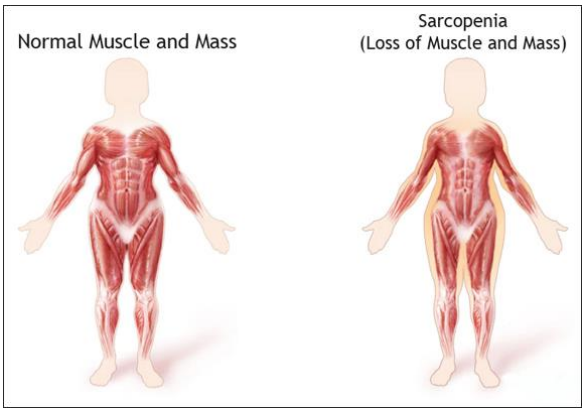
# Cancer Association of South Africa (CANSA)

Research • Educate • Support

## Fact Sheet
## on
## Sarcopenia in Cancer Patients and Cancer Survivors

**Introduction**

Sarcopenia, the loss of muscle mass and strength, becomes more common with age and can decrease lifespan and quality of life.




[Picture Credit: Sarcopenia Picture]

Consuming enough kilojoules and high-quality protein can slow down the rate of muscle loss. Omega-3 and creatine supplements may also help fight sarcopenia.

Exercise is the most effective way to prevent and reverse sarcopenia. Resistance exercises appear to be particularly effective, including using resistance bands, lifting weights or doing calisthenics like squats, push-ups and sit-ups. Even simple exercises like walking can slow your rate of muscle loss. At the end of the day, the most important thing is to get active.

**Da Silva, S.P., SAnatos, J.M.O., E Silva, M.P.C., da Costa, R.M.G. & Medeiros, R.** 2020.
"Cancer cachexia is a multifactorial syndrome characterized by a progressive loss of skeletal muscle mass, along with adipose tissue wasting, systemic inflammation and other metabolic abnormalities leading to functional impairment. Cancer cachexia has long been recognized as a direct cause of complications in cancer patients, reducing quality of life and worsening disease outcomes. Some related conditions, like sarcopenia (age-related muscle wasting), anorexia (appetite loss) and asthenia (reduced muscular strength and fatigue), share some key features with cancer cachexia, such as weakness and systemic inflammation. Understanding the interplay and the differences between these conditions is critical to advance basic and translational research in this field, improving the accuracy of diagnosis and contributing to finally achieve effective therapies for affected patients."

**Ganapathy, A. & Nieves, J.W.** 2020.
"Muscle health is important for the functionality and independence of older adults, and certain nutrients as well as dietary patterns have been shown to offer protective effects against declines in strength and function associated with aging. In this paper, micronutrients, macronutrients, and food groups have been reviewed, along with their studied effects on the prevalence and incidence of sarcopenia, as well as their ability to preserve muscle mass and optimize physical performance. Randomized controlled trials appear to suggest a critical role for dietary intake of protein in preventing sarcopenia and muscle loss, although the optimal dose and type of protein is unknown. There are some promising data regarding the role of vitamin D and

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sarcopenia, but it is unclear whether the dose, frequency of dose, or length of treatment impacts the efficacy of vitamin D on improving muscle mass or function. Selenium, magnesium, and omega 3 fatty acids have been studied as supplements in clinical trials and in the diet, and they appear to demonstrate a potential association with physical activity and muscle performance in older individuals. Following the Mediterranean diet and higher consumption of fruits and vegetables have been associated with improved physical performance and protection against muscle wasting, sarcopenia, and frailty."

**Kirwan, R., McCullough, D., Butler, R., Perez de Heredia, F., Davies, E.G. & Stewart, C.** 2020.
"The COVID-19 pandemic is an extraordinary global emergency that has led to the implementation of unprecedented measures in order to stem the spread of the infection. Internationally, governments are enforcing measures such as travel bans, quarantine, isolation, and social distancing leading to an extended period of time at home. This has resulted in reductions in physical activity and changes in dietary intakes that have the potential to accelerate sarcopenia, a deterioration of muscle mass and function (more likely in older populations), as well as increases in body fat. These changes in body composition are associated with a number of chronic, lifestyle diseases including cardiovascular disease (CVD), diabetes, osteoporosis, frailty, cognitive decline, and depression. Furthermore, CVD, diabetes, and elevated body fat are associated with greater risk of COVID-19 infection and more severe symptomology, underscoring the importance of avoiding the development of such morbidities. Here we review mechanisms of sarcopenia and their relation to the current data on the effects of COVID-19 confinement on physical activity, dietary habits, sleep, and stress as well as extended bed rest due to COVID-19 hospitalization. The potential of these factors to lead to an increased likelihood of muscle loss and chronic disease will be discussed. By offering a number of home-based strategies including resistance exercise, higher protein intakes and supplementation, we can potentially guide public health authorities to avoid a lifestyle disease and rehabilitation crisis post-COVID-19. Such strategies may also serve as useful preventative measures for reducing the likelihood of sarcopenia in general and in the event of future periods of isolation."

**Sarcopenia in Cancer Patients and Cancer Survivors**
Sarcopenia seems to be more prevalent amongst cancer patients than previously believed. It occurs in patients with a variety of cancers and inactivity seems to be a major risk factor, linked to nutrition.

*Older Patients with Cancer*
**Ligibel, J.A., Schmitz, K.H. & Berger, N.A.** 2020.
"Sarcopenia, defined as loss of muscle mass, strength and physical performance, is a hallmark of aging and is invariably associated with perturbation of amino acid metabolism, increased muscle protein catabolism relative to anabolism, and loss of muscle fibers. Sarcopenia may be associated with general loss of body mass, or it may also occur along with obesity [sarcopenic obesity (SO)]. Although sarcopenia is associated with multiple comorbidities in older adults, its effects may even be more severe in patients with malignant disease where it has been shown to contribute to poor surgical outcomes, increased chemotherapy toxicity associated with both cytotoxic and targeted agents, as well as adversely impacting survival. While development of sarcopenia is a common age-related phenomenon, the associated catabolic processes appear to be promoted by physical inactivity, inadequate nutrition, and systemic low-grade inflammation, as well as intrinsic muscle and molecular changes, including mitochondrial dysfunction and impaired muscle stem cell regenerative capacity. Increased physical activity and adequate protein intake can reduce incidence and severity of sarcopenia in cancer patients, but many older cancer patients do not meet physical activity and nutrition recommendations, and cancer treatment can make it more difficult to make favorable lifestyle changes. Sarcopenia is discussed in terms of its adverse clinical consequences in older subjects and

particularly, in older patients with cancer. Contributions of lifestyle, molecular, and cellular factors are likewise reviewed with suggestions for interventions to improve sarcopenia and its comorbid sequalae."

**Anjanappa, M., Corden, M., Green, A., Roberts, D., Hoskin, P., McWilliam, A. & Choudhury, A.** 2020.
"Sarcopenia is characterised by progressive and extensive skeletal muscle degeneration and is associated with functional decline. Sarcopenia has primary and secondary aetiology, arising as a result of the ageing process or through chronic cytokine-mediated inflammation (associated with health conditions including cancer), respectively. Diagnosis of sarcopenia is dependent upon detection of reduced skeletal muscle strength, mass and performance. A combination of non-radiological and radiological methods can be used to assess each of these in turn to accurately diagnose sarcopenia. Sarcopenia is known to adversely affect outcomes of patients with various forms of cancer. Early identification of sarcopenia is imperative in improving patient care and overall prognosis. Various interventions, such as resistance exercise, nutritional support, and amino acid and vitamin supplementation have shown promise in the management of sarcopenia. However, further insight into novel interventions and indeed, assessment of the benefits of management of sarcopenia in terms of survival, are required to better support cancer patients."

**Causes of Sarcopenia**
Unused muscles can waste away if you're not active. But even after it begins, this type of atrophy can often be reversed with exercise and improved nutrition.
Muscle wasting or atrophy is usually caused by not being able to regularly exercise your muscles. Your inability to move may be be due to an injury or an underlying health condition.
Muscle atrophy can also happen if you're bedridden or unable to move certain body parts due to a medical condition. Astronauts, for example, can experience muscle atrophy after a few days of weightlessness.
Other causes for muscle atrophy include:

- Cancer
- lack of physical activity for an extended period of time
- aging
- malnutrition
- spinal cord or peripheral nerve injuries
- stroke
- long-term corticosteroid therapy

Some medical conditions can cause muscles to waste away or can make movement difficult, leading to muscle atrophy. These include:

- Amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease
- Dermatomyositis
- Guillain-Barré syndrome
- Multiple sclerosis
- Muscular dystrophy
- Neuropathy
- Osteoarthritis
- Rheumatoid arthritis
- Spinal muscular atrophy

**Oflazoglu, U., Alacacioglu, A., Varol, U., Kucukzeybek, Y., Salman, T., Taskaynatan, H., Yildiz, Y., Saray, S. & Tarhan, M.O.** 2020.

**Background:** Sarcopenia is associated with physical disability, increased post-operative complications, poorer tolerance to chemotherapy, and reduced survival outcome. However, little is known about the changes in body composition during chemotherapy treatment. We aimed to determine whether adjuvant or palliative chemotherapy causes the development of sarcopenia in newly diagnosed cancer patients and to reveal the relationship of sarcopenia with the duration of chemotherapy.
**Methods:** The study included newly diagnosed cancer patients who underwent curative surgery for primary tumor and also cancer patients who were metastatic at diagnosis. Body composition and handgrip strength were assessed by bio-electric impedance analysis (BIA) and handgrip dynamometer tools, respectively. Measurement tests were performed prior to chemotherapy, in the third and sixth months of chemotherapy.
**Results:** The median age of a total of 276 patients was 57.5 years (range 18-83), and majority of them (55.8%) were women. Among the pre-chemotherapy factors that could be associated with sarcopenia, male gender ≥ 65 years of age, body mass ındex (BMI) < 25, and nutritional risk screening 2002 score < 3 were found to be positively associated with sarcopenia ($p < 0.001$, $p = 0.036$, $p < 0.001$, and $p < 0.001$, respectively). In the multivariate analysis, male gender ($p < 0.001$) and BMI < 25 ($p = 0.047$) were found to be significant. Of 276 patients, 14.5% were sarcopenic prior to chemotherapy. After chemotherapy, 21.4% of them were sarcopenic at the end of the third month and 23.9% were sarcopenic at the end of the sixth month.
**Conclusion:** The incidence of sarcopenia was found to be increased with chemotherapy itself and its duration in both non-metastatic and metastatic cancer patients which has to be evaluated in detail in disease-specific prospective and randomized studies.

**Signs and Symptoms of Sarcopenia**

Signs and symptoms may include:

- Loss of muscle coordination
- Visible loss of muscle mass
- Weakness or numbness in the limbs
- Impaired balance while walking
- Tingling or weakness of the extremities
- Fatigue and a general feeling of illness
- Progressive weakness
- Gradual memory loss
- Difficulty climbing stairs
- Difficulty in rising from a low sitting position
- Difficulty in getting up from a kneeling position

[Picture Credit: Muscle Mass Loss]

**Screening for Sarcopenia**

The risk of sarcopenia was evaluated in each studied subject using the following tools: SARC-F, SARC-CalF, SARC-F+EBM.

*The SARC-F Questionnaire*

The SARC-F examines five domains: 1) strength, 2) assistance with walking, 3) rising from a chair, 4) climbing stairs, and 5) falls, scored from 0 to 2. A score of ≥4 out of the maximum of 10 points indicates a risk of sarcopenia.

| Component | Question | Scoring |
|---|---|---|
| Strength | How much difficulty do you have in lifting and carrying a weight of 5kG? | None = 0<br>Some – 1<br>A lor or unable = 2 |
| Assistance in walking | How much difficulty to you have walking across a room? | None = 0<br>Some = 1<br>A lor, use aids, or unable = 2 |
| Rise from a chair | How much difficulty to do you in transferring from a chair or bed? | None = 0<br>Some = 1<br>A lor or unable without help = 2 |
| Climb stairs | How much difficulty do you have climbing a flight of 10 stairs? | None = 0<br>Some = 1<br>A lor or unable = 2 |
| Falls | How many times have you fallen in the past year? | None = 0<br>1 to 3 = 1<br>4 or more falls = 2 |

*The SARC-F+EBM Questionnaire*

SARC-F+EBM examines seven domains.
The first five items are identical to SARC-F.
The sixth item is age (scored 10 if age ≥ 75 years, and 0 if age < 75), and
The seventh item is BMI (scored 10 if BMI ≤ 21 kg/$m^2$, and 0 if BMI > 21 kg/$m^2$).
The maximal score of the SARC-F+EBM is 30 points. A score of ≥12 points indicates a risk of sarcopenia.

**Diagnosis of Sarcopenia**

If muscle atrophy is caused by another condition, one may need to undergo testing to diagnose the condition. Your doctor will request your complete medical history.

The patient will likely be asked to:

- Provide a detailed description of current symptoms
- Inform the doctor about old or recent injuries
- Inform the doctor of previously diagnosed medical conditions
- Provide information on previous prescriptions, over-the counter medications, and supplements.

The doctor may also order tests to help with the diagnosis and to rule out certain diseases.
These tests may include:

- Blood tests
- X-rays
- Magnetic Resonance Imaging (MRI)
- Computed Tomography (CT) scan
- Nerve conduction studies
- Muscle and/or nerve biopsy
- Electromyography (EMG)

The doctor may also refer the patient to a specialist depending on the results of the above tests.

**Fu, X., Tian, ., Thapa, S., Sun, H., Wen, S., Xiong, H. & Yu, S.** 2020.

**Background & aims:** Sarcopenia is a commonly prevalent malnutrition condition and serves as a valuable adverse prognostic indicator for survival in patients with cancer. A rapid and convenient screening test for sarcopenia would be helpful for patients. Aim of the study was to evaluate the diagnostic value of SARC-F and SARC-F combined with calf circumference (SARC-CalF) for screening cancer-related sarcopenia in cancer population.

**Methods:** A total of 309 patients with cancer who had routine abdominal comptued tomography (CT) images within 30 days were enrolled in this cross-sectional cohort. Sarcopenia was determined as the presence of both low muscle mass (LMM) and low muscle strength; muscle mass was evaluated by CT-scan, and muscle strength was evaluated by handgrip strength (HGS). Two different diagnostic criteria (Western criteria and Eastern criteria) were used as the reference standards. The sensitivity and specificity analyses of the SARC-F and SARC-CalF were calculated. The receiver operating characteristic (ROC) curves and the area under the ROC curves (AUC) were used to compare the diagnostic value of SARC-F and SARC-CalF for sarcopenia.

**Results:** The prevalence of LMM and sarcopenia in the patient group was 85.1% and 50.5% by Western criteria. Corresponding figures were lower as 42.4% and 26.2% by Eastern criteria. In the overall study population, when sarcopenia defined by the Eastern criteria, sensitivity and specificity of SARC-CalF were 66.6% and 70.1%, whereas that of SARC-F were 32.1% and 90.7%, respectively. The AUCs for SARC-CalF and SARC-F were 0.75 (95% confidence interval (CI) 0.70-0.80) and 0.70 (95% CI 0.64-0.75), respectively (P = 0.003). Against the Western criteria, SARC-CalF also had better sensitivity (55.1% vs. 22.4%) but lower specificity (76.4% vs. 92.1%) than that of SARC-F. The AUCs of SARC-CalF and SARC-F were 0.70 (95% CI 0.65-0.75) and 0.68 (95% CI 0.62-0.73), respectively, but the difference was not significant (P = 0.211).

**Conclusions:** SARC-CalF significantly increases the sensitivity and overall diagnostic accuracy of SARC-F for screening sarcopenia. SARC-CalF can be a rapid screening tool for sarcopenia in patients with cancer.

**Williams, G.R., Al-Oabaidi, M., Dai, C., Bhatia, S. & Smith, G.** 2020.

**Background:** Sarcopenia is associated with adverse outcomes among older adults with cancer; however, no easily applied sarcopenia measure exists for use in clinical practice. The use of SARC-F, a 5-item self-reported sarcopenia screening questionnaire, among older adults with cancer remains to be investigated.

**Methods:** Older adults (aged ≥60 years) with cancer enrolled in the University of Alabama Cancer and Aging Resilience Evaluation Registry were identified. Patients completed the SARC-F questionnaire (with scores ≥4 considered positive for sarcopenia). The authors assessed for differences in geriatric assessment domain impairments, health-related quality of life, and health care utilization between those with and without sarcopenia using multivariate regression, then assessed the association of sarcopenia with survival using Kaplan-Meier methods and a Cox regression model, adjusting for covariates.

**Results:** In total, 256 older adults were identified. The median age was 69 years, 59% of participants were men, and 75% were White. The median SARC-F score was 2 (interquartile range, 0-4), and 33% of participants screened positive. Those with sarcopenia had higher odds of having multiple impairments, including impaired instrumental activities of daily living (adjusted odds ratio [aOR], 18.1; 95% CI, 7.5-43.8) and frailty (aOR, 43.5; 95% CI, 17.7-106.8) as well as reduced physical and mental health-related quality of life (β coefficient, -13.6 and -11.5, respectively) and increased emergency room visits (aOR, 2.4; 95% CI, 1.3-4.7). Furthermore, sarcopenia was independently associated with inferior overall survival (adjusted hazard ratio, 2.98; 95% CI, 1.1-8.3; P = .04).

**Conclusions:** One-third of older adults with cancer in this cohort screened positive for sarcopenia using the SARC-F screening questionnaire, and these positive scores are associated with geriatric assessment domain impairments, reduced health-related quality of life, increased emergency room visits, and inferior overall survival.

**Williams, G.R., Chen, Y., Kenzik, K.M., McDonald, A., Shacchar, S.S., Klepin, H.D., Kritchevsky, S. & Bhatia, S.** 2020.

**Importance:** Progressive loss of muscle mass and strength, known as sarcopenia, is a well-known phenomenon of aging; however, little is known about the trajectory of sarcopenia measures before and after cancer diagnosis and its contribution to subsequent disability.

**Objective:** To examine the rate of decline of sarcopenia measures (ie, appendicular lean mass [ALM], muscle strength, and physical performance) in older adults with cancer both before and after the cancer diagnosis compared with the trajectory of a population without cancer, and secondarily to assess the association of sarcopenia measures with overall survival and major disability in patients with cancer.

**Design, setting, and participants:** This matched cohort study included participants from the Health, Aging, and Body Composition (Health ABC) study, which included 3075 community-dwelling older adults aged 70 to 79 years recruited from a random sample of white Medicare beneficiaries and all eligible black residents in and around Pittsburgh, Pennsylvania, and Memphis, Tennessee, beginning in January 1997 and observed for 17 years until December 2013. Data were analyzed from May 2018 to February 2020.

**Exposures:** The development of an adjudicated cancer diagnosis confirmed with pathology or cytology reports during the first 7 years of follow-up.

**Main outcomes and measures:** Annual assessments of ALM, hand grip strength, and gait speed were the primary outcome measures. Linear mixed-effect models were used to compare the change in ALM, hand grip strength, and gait speed between individuals who developed cancer and those who did not, adjusted for multiple comparisons ($P < .01$). Multivariable Cox regression was used to examine the association of sarcopenia measures with overall survival and major disability from date of cancer diagnosis.

**Results:** Of the 3075 included patients, 1491 (48.5%) were male, 1281 (41.7%) were black, and the mean (SD) age was 74.1 (2.9) years. A total of 515 patients (16.7%) developed cancer within the first 7 years of the study. The most common cancers were prostate (117 [23.2%]), colorectal (63 [12.5%]), lung (61 [12.1%]), and breast (61 [12.1%]) cancer, and 165 patients (32.0%) were diagnosed as having metastatic disease. Compared with controls without cancer, patients with a cancer diagnosis had a steeper decline in gait speed ($\beta = -0.02$; 95% CI, -0.03 to -0.01; $P < .001$) but not ALM ($\beta = -0.02$; 95% CI, -0.07 to 0.04; $P = .49$) or hand grip strength ($\beta = -0.21$; 95% CI, -0.43 to 0; $P = .05$) prior to cancer diagnosis. After cancer diagnosis, there was a decline in ALM ($\beta = -0.14$; 95% CI, -0.23 to -0.05; $P < .001$) but not hand grip strength ($\beta = -0.02$; 95% CI, -0.37 to 0.33; $P = .92$) or gait speed ($\beta = 0$; 95% CI, -0.01 to 0.02; $P = .51$). Declines in ALM after a cancer diagnosis were most striking in patients with metastases ($\beta = -0.32$; 95% CI, -0.53 to -0.10; $P = .003$). Slow gait speed was associated with a 44% increase in mortality (hazard ratio, 1.44; 95% CI, 1.05 to 1.98; $P = .02$) and a 70% increase in disability (hazard ratio, 1.70; 95% CI, 1.08 to 2.68; $P = .02$) but not low ALM or hand grip strength.

**Conclusions and relevance:** Accelerated losses in differing sarcopenia measures exist both prior to and after a cancer diagnosis and may present opportunities for targeted interventions to improve outcomes.

**Risk Factors of Sarcopenia**

Poor physical exercise and poor nutritional status are considered to be the main risk factors for sarcopenia, although the condition can be quite prominent among patients diagnosed with a variety of cancers.

Other risk factors may include:
Advancing age
Physical inactivity
Poor nutrition

**Felício de Souza, V., Ribeiro, T. de S. C., de Almeida Marques, R., Petarli, G.B.,Pereira, T.S.S., Rocga, J.L.M. & Guandalini, V.R.** 2020.

**Introduction**: sarcopenia is considered a risk factor for cancer patients, as it increases mortality and post-surgical complications, and reduces response to treatment and quality of life.
**Objective**: to identify the risk of sarcopenia by SARC-CalF, as well as the factors associated with this outcome in patients with cancer of the gastrointestinal tract (GIT) and adnexal glands.
**Methods**: this cross-sectional study included patients with cancer of the GIT and adnexal glands, without edema or ascites, of both sexes and aged ≥ 20 years. Conventional anthropometric variables and handgrip strength (HGS) were measured. The risk of sarcopenia was assessed through the SARC-CalF questionnaire, and nutritional status by the Patient-Generated Subjective Global Assessment (PG-SGA). The data analysis was performed using the SPSS® software, 22.0, with a significance of 5 %.
**Results**: seventy patients took part in the study. Of these, 55.7 % were female, 52.9 % were aged over 60 years, and 64.3 % were non-white. PG-SGA identified 50.0 % of patients as well-nourished and 50.0 % as having some degree of malnutrition. The prevalence of risk of sarcopenia was 28.6 %. There were different correlations between the SARC-CalF score and anthropometric variables ($p < 0.05$) according to life stage (adults and elderly). After a linear regression analysis the measures that most influenced the SARC-CalF score were arm circumference (AC) and adductor pollicis muscle thickness in the dominant hand (DAPMT) for adults, while for the elderly current weight and DAPTM ($p < 0.05$) were more relevant.
**Conclusion**: SARC-CalF identified 28.6 % of patients at risk for sarcopenia and was associated with body weight and anthropometric variables indicative of muscle reserve in adults and the elderly.

**Reducing the Risk of Sarcopenia**

Here are some ways on how to build and maintain muscle mass and help increase bone density:

Get more active – start with what one feels comfortable with such as raking leaves or going for a brisk walk

- Brisk walking on a treadmill
- Exercise on a stationary cycle

[Picture Credit: Stationary Cycle]

[Picture Credit: Treadmill]

- Doing balance exercises (prevent falls)
- Doing strength and/or resistance training exercises
- Combinations of aerobic exercise, resistance training and balance training can **prevent** and even reverse muscle loss. At least two to four exercise sessions weekly may be required to achieve these benefits
- Get enough Calcium in your diet

[Picture Credit: Light Weight Training]

- Research has found that people older than 50 years of age can not only maintain, but actually increase their muscle mass by lifting weights
- Research has shown that, through weight training, men and women in their 60s and beyond can grow muscles as big and strong as an average 40-year-old
- Increase your protein intake (preferably lean proteins), e.g. chicken, fish,

turkey, eggs, kidney/chickpea beans, peanut butter (2 tbsp), veggie burgers, tofu
- Try to get as much vitamin D from your diet as possible, e.g. fortified vitamin D milk or almond milk, mushrooms, salmon, tuna, beef liver, cheese, egg yolks which contain small amounts of vitamin D

**Treatment of Sarcopenia**

Treatment pf sarcopenia will depend on the diagnosis (cause) and the severity of muscle loss. Any underlying medical conditions will also need to be addressed.

Common treatments for muscle atrophy include:
- exercise
- physical therapy
- ultrasound therapy
- surgery
- prescription of certain medicines or supplements
- referral to a Registered Dietitian for dietary changes If malnutrition is the cause or contributory cause of loss of muscle mass
- Referral to a Physical Therapist who can teach the correct ways to exercise and can also do passive exercises of arm and leg muscles in patients who have trouble moving
- recommended exercises might include water exercises to help make movement easier
- ultrasound therapy is a non-invasive procedure that uses sound waves to aid healing.

**Research Articles on the Occurrence of Sarcopenia in Cancer Patients**

There are many research articles which deal with the occurrence of sarcopenia in patients diagnosed with a variety of cancers. Some examples are provided below.

Sarcopenia - *Colorectal Cancer*

**Vergara-Fernandez, O., Trejo-Avila, M. & Salgado-Nesme, N.** 2020.

Colorectal cancer (CRC) is the third most commonly diagnosed cancer globally and the second cancer in terms of mortality. The prevalence of sarcopenia in patients with CRC ranges between 12%-60%. Sarcopenia comes from the Greek "sarx" for flesh, and "penia" for loss. Sarcopenia is considered a phenomenon of the aging process and precedes the onset of frailty (primary sarcopenia), but sarcopenia may also result from pathogenic mechanisms and that disorder is termed secondary sarcopenia. Sarcopenia diagnosis is confirmed by the presence of low muscle quantity or quality. Three parameters need to be measured: muscle strength, muscle quantity and physical performance. The standard method to evaluate muscle mass is by analyzing the tomographic total cross-sectional area of all muscle groups at the level of lumbar 3rd vertebra. Sarcopenia may negatively impact on the postoperative outcomes of patients with colorectal cancer undergoing surgical resection. It has been described an association between sarcopenia and numerous poor short-term CRC outcomes like increased perioperative mortality, postoperative sepsis, prolonged length of stay, increased cost of care and physical disability. Sarcopenia may also negatively impact on overall survival, disease-free survival, recurrence-free survival, and cancer-specific survival in patients with non-metastatic and metastatic colorectal cancer. Furthermore, patients with sarcopenia seem prone to toxic effects during chemotherapy, requiring dose deescalations or treatment delays, which seems to reduce treatment efficacy. A multimodal approach including nutritional support (dietary intake, high

energy, high protein, and omega-3 fatty acids), exercise programs and anabolic-orexigenic agents (ghrelin, anamorelin), could contribute to muscle mass preservation. Addition of sarcopenia screening to the established clinical-pathological scores for patients undergoing oncological treatment (chemotherapy, radiotherapy or surgery) seems to be the next step for the best of care of CRC patients.

*Sarcopenia - Exercise and Activity*

**Moore, S.A., Hrisos, N., Errington, L., Tochester, L., Rodgers, H., Witham, M. & Sayer, A.A.** 2020.

**Background:** Sarcopenia is a progressive and generalised skeletal muscle disorder, and a powerful predictor of adverse health outcomes. Exercise is a widely recommended treatment but consensus about the best approach is lacking.

**Objective:** To synthesise current systematic review evidence on the effectiveness of exercise in the treatment of sarcopenia to inform clinical practice.

**Data sources:** Five electronic databases were searched (15 November 2018): Cochrane Database of Systematic Reviews; MEDLINE without revisions; EMBASE; Scopus; and Web of Science.

**Study selection or eligibility criteria:** Systematic reviews and meta-analyses of randomised controlled trials evaluating exercise to treat sarcopenia in adults including sarcopenic outcomes.

**Study appraisal and synthesis methods:** Review data were extracted and quality assessed (using the AMSTAR 2) by two independent assessors. Due to a lack of eligible reviews, a narrative synthesis of the evidence was performed.

**Results:** Two reviews were identified which included seven studies with 619 participants. Study exercise interventions included: resistance; mixed and whole body vibration training programmes. Review findings demonstrate limited low quality evidence of positive effects of mixed and resistance training in treating sarcopenia.

**Limitations:** Limited eligible reviews restricted synthesis and interpretation of findings.

**Conclusion and implications of key findings:** There is a lack of high quality research with which to inform the treatment of sarcopenia with exercise. Further research using more precision when selecting sarcopenic populations and outcomes is required in this field. This will enable the identification of effective ways of treating sarcopenia with exercise before evidence-based clinical guidelines can be established.

*Sarcopenia - Prostate Cancer*

**Ikeda, T., Ishihara, H., Iizuka, J., Hashimoto, Y., Yoshida, K., Kakuta, Y., Takagi, T., Okumi, M., Ishida, H., Kondo, T. & Tanabe, K.** 2020.

**Background:** Cancer cachexia is associated with a poor prognosis. This study aimed to investigate the association between sarcopenia and survival in patients with metastatic hormone-sensitive prostate cancer.

**Methods:** We retrospectively evaluated 197 patients diagnosed with metastatic hormone-sensitive prostate cancer in our department and its affiliated institution between January 2008 and December 2015. Sarcopenia was diagnosed according to the sex-specific consensus definition. Castration-resistance prostate cancer-free survival, cancer-specific survival and overall survival from the metastatic hormone-sensitive prostate cancer diagnoses were calculated using the Kaplan-Meier method and compared using the log-rank test. Risk factors affecting the survival outcomes were analyzed using the Cox proportional regression analysis.

**Results:** In total, 163 patients (82.7%) had sarcopenia. Cancer-specific survival and overall survival were significantly shorter in sarcopenic patients than in non-sarcopenic patients (median cancer-specific survival: 77.0 months vs. not reached, P = 0.0099; overall survival: 72.0 months vs. not reached, P = 0.0465), whereas castration-resistance prostate cancer-free survival did not significantly differ between the groups (P = 0.6063). Multivariate analyses showed that sarcopenia was an independent factor for cancer-specific survival (hazard ratio: 2.18, P = 0.0451), together with the Gleason score (hazard ratio: 1.87, P = 0.0272) and

LATITUDE risk classification (hazard ratio: 2.73, P = 0.0008). Moreover, the prognostic association of sarcopenia was remarkable in patients aged <73.0 years (cancer-specific survival: 82.0 months vs. not reached, P = 0.0027; overall survival: 72.0 months vs. not reached, P = 0.0078 in sarcopenic vs. non-sarcopenic patients), whereas the association was not significant in patients aged ≥73.0 years (cancer-specific survival: 76.0 and 75.0 months, respectively, P = 0.7879; overall survival: 67.0 and 52.0 months, respectively, P = 0.7263).
**Conclusion:** Sarcopenia was an independent risk factor of cancer-specific survival in patients with metastatic hormone-sensitive prostate cancer, especially in younger patients.

*Sarcopenia - Lung Cancer*

**Tanaka, S. & Takayama, K.** 2020.

"Lung cancer is the most common cause of death in all kinds of cancers in Japan, and the number of it increased year and year in these 50 years. Since the 5-year survival rate of advanced lung cancer is only 6.4%, it is one of the poorest prognosis cancers. Almost 70% of patients with advanced lung cancer is suggested to be in precachexia/cachexia stage at their diagnosis. Cancer cachexia is one of the major reasons of refractory to chemotherapy and cancer death, however there is no effective treatment developed. Because cancer cachexia is multifactorial syndrome, multimodal treatment is needed. Anamorelin, a novel selective ghrelin receptor agonist, is under development for treating cancer cachexia. It has promising results in improving lean body mass in patients with advanced non-small cell lung cancer(NSCLC)and gastrointestinal cancer who suffer from cancer cachexia. The trial for early induction of multimodal intervention, Nutrition and Exercise Treatment for Advanced Cancer(NEXTAC)program, showed excellent feasibility and safety in elderly patients with advanced NSCLC and pancreatic cancer. These trials can develop a novel method for the treatment of cancer cachexia."

*Sarcopenia - Cancer of the Stomach*

**Sugiyama, K.** 2020.

"Sarcopenia is regarded with a negative prognostic or detrimental factor for several diseases, regardless of benign or malignant disease. The relationship between sarcopenia and resectable gastric cancer has been investigated gradually. On the contrary, the effect of sarcopenia in advanced gastric cancer is not apparent. In this article, firstly, we summarised the impact of sarcopenia in resectable stage, and then in advanced gastric cancer receiving chemotherapy. Finally, we discussed the nutrition support for advanced gastric cancer."

*Sarcopenia - Head and Neck Cancers*

**Van Rijn-Dekker, M.I., van den Bosch, L., van den Hoek, J.G.M., Bijl, H.P., van Aken, E.S.M., van der Hoorn, A., Ossting, S.F., Halmos, G.B., Witjes, M.J.H., van der Laan, H., Langendijk, J.A. & Steenbakkers, R.J.H.M.** 2020.

**Background and purpose:** Sarcopenia is emerging as an adverse prognostic factor for survival and complication risk in cancer patients. This study aims to determine the impact of sarcopenia on survival and late toxicity in a large cohort of head and neck squamous cell carcinoma (HNSCC) patients treated with definitive (chemo)radiotherapy ((C)RT).
**Materials and methods:** HNSCC patients treated with definitive (C)RT from January 2007 to June 2016 were included. Sarcopenia was assessed from radiation planning computed tomography (CT) scans using skeletal muscles at level C3. The impact of sarcopenia on overall survival (OS) and disease-free survival (DFS) was evaluated using the Kaplan-Meier method. Multivariable association models were developed to assess the impact of sarcopenia on late toxicity.

**Results:** The study population was composed of 750 HNSCC patients. Cut-off values for sarcopenia were set at SMI < 42.4 $cm^2/m^2$ (men) and <30.6 $cm^2/m^2$ (women) corresponding lowest gender specific quartile. Sarcopenic patients had significantly poorer survival rates, especially those with lower performance status and locally advanced disease. In oropharyngeal cancer patients, survival was more determined by p16 status than by sarcopenia. In multivariable analysis, sarcopenia was associated with worse OS (HR 0.72, p = 0.012) and DFS (HR 0.67, p = 0.001). In multivariable association models, sarcopenia was associated with physician-rated xerostomia six months after treatment (OR 1.65, p = 0.027) and physician-rated dysphagia six and twelve months after treatment (OR 2.02, p = 0.012 and 2.51, p = 0.003, respectively).
**Conclusion:** Sarcopenia in HNSCC patients receiving definitive (C)RT is an independent prognostic factor for worse survival outcomes and is associated with physician-rated toxicity.

*Sarcopenia - Bladder Cancer*

**Hansen, T.T.D., Omland, L.H., von Heymann, A., Johanse, C., Clausen, M.B., Suetta, C., Pappot, H. & Rafn, V.S.** 2021.

**Objective:** Sarcopenia is known to influence cancer-related complications and overall survival. However, the effect of cancer treatment on the development or progression of sarcopenia is relatively unknown. The primary aim of this systematic review was to determine the prevalence and development of sarcopenia among people with bladder cancer.
**Data sources:** A systematic search was performed in PubMed, Web of Science, and EMBASE. Studies with ≥2 assessments of sarcopenia were eligible for inclusion. Five retrospective cohorts were included with a total of 438 participants. The baseline prevalence of sarcopenia across studies varied from 25% to 69% and post-treatment prevalence from 50% to 81%. The average loss of muscle mass was 2.2% to 10% during a time course of 3 to 12 months.
**Conclusion:** The prevalence of sarcopenia markedly increased during cancer treatment in patients with bladder cancer. Further research into the effect of different treatment regimens on the development of sarcopenia, and how these changes might affect functional capacity and survival is needed.
**Implications for nursing practice:** The development of sarcopenia is important to understand because of its negative affect on quality of life, complications, and mortality. Further, understanding how sarcopenia develops during treatment could potentially strengthen nurses' future care plans for patients with bladder cancer.

*Sarcopenia - Pancreatic Cancer*

**Sakamoto, T., Yagyu, R., Uchinaka, E., Miyatani, K., Hanaki, T., Kihara, K., Matsunaga, T., Yamamoto, M., Tokuyasu, N., Honjo, S. & Fujiwara, Y.** 2020.

**Background:** Sarcopenia is a prognostic factor in various cancers. However, the impact of sarcopenia in patients with recurrent pancreatic cancer remains unclear. This study evaluated the prognostic significance of sarcopenia in patients with recurrent pancreatic cancer.
**Methods:** Seventy-four patients who developed postoperative recurrence of pancreatic cancer after undergoing pancreatectomies were enrolled. Sarcopenia in these patients was defined according to the psoas muscle index (PMI) measured via computed tomography at the third vertebra.
**Results:** The mean PMIs at the time of recurrence were 4.47 ± 1.27 $cm^2/m^2$ for men and 3.26 ± 0.70 $cm^2/m^2$ for women. Of the 74 patients, 65 (87.8%) were diagnosed with sarcopenia with low PMI. The 2-year post-recurrence survival curve in the sarcopenia group was significantly worse than that in the non-sarcopenia group (P = 0.034). Multivariate analysis revealed that sarcopenia at the time of recurrence was an independent prognostic factor (P = 0.043) along with a high neutrophil-to-lymphocyte ratio (P = 0.004), early recurrence (P = 0.001), and chemotherapy after recurrence (P = 0.005) in patients with recurrent pancreatic cancer. Furthermore, the area under the curve (AUC) of the combination of sarcopenia and time to

recurrence for predicting 2-year survival was 0.763, which was much higher than that of sarcopenia alone (AUC = 0.622).
**Conclusions:** Sarcopenia is a useful prognostic factor in patients with recurrent pancreatic cancer. The combination of sarcopenia and time of recurrence may more accurately predict post-recurrence survival than can sarcopenia alone.

*Sarcopenia - Cancer-Related Malnutrition*

**Kiss, N., Loeliger, J., Findlay, M., Isenring, E., Baguley, B.J., Boltong, A., Butler, A., Deftereos, I., Eisenhuth, M., Fraser, S.F., Fichera, R., Griffin, H., Hayes, S., Jeffrey, E., Johnson, C., Lomma, C., van der Meij, B., McIntyre, C., Nicholls, T., Pugliano, L. Skinner, T., Stewart, J. & Bauer, J.** 2020.
"This position statement describes the recommendations of the Clinical Oncology Society of Australia (COSA) regarding management of cancer-related malnutrition and sarcopenia. A multidisciplinary working group completed a review of the literature, focused on evidence-based guidelines, systematic reviews and meta-analyses, to develop recommendations for the position statement. National consultation of the position statement content was undertaken through COSA members. All people with cancer should be screened for malnutrition and sarcopenia in all health settings at diagnosis and as the clinical situation changes throughout treatment and recovery. People identified as "at risk" of malnutrition or with a high-risk cancer diagnosis or treatment plan should have a comprehensive nutrition assessment; people identified as "at risk" of sarcopenia should have a comprehensive evaluation of muscle status using a combination of assessments for muscle mass, muscle strength and function. All people with cancer-related malnutrition and sarcopenia should have access to the core components of treatment, including medical nutrition therapy, targeted exercise prescription and physical and psychological symptom management. Treatment for cancer-related malnutrition and sarcopenia should be individualised, in collaboration with the multidisciplinary team (MDT), and tailored to meet needs at each stage of cancer treatment. Health services should ensure a broad range of health care professionals across the MDT have the skills and confidence to recognise malnutrition and sarcopenia to facilitate timely referrals and treatment. The position statement is expected to provide guidance at a national level to improve the multidisciplinary management of cancer-related malnutrition and sarcopenia."

**Consultation with a Registered Dietitian**

Patients on any type of cancer treatment (oncology surgery, radiation therapy and/or chemotherapy) should, if at all possible, consult a Registered Dietitian (RD) whenever they experience any issues with nutrition or diet. The same applies to cancer survivors between cancer treatments and upon completion of their cancer treatment.


[Picture Credit: Ask the Dietitian]

**For individualised nutritional advice, consult a Registered Dietitian (RD) in your area by visiting: http://www.adsa.org.za/Public/FindARegisteredDietitian.aspx**

*Sarcopenia - Nutrition Interventions and Diet Therapy*

**Prado, C.M., Purcell, S.A. & Laviano, A.** 2020.

"Many patients with cancer experience poor nutritional status, which detrimentally impacts clinical outcomes. Poor nutritional status in cancer is primarily manifested by severe muscle mass (MM) depletion, which may occur at any stage (from curative to palliative) and often co-exists with obesity. The objective of this article was to discuss gaps and opportunities related to the role of nutrition in preventing and reversing low MM in cancer. It also provides a narrative review of relevant nutritional interventions for patients capable of oral intake. The impact of nutrition interventions to prevent/treat low MM in cancer is not well understood, potentially due to the limited number of studies and of clinically viable, accurate body composition assessment tools. Additionally, the type of study designs, inclusion criteria, length of intervention, and choice of nutritional strategies have not been optimal, likely underestimating the anabolic potential of nutrition interventions. Nutrition studies are also often of short duration, and interventions that adapt to the metabolic and behavioural changes during the clinical journey are needed. We discuss energy requirements (25-30 kcal/kg/day) and interventions of protein (1.0-1.5 g/kg/day), branched-chain amino acids (leucine: 2-4 g/day), β-hydroxy β-methylbutyrate (3 g/day), glutamine (0.3 g/kg/day), carnitine (4-6 g/day), creatine (5 g/day), fish oil/eicosapentanoic acid (2.0-2.2 g/day EPA and 1.5 g/day DHA), vitamin/minerals (e.g. vitamin D: 600-800 international units per day), and multimodal approaches (nutrition, exercise, and pharmaceutical) to countermeasure low MM in cancer. Although the evidence is variable by modality type, interventions were generally not specifically studied in the context of cancer. Understanding patients' nutritional requirements could lead to targeted prescriptions to prevent or attenuate low MM in cancer, with the overall aim of minimizing muscle loss during anti-cancer therapy and maximizing muscle anabolism during recovery. It is anticipated that this will, in turn, improve overall health and prognostication including tolerance to treatment and survival. However, oncology-specific interventions with more robust study designs are needed to facilitate these goals."

**Higashiguchi, T.** 2020.

"There are 4 purposes in the nutritional management for cancer patient. At first, we had better perform the early metabolic recovery from several invasive damages by some cancer treatments. At second, we give some special nutritional management for improvement from cancer cachexia. At third, we consider palliative nutritional management to terminal cancer patients based on pathophysiology of cachexia, their life styles and ethics. Finally, we give the social nutritional management for keeping high quality of life through well eating until the end of life. The basic nutritional management for cancer patients is administration of adequate amount of energy, protein/amino acids and micronutrients with suitable rehabilitation in order to prevent sarcopenia and malnutrition. In this paper, we explained about the metabolic influences to normal tissues, especially skeletal muscle, during chemotherapy. Also we mentioned importance to prevent sarcopenia and malnutrition during cancer treatment especially chemotherapy. Additionally, we showed the new topic about assessment for malnutrition, such as GLIM criteria, which is the global nutritional assessment formula for malnutrition including weight loss, low BMI and reduce of muscle mass. Now, we can recommend to use the global nutritional assessment and nutritional therapies even for cancer patients."

**Medical Disclaimer**

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

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