloma Working Group (IMWG) score and comparison with other common comorbidity scores. Haematologica 101: 1110-1119, 2016

**52.** Palumbo A, Bringhen S, Mateos MV, et al: Geriatric assessment predicts survival and toxicities in elderly myeloma patients: An International Myeloma Working Group report. Blood 125:2068-2074, 2015

**53.** Ramjaun A, Nassif MO, Krotneva S, et al: Improved targeting of cancer care for older patients: A systematic review of the utility of comprehensive geriatric assessment. J Geriatr Oncol 4:271-281, 2013

**54.** Puts MT, Hardt J, Monette J, et al: Use of geriatric assessment for older adults in the oncology setting: A systematic review. J Natl Cancer Inst 104: 1134-1164, 2012

**55.** Puts MT, Santos B, Hardt J, et al: An update on a systematic review of the use of geriatric assessment for older adults in oncology. Ann Oncol 25: 307-315, 2014

**56.** Aparicio T, Jouve JL, Teillet L, et al: Geriatric factors predict chemotherapy feasibility: Ancillary results of FFCD 2001-02 phase III study in first-line chemotherapy for metastatic colorectal cancer in elderly patients. J Clin Oncol 31:1464-1470, 2013

**57.** Extermann M, Boler I, Reich RR, et al: Predicting the risk of chemotherapy toxicity in older patients: The Chemotherapy Risk Assessment Scale for High-Age Patients (CRASH) score. Cancer 118: 3377-3386, 2012

**58.** von Gruenigen VE, Huang HQ, Beumer JH, et al: Chemotherapy completion in elderly women with ovarian, primary peritoneal or fallopian tube cancer - an NRG oncology/Gynecologic Oncology Group study. Gynecol Oncol 144:459-467, 2017

**59.** Luciani A, Biganzoli L, Colloca G, et al: Estimating the risk of chemotherapy toxicity in older patients with cancer: The role of the Vulnerable Elders Survey-13 (VES-13). J Geriatr Oncol 6:272-279, 2015

**60.** Falandry C, Weber B, Savoye AM, et al: Development of a geriatric vulnerability score in elderly patients with advanced ovarian cancer treated with first-line carboplatin: A GINECO prospective trial. Ann Oncol 24:2808-2813, 2013

**61.** Hoppe S, Rainfray M, Fonck M, et al: Functional decline in older patients with cancer receiving first-line chemotherapy. J Clin Oncol 31:3877-3882, 2013

**62.** Owusu C, Margevicius S, Schluchter M, et al: Short Physical Performance Battery, usual gait speed, grip strength and Vulnerable Elders Survey each predict functional decline among older women with breast cancer. J Geriatr Oncol 8:356-362, 2017

**63.** Owusu C, Margevicius S, Schluchter M, et al: Vulnerable elders survey and socioeconomic status predict functional decline and death among older women with newly diagnosed nonmetastatic breast cancer. Cancer 122:2579-2586, 2016

**64.** Bellera CA, Rainfray M, Mathoulin-Pélissier S, et al: Screening older cancer patients: First evaluation of the G-8 geriatric screening tool. Ann Oncol 23: 2166-2172, 2012

**65.** Martinez-Tapia C, Paillaud E, Liuu E, et al: Prognostic value of the G8 and modified-G8 screening tools for multidimensional health problems in older patients with cancer. Eur J Cancer 83: 211-219, 2017

**66.** Biganzoli L, Mislang AR, Di Donato S, et al: Screening for frailty in older patients with early-stage solid tumors: A prospective longitudinal evaluation of three different geriatric tools. J Gerontol A Biol Sci Med Sci 72:922-928, 2017

**67.** Cesari M, Cerullo F, Zamboni V, et al: Functional status and mortality in older women with gynecological cancer. J Gerontol A Biol Sci Med Sci 68: 1129-1133, 2013

**68.** Guerard EJ, Deal AM, Chang Y, et al: Frailty index developed from a cancer-specific geriatric assessment and the association with mortality among older adults with cancer. J Natl Compr Canc Netw 15: 894-902, 2017

**69.** Ferrat E, Paillaud E, Caillet P, et al: Performance of four frailty classifications in older patients with cancer: Prospective elderly cancer patients cohort study. J Clin Oncol 35:766-777, 2017

**70.** Giantin V, Valentini E, Iasevoli M, et al: Does the Multidimensional Prognostic Index (MPI), based on a comprehensive geriatric assessment (CGA), predict mortality in cancer patients? Results of a prospective observational trial. J Geriatr Oncol 4:208-217, 2013

**71.** Pilotto A, Gallina P, Fontana A, et al: Development and validation of a Multidimensional Prognostic Index for mortality based on a standardized Multidimensional Assessment Schedule (MPI-SVaMA) in community-dwelling older subjects. J Am Med Dir Assoc 14:287-292, 2013

**72.** Cohen HJ, Smith D, Sun CL, et al: Frailty as determined by a comprehensive geriatric assessment-derived deficit-accumulation index in older patients with cancer who receive chemotherapy. Cancer 122: 3865-3872, 2016

**73.** Engelhardt M, Domm AS, Dold SM, et al: A concise revised Myeloma Comorbidity Index as a valid prognostic instrument in a large cohort of 801



 

multiple myeloma patients. Haematologica 102: 910-921, 2017

**74.** Tucci A, Ferrari S, Bottelli C, et al: A comprehensive geriatric assessment is more effective than clinical judgment to identify elderly diffuse large cell lymphoma patients who benefit from aggressive therapy. Cancer 115:4547-4553, 2009

**75.** Tucci A, Martelli M, Rigacci L, et al: Comprehensive geriatric assessment is an essential tool to support treatment decisions in elderly patients with diffuse large B-cell lymphoma: A prospective multicenter evaluation in 173 patients by the Lymphoma Italian Foundation (FIL). Leuk Lymphoma 56: 921-926, 2015

**76.** Mohile SG, Fan L, Reeve E, et al: Association of cancer with geriatric syndromes in older Medicare beneficiaries. J Clin Oncol 29:1458-1464, 2011

**77.** Wildes TM, Dua P, Fowler SA, et al: Systematic review of falls in older adults with cancer. J Geriatr Oncol 6:70-83, 2015

**78.** Tinetti ME: Clinical practice. Preventing falls in elderly persons. N Engl J Med 348:42-49, 2003

**79.** Tinetti ME, Williams CS: Falls, injuries due to falls, and the risk of admission to a nursing home. N Engl J Med 337:1279-1284, 1997

**80.** Guerard EJ, Deal AM, Williams GR, et al: Falls in older adults with cancer: Evaluation by oncology providers. J Oncol Pract 11:470-474, 2015

**81.** Panel on Prevention of Falls in Older Persons, American Geriatrics Society and British Geriatrics Society: Summary of the updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. J Am Geriatr Soc 59:148-157, 2011

**82.** Wolff JL, Starfield B, Anderson G: Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. Arch Intern Med 162: 2269-2276, 2002

**83.** Søgaard M, Thomsen RW, Bossen KS, et al: The impact of comorbidity on cancer survival: A review. Clin Epidemiol 5:3-29, 2013 (suppl 1)

**84.** Jørgensen TL, Hallas J, Friis S, et al: Comorbidity in elderly cancer patients in relation to overall and cancer-specific mortality. Br J Cancer 106: 1353-1360, 2012

**85.** Grønberg BH, Sundstrøm S, Kaasa S, et al: Influence of comorbidity on survival, toxicity and health-related quality of life in patients with advanced non-small-cell lung cancer receiving platinum-doublet chemotherapy. Eur J Cancer 46:2225-2234, 2010

**86.** Zauderer M, Patil S, Hurria A: Feasibility and toxicity of dose-dense adjuvant chemotherapy in older women with breast cancer. Breast Cancer Res Treat 117:205-210, 2009

**87.** Hassett MJ, Rao SR, Brozovic S, et al: Chemotherapy-related hospitalization among community cancer center patients. Oncologist 16: 378-387, 2011

**88.** Neugut AI, Matasar M, Wang X, et al: Duration of adjuvant chemotherapy for colon cancer and survival among the elderly. J Clin Oncol 24: 2368-2375, 2006

**89.** Schonberg MA, Davis RB, McCarthy EP, et al: Index to predict 5-year mortality of community-dwelling adults aged 65 and older using data from the National Health Interview Survey. J Gen Intern Med 24:1115-1122, 2009

**90.** Schonberg MA, Davis RB, McCarthy EP, et al: External validation of an index to predict up to 9-year mortality of community-dwelling adults aged 65 and older. J Am Geriatr Soc 59:1444-1451, 2011

**91.** Schonberg MA, Li V, Marcantonio ER, et al: Predicting mortality up to 14 years among community-dwelling adults aged 65 and older. J Am Geriatr Soc 65: 1310-1315, 2017

**92.** Linn BS, Linn MW, Gurel L: Cumulative illness rating scale. J Am Geriatr Soc 16:622-626, 1968

**93.** Brown JD, Hutchison LC, Li C, et al: Predictive validity of the Beers and Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) criteria to detect adverse drug events, hospitalizations, and emergency department visits in the United States. J Am Geriatr Soc 64:22-30, 2016

**94.** American Geriatrics Society 2015 Beers Criteria Update Expert Panel: American Geriatrics Society 2015 updated Beers criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc 63:2227-2246, 2015

**95.** Steinman MA, Beizer JL, DuBeau CE, et al: How to use the American Geriatrics Society 2015 Beers criteria—a guide for patients, clinicians, health systems, and payors. J Am Geriatr Soc 63:e1-e7, 2015

**96.** Prithviraj GK, Koroukian S, Margevicius S, et al: Patient characteristics associated with polypharmacy and inappropriate prescribing of medications among older adults with cancer. J Geriatr Oncol 3:228-237, 2012

**97.** LeBlanc TW, McNeil MJ, Kamal AH, et al: Polypharmacy in patients with advanced cancer and the role of medication discontinuation. Lancet Oncol 16:e333-e341, 2015

**98.** Maggiore RJ, Dale W, Gross CP, et al: Polypharmacy and potentially inappropriate medication use in older adults with cancer undergoing chemotherapy: Effect on chemotherapy-related toxicity and hospitalization during treatment. J Am Geriatr Soc 62: 1505-1512, 2014

**99.** Nightingale G, Skonecki E, Boparai MK: The impact of polypharmacy on patient outcomes in older adults with cancer. Cancer J 23:211-218, 2017

**100.** Nightingale G, Hajjar E, Swartz K, et al: Evaluation of a pharmacist-led medication assessment used to identify prevalence of and associations with polypharmacy and potentially inappropriate medication use among ambulatory senior adults with cancer. J Clin Oncol 33:1453-1459, 2015

**101.** Decoster L, Van Puyvelde K, Mohile S, et al: Screening tools for multidimensional health problems warranting a geriatric assessment in older cancer patients: An update on SIOG recommendations. Ann Oncol 26:288-300, 2015

**102.** VanderWalde N, Jagsi R, Dotan E, et al: NCCN guidelines insights: Older adult oncology, version 2.2016. J Natl Compr Canc Netw 14:1357-1370, 2016

**103.** Plassman BL, Langa KM, Fisher GG, et al: Prevalence of dementia in the United States: The Aging, Demographics, and Memory study. Neuroepidemiology 29:125-132, 2007

**104.** Plassman BL, Langa KM, Fisher GG, et al: Prevalence of cognitive impairment without dementia in the United States. Ann Intern Med 148: 427-434, 2008

**105.** Karuturi M, Wong ML, Hsu T, et al: Understanding cognition in older patients with cancer. J Geriatr Oncol 7:258-269, 2016

**106.** Magnuson A, Mohile S, Janelsins M: Cognition and cognitive impairment in older adults with cancer. Curr Geriatr Rep 5:213-219, 2016

**107.** Gupta SK, Lamont EB: Patterns of presentation, diagnosis, and treatment in older patients with colon cancer and comorbid dementia. J Am Geriatr Soc 52:1681-1687, 2004

**108.** Gorin SS, Heck JE, Albert S, et al: Treatment for breast cancer in patients with Alzheimer's disease. J Am Geriatr Soc 53:1897-1904, 2005

**109.** Raji MA, Kuo YF, Freeman JL, et al: Effect of a dementia diagnosis on survival of older patients after a diagnosis of breast, colon, or prostate cancer: Implications for cancer care. Arch Intern Med 168: 2033-2040, 2008

**110.** Borson S, Scanlan J, Hummel J, et al: Implementing routine cognitive screening of older adults in primary care: Process and impact on physician behavior. J Gen Intern Med 22:811-817, 2007

**111.** Katzman R, Brown T, Fuld P, et al: Validation of a short Orientation-Memory-Concentration test of cognitive impairment. Am J Psychiatry 140:734-739, 1983

**112.** Hurria A, Cirrincione CT, Muss HB, et al: Implementing a geriatric assessment in cooperative group clinical cancer trials: CALGB 360401. J Clin Oncol 29:1290-1296, 2011

**113.** Morris JC, Heyman A, Mohs RC, et al: The Consortium to Establish a Registry for Alzheimer's Disease (CERAD). Part I. Clinical and neuropsychological assessment of Alzheimer's disease. Neurology 39:1159-1165, 1989

**114.** Carpenter CR, Bassett ER, Fischer GM, et al: Four sensitive screening tools to detect cognitive dysfunction in geriatric emergency department patients: Brief Alzheimer's Screen, Short Blessed Test, Ottawa 3DY, and the caregiver-completed AD8. Acad Emerg Med 18:374-384, 2011

**115.** Borson S, Scanlan JM, Chen P, et al: The Mini-Cog as a screen for dementia: Validation in a population-based sample. J Am Geriatr Soc 51:1451-1454, 2003

**116.** Milian M, Leiherr AM, Straten G, et al: The Mini-Cog versus the Mini-Mental State Examination and the Clock Drawing Test in daily clinical practice: Screening value in a German Memory Clinic. Int Psychogeriatr 24:766-774, 2012

**117.** Borson S, Scanlan JM, Watanabe J, et al: Simplifying detection of cognitive impairment: Comparison of the Mini-Cog and Mini-Mental State Examination in a multiethnic sample. J Am Geriatr Soc 53:871-874, 2005

**118.** Andersen BL, DeRubeis RJ, Berman BS, et al: Screening, assessment, and care of anxiety and depressive symptoms in adults with cancer: An American Society of Clinical Oncology guideline adaptation. J Clin Oncol 32:1605-1619, 2014

**119.** Kok RM, Reynolds CF III: Management of depression in older adults: A review. JAMA 317: 2114-2122, 2017

**120.** Hurria A, Lichtman SM, Gardes J, et al: Identifying vulnerable older adults with cancer: Integrating geriatric assessment into oncology practice. J Am Geriatr Soc 55:1604-1608, 2007

**121.** Williams GR, Deal AM, Jolly TA, et al: Feasibility of geriatric assessment in community oncology clinics. J Geriatr Oncol 5:245-251, 2014

**122.** McCleary NJ, Wigler D, Berry D, et al: Feasibility of computer-based self-administered cancer-specific geriatric assessment in older patients with gastrointestinal malignancy. Oncologist 18:64-72, 2013

**123.** Hurria A, Akiba C, Kim J, et al: Reliability, validity, and feasibility of a computer-based geriatric assessment for older adults with cancer. J Oncol Pract 12:e1025-e1034, 2016

**124.** Magnuson A, Wallace J, Canin B, et al: Shared goal setting in team-based geriatric oncology. J Oncol Pract 12:1115-1122, 2016

  

**125.** Presley CJ, Gross CP, Lilenbaum RC: Optimizing treatment risk and benefit for elderly patients with advanced non-small-cell lung cancer: The right treatment for the right patient. J Clin Oncol 34: 1438-1442, 2016

**126.** Hamaker ME, Wildes TM, Rostoft S: Time to stop saying geriatric assessment is too time consuming. J Clin Oncol 35:2871-2874, 2017

**127.** Lee SJ, Lindquist K, Segal MR, et al: Development and validation of a prognostic index for 4-year mortality in older adults. JAMA 295:801-808, 2006

**128.** Lee SJ, Boscardin WJ, Kirby KA, et al: Individualizing life expectancy estimates for older adults using the Gompertz Law of Human Mortality. PLoS One 9:e108540, 2014

**129.** Lee SJ, Boscardin WJ, Stijacic-Cenzer I, et al: Time lag to benefit after screening for breast and colorectal cancer: Meta-analysis of survival data from the United States, Sweden, United Kingdom, and Denmark. BMJ 346:e8441, 2013

**130.** Cho H, Klabunde CN, Yabroff KR, et al: Comorbidity-adjusted life expectancy: A new tool to inform recommendations for optimal screening strategies. Ann Intern Med 159:667-676, 2013

**131.** Cho H, Mariotto AB, Mann BS, et al: Assessing non-cancer-related health status of US cancer patients: Other-cause survival and comorbidity prevalence. Am J Epidemiol 178:339-349, 2013

**132.** Tan A, Kuo Y-F, Goodwin JS: Predicting life expectancy for community-dwelling older adults from Medicare claims data. Am J Epidemiol 178:974-983, 2013

**133.** Cruz M, Covinsky K, Widera EW, et al: Predicting 10-year mortality for older adults. JAMA 309: 874-876, 2013

**134.** Suemoto CK, Ueda P, Beltrán-Sánchez H, et al: Development and validation of a 10-year mortality prediction model: Meta-analysis of individual participant data from five cohorts of older adults in developed and developing countries. J Gerontol A Biol Sci Med Sci 72:410-416, 2017

**135.** Kent M, Penson DF, Albertsen PC, et al: Successful external validation of a model to predict other cause mortality in localized prostate cancer. BMC Med 14:25, 2016

**136.** Minne L, Ludikhuize J, de Rooij SEJA, et al: Characterizing predictive models of mortality for older adults and their validation for use in clinical practice. J Am Geriatr Soc 59:1110-1115, 2011

**137.** Yourman LC, Lee SJ, Schonberg MA, et al: Prognostic indices for older adults: A systematic review. JAMA 307:182-192, 2012

**138.** Hamaker ME, Schiphorst AH, ten Bokkel Huinink D, et al: The effect of a geriatric evaluation on treatment decisions for older cancer patients–a systematic review. Acta Oncol 53:289-296, 2014

**139.** Chaïbi P, Magné N, Breton S, et al: Influence of geriatric consultation with comprehensive geriatric assessment on final therapeutic decision in elderly cancer patients. Crit Rev Oncol Hematol 79:302-307, 2011

**140.** Decoster L, Kenis C, Van Puyvelde K, et al: The influence of clinical assessment (including age) and geriatric assessment on treatment decisions in older patients with cancer. J Geriatr Oncol 4: 235-241, 2013

**141.** Caillet P, Canoui-Poitrine F, Vouriot J, et al: Comprehensive geriatric assessment in the decision-making process in elderly patients with cancer: ELCAPA study. J Clin Oncol 29:3636-3642, 2011

**142.** Farcet A, de Decker L, Pauly V, et al: Frailty markers and treatment decisions in patients seen in oncogeriatric clinics: Results from the ASRO pilot study. PLoS One 11:e0149732, 2016

**143.** Marenco D, Marinello R, Berruti A, et al: Multidimensional geriatric assessment in treatment decision in elderly cancer patients: 6-year experience in an outpatient geriatric oncology service. Crit Rev Oncol Hematol 68:157-164, 2008

**144.** Corre R, Greillier L, Le Caër H, et al: Use of a comprehensive geriatric assessment for the management of elderly patients with advanced non-small-cell lung cancer: The phase III randomized ESOGIA-GFPC-GECP 08-02 study. J Clin Oncol 34: 1476-1483, 2016

**145.** Rodin MB, Mohile SG: A practical approach to geriatric assessment in oncology. J Clin Oncol 25: 1936-1944, 2007

**146.** Stuck AE, Siu AL, Wieland GD, et al: Comprehensive geriatric assessment: A meta-analysis of controlled trials. Lancet 342:1032-1036, 1993

**147.** Stuck AE, Aronow HU, Steiner A, et al: A trial of annual in-home comprehensive geriatric assessments for elderly people living in the community. N Engl J Med 333:1184-1189, 1995

**148.** Cohen HJ, Feussner JR, Weinberger M, et al: A controlled trial of inpatient and outpatient geriatric evaluation and management. N Engl J Med 346: 905-912, 2002

**149.** Ekdahl AW, Alwin J, Eckerblad J, et al: Long-term evaluation of the ambulatory geriatric assessment: A frailty intervention trial (AGe-FIT): Clinical outcomes and total costs after 36 months. J Am Med Dir Assoc 17:263-268, 2016

**150.** Frese T, Deutsch T, Keyser M, et al: In-home preventive comprehensive geriatric assessment (CGA) reduces mortality–a randomized controlled trial. Arch Gerontol Geriatr 55:639-644, 2012

**151.** Trentini M, Semeraro S, Motta M: Effectiveness of geriatric evaluation and care. One-year results of a multicenter randomized clinical trial. Aging (Milano) 13:395-405, 2001

**152.** Bleijenberg N, Drubbel I, Schuurmans MJ, et al: Effectiveness of a proactive primary care program on preserving daily functioning of older people: A cluster randomized controlled trial. J Am Geriatr Soc 64:1779-1788, 2016

**153.** Boult C, Boult LB, Morishita L, et al: A randomized clinical trial of outpatient geriatric evaluation and management. J Am Geriatr Soc 49:351-359, 2001

**154.** Caplan GA, Williams AJ, Daly B, et al: A randomized, controlled trial of comprehensive geriatric assessment and multidisciplinary intervention after discharge of elderly from the emergency department–the DEED II study. J Am Geriatr Soc 52: 1417-1423, 2004

**155.** Harvey P, Storer M, Berlowitz DJ, et al: Feasibility and impact of a post-discharge geriatric evaluation and management service for patients from residential care: The Residential Care Intervention Program in the Elderly (RECIPE). BMC Geriatr 14:48, 2014

**156.** Lampela P, Hartikainen S, Lavikainen P, et al: Effects of medication assessment as part of a comprehensive geriatric assessment on drug use over a 1-year period: A population-based intervention study. Drugs Aging 27:507-521, 2010

**157.** Lihavainen K, Sipilä S, Rantanen T, et al: Effects of comprehensive geriatric assessment and targeted intervention on mobility in persons aged 75 years and over: A randomized controlled trial. Clin Rehabil 26:314-326, 2012

**158.** Rockwood K, Stadnyk K, Carver D, et al: A clinimetric evaluation of specialized geriatric care for rural dwelling, frail older people. J Am Geriatr Soc 48: 1080-1085, 2000

**159.** Phibbs CS, Holty JE, Goldstein MK, et al: The effect of geriatrics evaluation and management on nursing home use and health care costs: Results from a randomized trial. Med Care 44:91-95, 2006

**160.** Hoogendijk EO, van der Horst HE, van de Ven PM, et al: Effectiveness of a geriatric care model for frail older adults in primary care: Results from a stepped wedge cluster randomized trial. Eur J Intern Med 28: 43-51, 2016

**161.** Liu JJ, Extermann M: Comprehensive geriatric assessment and its clinical impact in oncology. Clin Geriatr Med 28:19-31, 2012

**162.** Suijker JJ, Buurman BM, ter Riet G, et al: Comprehensive geriatric assessment, multifactorial interventions and nurse-led care coordination to prevent functional decline in community-dwelling older persons: Protocol of a cluster randomized trial. BMC Health Serv Res 12:85, 2012

**163.** Rao AV, Hsieh F, Feussner JR, et al: Geriatric evaluation and management units in the care of the frail elderly cancer patient. J Gerontol A Biol Sci Med Sci 60:798-803, 2005

**164.** Ingram SS, Seo PH, Martell RE, et al: Comprehensive assessment of the elderly cancer patient: The feasibility of self-report methodology. J Clin Oncol 20:770-775, 2002

**165.** Andersen BL, Rowland JH, Somerfield MR: Screening, assessment, and care of anxiety and depressive symptoms in adults with cancer: An American Society of Clinical Oncology guideline adaptation. J Oncol Pract 11:133-134, 2015

**166.** Hurria A, Wildes T, Blair SL, et al: Senior adult oncology, version 2.2014: Clinical practice guidelines in oncology. J Natl Compr Canc Netw 12:82-126, 2014

**167.** American Geriatrics Society Expert Panel on the Care of Older Adults With Multimorbidity: Multimorbidity: An approach for clinicians. J Am Geriatr Soc 60:E1-E25, 2012

**168.** AGS/NIA Delirium Conference Writing Group, Planning Committee and Faculty: The American Geriatrics Society/National Institute on Aging Bedside-to-Bench Conference: Research agenda on delirium in older adults. J Am Geriatr Soc 63:843-852, 2015

**169.** Germain V, Dabakuyo-Yonli TS, Marilier S, et al: Management of elderly patients suffering from cancer: Assessment of perceived burden and of quality of life of primary caregivers. J Geriatr Oncol 8:220-228, 2017

**170.** Rajasekaran T, Tan T, Ong WS, et al: Comprehensive geriatric assessment (CGA) based risk factors for increased caregiver burden among elderly Asian patients with cancer. J Geriatr Oncol 7: 211-218, 2016

**171.** Gilligan T, Coyle N, Frankel RM, et al: Patient-clinician communication: American Society of Clinical Oncology consensus guideline. J Clin Oncol 35:3618-3632, 2017

**172.** Extermann M, Hurria A: Comprehensive geriatric assessment for older patients with cancer. J Clin Oncol 25:1824-1831, 2007

**173.** Wildes TM, Ruwe AP, Fournier C, et al: Geriatric assessment is associated with completion of chemotherapy, toxicity, and survival in older adults with cancer. J Geriatr Oncol 4:227-234, 2013

**174.** Institute of Medicine. Delivering High-Quality Cancer Care: Charting a New Course for a System in Crisis. Washington, D.C.: The National Academies Press, 2013




 

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## AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

**Practical Assessment and Management of Vulnerabilities in Older Patients Receiving Chemotherapy: ASCO Guideline for Geriatric Oncology**

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## Appendix

**Table A1.** Guideline Expert Panel Membership

| Panel Member | Affiliation | Role/Area of Expertise |
|---|---|---|
| Supriya G. Mohile, MD, MS, co-chair | University of Rochester Medical Center, Rochester, NY | Medical oncology/geriatric oncology |
| William Dale, MD, PhD, co-chair | University of Chicago, Chicago, IL (until 3/17); City of Hope, Duarte, CA (starting 4/17) | Geriatric and palliative medicine |
| Arti Hurria, MD, co-chair | City of Hope, Duarte, CA | Medical oncology/geriatric oncology |
| Mara A. Schonberg, MD | Beth Israel Deaconess Medical Center, Brookline, MA | Internist |
| Cynthia M. Boyd, MD | Johns Hopkins University School of Medicine, Baltimore, MD | Geriatric medicine/internal medicine |
| Peggy S. Burhenn, MS | City of Hope, Duarte, CA | Oncology nurse |
| Beverly Canin, patient representative | Breast Cancer Options, Kingston, NY | Patient representative/advocate |
| Harvey Jay Cohen, MD | Duke University Medical Center, Durham, NC | Medical oncology/geriatric oncology |
| Holly M. Holmes, MD | McGovern Medical School, Houston, TX | Geriatrics/internal medicine |
| Judith O. Hopkins, MD, PGIN representative | Novant Health Oncology Specialists, Winston-Salem, NC | Medical oncology/community |
| Michelle C. Janelsins, PhD | University of Rochester Medical Center, Rochester, NY | Cognition specialist |
| Alok A. Khorana, MD | Cleveland Clinic, Cleveland, OH | Medical oncology |
| Heidi D. Klepin, MD | Wake Forest Baptist Comprehensive Cancer Center, Winston-Salem, NC | Geriatric oncology |
| Stuart M. Lichtman, MD | Memorial Sloan Kettering Cancer Center, New York, NY | Medical oncology/geriatric oncology |
| Karen M. Mustian, PhD | University of Rochester Medical Center, Rochester, NY | Exercise physiologist |
| William P. Tew, MD | Memorial Sloan Kettering Cancer Center, New York, NY | Medical oncology/geriatric oncology |
| Mark R. Somerfield, PhD | ASCO, Alexandria, VA | Staff/health research methodologist |

Abbreviation: PGIN, Practice Guidelines Implementation Network.