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Cancer Survivorship and Aging: Moving the Science Forward

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Abstract

Given the high incidence and prevalence of cancer in older adults and the anticipated growth of this population over the next few decades, oncologists, geriatricians and primary care providers will be challenged to provide timely and appropriate post-treatment care to a diverse population of older cancer survivors. Few post-treatment epidemiologic or clinical trial studies have investigated the mental, social and physical health issues among older cancer survivors. The behavioral oncology, gerontology, geriatric and psychology literature on cancer survivorship and aging is reviewed. This article highlights several methodological challenges investigators face when conducting epidemiological and cancer clinical trial research with older cancer survivors following treatment. These challenges must be considered and overcome to develop an informative body of scientific knowledge to address the post-treatment health care needs of this growing population. Future research directions, new models of care, and the need for trans-disciplinary approaches are discussed.

Keywords

Cancer survivorship; aging; elderly; quality of life; well being

Introduction

Men and women over the age of 65 represent 12% (36.8 million) of the U.S. population and it is estimated that this number will double between 2000 and 2030.¹ It is well recognized that the incidence of cancer dramatically increases as people age with 61% of incident cases diagnosed in men and women over the age of 65.² The number of cancer survivors over the age of 65 in the United States is currently estimated at 6.5 million² and is expected to increase as the population ages. Although a diagnosis of cancer represents a major cause of mortality in this growing population,¹ very few post-treatment epidemiologic studies or clinical trials have investigated the long term mental, social and physical health issues among older individuals who survive the disease or interventions to prevent or mitigate adverse outcomes. These issues are important as there are 4.4 million cancer survivors over the age of 65 who have survived over 5 years beyond their diagnosis, while 2.8 million have survived over 10 years.² Often older cancer survivors have complex coexisting medical conditions that can affect cancer prognosis and exacerbate quality of life outcomes.^{3,4} A

recent study found that over a ten-year period, diabetics with colon cancer were 21% more likely to have a recurrence and they were 42% less likely to survive compared with non-diabetics with colon cancer.⁵ Data is also accumulating that suggests age is a risk factor for chronic complications of treatment, including chemotherapy induced acute leukemia and chronic cardiomyopathy, with obvious implications for quality of life.^{6,7} As the nascent field of cancer survivorship and aging continues to mature, researchers will face major challenges that are unique to studying a diverse population of older cancer survivors. These challenges must be considered and overcome in order to develop an informative body of scientific knowledge addressing the post-treatment health care needs of this steadily expanding older cancer survivor population.

Our discussion is guided by concepts derived from developmental psychology and life course research. Following the brief discussion of lifespan developmental processes, a synopsis of the existing research on the post-treatment health of older cancer survivors will be presented (For a full review see Avis and Deimling in this issue). Lastly, several methodological challenges investigators face when conducting epidemiological studies and cancer clinical trials with older cancer survivors following treatment will be highlighted. A clear understanding of these areas is critical in order to develop sound scientific evidence to inform standard of care guidelines for geriatric oncology. The information presented in this paper evolved from a roundtable discussion among experts in the field of behavioral oncology, gerontology and cancer survivorship during the “Cancer and Aging: Challenges and Opportunities across the Cancer Control Continuum” pre-conference session at the 2007 Annual Meeting of the Society of Behavioral Medicine in Washington, DC.

Developmental Life Course and Aging

It is well established that many changes occur with age, including diminished cardiovascular performance and respiratory capacity, visual and hearing problems, decrements in physical and cognitive function, loss of independence, decreased social interactions, and a reduction in reserve capacity or ability to respond to stress and/or recover from illness.^{8,9} Yet aging is not only associated with declining function, but also with stability and/or development and growth in the areas of personality, knowledge, creativity, generativity and wisdom.^{10–12} Understanding the interface between aging and the post-treatment cancer experience might be enhanced by examining the broader context of the lives of aging adults, and specifically, by applying concepts from the field of developmental psychology and life course research.¹³ In this realm, several theories exist that help explain adaptation to life stressors in later life, including Socioemotional Selectivity Theory and the Theory of Selective Optimization with Compensation.^{14–16} These theories suggest that emotional-regulatory skills, establishing new goals and life priorities, adjusting or realigning expectations in spite of losses (function, social networks, independence) are important components of optimal adjustment in later life.^{15,16} Additionally, with age, individuals tend to perceive less control over their health, have fewer emotional highs and lows, and lower their expectations for functional recovery.¹⁷ From a psychological developmental standpoint, the impact of aging on mental health or psychological adjustment might be beneficial for older cancer survivors, particularly in comparison to younger adults with cancer.

Another important developmental concept relates to the different roles and responsibilities of individuals as they transition from childhood to adolescence, through young adulthood to mid-life and old age. This concept might help explain differences in adjustment.¹³ The experience of cancer in early adulthood can be markedly different compared with cancer later in life. Many young adults with cancer are dealing with competing demands of work, family and other roles that are embedded in the lives of young adults. As people age, roles and responsibilities change, there might be fewer demands on individuals' lives and many older adults might derive strength from previous life experiences.¹⁷ Understanding an

individual's placement in the life course, when a diagnosis occurs and how cancer is assimilated in relation to other life demands and stressors may help our understanding of post-treatment adjustment in older adults.

Post-treatment Health of Older Cancer Survivors: A Brief Review of the Science

The post-treatment health of older cancer survivors is affected by several factors in addition to aging and coexisting comorbid medical conditions. These include the efficacy of treatments, and the effective management of acute, late and chronic side effects from the cancer itself and its treatments. Scientific knowledge regarding the quality of life (mental, social and physical health) of older cancer survivors following treatment is limited. Regarding mental health the evidence is mixed: some research suggests cancer and its treatments have negative consequences on mental health^{18–20} while other data suggests older survivors are psychologically resilient and their post-treatment mental health is the same or even better than that of the general population.^{21–24} With respect to social and physical functioning the evidence is more unequivocal and suggests that these two health domains are negatively affected by cancer and its treatments in older cancer survivors.^{3,21,25–32} The presence of physical health problems resulting from cancer and its treatment are often exacerbated by coexisting medical conditions which disproportionately affect the elderly and can ultimately lead to increased morbidity and mortality.^{4,5,33}

Survivorship Research with Older Cancer Survivors: Challenges and Opportunities

A recent Institute of Medicine (IOM) report entitled, “From Cancer Patient to Cancer Survivor: Lost in Transition” highlighted several challenges that researchers face in moving the science of oncology survivorship forward.³⁴ One of the issues is the length of follow up needed for surveillance of the cancer survivor population, as many late health effects are unlikely to emerge until several years following treatment. Related to surveillance, the ever changing diagnostic technology and advances in treatment, particularly targeted therapies, necessitate constant observation of this population, which can be costly and methodologically challenging. Another concern addressed by the IOM report is the difficult empirical task of disentangling cancer-related effects and health outcomes caused by competing medical conditions. This is a particularly relevant issue among elderly cancer survivors since older adults are affected by multiple comorbid health conditions. Additional specific challenges arise when conducting epidemiological studies and clinical trials with older cancer survivors, the focus of the following sections.

Epidemiological Research

Epidemiological studies, particularly surveillance research, provide us with critically important population-based estimates of the post-treatment mental, social and physical health burden from cancer and its treatments. This type of research also provides vital information about the downstream health services impact stemming from the post-treatment cancer burden among elderly and aging cancer survivors. Despite the importance of such research, few scientifically rigorous studies exist that inform our understanding of the post-treatment physical and psychological health of elderly cancer survivors. As attention to this area of research increases,^{35,36} several methodological challenges and issues must be considered to advance the science.

Research Design—Unlike ongoing studies of survivors of childhood cancer³⁷ or general health in the older adult population,³⁸ there is no infrastructure in place to specifically monitor the burden of cancer in the elderly. Design options utilized, to date, include mostly cross-sectional and, to a lesser extent, prospective cohort designs, but these types of studies

commonly lack the use of control groups, rely on convenience samples, are limited in their ability to extrapolate to the larger population of older cancer survivors and in the case of prospective design do not have pre-diagnosis (baseline) data on health and function.^{20,21,28,39,40} While designing a prospective cohort specifically to answer cancer survivorship and aging questions is advantageous and preferable, this approach is very expensive, time consuming and can take many years to produce results.

A minor design challenge that is unique to the aging population has to do with the stability of the population as a sizable number of elderly adults have two separate residences (snowbirds), moving from one location to another based on the seasons.^{41,42} Our ability to track older participants is important in order to reduce attrition and selection bias. Fortunately, newer technologies like cell phone and internet make it possible to keep in touch with participants and to collect data remotely.

Leveraging ongoing prospective cohorts, such as The Iowa Women's Health Study or the Nurses Health Study, would allow capture of the burden of disease in a select cohort of aging female cancer survivors. Other underutilized available platforms could also be used for surveillance of this population, including the National Health Interview Survey and the Medicare Health Outcomes Survey. However, these datasets are limited because they fail to capture the clinical information necessary for surveillance of the elderly population. As advocated by others,^{43–45} leveraging the Medicare – Surveillance, Epidemiology, and End Results (SEER) program link is an underutilized but potentially beneficial approach to monitoring the cancer burden among the elderly. This platform would allow researchers to capture population-based cancer registry and insurance claim data and to collect patient-reported outcome data via surveys. Additionally, the use of the Medicare-SEER link as a source of secondary data is more cost efficient than designing and conducting prospective studies.

Measurement—The emerging interest in aging and cancer survivorship research from investigators outside of the aging field warrants a brief discussion of some of the methodological considerations that need to be addressed when conducting surveillance research in this population. Particular attention needs to be paid to the length, mode and frequency of assessments. Respondent fatigue, slower response time, literacy level, and font size of survey items and questionnaires are important issues that need to be addressed when conducting survey research with an older population.^{46,47} While mail questionnaires are more cost effective using face-to-face interviews or telephone interviews with the elderly results in more accurate and complete data and likely a higher response rate.^{48,49} Another relevant issue researchers need to consider when conducting research in this population is respondents cognitive capacity and ability to provide informed consent. The elderly show significantly poorer comprehension of consent information compared with younger study participants and special instructions may be needed.⁵⁰ Not only are there ethical issues that must be addressed, but eliminating elderly participants based on cognitive status often limit researchers ability to include an important and sizable sub-population of elderly individuals in studies; thus, causing a severe selection bias. In some cases, proxies can be used to complete surveys, but research shows that this approach can adversely influence the accuracy of the data collected.⁵¹

Often overlooked in aging and cancer survivorship research is the validity and reliability of measurement instruments. With few exceptions, most of the measures used in oncology have been developed and validated in young to middle aged adults.⁴⁶ The extent to which existing measures are psychometrically valid and reliable in older populations remains unknown. A particular area of concern in the geriatric literature relates to the accuracy of self-report measures of physical functioning which are often used in aging and cancer

survivorship research. Some researchers are arguing for the use of performance based measures as recent evidence suggests this method of measurement is more accurate than self-report measures of physical function in older adults.^{52,53}

Another area of concern relates to quality of life domains examined and whether the questions researchers ask are indeed relevant to the target population. That is, are we measuring what's salient to older cancer survivors in terms of health outcomes? The gerontology and developmental psychology literature suggests outcomes such as independent living, social integration, mobility, spirituality, generativity, creativity, wisdom and frailty are important to the older population and may have implications for quality of life of older survivors.^{11,12,54} These concepts have received little attention in cancer survivorship and aging research. Adopting a set of psychometrically sound and universally agreed on quality of life and functional parameters to be routinely assessed in older adults with cancer would provide clinicians with important information that can help them address the post-treatment health needs of long term older cancer survivors.

A better understanding of these measurement issues in epidemiological studies is vital to accurately characterize the post-treatment health of older cancer survivors as well as to provide timely information to assist in the development of randomized clinical trials in elderly cancer survivors.

Clinical Trials

The extant epidemiological research suggests considerable post-treatment physical and social functioning issues result from cancer and its treatments among elderly survivors. Behavioral interventions provide a promising avenue for integrating allied health disciplines into standard oncological care to effectively manage the post-treatment health burden. A variety of behavioral interventions have shown promise for alleviating common side effects from cancer and its treatments, and improving quality of life among cancer survivors.^{55–57} Yet, comprehensive data elucidating effective behavioral interventions among elderly cancer survivors post treatment are limited. For example, elderly cancer survivors, just like younger survivors, do not spontaneously adopt behavioral changes⁵⁸ (for example, exercising or dieting) or maintain them,⁵⁶ suggesting the need for formal and targeted interventions.

Although most published clinical trials designed to attenuate adverse side-effects and to increase quality of life post-treatment have included older cancer survivors among the study participants, the number of participants over 65 years of age is often insufficient to examine the impact of these interventions on health outcomes of older cancer survivors.^{55–57} Among the limited number of published intervention trials that have been conducted over the past years only a few have focused on older cancer survivors. For example, McDougal reported that a memory improvement program conducted twice a week for 1.25 hours for 4 weeks was successful at improving cognitive function among older cancer survivors.⁵⁹ Demark-Wahnefried and colleagues conducted a diet and exercise intervention with the goal to improve physical function in older cancer survivors. Although the association among diet, exercise and physical functioning was not statistically significant, it was however in the right direction. The authors speculate that insufficient power to detect a statistically significant difference between the intervention and control groups might be responsible for the null effect.⁶⁰ Nevertheless, this study is an important example of a home-based exercise intervention designed specifically for seniors.

A recent review of the literature suggests that supportive and cognitive behavioral therapies are important components in the effective management of psychiatric issues in older cancer survivors, but that clinical trials are lacking.⁶¹ Most of the current practices for implementing behavioral interventions with older cancer survivors post-treatment are not

evidence-based but are derived from extrapolating published scientific data from healthy older adults, older adults with other chronic health conditions and cancer survivors in general.^{55,56,62}

Research Design—There are many research design considerations that need to be addressed when conducting post-treatment clinical trials in elderly cancer survivors, including: 1) modifying inclusion and exclusion criteria to increase the prevalence of older cancer survivors in post-treatment trials; 2) developing a phenotype for risk assessment of frailty in older cancer survivors; 3) addressing the issues of heterogeneity of mental and physical health needs among diverse older cancer survivors; 4) obtaining informed consent from older cancer survivors with cognitive decline and other logistical issues; and 5) adding and developing appropriate assessments for older cancer survivors.

Many older adults with cancer (65 and older) are excluded from clinical trials because of comorbid health conditions, physician age bias, perceived vulnerability of the elderly, and polypharmacy use.^{63,64} For similar reasons, older adults may not receive appropriate routine screening for cancer, compromising their likelihood of even being diagnosed with an earlier, more treatable tumor. While not the focus of the current article, it is important to acknowledge this body of literature as it is directly related to the long-term health of this population. Research suggests that many older cancer patients can tolerate cancer treatment, particularly radical surgery, to the same degree as do younger cancer patients.^{65,66} A recent review of the literature found that restrictive inclusion and exclusion criteria accounted for a large amount of variance in predicting whether older adults were able to participate in a clinical trial during cancer treatment.⁶⁷ Additionally, little is known about the preferences and attitudes of older survivors regarding clinical trials for treatment because older cancer patients have been largely understudied. Researchers conducting post-treatment clinical trials should be aware of similar issues regarding exclusion/inclusion criteria as well as patients' preferences and attitudes. Naturally, certain inclusion and exclusion criteria are not arbitrary and provide for patients' safety. However, exclusion criteria based on comorbidity and perceived vulnerability may disqualify the majority of older adults from participating in clinical trials during treatment and post-treatment. Thus, exclusion criteria need to be evaluated and modified to ensure that the trial does not exclude older patients unnecessarily. Another way to ensure adequate representation of wide age range of older cancer survivors is to design post-treatment trials with older age as a specific inclusion criteria.⁶⁰ This would allow investigators to have large enough samples to examine age group differences within the older survivor population.

As the size of the older cancer survivor population continues to increase, it will also become increasingly diverse. While cancer affects people from all racial, ethnic, economic and social groups, the burden of cancer and its treatments is often greater for minority and underserved groups (i.e., African Americans and the poor). Specifically, racial minorities tend to receive lower-quality health care than Caucasians even when insurance, income and age status are the same.^{34,35} As the body of knowledge regarding appropriate standards of care for elderly cancer survivors is developed it will be important to include diverse participants based on race, ethnicity, socioeconomic status, sexual orientation, geographic location, and disability in randomized controlled clinical trials.

To successfully accomplish the goal of improving a study's research design, researchers must creatively overcome multiple issues, such as obtaining consent from patients with cognitive decline as previously discussed, designing interventions that would take older patients' health limitations into account (e.g. medication dosage, pain management, polypharmacy), providing transportation, incorporating home based approaches, using more one-on-one time, minimizing the use of technologies that are cumbersome and intimidating

for older adults, and adding study staff with expertise in gerontology and geriatrics. An interim solution to assessing health outcomes of older adults in clinical trials may be to conduct secondary analyses of subgroups of older adults in existing clinical trials, and databases (e.g. Medicare, VA systems, completed clinical trials). However, a more enduring resolution would be to for investigators conducting clinical trials on older cancer survivors to utilize more objective inclusion/exclusion criteria.

Measurement—Most researchers agree that the measurement of functional decline is an important outcome in clinical trials for older cancer survivors. One study suggested that comorbidity rather than cancer diagnosis impacts functionality in older adults,³⁹ but the concomitant existence of medical comorbidity and cancer in older adults produces an adverse interaction effect on functioning.⁴ While comorbidity and functionality are interconnected, it is important to differentiate between comorbidity and functional status in older adults with cancer. Extermann and colleagues has shown that these are independent constructs and need to be assessed separately.⁶⁸ Common measures used to assess comorbidity in older adults include The Charlson, The Cumulative Illness Rating Scale-Geriatric (CIRS-G), and The Index of Co-Existing Disease (ICED).^{69–71} Measures of function, including the Karnofsky Performance Status & Eastern Cooperative Oncology Group performance scale, are also used in cancer research with older adults.^{72,73} However, these comorbidity and function measures are mostly used to determine appropriate treatment and and/or how disease and function may affect prognosis or other post-treatment health outcomes. These function measures do not specifically measure essential markers associated with daily functioning such as activities of daily living. Measures more closely associated with functioning (e.g. Evaluation of Katz Activities of Daily Living, Rosow-Breslau Health Scale, Nagi Instrumental Activities of Daily Living)^{74–76} might have more promise for research with the elderly, but their concurrent (discriminating between high functioning vs. lower levers of functioning) and predictive validity (predicting survival and quality of life) in elderly cancer patients need to be evaluated. The validity and reliability of measures most commonly used in cancer research with few notable exceptions (e.g. CES-D, SF-36) have not been established in older adults.^{77–79}

The Future of the Science and Care of Older Cancer Survivors

Moving the Oncology Survivorship Science Forward

Clearly more research is needed to understand the post-treatment health and functioning in older cancer survivors as well as appropriate interventions to improve health-related outcomes for this growing population. However, future research examining adjustment processes and health outcomes need to be theoretically-informed. Incorporating a developmental perspective into aging and cancer survivorship research is one approach that might elucidate the complex interface between cancer survivorship and aging processes.

Future surveillance research should focus on:

- the extent to which cancer and its treatment influences post-treatment aging processes, including, but not limited to, cardiovascular performance and respiratory capacity, and visual and hearing problems;
- characterizing the mental, social and physical health burden of older cancer survivors with different cancers as different cancers and their treatments likely produce different medical and quality of life health outcomes;
- research that identifies moderators/mediators of high health risk so that clinicians can quickly identify patients who require referral to appropriate support services;

- research that characterizes patients' changing illness and treatment representations (i.e., expectations and beliefs) across the life span and its influence on care seeking, functioning, and quality of life
- disentangling cancer related effects vs. age related effects on mental, social and physical health;
- examining health outcomes that are most salient to this population, such as functional capacity and quality of life issues that include autonomy, dependency, social isolation, mobility, and existential issues such as wisdom and generativity;
- examining the validity and reliability of current medical and psychosocial instruments in an older population with cancer, and developing new measures if appropriate.
- Research that examines different biological markers that may provide estimates of physiological aging.

Answers to these questions will require different research designs that address many of the methodological issues highlighted in this paper. Complicating these issues further is the fact that individuals become more heterogeneous as they age as a result of a variety of genetic, environmental and lifestyle factors. Understanding the variability within the older population is critical to our success in meeting the needs of older cancer survivors. Targeted research efforts are needed that examine age group differences with respect to the burden of disease in this diverse population.

Future clinical research should focus on discerning:

- brief, objective screening tools for determining health status of older cancer survivors for post-treatment clinical trial participation;
- what type of behavioral interventions (traditional western such as physical exercise, behavioral interventions, diet and stress management or alternative interventions such as yoga, polarity, and restorative therapies, as well as others) work best for older cancer survivors for optimizing post-treatment health;
- the most effective content and dose (frequency and duration) for behavioral interventions;
- the optimal delivery modality for behavioral interventions (e.g., individual home-based, couples, group or community based);
- who are the most qualified professionals to deliver the interventions (exercise physiologists, licensed psychologists, nurses, or non-licensed professionals);
- which single intervention or combination of interventions provide the most effective approach to treating late and chronic side effects among older cancer survivors post-treatment.

Future research should also consider investigating a phenotype for frail adults as proposed by Fried and colleagues.⁸⁰ Characteristics, such as unintentional weight loss, sarcopenia, weakness/grip strength, poor endurance/exhaustion, and low physical activity level should be assessed in clinical studies and would provide another source of data about cancer survivors' functioning post-treatment. This would augment information on both disability and comorbidity in which the latter would be looked at as a contributor to frailty and the former would be seen as an outcome of frail condition. There is also evidence to suggest markers of inflammation (interleukin 6, C-reactive protein) and coagulation (D-dimer) increase with age and these elevated markers may partially explain the development of a frailty phenotype.^{81,82} This phenotype of frailty can be an important part of standardized

clinical assessment in addition to serving as a screening tool for including or excluding older adults in clinical trial research.⁸⁰

Research on behavioral interventions for the management of post-treatment health issues should follow rigorous scientific research methodology. Clinical trials need to adhere to the CONSORT guidelines which takes an evidence-based approach to improve the quality of clinical trials.⁸³ Experimental designs and statistical analyses should include and measure proximal and distal quality of life domains as primary study outcomes. Research programs promoting specific interventions should include and be clearly reported as Phase I, Phase II, Phase III, or Phase IV clinical trials. Lastly, statistical analyses should utilize intent-to-treat analyses, when appropriate and effect sizes and adverse outcomes need to be well documented in publications to allow for pooling of data for meta-analyses.

Caring for the Growing Population of Older Cancer Survivors

Our capacity to respond to the health care needs of older cancer survivors is linked to our knowledge of the science from epidemiological and clinical trial research. As the evidence base evolves in this area of research, new models of care need to be considered to optimize the post-treatment health care of older cancer survivors. Two recent reports warn of an ominous shortage of oncologists and geriatricians as a result of the overall aging population, the number of oncologists heading into retirement, and the lack of interest among medical professionals in entering the field of geriatrics.^{84,85} The ideal approach would include a collaborative effort between geriatricians and oncologists. Geriatricians are experts in the management of co-existing health conditions and optimizing functional performance and quality of life for their patients. Oncologists are experts in diagnosing and treating cancer as well as coordinating the care of cancer patients during this critical period, but longer term follow up of this population is probably less familiar to these specialists. As elderly survivors transition out into the community, geriatricians, in collaboration with oncologists, would be best positioned to provide post-treatment and long-term management of cancer in the elderly. This type of shared care model, advocated by others,^{86,87} is associated with both better cancer surveillance practices, and management of more common chronic health conditions and preventive care practices.⁸⁸ Better utilization of the talents of geriatric and oncology nurse practitioners as they are on the front lines interacting with elderly patients can also lead to improvement of care for elderly cancer patients.⁸⁹ Geriatric nurses can assist in assessing the health status of patients, address polypharmacy issues, provide appropriate referrals, and help older cancer survivors navigate the post-treatment phase of cancer. Given the health complexities of the aging population, it is clear that the post-treatment management of the older cancer survivor will require multi-disciplinary teams.

The need for trans-disciplinary research

We have argued that the public health needs of a growing elderly cancer population make new and integrative research efforts imperative. Such research efforts should not only originate from funding agencies and scientists specializing in oncology and geriatrics (a top-down approach), but should also be initiated by the members of various health and aging related organizations (a bottom-up approach). As a start, AARP, one of the most powerful organizations of elderly adults in the US, could have a unique role by polling its members about their view on cancer survivorship research initiatives. Engaging this community could prove to be beneficial in terms of finding creative ways to accrue this hard to reach population in future research efforts. Additional efforts are needed to foster crosstalk and collaboration among geriatricians, gerontologists and adult oncologists. This endeavor is important because each of these disciplines contribute different perspectives to cancer survivorship and aging issues. We suggest that the members of the cancer and the aging special interest groups (SIGs) of the Society of Behavioral Medicine organize joint

symposia and workshops to explore common research interests. Particular efforts should be made to develop a combined research agenda that prioritizes the most pressing issues for older cancer survivors and how these could be addressed. Other aging organizations such as the American Society of Aging (ASA), International Society of Geriatric Oncology (SIOG), the Gerontological Society of America (GSA) or the Geriatric Oncology Consortium should be approached to contribute their expertise.

From a scientific point of view, a wide variety of disciplines ranging from geriatricians, gerontologists, primary care physicians, epidemiologists, basic scientists, urban planners and sociologists, need to be involved to address the varied requirements of this population. For example, psychologists and social workers might team with architects and urban planners to develop and evaluate new forms of integrated community living for the elderly. Cognitive psychologists, nurses, and industrial designers might develop new tools to ensure adherence to medication and to avoid untoward side-effects from competing medications. In short, the inclusion of disciplines that traditionally had little contact outside their own disciplines is challenging, but necessary if we are to meet the health care needs of older cancer survivors. It may also be deeply rewarding to those who seek to bridge these disciplines.

Conclusion

Despite the high prevalence of cancer in older adults and the anticipated growth of this population over the next few decades, knowledge about the post-treatment quality of life and efficacy of behavioral interventions in this population is limited. The time to address the issues highlighted in this paper is now before the exponential growth of this population overtakes the healthcare system. Existing resources need to be marshaled to ensure that aging populations are included into current research efforts. In addition, there is a need for innovative multi- and trans-disciplinary approaches to optimize the post-treatment care of this population.

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