



The musculoskeletal system

The musculoskeletal system, which is made up of the body's muscles and bones, provides support, allows for movement, and protects the body's internal organs.

Muscles and bones change as people age, often becoming weaker and leaving individuals vulnerable to musculoskeletal disorders.

The less muscles and bones are used, the weaker they become, which is why ambulating residents is so important.

To better care for their residents, CNAs should have a thorough understanding of the musculoskeletal system and how its components function.

This review of the musculoskeletal system will teach you about the various types of muscles and joints and explain the structure of bones.

You will also learn how disorders such as **osteoporosis**, **osteoarthritis**, and **fractures** affect the musculoskeletal system.

Have a good day of training, and stay tuned for next month's issue of **CNA Training Advisor**, which will cover sleep disorders.

About your CNA training advisor

Judith Ryan, RN, BSN, is the senior advisor for **CNA Training Advisor**. She is the director of staff development at Abbott House, a 55-bed nursing home in Lynn, MA. Ryan has been a nurse for 20 years. As part of her job, she is responsible for conducting inservices on a wide range of topics for CNAs.

PROGRAM PREP

Program time

Approximately 30 minutes

Learning objectives

Participants in this activity will learn how to:

- Briefly describe the anatomy and functions of the muscles and bones
- Identify the functions of cartilage, tendons, and ligaments
- Discuss some of the common disorders of the musculoskeletal system

Preparation

- Review the material on pp. 2–4
- Duplicate the **CNA Professor** insert for participants
- Gather equipment for participants (e.g., an attendance sheet, pencils, etc.)

Method

1. Place a copy of **CNA Professor** and a pencil at each participant's seat
2. Conduct the questionnaire as a pretest or, if participants' reading skills are limited, as an oral posttest
3. Present the program material
4. Review the questionnaire
5. Discuss the answers

Tips and tools for CNA training

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THE MUSCULOSKELETAL SYSTEM

As people age, their muscle mass may decrease, bones may become fragile, and joints may become irritated or inflamed. CNAs who understand the structure and functions of the musculoskeletal system are better equipped to help their residents handle these changes.

Muscles

The four functions of the muscles are to:

- Produce movement (e.g., walking, scratching)
- Perform vital body functions (e.g., heartbeat)
- Protect the abdomen's organs
- Help support the body structure

Muscles are bundles of long, slender cells or fibers that can contract. They range in length from thousandths of an inch to several inches. Muscles come in various shapes, from the long, rounded muscles of the legs to the flatter muscles of the heart. Each muscle fiber has a nerve to permit very fine adjustments in movement.

The brain sends messages to the muscles via the nervous system. Reaction time is the short period elapsing from the moment the brain sends the message until it is received by the muscle. Driving a vehicle is a prime example of reaction time. For example, let's say a dog unexpectedly runs in front of your car. To avoid hitting the dog, you must quickly apply the brakes. The reaction time is the slight delay from the moment you saw the dog until the time you applied your foot to the brake.

Types of muscles

The body has three types of muscles:

- **Voluntary muscles.** The first type of muscles are called voluntary muscles because we can control them. For most people, muscle

movement is a natural, effortless part of our daily lives. We learn to control our muscles when we are very young. Over the years, actions such as walking, chewing, and reaching become automatic through constant repetition.

Because most of us take muscle movements for granted, we don't realize how much effort and repetition is required to perform them. It only becomes obvious to us in special situations, such as learning to play the piano or use a walker or cane correctly.

When we move, one group of muscles contracts and shortens, and the opposite muscles relax and lengthen. To see how this occurs, put one hand on either side of your neck. Bend your head to one side and then the other. You can feel the contracting muscles shorten and the relaxing muscles lengthen. There are approximately 600 voluntary muscles in the body.

- **Involuntary muscles.** The second type of muscles are called involuntary muscles because we do not consciously control them. Involuntary muscles are in the walls of the internal organs. They force food through the intestines, pump blood, and contract the uterus during childbirth.

- **Cardiac muscle.** The third type of muscle is the cardiac muscle, which contracts and relaxes to maintain the heartbeat.

Muscle tone and movement

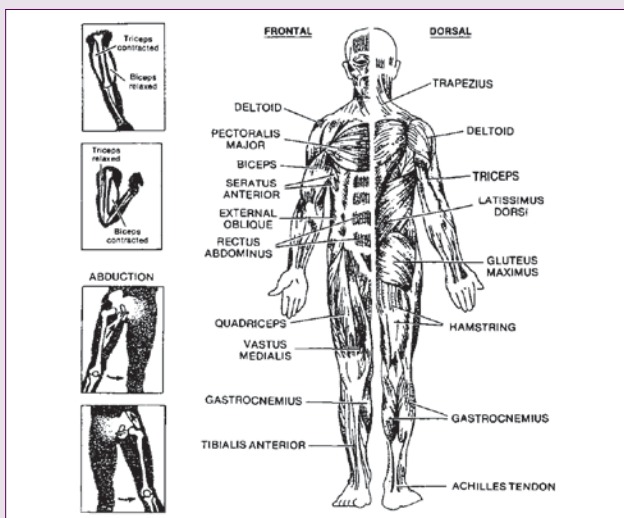
Our muscles are never completely relaxed while we are conscious. This slightly contracted state of the muscles is called tone. Muscle tone allows us to maintain our body position and holds our bones in place.

Exercise and proper diet are essential for maintaining muscle tone. The more muscles are used, the better their tone. CNAs can help their facility's residents maintain muscle tone through ambulation, posture changes, and range of motion exercises.

When muscles become paralyzed, they lose tone. Muscles without tone are called flaccid. For example, people who have had a severe stroke have flaccid muscles.

Flaccid muscles are unable to hold the body in proper position or keep the bones in alignment. It is then necessary for nursing staff members to provide body support to patients to prevent their bones from drifting out of alignment.

The muscular system



Source: HCPro, Inc.

Questions? Comments? Ideas?

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THE MUSCULOSKELETAL SYSTEM

The skeleton

Now let's review the bones and the skeletal system. The average adult has 206 bones in his or her body.

The functions of the bones are to:

- Provide support and shape to the body
- Protect delicate internal organs
- Store and help maintain the correct level of calcium in the body
- Manufacture blood cells in the marrow of the bone

The skull, ribs, and sternum (i.e., breastbone) have the main job of protecting internal organs. The 24 differently shaped spinal bones, called vertebrae, protect the spinal cord.

The skeleton consists of two basic sections. The first section is composed of the skull, spine, ribs, and sternum. The second section includes all of the other bones attached to the first section, such as the shoulder bones, arm bones, pelvic bones, and leg bones.

Joints

Any place where two or more bones come together is called a joint. The manner in which the bones are joined determines whether they are able to move and how they move. The skull is one example of joined bones that do not move.

Some joints are called hinge joints because they act in the same way as a door hinge. They can move back and forth in only one direction. The elbow, knee, and finger joints are all hinge joints.

Another type of joint is the ball and socket, which can move in more than one direction. The shoulder and the hip are ball-and-socket joints.

There are several other types of specialized joints that allow certain useful movements. The thumb is one example. It can rotate, but not as fully as a ball-and-socket joint.

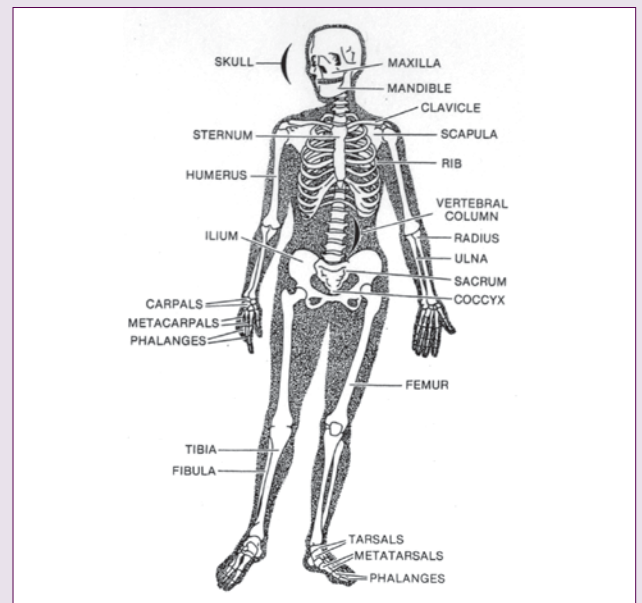
The spine is another type of specialized joint. The spine can glide and twist to some degree. Between each of the spinal bones, there is

a disc of hard cartilage to help absorb shocks to the bones that occur with each step we take.

Because of the pressure on the spine during our daily activities, we are about 3/8 of an inch shorter by the time we go to bed than we were when we got up.

You have probably heard of tendons, cartilage, and ligaments. Tendons are strong, white fibrous tissues that attach the muscle to the bone. There are several types of cartilage, but when we are referring to the skeleton, it is the fibrous coating at the end of a bone. Cartilage allows the bones of the joints to move smoothly. Ligaments are bands of fibrous tissue that connect joints or cartilage. They provide support and strengthen joints.

The skeletal system



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THE MUSCULOSKELETAL SYSTEM

Bones

Bones consist of several layers of material. The outer layer is a thin, tough membrane of fibrous tissue that protects the bone and provides support for the tendons that attach the muscles to the bone.

The next layers are composed of dense, hard bone tissue. They are more fibrous than solid and make the bone somewhat elastic. In cases of minor injury to the bone, the result may be only a bone bruise, rather than a break.

Within these layers—and making up the largest part of the bone—is an area called spongy bone because it has little hollows like a sponge. The innermost area of the bone is hollow, containing marrow in which blood cells are produced.

Every layer of bone has blood vessels to supply nutrients and oxygen and carry away waste products. Bone also has numerous nerve fibers.

Bone density decreases as we age and bones lose calcium and other minerals. As a result, bones are more brittle and may break more easily. The cells of the bones continue to renew themselves during the years, but the process slows to some degree as we age.

Weight-bearing bones, such as the femur, develop heavy mineral deposits so that they can perform their important function. The more the legs are used, the stronger the leg bones become. Much of the mineral deposit in the leg bones is lost when a person does not walk. This is why ambulating nursing facility residents is so important.

Common musculoskeletal system disorders

The following are a few of the most common disorders of the musculoskeletal system:

➤ **Fractures.** The most common injury to a bone is a fracture. It may be a closed fracture (i.e., when there is no break in the skin) or an open fracture (i.e., when there is a skin break). Fractures may or may not go completely through the bone. Fractures may also involve a partial crushing or splintering of the bone.

➤ **Osteoporosis.** Osteoporosis is the most common bone disease in the world. Osteoporosis causes the bones to gradually lose their minerals, and the hollows in the spongy part of the bone become larger. Fractures are more likely to occur as the bones become more porous.

➤ **Osteoarthritis.** Osteoarthritis is the result of the cartilage wearing down at the ends of the bones where they form a joint. Often, the bones begin to rub against each other and become rough. This results in painful joint movement. The joints most often affected are those that endure the most wear throughout the years, such as the knees and the spine.

➤ **Sprain/strain.** A muscle sprain is the severe wrenching or twisting of a joint with a partial rupture of the ligaments. Tendons, blood vessels, and nerves may also be damaged. Severe sprains cause swelling, and the ruptured blood vessels cause discoloration. The pain is usually so great that the joint cannot be moved. When treating a sprain, it is best to:

- Rest the joint
- Avoid all weight-bearing activities
- Elevate the area
- Apply ice or cold compresses to reduce swelling
- Seek medical attention to check whether a cast or surgical repair is necessary

A muscle strain is the overstretching of a muscle without resulting in swelling. However, it is important to rest the muscle and take care not to injure it further while it is weak.

➤ **Tendonitis/bursitis.** Tendonitis, the inflammation of the tendons and the tendon-muscle attachments, is also a common disorder. Although tendonitis can occur in many parts of the body, it appears most often in the shoulder. When a calcium deposit also affects the area, the condition is called bursitis.

➤ **Carpal tunnel syndrome.** Carpal tunnel syndrome causes pain and a feeling of burning and numbness in the fingers and hand and may even extend to the elbow. It is caused by excessive, repetitive wrist movements. Treatment of carpal tunnel syndrome usually involves splinting the wrist to allow it to rest. Medications may be used and, in severe cases, surgery may be necessary. ■



Have you ever cared for a resident with a musculoskeletal disorder? If so, what special precautions did you have to take?

Discuss.

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CNA Training Advisor (ISSN: 1545-7028 [print]; 1937-7487 [online]) is published monthly by HCPro, Inc., 200 Hoods Lane, Marblehead, MA 01945. Subscription rate: \$149/year; back issues are available at \$15 each. • Copyright © 2009 HCPro, Inc. All rights reserved. Printed in the USA. Except where specifically encouraged, no part of this publication may be reproduced, in any form or by any means, without prior written consent of HCPro, Inc., or the Copyright Clearance Center at 978/750-8400. Please notify us immediately if you have received an unauthorized copy. • For editorial comments or questions, call 781/639-1872 or fax 781/639-2982. For renewal or subscription information, call customer service at 800/650-6787, fax 800/639-8511, or e-mail: *customerservice@hcpro.com*. • Visit our Web site at *www.hcpro.com*. • Occasionally, we make our subscriber list available to selected companies/vendors. If you do not wish to be included on this mailing list, please write to the marketing department at the address above. • Opinions expressed are not necessarily those of CTA. Mention of products and services does not constitute endorsement. Advice given is general, and readers should consult professional counsel for specific legal, ethical, or clinical questions.



THE MUSCULOSKELETAL SYSTEM

Mark the correct response.

Name: _____

Date: _____

1. Which of the following functions do muscles perform?
 - a. Produce movement
 - b. Perform vital body functions
 - c. Produce hormones
 - d. Both a & b
2. Three types of muscles are _____.
 - a. voluntary
 - b. sedentary
 - c. involuntary
 - d. subcutaneous
 - e. cardiac
3. There are approximately ____ voluntary muscles.
 - a. 300
 - b. 600
 - c. 900
 - d. 1,000
4. A muscle without tone is said to be _____.
 - a. contracted
 - b. exercised
 - c. flaccid
 - d. loose
5. The average adult has ____ bones in his or her body.
 - a. 145
 - b. 174
 - c. 206
 - d. 500
6. Which of the following functions do bones perform?
 - a. Protect internal organs
 - b. Store/help maintain the correct level of calcium in the body
 - c. Produce lymph
 - d. Both a & b
7. The spine has _____ vertebrae (i.e., bones).
 - a. 14
 - b. 24
 - c. 34
 - d. 42
8. Which joints are hinge joints?
 - a. Hip
 - b. Elbow
 - c. Thumb
 - d. Knee
9. Cartilage is _____.
 - a. the fibrous tissue that attaches muscle to bone
 - b. the fibrous coating at the end of a bone
 - c. the fibrous tissue that connect joints or cartilage
 - d. none of the above
10. Tendons are _____.
 - a. fibrous tissues that attach muscle to bone
 - b. the fibrous coating at the end of a bone
 - c. fibrous tissues that connect joints or cartilage