

# Cancer rehabilitation and palliative care: critical components in the delivery of high-quality oncology services

Julie K. Silver<sup>1</sup> · Vishwa S. Raj<sup>2</sup> · Jack B. Fu<sup>3</sup> · Eric M. Wisotzky<sup>4</sup> · Sean Robinson Smith<sup>5</sup> · Rebecca A. Kirch<sup>6</sup>

Received: 16 May 2015 / Accepted: 16 August 2015 / Published online: 28 August 2015  
© Springer-Verlag Berlin Heidelberg 2015

**Abstract** Palliative care and rehabilitation practitioners are important collaborative referral sources for each other who can work together to improve the lives of cancer patients, survivors, and caregivers by improving both quality of care and quality of life. Cancer rehabilitation and palliative care involve the delivery of important but underutilized medical services to oncology patients by interdisciplinary teams. These subspecialties are similar in many respects, including their focus on improving cancer-related symptoms or cancer treatment-related side effects, improving health-related quality of life, lessening caregiver burden, and valuing patient-centered care and shared decision-making. They also aim to improve healthcare efficiencies and minimize costs by means such as reducing hospital lengths of stay and unanticipated readmissions. Although their goals are often aligned, different specialized skills and approaches are used in the delivery of care. For example, while each specialty prioritizes goal-concordant care through identification of patient and family

preferences and values, palliative care teams typically focus extensively on using patient and family communication to determine their goals of care, while also tending to comfort issues such as symptom management and spiritual concerns. Rehabilitation clinicians may tend to focus more specifically on functional issues such as identifying and treating deficits in physical, psychological, or cognitive impairments and any resulting disability and negative impact on quality of life. Additionally, although palliative care and rehabilitation practitioners are trained to diagnose and treat medically complex patients, rehabilitation clinicians also treat many patients with a single impairment and a low symptom burden. In these cases, the goal is often cure of the underlying neurologic or musculoskeletal condition. This report defines and describes cancer rehabilitation and palliative care, delineates their respective roles in comprehensive oncology care, and highlights how these services can contribute complementary components of essential quality care. An understanding of how

✉ Julie K. Silver  
julie\_silver@hms.harvard.edu

Vishwa S. Raj  
vishwa.raj@carolinashhealthcare.org

Jack B. Fu  
jfu@mdanderson.org

Eric M. Wisotzky  
eric.m.wisotzky@medstar.net

Sean Robinson Smith  
srsz@med.umich.edu

Rebecca A. Kirch  
rkirch@cancer.org

<sup>1</sup> Department of Physical Medicine and Rehabilitation, Harvard Medical School, Spaulding Rehabilitation Hospital, 300 First Avenue, Charlestown, MA 02129, USA

<sup>2</sup> Department of Physical Medicine and Rehabilitation, Carolinas Rehabilitation, 1100 Blythe Boulevard, Charlotte, NC 28203, USA

<sup>3</sup> Department of Palliative, Rehabilitation, and Integrative Medicine, MD Anderson Cancer Center, University of Texas, 1515 Holcombe Blvd. Unit 1414, Houston, TX 77030, USA

<sup>4</sup> MedStar National Rehabilitation Network, 102 Irving St, NW, Washington, DC 20010, USA

<sup>5</sup> Department of Physical Medicine and Rehabilitation, University of Michigan, 325 E Eisenhower Pkwy, Ste 100, Ann Arbor, MI 48108, USA

<sup>6</sup> American Cancer Society, 555 11th Street NW, Suite 300, Washington, DC 20004, USA

cancer rehabilitation and palliative care are aligned in goal setting, but distinct in approach may help facilitate earlier integration of both into the oncology care continuum—supporting efforts to improve physical, psychological, cognitive, functional, and quality of life outcomes in patients and survivors.

**Keywords** Cancer rehabilitation · Prehabilitation · Palliative care · Supportive oncology · Survivorship · Quality of life

## Introduction

Although the majority of cancer patients and survivors would benefit from integration of cancer rehabilitation services during and after treatment, the underutilization of this care is well documented [1–3]. Palliative care, another important component of high-quality oncology care, is also underutilized [4]. The reason for underutilization of these critical services is multifactorial, and one important step that the medical community can take to improve access to quality care is to encourage healthcare professionals to better understand and recommend these services to colleagues, patients, and families early in the course of oncology care. This report defines and describes cancer rehabilitation and palliative care and highlights how they are aligned with and differ from each other.

On the surface, the roles of palliative care (i.e., symptom management and supportive care) and rehabilitation medicine (i.e., improving function and reducing disability) may seem divergent as they apply to cancer care for patients and survivors. Palliative care focuses specifically on addressing immediate quality of life (QOL) needs and concerns related to physical, psychological, and social distress; often in the setting of serious and complex life-threatening illness [5]. In contrast, rehabilitation medicine and physiatry emphasize short- and long-term solutions for restoration of or improvement in functioning and care management through patient empowerment and coordination of multispecialty care [6]. Palliative care and rehabilitation practitioners are trained to diagnose and treat medically complex patients. However, while palliative care consultations are often (though not always) triggered by a high symptom burden or metastatic disease, rehabilitation clinicians may treat many patients with a single impairment and low symptom burden. In these cases, the aim is often a cure of the underlying neurologic or musculoskeletal condition.

Parallels become evident, however, after considering the clinical philosophy underlying each specialty. Both use an interdisciplinary model to identify goals of care; improve function; develop treatment plans that are patient and family centric; and take into account medical, physical, social, and psychological components while employing a symptom-oriented approach [7]. They mutually focus on improving cancer-related symptoms or cancer treatment-related side

effects, improving patient health-related QOL, lessening caregiver burden, and valuing patient-centered care and shared decision-making. Each aims to improve health care efficiencies and reduce healthcare costs by means such as reducing hospital lengths of stay and unanticipated readmissions. They value psycho-oncology and the diagnostic and treatment services provided by trained behavioral health professionals. Thus, palliative care [8] and cancer rehabilitation [9] goals are aligned in helping to improve and restore QOL for patients and families. In recognition of the importance of cancer rehabilitation and palliative care services, the American College of Surgeons' Commission on Cancer (CoC) requires that patients have access to both [10]. Furthermore, the CoC now requires that patients receive a survivorship care plan that documents their past treatment as well as future needs, including cancer rehabilitation and palliative care services [11].

Cancer rehabilitation and palliative care services support delivery of patient-centered care, which, as defined by the Institute of Medicine (IOM), involves “providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions” [12]. The IOM goes on to identify patient-centered care as one of six interrelated factors constituting high-quality healthcare. While cancer rehabilitation and palliative care are congruent with patient-centered care initiatives, their approaches involve application of different specialized expertise and focus to achieve improved QOL and functional outcomes. For example, palliative care professionals offer patient-centered, family oriented care by using communication strategies to help determine and align treatments with patient preferences and values across the care continuum and throughout the lifespan. In contrast, cancer rehabilitation professionals focus more on developing treatment plans with individualized goals designed to promote optimal patient function at home, work, and in the community.

Studies have demonstrated the benefits of palliative care in terms of QOL, economic, and medical outcomes [13–15], and an increasing recognition of the benefits of palliative care has led to a tripling in the number of palliative care programs in American hospitals since 2000 [16]. Cancer rehabilitation improves physical and functional outcomes [1], may be cost-effective [17], and may ameliorate some of the costs associated with lost work productivity and early retirement [18–20]. Not surprisingly, and like palliative care, cancer rehabilitation has been shown to improve QOL, even in patients with late-stage cancers [21].

These specialties utilize an interdisciplinary team approach to total patient care and work closely with interdisciplinary healthcare professionals such as dietitians and mental health professionals. For example, dietitians can provide interventions that address the nutritional demands associated with premonitory or comorbid malnutrition; increased levels of activity with physical therapy (energetics); and common side

effects of cancer-related treatment (anorexia, nausea, vomiting, and diarrhea). As a cancer diagnosis can also be associated with significant levels of distress anywhere along the continuum of care, mental health professionals are critical to the process of maintaining and, more importantly, improving patient well-being and QOL.

Cancer rehabilitation and palliative care may also utilize integrative medicine approaches such as massage or acupuncture, although they may be prescribed in a different manner. For example, in palliative care, generalized massage may be prescribed to reduce stress and muscle tension. In rehabilitation medicine, however, the approach might be focused on alleviating a specific impairment such as improving shoulder range of motion in someone with a rotator cuff impingement through a physical therapist's use of myofascial release techniques. In addition, as rehabilitation professionals tend to focus on identifying musculoskeletal or neurologic impairments that can be improved with specific interventions, physiatrists may prescribe opiate medications or rely on non-opiate oral medications or perform procedures including, but not limited to, trigger point, botulinum toxin, and joint injections. Incorporation of therapeutic exercise, physical modalities, and neurocognitive therapy interventions into the treatment plan through use of physical, occupational, and speech therapy may provide further benefit.

Both specialties may provide effective intervention in the case of cognitive deficits. For example, neuro-stimulants are frequently used to improve fatigue, attention, and memory [22–24]. However, rehabilitation and palliative care approaches to cognitive problems may differ depending upon a host of factors including professional training, familiarity with the patient population, and scientific evidence base [25–28]. For instance, physiatrists have expertise in managing brain injuries in non-oncological populations and are typically very familiar with the research in traumatic brain injury, stroke, and other neurological conditions that affect cognition. They bring this scientific knowledge and clinical expertise forward when managing cancer patients with various forms of cognitive impairment including agitation, delirium, and impaired arousal.

During the evaluation and treatment phase, the specialties often utilize similar approaches such as incorporating neuropsychological testing and other mental health services, but there may be differences as well. For instance, rehabilitation professionals might tend to focus on function and emphasize goals for patient safety, especially mobility to avoid falls, by addressing ambulation and transfers (e.g., from the bed to a chair or on/off the toilet seat), home accommodations (e.g., ramp to enter the home), adaptive equipment (e.g., shower seat/grab bars or Hoyer lift for transfers) and assistive devices (e.g., cane or walker). They may also spend considerable time on patient and family training to encourage functional independence in the cancer survivor in an effort to preserve everyone's QOL and reduce the physical and emotional burden of

care on others in the home. Palliative care professionals may approach the services with a bit of a different lens and spend more time on psychosocial issues such as management of cognition-related patient and caregiver distress and symptoms such as nausea and vomiting. It is easy to see that specialists in rehabilitation medicine and palliative care, working in cooperation with each other, are likely to be mutually beneficial to patients and family members.

It is well documented that there is a growing population of adult and childhood cancer survivors who are living long-term with disease-related effects, treatment-related side effects, and/or late effects of earlier treatment [4]. These survivors often endure multiple chronic conditions that can be disabling, life-threatening, and medically complex. Especially in these cases, together, cancer rehabilitation and palliative care have the potential to positively affect a multitude of issues. The most commonly cited symptoms seen in advanced cancer patients include fatigue, pain, weakness, dyspnea, delirium, nausea, vomiting, anxiety, and depression [29]. While oncology teams may consult with palliative care specialists to help manage these more complex or refractory symptoms, concern has been raised about neglecting to address physical function in advanced cancer patients [30]. Indeed, in a systematic review of rehabilitation in advanced-stage cancer, the authors demonstrated that including physical rehabilitation in a palliative care program can have positive effects on many cancer-related symptoms [31]. Furthermore, in a recent systematic review of 13 studies of the effects of cancer rehabilitation in patients with advanced cancer who were also receiving palliative care, Salakari et al. found significant improvements in general well-being and QOL as well as positive effects on fatigue, general condition, mood, and coping with cancer [32]. Therefore, it may be reasonable to consider utilizing these services in cancer patients regardless of their age, stage, or prognosis.

### **Fostering a better understanding of cancer rehabilitation**

Although palliative care and rehabilitation can play important roles in improving QOL and survivorship, both services are often misunderstood by health professionals and the public as well. Confusion about the scope and focus of these subspecialties may exist even within oncology care. For example, rehabilitation is often confused with exercise or fitness programs, and many “rehabilitation” research studies and clinical interventions are described as “exercise only” and do not address the range of impairments that patients and survivors encounter. This misunderstanding has led to a concerning trend among some professionals—encouraging the adoption of the cardiac rehabilitation model of care [33] in oncology, without taking into account the medical complexities and

disabilities experienced by many in the cancer population. As evidence, consider that an exercise-only based model of cancer rehabilitation does not support the diagnosis or treatment of speech, swallowing, and cognitive impairments that may develop in patients with head and neck or primary or metastatic brain cancer.

It is important to note that within cardiac rehabilitation, the cardiologist usually manages a single impairment or set of impairments that are localized to the cardiovascular system. In contrast, cancer patients and survivors often experience many concurrent impairments which may occur in any organ system in the body—with the complexity of their presentation being more similar to that of a patient after a stroke than to that of a patient with cardiac disease. This profile can be overwhelming for oncologists and other members of the oncology team who are not generally equipped to diagnose and treat the many rehabilitation issues and subsequent disability that can significantly reduce function and QOL in this population. Furthermore, functional impairment(s) may preclude a patient's participation in the exercise recommended under the cardiac rehabilitation model. Therefore, a conventional and well-tested interdisciplinary model for rehabilitation care—such as that used for stroke and other serious illnesses and injuries in which psychiatrists; rehabilitation nurses; and physical, occupational, and speech therapists play a critical role—is likely a more reasonable approach to addressing the impairments and disabilities exhibited by the medically complex cancer patient. Importantly, while fitness is a key component of the conventional rehabilitation model, it does not represent the totality of the services provided.

Over the years, numerous attempts have been made to define the term “cancer rehabilitation.” Cromes, in 1978, wrote that “cancer rehabilitation aims to allow the patient to achieve optimal physical, social, physiological and vocational functioning within the limits imposed by the disease and its treatment” [34]. Later, J. Herbert Dietz, MD, an attending surgeon at Memorial-Sloan Kettering Cancer Center and author of one of the first cancer rehabilitation textbooks, defined cancer rehabilitation according to four distinct phases [35]:

1. Preventative: Interventions that will lessen the effect of expected disabilities
2. Restorative: Interventions that attempt to return patients to previous levels of physical, psychological, social, and vocational functioning
3. Supportive: Interventions designed to teach patients to accommodate to their disabilities and to minimize debilitating changes from ongoing disease
4. Palliative: Interventions focused on minimizing or eliminating complications and providing comfort and support

Of note, this classification system acknowledged the utility of integrating rehabilitation interventions into a palliative

phase long before a growing body of evidence was available to support this concept.

Dietz was similarly insightful in discussing the use of preventative cancer rehabilitation, now commonly described as *prehabilitation* [36]. Prehabilitation in the cancer population is a growing area of clinical interest and research. Silver and colleagues have specifically defined cancer prehabilitation as “a process on the continuum of care that occurs between the time of diagnosis and the beginning of acute treatment and includes physical and psychological assessments that establish a baseline functional level, identify impairments, and provide targeted interventions that promote physical and psychological health to reduce the incidence and/or severity of future impairments” [1]. The primary goal of prehabilitation then is to prevent or reduce the severity of existing and anticipated treatment-related impairments that may cause significant disability.

Following initiation of treatment, rehabilitation of the patient with cancer should operate within the framework of “impairment-driven cancer rehabilitation,” also introduced by Silver and colleagues [1]. This framework includes the screening of all cancer patients for specific psychological and physical impairments that should trigger referrals to appropriately and highly trained rehabilitation healthcare professionals. These professionals would include only those whose scope of practice includes the diagnosis and treatment of physical and psychological impairments and the resulting disabilities and functional issues associated with cancer and its treatment.

Because this report reviews and provides an opportunity to further clarify the scope of cancer rehabilitation care, we propose a new definition for cancer rehabilitation that addresses critical concepts used in the International Classification of Function (ICF), including changes in body structure/function, activity limitations, and participation restriction:

Cancer rehabilitation is medical care that should be integrated throughout the oncology care continuum and delivered by trained rehabilitation professionals who have it within their scope of practice to diagnose and treat patients' physical, psychological and cognitive impairments in an effort to maintain or restore function, reduce symptom burden, maximize independence and improve quality of life in this medically complex population.

### Fostering better understanding of palliative care

Despite mounting evidence consistently demonstrating its benefits to QOL and even survival in patients with cancer or other serious illnesses [37], palliative care also is



misunderstood and often still wrongly considered applicable only at the end of life or when cancer treatment has “failed.” The World Health Organization has long defined *palliative care* as “an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual” [38]. It is therefore important to note that palliative care is appropriate at any age and stage of disease, and should be provided together with therapeutic cancer treatment intended to cure or halt progression of the disease [37]. Indeed, a provisional clinical opinion of the American Society of Clinical Oncology calls for integrated palliative care as part of cancer treatment in all patients experiencing high symptom burden or metastatic disease [39].

Using consistent and clear messages to explain palliative care is essential to improving patient and family access to these services and their benefits. A national poll commissioned by the Center to Advance Palliative Care and the American Cancer Society revealed that 7 in 10 Americans are “not at all knowledgeable” about palliative care [40]. However, an overwhelming majority of respondents (92 %) indicated that they would want palliative care for themselves or their loved ones and believed that it should be accessible in hospitals when the following definition was included:

Palliative care is specialized medical care for people with serious illnesses. This type of care is focused on providing patients with relief from the symptoms, pain, and stress of a serious illness—whatever the diagnosis. The goal is to improve quality of life for both the patient and the family. Palliative care is provided by a team of doctors, nurses, and other specialists who work with a patient’s other doctors to provide an extra layer of support. Palliative care is appropriate at any age and at any stage in a serious illness, and can be provided together with curative treatment [40].

To ensure delivery of the best care possible, the language and approaches used in clinical care to introduce and describe palliative services to patients, families, and professional colleagues must evolve so that they align consistently with this definition and messaging proven to minimize confusion and promote better understanding, acceptance, and access. Although significant differences in practice patterns may exist depending upon the actual name of the service line available [41], palliative care in oncology settings often is considered synonymous with “supportive care” [42]. Contrary to recent evidence supporting integration of palliative care services early in the disease course, differentiation is still sometimes made according to each perceived level of care; with palliative care being reserved only for the end of life and supportive care

focusing on management of treatment and post-treatment issues [43]. Adding to the complexity, rehabilitation is often understood as an integral component of supportive care [44], but not necessarily understood as an essential part of palliative care. Clearly, the diversity in definition of scope is confusing, and may lead to underutilization of services as awareness of appropriate referral for specific impairments may be compromised within the medical community itself.

### Advancing collaborative interdisciplinary care coordination

In order to advance the provision of high-quality oncology care, it is important to recognize barriers to care and implement strategies to overcome them. It is clear that cancer rehabilitation and palliative care play independent and important roles in the treatment of the complex cancer patient, but better collaboration between these two specialties is needed. However, barriers may include, but are not limited to, rehabilitation professionals’ real or perceived lack of experience with medically complex cancer patients who may have a high symptom burden that may include end of life situations [45, 46]. On the other hand, oncology professionals, including those in palliative care, may not understand the many different ways rehabilitation medicine can help these patients and/or they may not have experience in screening these patients for their rehabilitation needs [30]. In addition and as previously discussed, rehabilitation and palliative care clinicians each apply different skills and address different areas of emphasis. Importantly, both typically use interdisciplinary team approaches to care. It is this common approach to care that can form the foundation for an effective strategy aimed at overcoming some of the barriers to provision of high-quality oncology care: collaborative interdisciplinary care coordination between the oncology, rehabilitation, and palliative care teams working together within their own specialties to address cancer-related and treatment-related issues.

Interdisciplinary hospital-based palliative care teams often consist of a physician, nurse, and social worker, and may also include a chaplain or spiritual counselor, a pharmacist, and several others [5]. While outpatient and community-based service models are emerging with increasing frequency, hospital-based teams that provide consultation services remain the most prevalent model of palliative care delivery. These services usually involve specialty level palliative care for difficult-to-manage symptoms, complex family dynamics, and challenging care decisions that may involve the use of life-sustaining treatments [5]. Their efforts focus on getting distressing symptoms under control and coordinating communication in order to help align treatments with patient and family goals.

The interdisciplinary inpatient rehabilitation team usually is led by a physiatrist and includes a physical therapist (PT), occupational therapist (OT), and speech-language pathologist (SLP). Mental health professionals are also important members and may include a rehabilitation psychologist, social worker, case manager, and neuropsychologist. Recreational therapists, dietitians, orthotists, prosthetists, chaplains, and other types of professionals are either incorporated into the team automatically or may be available on a consultative basis when a need arises. Physiatry and physical/occupational/speech therapy services play prominent roles in maintaining, recovering, or improving patient function [47], and mental health services focus on cognitive and psychosocial issues including, but not limited to, distress associated with the cancer and treatment-related symptoms or impairments and resulting disability [1]. Physiatrists typically manage the rehabilitation team and provide additional expertise in diagnostic testing, performing injections and prescribing medications, adaptive equipment, prosthetics, and orthotics that compensate for a patient's disabilities.

Palliative care teams are often involved in end of life care and may have more experience with and perhaps rely more often on prescription of opioids and other medications for alleviation of physical symptoms associated with pain than rehabilitation teams who may utilize other interventions, even in cases of advanced cancer. The role that rehabilitation medicine and physical agents play in the treatment of cancer pain has been well documented [48] and complements conventional systemic analgesic therapy that is common among palliative care patients. In particular, physiatrists receive specialized training in the management of neurologic and musculoskeletal causes of impairment; receive specialized training to perform symptom relief procedures that include botulinum toxin, joint, and trigger point injections; and often earn additional board certifications including electrodiagnostic medicine and pain management. Consider then how the rehabilitation team may be helpful in supporting the palliative care team in the treatment of patients near the end of life with comorbid cognitive deficits. Use of injectable local treatments for pain could defer or forego the use of potentially sedating systemic medications [49, 50]. In these instances, physiatrists may be uniquely qualified to prescribe appropriate treatment supporting palliative care efforts without further compromising cognitive function. Moreover, Chevillat and Basford described the use of physical medicine interventions in patients with pain due to cancer itself [48]. In many cases, adding an extra layer of support through use of specialized physiatry skills may be of significant benefit to palliative care teams trying to manage pain and other symptoms in their patients.

The rehabilitation team can also play a role in the treatment of fatigue. Fatigue is one of the most distressing and prevalent problems affecting patients with cancer, and it is a common reason for referral to cancer rehabilitation or palliative care

specialists [51]. Often, the physiatrist will be consulted because the fatigue has impacted the patient's function. Physical and occupational therapy may also be prescribed in order to facilitate appropriate therapeutic exercise. Prescription of energy conservation techniques such as energy conservation and activity management may be useful as well [52, 53].

Cancer patients and survivors are also at a higher risk for musculoskeletal injuries than noncancer patients [54, 55]. Common contributing issues are asthenia, cachexia, peripheral neuropathies, plexopathies, myopathies, radiation fibrosis, and medications such as aromatase inhibitors [56–58]. Physiatrists can be helpful in these cases because they are skilled in the diagnosis and treatment of musculoskeletal complications. Diagnostic work-up can include physical examination and analysis of imaging tests such as x-rays, magnetic resonance imaging, and computed tomography scans. Physiatrists may then perform musculoskeletal injections [59, 60] and/or prescribe oral medications as well as physical, occupational, and speech therapy.

Opportunities to improve the patient experience exist throughout all phases of cancer care, especially during times of disease recurrence and at the end of life. Use of rehabilitation may prevent a decline in or even improve function in patients with advanced cancer; "improving the quality of life by palliating function, mobility, activities of daily living, pain relief, endurance, and the psyche of a patient while helping to maintain as much independence as possible, leading to a decrease in burden on caregivers and family" [61]. Physical therapy and exercise have been shown to be a feasible modality for terminally ill patients [62], and patients who participated in a specific combination palliative rehabilitation program did show improvement in physical performance and symptom severity [63]. Rehabilitation services provided in a hospice day care unit for individuals with advanced, recurrent, or progressive breast or hematological malignancy also showed significant reduced need for health service resources along with corresponding improvement in QOL [64]. Furthermore, early integration of palliative care in the oncology care continuum may result in particularly meaningful healthcare cost reductions, as this approach improved both survival rates and QOL [65].

Because people often face complex physical and psychosocial needs near the end of life, the IOM advocated for improved care coordination and patient-caregiver communication in its 2014 report *Dying in America: Improving quality and honoring individual preferences near the end of life* [66]. As the disease process advances, people are faced with an increasing number of healthcare transitions, creating inefficiencies and leading to unrecognized and undertreated problems [67]. This finding was corroborated in a 2014 comprehensive analysis demonstrating that patients were dissatisfied with clinician recognition of symptoms and the lack of proper referrals when symptoms were identified [68]. The authors concluded that use of patient-centered outcome measures improved awareness of unmet needs, and improved patient

psychological QOL. It seems reasonable to suggest then that appropriate integration of oncology, rehabilitation, and palliative care that is focused on patient-centered outcomes may improve outcomes in domains such as patient health, function, QOL, and satisfaction with care.

### Improving access to cancer rehabilitation and palliative care services

Appropriate and timely use of screening protocols and tools is one way to improve care coordination and access to services. Additionally, it is important that the evaluation processes address the constellation of symptoms that this patient population faces by screening for physical, cognitive, emotional, and other factors (Table 1) [20]. Screening can begin at the time of diagnosis and continue throughout treatment and survivorship, and ideal baseline and subsequent follow-up assessments will help facilitate appropriate referrals to rehabilitation and palliative care services. In fact, use of this type of protocol has been proposed in breast cancer survivors—the Prospective Surveillance Model [69]. This strategy helps capture symptoms as they arise, possibly reducing symptom burden and improving outcomes. Ultimately, assessments and recommendations for palliative care and rehabilitation services at the moment and in the future should be integrated into a patient's survivorship care plan [70].

Currently, there is no single universally recognized screening tool that will facilitate referrals to cancer rehabilitation and palliative care (Table 1). A consensus report from the Center to Advance Palliative Care outlined primary trigger criteria in order to help identify patients in need of a palliative care assessment in the hospital setting [71]. Guidelines set by the CoC endorsed distress screening as a standard of care in the USA. Dual screening—for both distress and physical impairments—has been proposed as well [1]. Screening for frailty, particularly in those with comorbidities, a long or complicated cancer history, and/or advanced age, is becoming increasingly important as the life expectancy and symptom burden of cancer survivors increases.

Since screening tools may collect a considerable amount of data, building space for assessment outcomes in an electronic medical record (EMR) can be useful. Indeed, one study of over 900 hospice programs found that the majority used EMR to track assessment of physical symptoms [72]. Many of those programs also used EMR to monitor psychosocial issues and coordination of interdisciplinary care. EMR systems can also use documentation to calculate assessment tool scores, indicate when a referral is necessary, and collect data related to quality improvement projects.

Improving interdisciplinary palliative and rehabilitation care demands a comprehensive strategy, and governmental and advocacy organizations have recently highlighted the

substantial need for more research [73]. Interdisciplinary collaboration on projects was specifically emphasized as necessary to the translation of data into improved clinical care. Subsequent outcome studies will be needed to measure the impact of any improvements in these services. Importantly, although both palliative care [74] and rehabilitation of patients with advanced cancer [75] have been shown to reduce overall costs, given recent health care reforms in the USA that emphasize Accountable Care Organizations [76] and bundled payment models [77], the economic impact of improvement in these services must be further studied.

The interdisciplinary nature of palliative care and rehabilitation also demands ongoing collaboration between national advocacy groups, government, professional organizations, clinicians, and patients in order to foster meaningful change in delivery of care models. The CoC has already mandated screening assessments, and the National Institute of Health's Cancer Rehabilitation Conference [78] and American Congress of Rehabilitation Medicine [79] are working to better integrate these services into healthcare systems. Advocacy initiatives like the Patient Quality of Life Coalition [80] that bring together a variety of stakeholders across diseases and disciplines provide a helpful coordinating infrastructure and framework to help advance these opportunities. In order to build upon this momentum, more involvement is needed from groups and individuals alike.

Finally, there is a lack of expertise in [81] and a number of providers for [82] this complex patient population and the IOM strongly advocates for improved education

**Table 1** Examples of currently available rehabilitation and/or palliative care screening tools

Subject	Tool
Frailty	Vulnerable Elders Survey-13 Comprehensive Geriatric Assessment
Functional status	Barthel Index Functional Independence Measures Karnofsky Performance Status Scale
Gait/mobility	Timed Up and Go Test 6-Minute Walk Test
Cognition	Functional Assessment of Cancer Therapy (FACT)-Cog Mini-Cog
Quality of life	FACT-G Functional Living Index-Cancer
Distress	Distress Thermometer Hospital Anxiety and Depression Scale Edmonton Symptom Assessment System
Longitudinal research	PROMIS Cancer Rehabilitation Evaluation System

This is not intended to be a comprehensive list

of allied health providers, medical trainees, and even patients. For example, physicians and medical students have expressed deficiencies in palliative care training and communication skills and concerns also exist regarding the variable approach to training across medical schools [83]. Although cancer rehabilitation is considered an important part of physical medicine and rehabilitation (PM&R) residency education, research has demonstrated that the quality and quantity of experiences may be improved [45]. Furthermore, variability exists regarding perceived appropriateness of rehabilitation for individuals with advanced cancer by both medical oncologists and psychiatrists [84]. Consideration of these issues may help explain why many oncologists feel inadequately prepared for supportive care tasks [85]. However, opportunities do exist to improve the delivery of supportive cancer care. In fact, studies have demonstrated that mid-level providers, after brief training, have been able to successfully screen patients for symptom burden and discuss end of life care [86], and should therefore be integrated into care programs. Trainees, including medical students, must have increased instruction in palliative and rehabilitation care. The IOM is currently recommending that clinicians across almost all specialties be trained in person-centered communication skills—a key foundation of palliative care—as well as “interprofessional collaboration, and symptom management” [66].

Perhaps equally concerning is that patients and families too lack understanding of palliative care services [45], and a concerted effort must be made to educate them about available resources and give them the words to use to get the care they need. Patients and survivors experience reduced health-related QOL as a result of impairments, and rehabilitation can improve physical, psychological, and cognitive impairments throughout the trajectory of cancer care [1]. In the USA, the court case *Jimmo v Sebelius* helped to clarify the “improvement standard” used by Medicare and resulted in an understanding that rehabilitation care should be focused on the individual need, and not solely on restorative potential, thus increasing access for patients in all phases of treatment [87]. Helping to understand the clinical implications of quality treatment and survivorship care may allow for new and exciting opportunities to integrate palliative care and cancer rehabilitation and significantly improve the quality of patient-centered programs.

## Conclusion

Cancer rehabilitation and palliative care services are critical components of high-quality oncology care. Recognizing that cancer rehabilitation is medical care that goes far beyond exercise is essential. Clinicians and researchers alike should

differentiate general exercise and wellness initiatives from comprehensive cancer rehabilitation by qualified professionals that diagnose and treat patients’ and survivors’ impairments and improve their function and QOL. With the challenging goals of simultaneously lowering healthcare costs while improving patient outcomes and satisfaction with care, there is an urgent need to address the underutilization of both cancer rehabilitation and palliative care services as well as improve access.

The research in these fields continues to evolve and support better integration of these services into high-quality oncology care. For example, recent reports have suggested that palliative care services may decrease emergency department visits [88], prehabilitation may reduce costs and improve outcomes [89], and rehabilitation may prevent hospital-acquired disability [90]. As there is a need to continue to develop the evidence base with further integrated and collaborative research, both rehabilitation medicine and palliative care will be positioned to evolve in a complementary manner that improves oncology care outcomes.

**Acknowledgments** The authors would like to thank Julie A. Poorman, PhD, for assistance with manuscript preparation.

**Conflict of interest** Financial disclosure statements have been obtained, and no conflicts of interest have been reported by the authors or by any individuals in control of the content of this article. Dr. Silver discloses that she is the founder of Oncology Rehab Partners, LLC that developed the STAR Program® (Survivorship Training and Rehabilitation). None of the other authors have disclosures.

## References

1. Silver JK, Baima J, Mayer RS (2013) Impairment-driven cancer rehabilitation: an essential component of quality care and survivorship. *CA Cancer J Clin* 63(5):295–317. doi:10.3322/caac.21186
2. Cheville AL, Troxel AB, Basford JR, Kornblith AB (2008) Prevalence and treatment patterns of physical impairments in patients with metastatic breast cancer. *J Clin Oncol* 26(16):2621–2629. doi:10.1200/JCO.2007.12.3075
3. Pergolotti M, Deal AM, Lavery J, Reeve BB, Muss HB (2015) The prevalence of potentially modifiable functional deficits and the subsequent use of occupational and physical therapy by older adults with cancer. *J Geriatr Oncol*. doi:10.1016/j.jgo.2015.01.004
4. Institute of Medicine (2013) Delivering high-quality cancer care: charting a new course for a system in crisis. National Academies Press, Washington, DC
5. Bruera E, Hui D (2012) Conceptual models for integrating palliative care at cancer centers. *J Palliat Med* 15(11):1261–1269. doi:10.1089/jpm.2012.0147
6. Mukai A (2011) The future of psychiatry: with challenges come opportunities. *PM R* 3(3):189–192. doi:10.1016/j.pmrj.2011.02.002
7. Santiago-Palma J, Payne R (2001) Palliative care and rehabilitation. *Cancer* 92(4 Suppl):1049–1052
8. Rome RB, Luminais HH, Bourgeois DA, Blais CM (2011) The role of palliative care at the end of life. *Ochsner J* 11(4):348–352



9. Stubblefield MD, Hubbard G, Cheville A, Koch U, Schmitz KH, Dalton SO (2013) Current perspectives and emerging issues on cancer rehabilitation. *Cancer* 119(Suppl 11):2170–2178. doi:10.1002/cncr.28059
10. Commission on Cancer (2012) Cancer program standards 2012: ensuring patient-centered care. American College of Surgeons. <https://www.facs.org/~media/files/quality%20programs/cancer/coc/programstandards2012.ashx>. Accessed 2 Mar 2015
11. Institute of Medicine, National Research Council (2005) From cancer patient to cancer survivor: lost in transition. National Academies Press, Washington, DC
12. Institute of Medicine (2001) Crossing the quality chasm: a new health system for the 21st century. National Academy Press. <https://www.iom.edu/Reports/2001/Crossing-the-Quality-Chasm-A-New-Health-System-for-the-21st-Century.aspx>. Accessed 3 Mar 2015
13. Brumley R, Enguidanos S, Jamison P, Seitz R, Morgenstern N, Saito S, McIlwane J, Hillary K, Gonzalez J (2007) Increased satisfaction with care and lower costs: results of a randomized trial of in-home palliative care. *J Am Geriatr Soc* 55(7):993–1000. doi:10.1111/j.1532-5415.2007.01234.x
14. Gade G, Venohr I, Conner D, McGrady K, Beane J, Richardson RH, Williams MP, Liberson M, Blum M, Della Penna R (2008) Impact of an inpatient palliative care team: a randomized control trial. *J Palliat Med* 11(2):180–190. doi:10.1089/jpm.2007.0055
15. Bakitas M, Lyons KD, Hegel MT, Balan S, Brokaw FC, Seville J, Hull JG, Li Z, Tosteson TD, Byock IR, Ahles TA (2009) Effects of a palliative care intervention on clinical outcomes in patients with advanced cancer: the project ENABLE II randomized controlled trial. *JAMA* 302(7):741–749. doi:10.1001/jama.2009.1198
16. Morrison RS, Augustin R, Souvanna P, Meier DE (2011) America's care of serious illness: a state-by-state report card on access to palliative care in our nation's hospitals. *J Palliat Med* 14(10):1094–1096. doi:10.1089/jpm.2011.9634
17. Mewes JC, Steuten LM, Ijzerman MJ, van Harten WH (2012) Effectiveness of multidimensional cancer survivor rehabilitation and cost-effectiveness of cancer rehabilitation in general: a systematic review. *Oncologist* 17(12):1581–1593. doi:10.1634/theoncologist.2012-0151
18. Pearce AM, Hanly P, Timmons A, Walsh PM, O'Neill C, O'Sullivan E, Gooberman-Hill R, Thomas AA, Gallagher P, Sharp L (2015) Productivity losses associated with head and neck cancer using the human capital and friction cost approaches. *Appl Health Econ Health Policy*. doi:10.1007/s40258-015-0155-8
19. Silver JK, Baima J, Newman R, Galantino ML, Shockney LD (2013) Cancer rehabilitation may improve function in survivors and decrease the economic burden of cancer to individuals and society. *Work* 46(4):455–472. doi:10.3233/WOR-131755
20. Silver JK (2014) Cancer rehabilitation and prehabilitation may reduce disability and early retirement. *Cancer* 120(14):2072–2076. doi:10.1002/cncr.28713
21. Quist M, Rorth M, Langer S, Jones LW, Laursen JH, Pappot H, Christensen KB, Adamsen L (2012) Safety and feasibility of a combined exercise intervention for inoperable lung cancer patients undergoing chemotherapy: a pilot study. *Lung Cancer* 75(2):203–208. doi:10.1016/j.lungcan.2011.07.006
22. Sami MB, Faruqi R (2015) The effectiveness of dopamine agonists for treatment of neuropsychiatric symptoms post brain injury and stroke. *Acta Neuropsychiatr* 1–11. doi:10.1017/neu.2015.17
23. Johansson B, Wentzel AP, Andrell P, Mannheimer C, Ronnback L (2015) Methylphenidate reduces mental fatigue and improves processing speed in persons suffered a traumatic brain injury. *Brain Inj* 1–8. doi:10.3109/02699052.2015.1004747
24. Escalante CP, Meyers C, Reuben JM, Wang X, Qiao W, Manzullo E, Alvarez RH, Morrow PK, Gonzalez-Angulo AM, Wang XS, Mendoza T, Liu W, Holmes H, Hwang J, Pisters K, Overman M, Cleeland C (2014) A randomized, double-blind, 2-period, placebo-controlled crossover trial of a sustained-release methylphenidate in the treatment of fatigue in cancer patients. *Cancer J* 20(1):8–14. doi:10.1097/PPO.000000000000018
25. Pillai A, Parikh V, Terry AV Jr, Mahadik SP (2007) Long-term antipsychotic treatments and crossover studies in rats: differential effects of typical and atypical agents on the expression of antioxidant enzymes and membrane lipid peroxidation in rat brain. *J Psychiatr Res* 41(5):372–386. doi:10.1016/j.jpsychires.2006.01.011
26. Wilson MS, Gibson CJ, Hamm RJ (2003) Haloperidol, but not olanzapine, impairs cognitive performance after traumatic brain injury in rats. *Am J Phys Med Rehabil* 82(11):871–879. doi:10.1097/01.PHM.0000091982.33232.CB
27. Elovic EP, Lansang R, Li Y, Ricker JH (2003) The use of atypical antipsychotics in traumatic brain injury. *J Head Trauma Rehabil* 18(2):177–195
28. Alici Y, Breitbart W (2015) Delirium. In: Bruera E, Higginson I, von Gunten CF, Morita T (eds) *Textbook of palliative medicine and supportive care*, 2nd edn. CRC Press, Boca Raton, pp 702–721
29. Donnelly S, Walsh D (1995) The symptoms of advanced cancer. *Semin Oncol* 22(2 Suppl 3):67–72
30. Eyigor S (2010) Physical activity and rehabilitation programs should be recommended on palliative care for patients with cancer. *J Palliat Med* 13(10):1183–1184. doi:10.1089/jpm.2010.0064
31. Albrecht TA, Taylor AG (2012) Physical activity in patients with advanced-stage cancer: a systematic review of the literature. *Clin J Oncol Nurs* 16(3):293–300. doi:10.1188/12.CJON.293-300
32. Salakari MR, Surakka T, Nurminen R, Pylkkanen L (2015) Effects of rehabilitation among patients with advanced cancer: a systematic review. *Acta Oncol* 54(5):618–628. doi:10.3109/0284186X.2014.996661
33. Dittus KL, Lakoski SG, Savage PD, Kokinda N, Toth M, Stevens D, Woods K, O'Brien P, Ades PA (2015) Exercise-based oncology rehabilitation: leveraging the cardiac rehabilitation model. *J Cardiopulm Rehabil Prev* 35(2):130–139. doi:10.1097/HCR.0000000000000091
34. Cromes GF Jr (1978) Implementation of interdisciplinary cancer rehabilitation. *Rehab Counsel Bull* 21(3):230–237
35. Dietz JH (1981) *Rehabilitation oncology*. John Wiley & Sons Inc, New York
36. Silver JK, Baima J (2013) Cancer prehabilitation: an opportunity to decrease treatment-related morbidity, increase cancer treatment options, and improve physical and psychological health outcomes. *Am J Phys Med Rehabil* 92(8):715–727. doi:10.1097/PHM.0b013e31829b4afe
37. Parikh RB, Kirsh RA, Smith TJ, Temel JS (2013) Early specialty palliative care—translating data in oncology into practice. *N Engl J Med* 369(24):2347–2351. doi:10.1056/NEJMs1305469
38. Who definition of palliative care (2015) World Health Organization. <http://www.who.int/cancer/palliative/definition/en/>. Accessed 2 Mar 2015
39. Smith TJ, Temin S, Alesi ER, Abernethy AP, Balboni TA, Basch EM, Ferrell BR, Loscalzo M, Meier DE, Paice JA, Peppercorn JM, Somerfield M, Stovall E, Von Roenn JH (2012) American society of clinical oncology provisional clinical opinion: the integration of palliative care into standard oncology care. *J Clin Oncol* 30(8):880–887. doi:10.1200/JCO.2011.38.5161
40. Center to advance palliative care (2011) Public opinion research on palliative care. [https://www.capc.org/media/filer\\_public/18/ab/18ab708c-f835-4380-921d-fb729702e36/2011-public-opinion-research-on-palliative-care.pdf](https://www.capc.org/media/filer_public/18/ab/18ab708c-f835-4380-921d-fb729702e36/2011-public-opinion-research-on-palliative-care.pdf). Accessed 3 Mar 2015
41. Dalal S, Palla S, Hui D, Nguyen L, Chacko R, Li Z, Fadul N, Scott C, Thornton V, Coldman B, Amin Y, Bruera E (2011) Association between a name change from palliative to supportive care and the

- timing of patient referrals at a comprehensive cancer center. *Oncologist* 16(1):105–111. doi:10.1634/theoncologist.2010-0161
42. American Cancer Society (2014) A guide to palliative or supportive care: what is palliative care? <http://www.cancer.org/treatment/treatmentsandsideeffects/palliativecare/supportive-care>. Accessed 2 Mar 2015
  43. Aapro MS (2012) Supportive care and palliative care: a time for unity in diversity. *Ann Oncol* 23(8):1932–1934. doi:10.1093/annonc/mds239
  44. What is MASCC? (2015) Multinational association of supportive care in cancer. <http://www.mascc.org/about-mascc>. Accessed 2 Mar 2015
  45. Raj VS, Balouch J, Norton JH (2014) Cancer rehabilitation education during physical medicine and rehabilitation residency: preliminary data regarding the quality and quantity of experiences. *Am J Phys Med Rehabil*. doi:10.1097/PHM.0000000000000060
  46. Palacio A, Calmels P, Genty M, Le-Quang B, Beuret-Blanquart F (2009) Oncology and physical medicine and rehabilitation. *Ann Phys Rehabil Med* 52(7–8):568–578. doi:10.1016/j.rehab.2009.05.004
  47. Shin KY, Guo Y, Konzen B, Fu J, Yadav R, Bruera E (2011) Inpatient cancer rehabilitation: the experience of a national comprehensive cancer center. *Am J Phys Med Rehabil* 90(5 Suppl 1):S63–68. doi:10.1097/PHM.0b013e31820be1a4
  48. Cheville AL, Basford JR (2014) Role of rehabilitation medicine and physical agents in the treatment of cancer-associated pain. *J Clin Oncol* 32(16):1691–1702. doi:10.1200/JCO.2013.53.6680
  49. Fu J, Ngo A, Shin K, Bruera E (2013) Botulinum toxin injection and phenol nerve block for reduction of end-of-life pain. *J Palliat Med* 16(12):1637–1640. doi:10.1089/jpm.2013.0182
  50. Dhah S, Fu J (2015) Musculoskeletal disease management at the end of life: an opportunity for physiatrists to provide expert consultation. Poster presented at the Association of Academic Physiatrists, San Antonio, TX, March 10–14
  51. Bower JE (2014) Cancer-related fatigue—mechanisms, risk factors, and treatments. *Nat Rev Clin Oncol* 11(10):597–609. doi:10.1038/nrclinonc.2014.127
  52. Jacobsen PB, Donovan KA, Vadaparampil ST, Small BJ (2007) Systematic review and meta-analysis of psychological and activity-based interventions for cancer-related fatigue. *Health Psychol* 26(6):660–667. doi:10.1037/0278-6133.26.6.660
  53. Barsevick AM, Whitmer K, Sweeney C, Nail LM (2002) A pilot study examining energy conservation for cancer treatment-related fatigue. *Cancer Nurs* 25(5):333–341
  54. Soulen RL, Romero JA, Chuba PJ, Evelhoch JL, Simpson RE, Forman JD (1997) Musculoskeletal complications of neutron therapy for prostate cancer. *Radiat Oncol Investig* 5(2):81–91. doi:10.1002/(SICI)1520-6823(1997)5:2<81::AID-ROI6>3.0.CO;2-F
  55. Olufade T, Gallicchio L, MacDonald R, Helzlsouer KJ (2015) Musculoskeletal pain and health-related quality of life among breast cancer patients treated with aromatase inhibitors. *Support Care Cancer* 23(2):447–455. doi:10.1007/s00520-014-2364-3
  56. Crew KD, Greenlee H, Capodice J, Raptis G, Braffman L, Fuentes D, Sierra A, Hershman DL (2007) Prevalence of joint symptoms in postmenopausal women taking aromatase inhibitors for early-stage breast cancer. *J Clin Oncol* 25(25):3877–3883. doi:10.1200/JCO.2007.10.7573
  57. Henry NL, Giles JT, Ang D, Mohan M, Dadabhoy D, Robarge J, Hayden J, Lemler S, Shahverdi K, Powers P, Li L, Flockhart D, Stearns V, Hayes DF, Storniolo AM, Clauw DJ (2008) Prospective characterization of musculoskeletal symptoms in early stage breast cancer patients treated with aromatase inhibitors. *Breast Cancer Res Treat* 111(2):365–372. doi:10.1007/s10549-007-9774-6
  58. Niravath P (2013) Aromatase inhibitor-induced arthralgia: a review. *Ann Oncol* 24(6):1443–1449. doi:10.1093/annonc/mdt037
  59. Ashraf MO, Devadoss VG (2014) Systematic review and meta-analysis on steroid injection therapy for De Quervain's tenosynovitis in adults. *Eur J Orthop Surg Traumatol* 24(2):149–157. doi:10.1007/s00590-012-1164-z
  60. Ng YC, Lo NN, Yang KY, Chia SL, Chong HC, Yeo SJ (2011) Effects of periarticular steroid injection on knee function and the inflammatory response following unicondylar knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc* 19(1):60–65. doi:10.1007/s00167-010-1126-0
  61. Barawid E, Covarrubias N, Tribuzio B, Liao S (2015) The benefits of rehabilitation for palliative care patients. *Am J Hosp Palliat Care* 32(1):34–43. doi:10.1177/1049909113514474
  62. Jensen W, Bialy L, Ketels G, Baumann FT, Bokemeyer C, Oechsle K (2014) Physical exercise and therapy in terminally ill cancer patients: a retrospective feasibility analysis. *Support Care Cancer* 22(5):1261–1268. doi:10.1007/s00520-013-2080-4
  63. Chasen MR, Feldstain A, Gravelle D, Macdonald N, Pereira J (2013) An interprofessional palliative care oncology rehabilitation program: effects on function and predictors of program completion. *Curr Oncol* 20(6):301–309. doi:10.3747/co.20.1607
  64. Jones L, Fitzgerald G, Leurent B, Round J, Eades J, Davis S, Gishen F, Holman A, Hopkins K, Tookman A (2013) Rehabilitation in advanced, progressive, recurrent cancer: a randomized controlled trial. *J Pain Symp Manag* 46(3):315–325. doi:10.1016/j.jpainsymman.2012.08.017, e313
  65. Temel JS, Greer JA, Muzikansky A, Gallagher ER, Admane S, Jackson VA, Dahlin CM, Blinderman CD, Jacobsen J, Pirl WF, Billings JA, Lynch TJ (2010) Early palliative care for patients with metastatic non-small-cell lung cancer. *N Engl J Med* 363(8):733–742. doi:10.1056/NEJMoa1000678
  66. Institute of Medicine (2014) Dying in America: improving quality and honoring individual preferences near the end of life. The National Academies Press, Washington, DC
  67. Teno JM, Gozalo PL, Bynum JP, Leland NE, Miller SC, Morden NE, Scupp T, Goodman DC, Mor V (2013) Change in end-of-life care for Medicare beneficiaries: site of death, place of care, and health care transitions in 2000, 2005, and 2009. *JAMA* 309(5):470–477. doi:10.1001/jama.2012.207624
  68. Etkind SN, Daveson BA, Kwok W, Witt J, Bausewein C, Higginson IJ, Murtagh FE (2014) Capture, transfer, and feedback of patient-centered outcomes data in palliative care populations: does it make a difference? A systematic review. *J Pain Symp Manag*. doi:10.1016/j.jpainsymman.2014.07.010
  69. Stout NL, Binkley JM, Schmitz KH, Andrews K, Hayes SC, Campbell KL, McNeely ML, Soballe PW, Berger AM, Cheville AL, Fabian C, Gerber LH, Harris SR, Johansson K, Pusic AL, Prosnitz RG, Smith RA (2012) A prospective surveillance model for rehabilitation for women with breast cancer. *Cancer* 118(8 Suppl):2191–2200. doi:10.1002/ncr.27476
  70. Smith SR, Reish AG, Andrews C (2014) Cancer survivorship: a growing role for physiatric care. *PM R*. doi:10.1016/j.pmrj.2014.12.004
  71. Weissman DE, Meier DE (2011) Identifying patients in need of a palliative care assessment in the hospital setting: a consensus report from the center to advance palliative care. *J Palliat Med* 14(1):17–23. doi:10.1089/jpm.2010.0347
  72. Zheng NT, Rokoske FS, Kirk MA, Lyda-McDonald B, Bernard SL (2014) Hospices' use of electronic medical records for quality assessment and performance improvement programs. *J Pain Symp Manag* 48(4):582–589. doi:10.1016/j.jpainsymman.2013.11.010
  73. Alfano CM, Smith T, de Moor JS, Glasgow RE, Khoury MJ, Hawkins NA, Stein KD, Rechis R, Parry C, Leach CR, Padgett L, Rowland JH (2014) An action plan for translating cancer survivorship research into care. *J Natl Cancer Inst* 106(11). doi:10.1093/jnci/dju287

74. Ciemins EL, Blum L, Nunley M, Lasher A, Newman JM (2007) The economic and clinical impact of an inpatient palliative care consultation service: a multifaceted approach. *J Palliat Med* 10(6):1347–1355. doi:10.1089/jpm.2007.0065
75. Round J, Leurent B, Jones L (2014) A cost-utility analysis of a rehabilitation service for people living with and beyond cancer. *BMC Health Serv Res* 14(1):558. doi:10.1186/s12913-014-0558-5
76. O'Halloran K, Depalma A, Joseph V, Cobelli N, Sharan A (2012) The role of accountable care organizations in delivering value. *Curr Rev Musculoskelet Med* 5(4):283–289. doi:10.1007/s12178-012-9138-7
77. Greenapple R (2013) Rapid expansion of new oncology care delivery payment models: results from a payer survey. *Am Health Drug Benefit* 6(5):249–256
78. National Institutes of Health Clinical Center (2015) Save the date—cancer rehabilitation conference <http://www.cc.nih.gov/rmd/crc/index.html>. Accessed March 2 2015
79. Cancer rehabilitation networking group (2013) American congress of rehabilitation medicine. <http://www.acrm.org/acrm-communities/cancer/>. Accessed 2 Mar 2015
80. About PQLC (2015) Patient quality of life coalition. <http://patientqualityoflife.org/about-pqlc/>. Accessed 15 May 2015
81. Dickinson GE (2011) Thirty-five years of end-of-life issues in us medical schools. *Am J Hosp Palliat Care* 28(6):412–417. doi:10.1177/1049909110397608
82. Lupu D, American Academy of H, Palliative Medicine Workforce Task F (2010) Estimate of current hospice and palliative medicine physician workforce shortage. *J Pain Symp Manag* 40(6):899–911. doi:10.1016/j.jpainsymman.2010.07.004
83. Chiu N, Cheon P, Lutz S, Lao N, Pulenzas N, Chiu L, McDonald R, Rowbottom L, Chow E (2014) Inadequacy of palliative training in the medical school curriculum. *J Cancer Educ*. doi:10.1007/s13187-014-0762-3
84. Spill GR, Hlubocky FJ, Daugherty CK (2012) Oncologists' and physiatrists' attitudes regarding rehabilitation for patients with advanced cancer. *PM R* 4(2):96–108. doi:10.1016/j.pmrj.2011.08.539
85. Cherny NI, Catane R, European Society of Medical Oncology Taskforce on P, Supportive C (2003) Attitudes of medical oncologists toward palliative care for patients with advanced and incurable cancer: report on a survey by the European Society of Medical Oncology Taskforce on Palliative and Supportive Care. *Cancer* 98(11):2502–2510. doi:10.1002/cncr.11815
86. Lesperance M, Shannon R, Pumphrey PK, Dunbar E, Genter R, Coleman CL, Tabano M, Maurer J, Vazquez A, Capp E, McMillan J, Wilkerson K, Robbins G, Phillips DG, Howick P, Solaun C, Sloan J, Colon-Otero G (2014) Training mid-level providers on palliative care: bringing advanced directives and symptom assessment and management to community oncology practices. *Am J Hosp Palliat Care* 31(3):237–243. doi:10.1177/1049909113486335
87. Gladieux JE, Basile M (2014) Jimmo and the improvement standard: implementing medicare coverage through regulations, policy manuals and other guidance. *Am J Law Med* 40(1):7–25
88. Delgado-Guay MO, Kim YJ, Shin SH, Chisholm G, Williams J, Allo J, Bruera E (2015) Avoidable and unavoidable visits to the emergency department among patients with advanced cancer receiving outpatient palliative care. *J Pain Symp Manag* 49(3):497–504. doi:10.1016/j.jpainsymman.2014.07.007
89. Silver JK (2015) Cancer prehabilitation and its role in improving health outcomes and reducing health care costs. *Semin Oncol Nurs* 31(1):13–30. doi:10.1016/j.soncn.2014.11.003
90. Cheville AL, Basford JR (2014) Postacute care: reasons for its growth and a proposal for its control through the early detection, treatment, and prevention of hospital-acquired disability. *Arch Phys Med Rehabil* 95(11):1997–1999. doi:10.1016/j.apmr.2014.07.397