Cancer survivors are at greater risk of recurrent disease, development of new cancers, and long-term morbidity as compared to those without a cancer diagnosis, likely because of factors associated with their disease, its treatment, and unhealthy lifestyle behaviors (e.g., obesity, lack of physical activity) (Centers for Disease Control and Prevention [CDC], 2012). Consequently, oncology professionals should develop cancer survivorship programs that help prevent or reduce risks of new or recurrent cancers, provide cancer surveillance, and assess for late psychosocial and medical effects of cancer and its treatment; they should also intervene as needed (CDC, 2012; Hewitt, Greenfield, & Stovall, 2006).

Aversion of sarcopenic obesity and its importance in a survivor's optimal physical function could play a significant role in survivorship programs. Sarcopenic obesity is a loss of muscle mass (sarcopenia) coupled with an increase in fat mass (obesity) (Fielding et al., 2011). This dual condition can synergistically exacerbate functional decline and negatively affect health and quality of life more so than obesity or sarcopenia alone (Batsis et al., 2013). Sarcopenic obesity can be caused by aging and the effects of disease or treatment, and it escalates the risks of toxicity, morbidity, and mortality in adult cancer survivors (Chung, Kang, Lee, Lee, & Lee, 2013; Del Fabbro et al., 2012). Ormsbee et al. (2014) hypothesized that sarcopenic obesity may be present in more individuals at diagnosis of conditions like cancer than in those without disease. Other researchers have found that weight gain because of chemotherapy for breast cancer shows a distinctive pattern of sarcopenic obesity in women undergoing treatment (Markes, Brockow, & Resch, 2006). Despite its clinical importance, sarcopenic obesity is under-recognized (Batsis et al., 2013; Chung et al., 2013).

**Background:** Sarcopenic obesity, the dual condition of decreased muscle mass with increased fat mass, can affect morbidity, mortality, and quality of life in adult cancer survivors.

**Objectives:** The purpose of this project was to determine the effects of the use of an educational toolbox on advanced practice nurses’ (APNs’) confidence in identifying and managing adult cancer survivors at risk for sarcopenic obesity.

**Methods:** APNs in an outpatient practice who care for adult cancer survivors received an educational toolbox with strategies to identify and manage adult cancer survivors at risk for sarcopenic obesity.

**Findings:** APNs reported being more confident in their ability to identify adult patients with cancer at risk for sarcopenic obesity and in their ability to manage these patients compared to prior to the intervention. Educational resources provided an effective tool for identifying and managing patients at risk for sarcopenic obesity.

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or their detrimental effects on health (Batsis et al., 2013; Gonzalez, Pastore, Orlandi, & Heymsfield, 2014; Juby, 2014). A clinical diagnosis of sarcopenic obesity can be made with the use of dual-energy x-ray absorptiometry, computed tomography, or magnetic resonance imaging to estimate muscle mass; however, these tests are costly and require special equipment and scheduling (Abellan van Kan, Houles, & Velas, 2012; Cruz-Jentoft et al., 2010; Fielding et al., 2011; Juby, 2014). Woo, Leung, and Morley (2014) piloted the SARC-F, an instrument developed for use in the community setting to rapidly screen for people at risk for sarcopenia. This instrument consists of five questions that rate a patient’s strength, functional abilities (assistance with walking, rise from a chair, climb stairs [0 = no difficulty; 1 = some difficulty; 2 = a lot of difficulty, use of aids, or unable]), and number of falls within the past year (0 = none, 1 = 1–3 falls, 2 = 4 or more falls); a total score of greater than 4 is suspicious for sarcopenia (Woo et al., 2014).

Although consensus exists on diagnosing sarcopenia through imaging, no specific criteria are available to clinically diagnose sarcopenic obesity. However, little doubt remains concerning its impact on wellness and healthcare resources. Healthcare costs associated with sarcopenia were estimated at $18.5 billion in the United States in 2000 (Janssen, Shepard, Katzmarzyk, & Roubenoff, 2004). In addition, the CDC (2015) estimated the healthcare costs associated with obesity at $147 billion in 2008. Given the high risk of increased morbidity in cancer survivors, preventing or decreasing the impact of sarcopenic obesity through education and appropriate referrals may be cost effective and improve health outcomes.

Most clinicians and researchers accept the International Working Group on Sarcopenia’s consensus definition of sarcopenia as a loss of skeletal muscle usually associated with aging (Cruz-Jentoft et al., 2010; Fielding et al., 2011). Several researchers have synthesized literature that differentiates sarcopenia from various malnutrition syndromes (Tsai, 2012; Vandewoude, Alish, Sauer, & Hegazi, 2012). Factors contributing to the development of sarcopenia include hormonal, nutritional, lifestyle, genetic, and neuromuscular changes (Cruz-Jentoft et al., 2010; Fielding et al., 2011; Thibault, Cano, & Pichard, 2011). Sarcopenic obesity contributes to mobility limitations and functional disability (Dufour, Hannan, Murabito, Kiel, & McLean, 2013; Fielding et al., 2011; Poggiogalle, Migliaccio, Lenzi, & Donini, 2014; Tao & Lagergren, 2013). Researchers have concluded that sarcopenic obesity is predictive of cancer mortality, treatment toxicity, and increased morbidity (Alfano, Molfino, & Muscaritoli, 2013; Antoun et al., 2013; Biolo, Cederholm, & Muscaritoli, 2014; Dalal et al., 2012; Del Fabbro et al., 2012; Demark-Wahnefried, Campbell, & Hayes, 2012; Dufour et al., 2013; Tsai, 2012). Evidence exists that weight loss during cancer treatment, in the presence of sarcopenia, leads to an increase in mortality (Dalal et al., 2012; Gonzalez et al., 2014).

The National Comprehensive Cancer Network’s (NCCN’s), 2016 clinical practice guidelines on survivorship do not specifically mention sarcopenia or sarcopenic obesity, but they do include updated algorithms on principles of healthy lifestyles, physical activity, and nutrition. In addition, the NCCN (2016) guidelines incorporate findings from a review of other clinical practice guidelines in related areas of nutrition, geriatric nursing, integrative and complementary therapies, and physical therapy (Boltz, Resnick, & Galik, 2012; Deng et al., 2013; Li & Heber, 2012; Markes et al., 2006; Mason, Xiao, et al., 2013; Montero-Fernández & Serra-Rexach, 2013; Poggiogalle et al., 2014; Tappenden et al., 2013). Specifically, research indicates that exercise during chemotherapy is appropriate to manage cancer-related fatigue and decrease muscle wasting (Andersen et al., 2013; NCCN, 2016; Tao & Lagergren, 2013). Nutrition recommendations include a high-quality plant-based diet with 20–30 grams of protein three times per day (NCCN, 2016).

In a review of nursing literature, Benton, Whyte, and Dyal (2011) identified sarcopenic obesity management strategies, including nutritional and physical activity guidelines. The authors found that including resistance training three days a week is crucial, as is increasing high-quality protein intake to support muscle growth and increase loss of fat in those with sarcopenic obesity (Benton et al., 2011). Effective nursing care strategies include encouraging physical activity and goal setting.

![Knowledge discovery: Sarcopenic obesity has adverse effects on cancer survivors.](image1.jpg)

**Evaluation of knowledge transformation:** Assessing advanced practice nurses’ self-report of their ability to identify and manage adult cancer survivors at risk for sarcopenic obesity

**Integration:** Pilot of the toolbox to address factors affecting adoption and sustainability of the intervention

**Evidence summary:** Sarcopenic obesity in cancer survivors is under-recognized and has negative consequences; interventions are likely to improve outcomes.

**Evidence translation:** Development of the evidence-based toolbox consisting of practical instruments and educational materials

**FIGURE 1. Star Model of Knowledge Transformation With Sarcopenic Obesity Project Descriptors**

as well as enhancing participation in activities of daily living and decreasing fall risk by modifying the environment for safety and providing rest periods (Boltz et al., 2012).

Increasingly, many survivors are managed in the outpatient setting by advanced practice nurses (APNs). These APNs are on the frontlines of affecting the care of patients who may benefit from nurse-led interventions to improve outcomes (Newhouse et al., 2011). Nurses, including APNs, are trained and well positioned to improve patient outcomes through educational interventions when caring for patients with chronic disease in the outpatient setting (Strupeit, Buß, & Dassen, 2013). Symptom management and survivorship clinics led by oncology APNs may be efficient, cost-effective options to achieve quality health outcomes (Arts, Landewe-Cleuren, Schaper, & Vrijhoef, 2012; Comiskey, Coyne, Lalor, & Begley, 2014; Mason, DeRubeis, Foster, Taylor, & Worden, 2013; McCorkle et al., 2009; Oliver, Pennington, Revelle, & Rantz, 2014).

One of the roles of APNs is to educate their patients; APNs help interpret health information and ensure their patients’ level of understanding. The Star Model of Knowledge Transformation (see Figure 1) provides an appropriate framework to project effects of educational interventions (Stevens, 2012). The primary outcome of this model is shortening the time from knowledge discovery to full implementation of clinical evidence (Stevens, 2012). The model contains five stages of knowledge transformation: knowledge discovery, evidence summary, evidence translation, integration, and evaluation of knowledge translation (Stevens, 2012). In this project, stage 1 was the evaluation of current literature knowledge gaps; stage 2 was the synthesis of the best practices; and stage 3 was the development of the evidence-based toolbox to identify and manage sarcopenic obesity. Stage 4 was represented by the participants’ use of the toolbox and their feedback, and stage 5 was the evaluation of the project results. The cyclical model serves to examine the clinical impact of the intervention, as well as any nursing implications of the results.

The purpose of this project was to determine the effects of an educational intervention for APNs regarding sarcopenic obesity. The expected outcome was an increase in the APNs’ ratings of self-confidence to identify and manage patients at risk for sarcopenic obesity following use of the education toolbox. In addition, an increase was expected regarding the APNs’ documentation of patients’ baseline risk factors, education they provided to patients, and referrals made to agencies for management of physical, functional, and/or nutritional deficits related to sarcopenic obesity.

**Methods**

Participants in this project were a convenience sample of APNs recruited from Illinois CancerCare, an oncology practice in the Midwestern United States. At the practice, APNs and physicians have about 89,000 outpatient encounters annually, with about 5,900 individual patients receiving treatment in a year. Fourteen APNs who work at one or more of the 12 outpatient clinics were invited to participate in the project. Only APNs working solely in the inpatient setting were excluded.

**Instrument**

The lead investigator developed the pre- and postintervention surveys after reviewing the oncology literature and consulting several oncology APNs. The final survey questions were reviewed by two PhD-prepared nurse researchers and an oncologist for appropriateness and clarity. Two questions on the presurvey were related to the participants’ confidence in their ability to identify and manage risk factors related to sarcopenic obesity (“I feel confident in my ability to identify adult patients with cancer at risk for sarcopenic obesity,” “I feel confident in my ability to manage adult patients with cancer at risk for sarcopenic obesity, including making appropriate referrals to programs and services”). Participants rated their confidence on a three-point Likert-type scale, ranging from 0 (not at all confident) to 2 (very confident). Other questions regarded participants’ documentation and referral practices related to risk factors of sarcopenic obesity and are as follows:

- In the past two months, I have documented identified risk factors for sarcopenic obesity in a patient’s chart.
- In the past two months, I have documented any education provided to patients regarding sarcopenic obesity.
- In the past two months, I have made referrals to physical therapy/occupational therapy or rehabilitation programs for patients at risk for sarcopenic obesity.
- In the past three months, I have made referrals to nutritional services for patients at risk for sarcopenic obesity.
- In the past three months, I have documented referrals made to agencies for management of physical, functional, and/or nutritional deficits related to patients at risk for sarcopenic obesity.

For these questions, participants could select “never” or indicate the approximate number of times they had performed a particular action. An area for comments, questions, and concerns was also made available.

The postintervention survey contained the same questions as the preintervention survey, with some additions. The authors added a question that allowed the participants to rate their overall perception of the effectiveness of the toolbox content (“I have found the sarcopenic obesity resource toolbox to be helpful in caring for my patients”) using a three-point Likert-type scale (0 = not at all, 1 = somewhat, 2 = very true). A “not applicable” response was also available. In addition, participants had the opportunity to respond to the following open-ended question: “What, if anything, did you find most helpful within the toolbox?”

**Intervention**

The intervention consisted of a short overview and a paper copy of an educational presentation included in a toolbox with additional educational materials related to sarcopenic obesity. Based on the review of the literature and expert recommendations, the lead investigator developed the educational presentation for the participants. The toolbox materials, collated in binders, were provided for each individual participant, and they were also available in electronic form.
on the shared drive used by the APNs in the oncology practice. The toolbox featured the following materials:

- Paper copy of the educational presentation on sarcopenic obesity. This presentation provided the definition and clinical importance of sarcopenic obesity, along with expert recommendations for suspecting and managing this condition.
- Educational resources detailing expert recommendations for nutrition, weight management, and physical activity
- Evidence-based practice guidelines on healthy lifestyles adapted from the NCCN’s (2016) survivorship guidelines
- SARC-F rapid scoring tool (Woo et al., 2014)
- List of referral resources for expert management of functional impairment, physical disability, and nutritional counseling available within the community
- Documentation template providing an example for APNs to consider for documenting an assessment and/or intervention in the patient’s electronic record
- Educational handout for patients

Procedure

After receiving institutional review board approval, the lead investigator recruited participants through an email distribution list specific to APNs. The email informed them about the project and procedures and invited them to participate. Participants provided written informed consent. Each participant then completed an anonymous preintervention survey. Anonymous responses allowed participants to provide candid responses and decreased the risk of research bias.

The lead investigator presented a 10-minute educational inservice to participants individually at their respective offices and gave participants the toolbox materials. The short educational inservice focused on the significance of sarcopenic obesity in cancer survivors, as well as clinical signs of patients at risk for this condition, highlighting a variety of tools, such as the SARC-F; the APNs were allowed to use the contents of the toolbox within the context of their practice as they saw fit. Participants were encouraged to ask questions. During the project, the participants were asked to keep track of the number of referrals to supportive services made based on their identification of at-risk patients, as well as the number of times they documented any risk factor or intervention related to sarcopenic obesity; they kept their own tallies and self-reported that number on the postintervention survey.

Two months after receiving the toolbox, participants completed the postintervention survey to identify any changes in their confidence to identify and manage patients at risk for sarcopenic obesity. They also rated their perception of the effectiveness of the intervention materials. The postintervention survey was distributed electronically through office email, and participants anonymously returned the survey through interoffice mail.

Data Analysis

The sample was characterized using descriptive statistics, and SPSS®, version 21.0, was used to compare the pre- and postintervention surveys. Results were compared as an aggregate. Means were calculated for confidence; frequencies and means were calculated for documentation and referrals. Two-tailed paired t tests provided aggregate comparisons of the means. Statistical significance was set at p < 0.05.

Results

Twelve master’s-prepared APNs enrolled in the project; 11 of these participants completed the postintervention survey. All participants were women and had worked for the oncology practice an average of 7.42 years (SD = 3.85).

After spending two months using the educational toolbox, participants were resurveyed. They reported a higher mean confidence score of 1.36 (SD = 0.51) than at baseline (X = 0.73, SD = 0.47), indicating more confidence in their ability to identify adult patients with cancer at risk for sarcopenic obesity. This difference was significant (t[10] = –3.13, p = 0.011) and represented a large effect (d = 1.36). In addition, the same participants were resurveyed and reported a higher mean confidence score of 1.82 (SD = 0.41), indicating more confidence in their ability to manage adult patients with cancer at risk for sarcopenic obesity than at baseline. This difference was significant (t[10] = –4.35, p = 0.001) and represented a large effect (d = 1.68).

Participant responses indicated an increase, compared to baseline survey responses, in the number of times the APNs documented identified risk factors, education provided, referrals made to therapy or rehabilitation programs, and referrals made to nutritional services; however, these increases were not statistically significant (see Table 1). In addition, although an increase was noted in the documentation of risk factors, education provided, and referrals made, these were not statistically significant.

All participants indicated that the toolbox was very helpful or somewhat helpful in caring for their patients. When

<table>
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<tr>
<th>TABLE 1. Difference in the Mean Number of Documentations and Referrals Pre- and Postintervention (N = 11)</th>
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<tr>
<td>Paired Samples</td>
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<tr>
<td>Pre- and postintervention documentation of risk factors</td>
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<tr>
<td>Pre- and postintervention documentation of education</td>
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<tr>
<td>Pre- and postintervention referrals to physical or occupational therapy for risk factors</td>
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<tr>
<td>Pre- and postintervention referrals to dietitian for risk factors</td>
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<tr>
<td>Pre- and postintervention documentation of referrals</td>
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asked what was most helpful within the toolbox, 36% (n = 4) indicated the patient education material, followed by the SARC-F tool (27%, n = 3). One participant indicated that the definition of sarcopenic obesity and the expert recommendations and guidelines were helpful. General comments included “very informative and complete” and “great resource manual.” No negative comments were made; however, one participant commented that, during the short project period, she did not have the opportunity to identify anyone at risk for sarcopenic obesity.

Discussion

This project explored the effectiveness of an evidence-based educational intervention on APNs’ confidence to identify and manage adult cancer survivors at risk for sarcopenic obesity. Overall, APNs caring for adult cancer survivors who used the toolbox experienced an increase in their confidence to identify and manage patients at risk for sarcopenic obesity. They also indicated a willingness to refer patients to appropriate resources to mitigate morbidity related to sarcopenic obesity.

Nursing literature exploring the impact of APN confidence suggests that education is an effective tool to improve patient recommendations provided in clinical practice (Cashin, Stasa, Dunn, Pont, & Buckley, 2014; Taylor-Fishwick, Okafor, & Fletcher, 2015). This was similar to the results found in this project. Little research was discovered that examined APN education and its impact on documentation and referral practices.

Limitations

The small convenience sample and short project duration limited APNs’ exposure to patients at risk for sarcopenic obesity. This convenience sample using APNs could be expanded to physicians and other oncology professionals who provide care to cancer survivors and to multiple oncology practices. A greater depth of information may have been gained by asking participants to describe any patients they identified as at risk for sarcopenic obesity.

Implications for Nursing

Sarcopenic obesity can affect morbidity, mortality, and quality of life in adult cancer survivors. Improved awareness combined with educational resources provide an effective learning modality for identifying and managing patients at risk for sarcopenic obesity. Because nurses serve as interpreters of issues that affect optimal health and functioning in cancer survivors, they must be able to describe the characteristics of sarcopenic obesity. Patients who present deconditioned (i.e., loss of fitness with muscle wasting and loss of strength) by cancer or comorbidities may already have sarcopenic obesity (Ormsbee et al., 2014). In addition, patients who present obese and lose weight because of cancer or its treatment are at risk of losing muscle mass (Fielding et al., 2011), whereas patients who gain weight on treatment are at increased risk for sarcopenic obesity (Demark-Wahnefried et al., 2012). Sarcopenia should be considered in patients who cannot rise from a chair unassisted, walk without assistance, have fatigue with climbing stairs, have decreased strength, or are a fall risk (Woo et al., 2014). Those at risk for sarcopenic obesity should be encouraged to participate in physical exercise or a rehabilitation program and consume a nutritionally balanced diet that includes high-quality protein (Benton et al., 2011).

Conclusion

The Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine report Cancer Patient to Cancer Survivor: Lost in Transition urges oncology providers to focus on post-treatment cancer survivorship (Hewitt et al., 2006). Essential components of survivorship include prevention of new and recurrent cancers, mitigation of latent effects of cancer and cancer treatment, and intervention for consequences of cancer and treatment (Hewitt et al., 2006). APNs are well suited to lead survivorship care. Although this project was not meant to assess a direct change in risk factors, it does indicate that APNs who are given simple, inexpensive, and practical tools have increased confidence in their ability to identify and manage sarcopenic obesity; this could potentially help patients return to optimal health after diagnosis.

A substantial amount of evidence documents the negative impact of sarcopenia, obesity, and sarcopenic obesity on functionality and quality of life (Li & Heber, 2012; Weinheimer, Sands, & Campbell, 2010). The impact on survivorship issues during and after treatment for cancer is also growing, as is the potential for severe consequences if these issues are not addressed (Markes et al., 2006; Tao & Lagergren, 2013). Baseline survey results from this project highlight the need to increase awareness about sarcopenic obesity and provide healthcare providers with tools to address and intervene early to prevent and manage sarcopenic obesity in cancer survivors.

References


Biolo, G., Cederholm, T., & Muscaritoli, M. (2014). Muscle contractile and metabolic dysfunction is a common feature of sarcopenia of aging and chronic diseases: From sarcopenic obesity to cachexia. Clinical Nutrition, 33, 737–748. doi:10.1016/j.cnu.2014.03.007


