

## CE405 | 1.0 hr

### Sarcopenia Robs Older Adults of Strength

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#### Course Objectives

The goal of this program is to provide nurses with the latest knowledge about age-related sarcopenia. After studying the information presented here, you will be able to:

- Define sarcopenia and describe its consequences.
  - Identify its causes and contributing factors.
  - Discuss modalities used in its prevention and management.
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Eighty-three-year-old Ida lives alone in her two-story home and has always taken pride in her independence and self-reliance. But over the past three years, she has had to make changes to her routine as her muscle strength has decreased. Too weak to climb the stairs to her bedroom, she remains on the first floor. With her gradual loss of arm and leg strength, getting in and out of the tub on her own is impossible, and even standing up from the toilet is taxing. Because her balance is poor, she must hold onto furniture when she walks in the three remaining rooms she uses.

Ida is at high risk for falls, loss of independence, increased isolation, and depression.<sup>1,2</sup> She is one of about 8.9 million Americans over age 80 who have a condition called sarcopenia.<sup>3</sup> Sarcopenia is the loss of skeletal muscle mass and strength, leading to muscle weakness. (The word sarcopenia comes from the Greek words sarx, which means flesh, and penia, meaning loss.)<sup>1</sup> The condition is specifically associated with normal aging.<sup>1,4</sup> About 30% of people over age 60 will develop sarcopenia, and the percent increases with age.<sup>1,4</sup>

Nurses are likely to encounter patients such as Ida in hospitals after a fall, in assisted-living facilities, or even in their own homes. Nurses must be able to address this common problem by identifying causes and consequences and by teaching preventive measures to improve quality of life.

Of the three classes of muscle tissue, skeletal muscle (which attaches to and moves bones) is the one involved in sarcopenia. Skeletal muscle represents 45% to 50% of an average adult's body weight. Muscle tissue is composed of parallel fibers held together in bundles of connective tissue. Groups of muscle fiber cells work together to contract and relax, resulting in movement of the arms, the legs, and other body parts. Nerve tissue is directly involved in muscle movement by carrying neuromuscular impulse messages from the brain and the spinal cord.<sup>5</sup>

As people age, muscle mass (the number and size of muscle fibers) declines, and body fat increases. The process starts at about age 35 and advances incrementally, with a loss of about 1% to 2% of muscle mass per year after age 50. By age 60, body composition has changed, with an average of 15 pounds of

muscle mass lost and 30 pounds of fat gained.<sup>1,3</sup>

With aging, there is a loss of nerves, especially those that branch out from the spinal cord into peripheral skeletal muscle. When a nerve is injured or dies, nearby nerves branch out to create collateral nerve innervation into adjacent muscle tissue. Without this process, muscle would eventually atrophy and die. Nevertheless, both the number and function of nerves slowly decline with aging, resulting in inadequately innervated muscles and so contributing to sarcopenia.<sup>1,6</sup>

### **The forces behind sarcopenia**

Multiple factors are responsible for sarcopenia, including hormonal, metabolic, nutritional, and lifestyle changes as well as normal age-related changes in muscles and nerves. With aging, the secretion of multiple hormones declines. Some of these hormones, including estrogen, testosterone, growth hormone (GH), and insulin-like growth factor<sup>1</sup>, play an important role in skeletal muscle development and strength. Skeletal muscle performance declines at the same time that hormone levels do, indicating the connection with sarcopenia.<sup>1,3</sup>

With advancing age, insulin resistance grows, as does body fat. This change may accelerate sarcopenia by reducing absorption of amino acids needed for the synthesis of skeletal muscle proteins.<sup>1,3</sup>

The decline in food intake associated with aging (anorexia of aging) is an important factor in the development and progression of sarcopenia. Malnutrition due to anorexia leads to loss of lean muscle mass. It has been reported that a high percent of people over age 60 eat less than 75% of the RDA of protein.<sup>4</sup> If a person's intake of calories and protein is inadequate, the calories consumed from protein may actually be used for energy to support basic body processes instead of going toward the ongoing maintenance and repair of lean muscle mass.

Vitamin D deficiency correlates with an increased risk of sarcopenia in elderly people.<sup>7</sup> An elderly person may have a decreased intake of vitamin D from food or sunlight. He or she also may be unable to absorb vitamin D as efficiently because of malnourishment or a lack of the enzymes (made from protein) needed to convert vitamin D from sunlight to its active hormonal form.

A sedentary lifestyle plays a significant role in the decline of muscle mass and function with aging. Two-thirds of people over age 75 do not engage in physical activity in their leisure time.<sup>3</sup> Older adults who are less physically active have less skeletal muscle mass and an increased risk for developing disease and disability of musculoskeletal tissues.<sup>3,4</sup> The lower extremity muscles, so essential for daily activities, are the most affected as people age.<sup>8,9</sup> Bedridden, inactive elderly people lose an estimated 1.5% of their muscle mass daily; one day of bed rest requires two weeks of reconditioning to restore baseline muscle strength.<sup>8</sup>

### **Searching for answers**

Because muscle weakness can be a symptom of many medical disorders, careful subjective and objective nursing assessments are essential in identifying possible causes of muscle weakness other than sarcopenia. The basic elements of the assessment should include information on —

1. Height and weight: Question any weight loss or gain. Was it intentional? Find out about the patient's

ideal weight and body mass. Height and weight data help identify obesity or drastic weight loss.

2. Nutrition: What is the typical daily dietary intake? Is the dietary intake sufficient to supply the essential amounts of carbohydrates, fat, protein, vitamins, minerals, and calories?

3. Lifestyle: Obtain information on activity and rest patterns, both past and present. What does the patient do to stay fit? This helps to assess limitations and plan interventions. Any falls? A patient report of recurrent falls should lead to a more detailed evaluation.

4. Ability to perform ADLs: What kind and amount of help does the patient need with bathing, dressing, walking, and preparing and eating meals? How is the interior and exterior of the home laid out, e.g., room size, stairs? Assess risk for injury.<sup>10,11</sup>

5. Medications: Older patients are more prone to drug toxicities and adverse effects. Review all medications with the patient, including frequency, duration, indications, and effectiveness of daily medication regimen. Prolonged use of medications such as steroids, potassium-depleting drugs, and colchicine (an antigout agent) can precipitate progressive muscle weakness.<sup>12,13</sup> Statins or other drugs to reduce cholesterol may cause myalgia and muscle weakness in some people.<sup>12,14</sup>

Excessive use of muscle relaxants, digoxin, alcohol, or recreational drugs can contribute to muscle weakness.<sup>13</sup> Many medications, medication-medication interactions, and medication-food interactions can also affect the absorption of nutrients, including those needed to maintain and repair muscle tissue. Some medications may reduce appetite, thereby compromising nutritional intake and leading to anorexia of aging and malnutrition.

6. Medical and surgical history: Obtain a history of chronic or muscle-debilitating diseases and illnesses, total joint replacement, and trauma. Does the patient have a history of anemia, connective tissue disease, diabetes mellitus, renal disease, or thyroid disease?

Hypothyroidism can lead to diffuse muscle weakness that is more pronounced in the lower extremities. In contrast, with hyperthyroidism the shoulder girdle muscles tend to become weak, and muscle function may become compromised.<sup>8</sup> Hematologic conditions, such as low hematocrit and hemoglobin levels, create inadequate oxygen supply to muscles, leading to decreased muscle strength.<sup>15</sup>

Rheumatoid arthritis and osteoarthritis are diseases of the musculoskeletal structures that may be associated with sarcopenia. Progressive symmetrical muscle weakness can occur in osteomalacia (abnormal softening of bone) and osteoporosis, which is often caused by a deficiency of phosphorus, calcium, or vitamin D. Muscle weakness in elderly patients often affects muscles of the pelvis and the quadriceps. Muscle weakness and atrophy can result from a herniated disk after prolonged pressure on the peripheral nerve roots. Typically, the patient complains of back pain in addition to muscle weakness. Distal muscle weakness can also be a sign of peripheral neuropathy, which has many causes. Muscle weakness may also be a symptom of multiple sclerosis.<sup>8,13</sup>

Once you obtain information from the patient and family, ask the following questions to further characterize the muscle weakness:

Was the onset gradual or sudden? Is the muscle weakness progressive, intermittent, or stable? Is it

unilateral or bilateral? Is it generalized or localized to one muscle area? Sudden onset of muscle weakness is often associated with transient ischemic attacks or stroke, which have to be ruled out. The red flags for TIA or stroke are sudden weakness on one side of the body or both, loss of coordination, unexplained dizziness, changes in speech, or a sudden dimness or loss of vision, particularly in one eye. These findings require immediate attention.

Localized weakness can be due to a spinal cord or brain lesion, for example, in MS or cervical or lumbar spinal stenosis (narrowing of the spinal canal).<sup>8,13</sup>

Symptoms such as numbness, muscle pain, twitching, change in sensation, and heat intolerance provide valuable information. For example, a loss of sensation in the feet can lead the nurse to suspect neuropathy associated with long-term poorly managed diabetes or folate deficiency. Heat or cold intolerance can be a symptom seen in thyroid dysfunction.

Chronic pain in older patients can cause muscle weakness due to lack of muscle use. Ask questions about trauma to the muscles and surgery, such as hip or knee replacement.<sup>5</sup> Remember that it takes much longer in the elderly for injured muscles to recover.<sup>6</sup> If a patient complains of pain or other discomfort in addition to muscle weakness, question its nature, severity, location, and duration. Use a pain-rating scale to evaluate severity.<sup>5,16</sup>

After assessing weight and height, observe how the patient walks, gets on and off the examining table, and gets dressed.<sup>5,11</sup> Unsteady gait can be due to weakened muscles.<sup>9</sup> Observe whether the patient favors one side. Does the patient use a cane or a walker? The muscle assessment includes observing and inspecting muscle bulk and tone. Look for atrophy of the muscle, which could be caused by disrupted nerve innervation to a damaged muscle or prolonged immobility. Assess the patient for signs of inflammatory arthritis, such as painful, red, and swollen joints. Palpate muscles and joints for tenderness. To evaluate lower extremity strength, ask the patient to walk on the heels and toes, rise from a chair without using the arms, and push or pull extremities against resistance.<sup>5</sup> A manual push or pull test can measure muscle strength on a 0-to-5 scale, with 0 indicating no muscle contraction detected and 5 indicating normal strength.

Sometimes imaging studies are necessary to confirm a diagnosis or to rule out contributing factors. For example, a plain X-ray of the spine can diagnose certain spinal disorders and osteoarthritis. CT scan or MRI can identify damaged muscle and soft tissue structures or a lesion of the brain or spinal cord.<sup>5</sup>

Testing for sarcopenia may also include measuring muscle mass. This can be done by dual-energy X-ray absorptiometry (DEXA).<sup>3</sup> Falling below the 50th percentile in the national standards for a given age indicates that a person has sarcopenia.<sup>17</sup> A registered dietitian can determine a person's muscle mass by measuring skin fold thickness along with arm and leg circumference.

Because muscle weakness can be a symptom of many medical disorders, additional tests will be helpful in ruling out treatable conditions that in many cases could precipitate or aggravate sarcopenia. An albumin level below 3.5 g/dL raises concern for malnutrition.<sup>10</sup> Helpful blood tests to consider include those for thyroid-stimulating hormone, CBC, and blood glucose level.<sup>15,18</sup> Measurement of serum electrolyte and bicarbonate levels can rule out acidosis or alkalosis; this is especially important if the

patient complains of cramps and muscle pain with the muscle weakness.<sup>11</sup>

### **To the rescue**

The priorities of treatment for sarcopenia are physical exercise and a diet with sufficient protein, calories, vitamins, and minerals. But many elderly people find it difficult to maintain a balanced diet. A consultation with a registered dietitian to obtain a diet history and develop a plan for daily food intake is a necessary part of the evaluation, prevention, and treatment of sarcopenia.

Physical exercise, specifically muscle resistance training, helps preserve or even increase lean body mass and strength. Caring for hospitalized elderly patients should include an early physical therapy referral. The major muscles required for sitting up, standing up, and pulling up are crucial for performing ADLs. An exercise plan tailored to strengthening large weight-bearing and supporting muscles benefits all older adults. A routine walking program can help protect against sarcopenia.<sup>19</sup> Extremity resistance exercise has led to increased strength and muscle mass even among frail elders over age 90.<sup>20,21</sup>

Drugs such as growth hormone, estrogen, and testosterone have been suggested as a means to build muscle mass in older adults with sarcopenia. Studies have shown mixed results, and more research is needed before such treatments can be safely and confidently prescribed.<sup>2,22-24</sup>

Some research has demonstrated that testosterone supplements increase muscle mass and strength in healthy young men who have a deficiency in testosterone secretion. Studies on healthy older men showed similar results. But it is not known yet whether testosterone supplements have the same effect on physically impaired or frail elderly men. In addition, there is concern about adverse effects in older men, such as the risk for cardiovascular disease. Increased red cell mass from testosterone may lead to stroke. Testosterone replacement can also cause sleep apnea, possibly by having some effect on upper airway muscles and nerves. Men with prostate cancer should not use testosterone supplements because the progression of neoplasm can be exacerbated.<sup>2,22</sup>

Several studies indicate that recombinant human growth hormone may help prevent or even reverse aging-related loss of physical or functional capability. Some consider rhGH an antiaging medicine; however, this claim remains controversial, and further studies are needed.<sup>23,25</sup> The treatment has a variety of adverse effects, such as fluid retention, peripheral edema, carpal tunnel syndrome, arthralgias and joint swelling, gynecomastia, glucose intolerance, and hypertension. Evidence also exists that rhGH treatment can cause or accelerate colon, breast, and prostate cancer, and it is very expensive.<sup>4,23</sup>

### **Act now, be strong later**

New research indicates that sarcopenia should not be accepted as a necessary part of aging. Surprisingly, some recent research indicates that sarcopenia could have its origins in early life. One study documented a relationship between birth weight, weight at 1 year, and adult muscle strength.<sup>26</sup> Beginning regular exercise at an early age helps maintain lean muscle mass and may be crucial in preventing sarcopenia later. Programs for muscle-strength training tailored for people of all ages are desirable; it is never too late to start muscle training.<sup>19,20</sup> Promoting independence and teaching elderly patients and their families the consequences of immobility are part of the nursing role.<sup>16</sup>

Maintaining a diet with sufficient calcium, vitamin D, protein, and calories and performing consistent weight-bearing exercises help deter sarcopenia. Early identification and treatment of medical conditions and diseases that precipitate loss of lean muscle mass also are important to prevent sarcopenia.<sup>4</sup>

The study of sarcopenia is relatively new. More research is needed to understand the pathophysiology of sarcopenia and identify additional treatments. We do know that sarcopenia is an extremely common condition in elderly people and that it can lead to falls, disability, and loss of independence. Numerous interrelated factors contribute to its development and progression. While treatments with estrogen, testosterone, and growth hormone have been suggested and researched, they have shown mixed results. Adequate protein, calories, and exercise are clearly beneficial in restoring or even improving strength and function of weakened muscles. Nurses caring for elderly patients should be aware of this problem and be prepared to provide education about remedies. Maintaining muscle function is essential in ensuring quality of life in the older population.

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