CE

Sarcopenia: What Every NP Needs to Know

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ABSTRACT

Sarcopenia is a complex geriatric condition resulting in age-related loss of muscle mass, strength, and function. Onset occurs in adults as young as 40 years old and affects up to 50% of those over 80 years of age. Sarcopenia results in reduced quality of life, disability, and significant health care costs. Diagnosis involves a history, physical, and imaging tests. Treatment requires a multidisciplinary approach to address comorbidities, diet, and exercise prescription. As gatekeepers in primary care, nurse practitioners' knowledge of evidenced-based interventions for sarcopenia is critical if they are to be an effective part of the solution for this significant health care challenge.

Keywords: geriatric condition, muscle loss, progressive resistance training, sarcopenia

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Sarcopenia is a complex geriatric condition that has emerged over the last 20 years and is defined by low muscle mass and a decline in walking speed or grip strength.[1] First described in 1997 by Rosenberg,[2] the term sarcopenia comes from the Greek roots of the word *sarx* for flesh and *penia* for loss. Many consensus groups have worked to develop and standardize operational criteria for use in the research and clinical domains. Three notable ones are the European Working Group on Sarcopenia in Older People (EWGSOP),[1] the International Working Group on Sarcopenia,[3] and the Foundation for the National Institute of Health.[4] Unfortunately, each group's approach to evaluating muscle function and mass is slightly different, and there remains no universal consensus on how best to standardize the operational criteria.

ECONOMIC BURDEN

A United States census report projects more than doubling of the population of those over the age of 65 from 35 million in 2000 to 86.6 million in 2050.[5]

This CE learning activity is designed to augment the knowledge, skills, and attitudes of nurse practitioners and assist in their diagnosis and treatment of sarcopenia.
At the conclusion of this activity, the participant will be able to:
A. List common physiologic etiologies associated with sarcopenia
B. Describe appropriate screening/diagnostic tools when evaluating and diagnosing sarcopenia
C. List 2 evidence-based strategies to help prevent, attenuate or reverse the effects of sarcopenia
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The authors do not present any off-label or non-FDA-approved recommendations for treatment.

This activity has been awarded 1.0 contact hours for nurses of which 0.5 credit is in the area of pharmacology. The activity is valid for CE credit until October 1, 2017.

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The prevalence of sarcopenia ranges from 13% in individuals 60 to 70 years old and as high as 50% in those over 80 years of age.[6] Past estimates of US health care costs associated with the treatment of sarcopenia ranged from $11.8 to $26.2 billion[7] and are likely much higher today. In comparison, fracture-related costs of osteoporosis, a more widely recognized and debilitating disease, are estimated at $20 billion today.[8] Sarcopenia is considered a risk factor for physical disability independent of age, ethnicity, obesity, socioeconomic status, morbidity, and health behaviors.[9]

PHYSIOLOGY OF SKELETAL MUSCLE LOSS WITH AGING

The rate of decline in muscle mass during normal aging is 3% to 8% per decade after the age of 40; this rate accelerates after age 65. The decline in muscle strength occurs more rapidly than muscle mass with a reduction in strength of 20% to 40% in upper and lower limb muscles by 70 years of age.[10] Muscle loss in sarcopenia can be categorized as either physiologic or pathologic.[11] Physiologic sarcopenia results from the functional decline of many systems of the body that occurs with normal aging. Potential physiologic causes include genetics, sedentary lifestyle, lack of exercise, and immobility or inactivity because of disability. Other causes are reduced levels or responsiveness to trophic hormones such as growth hormone, androgens, or estrogens; nutritional deficiency or imbalance; and neuromuscular inefficiency from muscle fiber atrophy or apoptosis. Pathologic sarcopenia is attributed to cachexia and disease states such as alcoholic liver disease, AIDS, chronic obstructive pulmonary disease, congestive heart failure, and neurogenic degeneration linked by the damaging influence of proinflammatory cytokines.[11]

A characteristic of muscle loss with aging is the predictable and steady loss of motor units.[12,13] Skeletal muscle differentiates into 3 types of motor units, and each is composed of different types (I, IIx, and IIa) of muscle fibers. Slow (type I) motor units have the smallest number of fibers and contract slowly but have increased endurance capacity. Fast fatigable (type IIx) motor units generate more force and velocity but only for a short duration. Finally, fast fatigue-resistant (type IIa) motor units are an intermediate between slow and fast fatigable motor units.[13] Aging results in varying degrees of neurodegeneration of muscle motor units and can occur both centrally and peripherally, with fast motor units being most affected. Although some fibers may reinnervate through collateral sprouting, this can result in conversion of type II to type I fibers. The net result is a loss of type II motor units and fibers causing muscle atrophy and decreased force production, which negatively affects ambulation, balance, and activities of daily living.[13,14]

Other contributing mechanisms for muscle loss include hormonal changes, oxidative stress, and inflammation. Aging is associated with declines in growth hormone (GH), insulin-like growth factor 1, and androgens and estrogen production, resulting in a less anabolic environment.[15] Oxidative stress results when enzymatic and chemical reactions produce highly reactive molecules, which tend to accumulate over time. At low levels, they trigger adaptive responses, but higher levels cause alterations of lipids, proteins, mitochondria, and DNA sequences. The net result of these reactions is increased proteolytic activity and apoptosis of muscle cells.[13,16] Skeletal muscle can secrete cytokines and myokines that are involved in inflammatory processes. Some cytokines that increase are interleukin 6 and tumor necrosis factor α. Higher levels of inflammation are associated with a physical decline in older persons because of decreased muscle mass and strength. These effects may be caused by the catabolic effect that inflammatory mediators have on muscle. However, true causation has not been proven.[16,17] A related hypothesis is that physical inactivity promotes an imbalance favoring proinflammatory mediators and an increase in visceral fat, which contributes to the development of cardiovascular disease, type 2 diabetes mellitus, and cancer.[18]

ASSESSMENT

The onset and progression of sarcopenia are insidious and often not recognized until significant limitations occur. It is important that nurse practitioners (NPs) remain vigilant because accurate assessment, early diagnosis, and intervention may decrease premature morbidity and mortality. From a clinical perspective,