



# Chapter 9: Age-Related Changes of the Musculoskeletal System

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## What You Will Learn

- Normal changes in the musculoskeletal system that occur in the elderly
- Risks associated with decreased bone density, loss of muscle mass, and joint degeneration in the elderly

## Key Terms

*Atrophy* — Decrease in the size of a cell, tissue, organ, or multiple organs, associated with a variety of pathological conditions, such as abnormal cellular changes, ischemia, malnutrition, or hormonal changes

*Bone Density* — The amount of matter per cubic centimeter of a bone; the reduction in skeletal mass that predisposes patients to fractures; decrease seen in osteoporosis

*Degenerative Disc Disease* — A change in the discs that occurs with aging; the loss of intervertebral disc flexibility, elasticity, and shock-absorbing characteristics; disc change from supple to rigid

*Musculoskeletal System* — The body system that includes the bones, joints, muscles, and tendons

*Osteoarthritis* — A type of joint inflammation marked by progressive cartilage deterioration in synovial joints and vertebrae

*Sarcopenia* — A decrease in the number and size of muscle fibers with a resulting decrease in overall muscle mass

The age-related changes of the **musculoskeletal system** are of special concern in the elderly because of the risk of falls in long-term care facilities. Normal aging changes contribute to activity intolerance and impaired physical mobility, leading to weakness and increased risk of falls. Many falls can be prevented with the proper knowledge of the changing musculoskeletal system, good assessment, and solid fall prevention programs. This system is also important to this age group because it is the most common source of pain and reduces independence. Maintaining as much strength and function as possible reduces pain and dependency.

There are 206 bones in the body. These bones perform several functions that include providing support for the body, storing minerals, producing blood cells, providing the body leverage and movement, and protecting the body's organs. Unfortunately, around middle age, bone mass (or **bone density**) gradually begins to decline. This occurs because aging causes an imbalance between the cells that produce bone and those that absorb bone. As bone growth slows, the bones become thin and more sponge-like. This occurs more rapidly in women, usually within five years of menopause. Therefore, much of women's bone loss can be contributed to menopause. Eventually, the bones become so fragile that even minor trauma can cause a fracture. When the bones are weak and do not support the body's structure, there is an increased risk for fractures, falls, and gait problems.

Bone loss in the vertebral bodies can lead to compression fractures, often called pancake fractures. They are called pancakes because the vertebra appear flat like a pancake. Intervertebral discs also decrease in height, and the moisture content lessens. **Degenerative disc disease** is the advanced form of this process. Degenerative disc disease can cause severe pain in the back and the extremities, further putting the older person at risk for falls and fractures.

Muscle loss begins around the age of 30 and continues throughout life. As aging occurs, the number and size of muscle fibers begin to decrease, resulting in a decrease in muscle mass. This is thought to be due to changes in growth hormone and testosterone, which stimulate muscle development. The result is an inability to fully contract the muscles. The loss of muscle mass and muscle strength is called **sarcopenia**. The decrease in muscle strength seen with aging is more likely related to inactivity, malnutrition, or disease rather than aging itself. It is also thought that decreased strength may be related to a reduced blood supply to the muscles. The loss of muscle mass and strength is more evident in the lower extremities. This is most likely because the upper extremities are used frequently during the day when performing ADLs, but the legs are used in spurts for short distance walking. This puts every nursing home resident at risk for falls, especially those who are ill or have restricted mobility. For residents who are bedridden or in a chair much of the time, skin breakdown and painful contractures are also concerns.

Muscles may exhibit **atrophy**. Atrophy occurs as the cells in tissue shrink. The cause of this cell shrinking is unknown, but may be due to reduced use, decreased workload, or reduced stimulation by nerves.

There is usually less body fat on an older person, which can result in the resident feeling cold even when a younger person does not. Temperature control can further be a problem because there is also less sweat gland activity.

Joints are where two bones interconnect. Cartilage provides the lubricating surface of most joints. Aging causes the water content of cartilage to decrease resulting in the joints being unable to adapt to repetitive stress such as walking. Tendons attach muscle to bone, and ligaments attach bone to bone. Ligaments lose elasticity, further decreasing the joints' ability to accommodate stress. Joint space narrows with these changes, and pain and stiffness result. This is called **osteoarthritis**. The pain associated with osteoarthritis often leads to inactivity and decreased muscle strength. The old adage, "If you don't use it, you lose it," applies here.

The musculoskeletal system is of special concern in the elderly because it is the system that carries and moves the body. Although there is no known way to prevent the painful changes in aging bones, muscles, and ligaments, having knowledge of the normal musculoskeletal changes will separate disease signs and symptoms from the normal changes of aging.

# Chapter 9 Review Questions

## Define the following terms:

1. Atrophy —
2. Bone Density —
3. Degenerative Disc Disease —
4. Musculoskeletal System —
5. Osteoarthritis —
6. Sarcopenia —

## Circle “True” or “False” as appropriate for the following statements:

7. (*True /False*) — Musculoskeletal problems seldom affect the elderly.
8. (*True /False*) — Changes seen in bone with aging include a decrease in bone mass and increasing fragility.
9. (*True /False*) — Bones weaken with age due to an imbalance between cells that produce bone and cells that absorb bone.

## Answer the following multiple choice questions:

10. Temperature control can be a problem in the elderly because:
  - a. There is usually less body fat on an older adult.
  - b. Nursing homes are usually quite cold.
  - c. They cannot feel hot or cold.
  - d. They have overactive sweat glands.
11. Older women can contribute much of their bone loss to:
  - a. Menopause
  - b. Numerous fracture
  - c. Urinary tract infections
  - d. Years of hard work
12. Some muscle tissue shrinks with age. This is called:
  - a. Atrophy
  - b. Degenerative disc disease
  - c. Osteoarthritis
  - d. Shrinkage of the greater muscles

## Complete the following:

13. Muscle mass decreases with aging because there is a decrease in the \_\_\_\_\_ and \_\_\_\_\_ of muscle fibers.
14. The age-related loss of muscle mass and strength puts every resident at risk for \_\_\_\_\_.
15. List two joint changes seen with aging.
  - a.
  - b.