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From vulnerability to vitality: Addressing frailty in geriatric oncology practice

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Abstract

Frailty, a multidimensional syndrome characterized by decreased physiological reserves and increased vulnerability to stressors, is increasingly recognized as a critical determinant of outcomes in cancer patients, particularly among the elderly. The intersection of cancer and frailty compounds the risk of adverse events, poor treatment tolerance, and diminished quality of life. This review explores the implications of frailty in geriatric oncology by providing an overview of its definition, pathophysiology, and assessment, particularly in the context of cancer. We detail how cancer and its treatments can exacerbate functional decline, how frailty is evaluated using both general and oncology-specific tools, and the importance of integrating frailty assessment into oncologic decision-making. Furthermore, we explore management strategies tailored to frail cancer patients, emphasizing multidisciplinary approaches, prehabilitation, rehabilitation, nutritional support, pharmacologic optimization, and psychosocial care. Addressing frailty systematically within oncology has the potential to enhance patient-centered care, optimize therapeutic strategies, and ultimately improve survival and quality of life.

Keywords: Frailty; Cancer; Geriatric oncology; Functional decline; Frailty assessment; Cancer management; Clinical practice.

Introduction

Cancer continues to be a primary contributor to illness and death globally, with projections indicating a significant increase in its burden in the forthcoming decades [1]. Notably, the incidence of cancer increases significantly with age, and a growing proportion of patients diagnosed with cancer are older adults. This demographic shift necessitates a greater understanding of the unique challenges faced by the elderly cancer population. Cancer represents a considerable health risk for the elderly, constituting a significant percentage of cancer patients aged 65 and older. With increasing life expectancy and an aging population, the occurrence of cancer among older adults is anticipated to rise further. Age serves as a primary risk factor for most prevalent cancers, with both incidence and prevalence escalating as individuals age. Research indicates that the rates of incidence and mortality for various cancers among the elderly and very old populations are increasing globally, with most cancer types reaching their peak between the ages of 75 and 90, followed by a notable decline [2,3].

Geriatric oncology is a distinct area of medicine dedicated to the diagnosis, treatment, and management of cancer among elderly patients. As the global population ages, the incidence of cancer among the elderly is rising, making this area increasingly important. Older patients often present unique challenges due to age-related physiological changes, multiple comorbidities, and varying levels of functional and cognitive ability. Geriatric oncology aims to provide personalized care by integrating oncologic treatment with comprehensive geriatric assessment to optimize outcomes, minimize treatment-related toxicity, and maintain quality of life. This multidisciplinary approach ensures

that therapeutic decisions align not only with cancer prognosis but also with the patient's overall health status and personal preferences [3,4].

Frailty, a multidimensional syndrome, is defined as a clinical state of increased vulnerability resulting from age-associated decline across multiple physiological systems [6], has emerged as a critical factor in the management of older adults with cancer. It is distinct from chronological age and more accurately predicts adverse outcomes including treatment toxicity, postoperative complications, and mortality [7].

In oncology, frailty has emerged as a critical factor affecting treatment outcomes and quality of life, especially among older adults [8]. The co-occurrence of cancer and frailty intensifies the burden of illness, not only physiologically but also psychologically and socially. Understanding the consequences of frailty in cancer patients is essential for holistic care and improved outcomes [9].

Despite its importance, frailty is often under recognized in oncology, leading to suboptimal treatment planning and poorer outcomes [10]. Traditional performance status scales such as the Eastern Cooperative Oncology Group (ECOG) [11] or Karnofsky Performance Status (KPS) [12] do not adequately capture the complexity of frailty [13]. Therefore, incorporating comprehensive frailty assessment into cancer care is essential for guiding therapeutic decisions and delivering personalized treatment [10].

Cancer and its treatments significantly impact physical function, leading to functional decline and loss of independence. The physiological stress of malignancy, compounded by aggressive interventions such as surgery, chemotherapy, and radiotherapy, can precipitate or exacerbate frailty. Specific cancer-related factors contributing to functional impairment include tumor burden, paraneoplastic syndromes, cancer cachexia, fatigue, and neuropathy [14].

Then, cancer cachexia is a multifaceted metabolic disorder marked by unintentional weight loss, muscle depletion, and widespread inflammation, which significantly impairs functional capacity [15]. Additionally, treatment-induced side effects such as chemotherapy-related fatigue, peripheral neuropathy, and cognitive dysfunction further impair physical and cognitive function. These effects are often more pronounced in older adults due to pre-existing comorbidities, polypharmacy, and diminished physiological reserves [16].

Moreover, functional decline in cancer patients is not merely a consequence of aging or treatment but reflects interplay of biological, psychological, and social factors. Depression, anxiety, social isolation, and economic hardship can also contribute to decreased functionality [15,17]. Recognizing and addressing these multifactorial contributors is essential in comprehensive cancer care. This review aims to analyze the current understanding of frailty in older cancer patients, explore assessment tools and management strategies, and highlight the implications for clinical practice and future research.

Frailty

Definition and pathophysiology

Frailty is a multidimensional syndrome characterized by reduced strength, endurance, and physiological function, increasing an individual's vulnerability to external stressors. It is a distinct clinical entity from comorbidity and disability, although there is significant overlap [18,19].

Two predominant models define frailty: the phenotype model proposed by Fried et al. [20], and the cumulative deficit model developed by Rockwood and Mitnitski [21]. The Fried phenotype is characterized by five criteria: unintentional weight loss, self-reported fatigue, diminished grip strength, reduced walking speed, and low levels of physical activity. An individual meeting three or more of these criteria is considered frail [20]. The cumulative deficit model conceptualizes frailty as the accumulation of health deficits, resulting in a frailty index based on the proportion of potential deficits present [21].

The pathophysiology of frailty involves multiple systems, including musculoskeletal, neuroendocrine, and immune pathways. Chronic inflammation, sarcopenia (loss of muscle mass and strength), hormonal dysregulation, oxidative stress, and mitochondrial dysfunction contribute to the frailty phenotype. These pathophysiological changes reduce the body's ability to maintain homeostasis in the face of physiological stress, such as cancer or its treatments [22].

Assessment

Accurate assessment of frailty is essential to identify patients at risk and tailor treatment accordingly. Several tools have been developed, each with specific strengths and limitations [23].

The Fried Frailty Criteria are widely used in research but may be impractical in busy clinical settings due to the need for physical performance measurements [20]. The Clinical Frailty Scale (CFS), a 9-point scale based on clinical judgment, is simple, quick, and increasingly used in clinical practice [24].

The Edmonton Frail Scale is another comprehensive tool that includes assessments of cognition, mood, functional performance, and social support [25]. The Comprehensive Geriatric Assessment (CGA) remains the gold standard for evaluating frailty. It includes domains such as physical health, functional status, cognition, nutrition, social support, and psychological well-being. Although time-consuming, CGA provides a holistic understanding of the patient's health status and can guide multidisciplinary interventions [26].

Frailty affects a significant proportion of older adults with cancer. Up to 50% of older cancer patients exhibit some degree of frailty. Frailty impacts tolerance to chemotherapy, increases postoperative complications, and affects survival rates. However, beyond these clinical implications, frailty has profound psychological and social repercussions that can further complicate cancer care [27].

Frailty assessment is particularly relevant in oncology, where treatment decisions often involve weighing potential benefits against risks of toxicity. Multiple studies have demonstrated that frailty is a strong predictor of chemotherapy toxicity, surgical complications, hospitalizations, and mortality in cancer patients [10].

Geriatric assessment has been endorsed by major oncology societies, including the American Society of Clinical Oncology (ASCO) [28,29] and the International Society of Geriatric Oncology (SIOG) [30], as an essential component of care for older adults with cancer. Tools such as the Cancer and Aging Research Group (CARG) score [31,32] and the Chemotherapy Risk Assessment Scale for High-Age Patients (CRASH) score [33] have been developed to predict chemotherapy toxicity in older adults.

However, the implementation of frailty assessment in routine oncology practice remains inconsistent due to barriers such as time constraints, lack of training, and limited resources. There remains a global deficiency in the awareness and application of frailty screening tools, which may vary based on geographical location, national income, and educational levels. Increasing awareness among healthcare professionals, simplified screening tools, integrated electronic health records, and interdisciplinary collaboration may facilitate broader adoption [34].

Management strategies

Management of frailty in cancer patients requires a comprehensive and individualized approach. The goals are to optimize function, enhance treatment tolerance, and improve quality of life [35]. Prehabilitation, which focuses on improving a patient's functional capacity prior to treatment, has demonstrated potential in enhancing outcomes. This may include structured exercise programs focusing on strength, balance, and endurance; nutritional support to improve caloric and protein intake and psychological support to address anxiety or depression prior to treatment initiation [36].

Rehabilitation should be viewed as a continuous process that begins with diagnosis and extends through survivorship or palliative care. Tailored physiotherapy programs can aid in restoring mobility and managing fatigue [37]. Occupational therapy may assist patients in maintaining independence in daily living activities, while speech and cognitive therapy may be essential for those affected by head and neck cancers or chemobrain [38].

Nutritional interventions are critical, particularly in patients with cancer cachexia or sarcopenia. Regular nutritional screening, dietary counseling, and use of oral nutritional supplements can support muscle mass, enhance immunity, and reduce treatment-related complications. Anti-inflammatory and high-protein diets, along with agents like omega-3 fatty acids, may also play a role [39]. Also, pharmacologic optimization is another cornerstone of frailty management. Regular medication reviews can reduce polypharmacy and avoid potentially inappropriate medications [40].

Psychosocial support is essential and should address depression, anxiety, and caregiver burden. Social work consultations can facilitate access to community resources, home care services, and financial assistance [41]. Multidisciplinary care involving oncologists, geriatricians, physiotherapists, dietitians, pharmacists, psychologists, and social workers ensures that all aspects of a patient's health and well-being are addressed holistically. Personalized care plans should be dynamic and responsive to changes in health status over time [29].

Psychological and social consequences

Psychological and social consequences of frailty are deeply interconnected. For example, social isolation can lead to depression, while depression can reduce motivation to engage socially, creating a vicious cycle. This interplay complicates treatment planning and underscores the need for multidisciplinary interventions that address both psychological well-being and social support systems [42].

Frailty significantly increases the risk of depression and anxiety in cancer patients. The reduced physical capacity and dependence associated with frailty often lead to feelings of helplessness and hopelessness. A study by Loh et al. (2016) found that frail cancer patients had higher levels of depressive symptoms compared to their non-frail counterparts. The psychological stress of managing cancer, compounded by frailty-related limitations, exacerbates emotional distress [43].

There is growing evidence that frailty is associated with cognitive impairment, which may be worsened in the context of cancer and its treatment. Cognitive decline in frail cancer patients can lead to difficulties in understanding treatment plans, decision-making, and maintaining independence. The phenomenon of chemobrain or cancer-related cognitive impairment is more pronounced in frail individuals due to their diminished physiological reserve [20,44].

Frail cancer patients often experience a loss of autonomy, which can erode their self-efficacy. This psychological burden affects treatment adherence and coping strategies. The inability to perform daily tasks or participate in meaningful activities can lead to diminished self-worth and an increased sense of burden. This perceived loss of control over their health and life trajectory is a major source of psychological distress [45].

Additionally, frailty often leads to mobility limitations, which restrict social engagement inducing social isolation. Cancer patients who are frail are less likely to attend social gatherings or participate in community activities, leading to social withdrawal and isolation [46,47]. Social isolation has been linked to worse mental health outcomes and lower survival rates in cancer patients [17].

Frailty increases the need for caregiving, which can place significant strain on families. This strain can alter family dynamics, sometimes leading to conflict or emotional fatigue among caregivers. The stress of caregiving is often compounded by the emotional toll of watching a loved one struggle with both cancer and frailty. This dynamic can contribute to feelings of guilt, resentment, or helplessness within the family unit [46,48].

Finally, frail cancer patients may be more likely to experience job loss if not retired, financial strain, and reduced access to healthcare resources. They may also face challenges in navigating healthcare systems, especially if they lack a strong support network. The economic burden of managing cancer and frailty can exacerbate social inequities and limit treatment options [49].

Implications for clinical practice

Integrating frailty assessment into oncology practice can improve patient outcomes by guiding individualized treatment planning. It supports shared decision-making by aligning therapeutic goals with the patient's values and functional status [35]. routine use of Comprehensive Geriatric Assessment (CGA) in oncology settings can help identify frailty and its associated risks early. CGA includes assessments of physical health, cognition, psychological state, and social circumstances, providing a holistic view of the patient's condition [30].

Risk stratification based on frailty can inform decisions regarding the intensity of therapy, the need for supportive care measures, and appropriate follow-up strategies. It also helps identify patients who may benefit from geriatric interventions or palliative care services. Ethically, assessing frailty ensures that vulnerable patients are not subjected to harmful or futile treatments and promotes equity in care delivery [50].

Psychosocial Interventions such as counseling, cognitive-behavioral therapy, and support groups can mitigate the psychological consequences of frailty [51]. Tailoring these interventions to accommodate physical limitations is essential. For

example, telemedicine may be a viable option for frail patients with mobility issues [52]. Also, access to social workers, community health programs, and caregiver support groups can alleviate the social burden of frailty. Programs that promote social engagement through volunteer visits or online platforms can help reduce isolation and improve quality of life [53].

Lastly, integrating palliative care early in the treatment process allows for symptom management, psychosocial support, and advance care planning. This approach is particularly beneficial for frail patients, as it emphasizes comfort, dignity, and patient-centered goals [54].

There is a need for standardized, validated, and easy-to-use frailty screening tools tailored for oncology settings. Future research should focus on identifying biomarkers of frailty, leveraging digital health technologies, and integrating artificial intelligence to enhance frailty prediction and management. Randomized controlled trials evaluating the impact of frailty-targeted interventions on cancer outcomes are warranted. Additionally, policies and guidelines should promote routine frailty assessment as part of comprehensive cancer care.

Conclusion

Frailty significantly amplifies the physiological, psychological and social challenges faced by cancer patients. Functional decline, depression, anxiety, cognitive impairment and social isolation are among the many consequences that can compromise treatment outcomes and quality of life. Addressing these challenges requires a multidisciplinary approach that incorporates geriatric assessment, mental health support, and social care planning. As the population ages and the prevalence of frailty increases, especially in oncology, recognizing and mitigating these consequences will be crucial for improving holistic cancer care. By recognizing and addressing frailty through individualized, multidisciplinary strategies healthcare professionals can personalize treatment, reduce adverse outcomes, and improve the quality of life for cancer patients. Ongoing research and systemic implementation of frailty informed care are essential to advance the field of geriatric oncology.

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