Program Area: Health Occupations Education

Course Title: Medical Sciences I  Number: 7221

Unit Title: Skeletal System

Suggested Time for Instruction: 5 class periods (90 minute classes)
10 class periods (55 minute classes)

Course Percent: 5%

Unit Evaluation: 100% Cognitive

Competency: MD05. Analyze the anatomy and physiology of the skeleton.

Specific Objectives:

MD05.01 Describe the structure of the bones.
MD05.02 Analyze the function of the skeletal system.
MD05.03 Analyze characteristics and treatment of common skeletal disorders.
E. Skeletal System

MD05.01 Explain the structure of the bones.

A. Structure of long bones
   1. Osteocytes
   2. Fontanel
   3. Structure
      a. Diaphysis (compact bone)
      b. Epiphysis
      c. Medullary canal
      d. Endosteum
      e. Spongy bone
      f. Periosteum
      g. Articular cartilage

B. Parts of the skeleton
   1. Axial skeleton
      a. Skull
         i. Parietal
         ii. Frontal
         iii. Occipital
         iv. Temporal
         v. Nasal bone
         vi. Zygomatic arch
         vii. Infraorbital foramen
         viii. Mental foramen
         ix. Mandible
         x. Maxilla
         xi. Vomer
         xii. Mastoid process
         xiii. Styloid process
         xiv. External auditory meatus
         xv. Suture
      b. Spinal column/vertebra
         i. Cervical vertebrae
         ii. Thoracic vertebrae
         iii. Lumbar vertebrae
         iv. Sacrum
         v. Coccyx
      c. Ribs and sternum
         i. Xiphoid process
   2. Appendicular skeleton
      a. Clavicle and scapula
      b. Humerus, radius and ulna
      c. Carpals, metacarpals and phalanges
         i. Thumb
         ii. First through fourth digits
      d. Pelvis
         i. Ilium
         ii. Ischium
         iii. Pubis
e. Femur, patella, tibia and fibula
f. Tarsals, metatarsals, phalanges
g. Calcaneus

C. Joints
1. Ball and socket joints
2. Hinge joints
3. Pivot joints
4. Gliding joints
5. Suture

MD05.02 Analyze the function of the skeletal system.
A. Supports
B. Protects internal organs
C. Movement and anchorage
   1. Abduction and adduction
   2. Circumduction and rotation
   3. Flexion and extension
   4. Pronation and supination
D. Mineral storage (calcium and phosphorus)
E. Hemopoiesis
   1. White blood cells made in yellow marrow
   2. Red blood cells made in red marrow
F. Bone formation
   1. Embryo skeleton starts as osteoblasts, then change to cartilage
   2. Ossification (bone replaces cartilage) starts at 8 weeks
   3. Fontanel – soft spot on baby’s head
   4. Periosteum – tough covering of long bones, contains blood vessels, lymph vessels and nerves
G. Vertebral column
   1. Encloses spinal cord
   2. Separated by pads of cartilage = intervertebral discs
H. Bones
   1. 12 pairs of ribs = 7 true, 3 false, 2 floating
   2. Femur is longest and strongest bone in body
I. Joints
   1. Synovial fluid - lubrication
   2. Types of joints
      a. Ball and socket joints – ball-shaped head, examp. Hip and shoulder
      b. Hinge joints – move in one direction or plane, examp. Knees, elbows, outer joints of fingers
      c. Pivot joints – rotate on a 2nd, arch-shaped bone, examp. radius and ulna
      d. Gliding joints – flat surfaces glide across each other, examp. vertebrae
      e. Suture – immovable joint in skull
MD05.03 Discuss characteristics and treatment of common skeletal disorders.

A. Trauma
1. Fracture – any break in a bone
   a. Greenstick fracture – common in children, bone bent and splintered but never completely separates
   b. Comminuted fracture – splintered or broken into many pieces
   c. Compound fracture (open fracture) broken bones pierce skin, can lead to infection
   d. Simple fracture (closed fracture) bone broken, broken ends do not break the skin
   e. Spiral fracture – bone twists, resulting in one or more breaks
   f. Closed reduction – cast or splint
   g. Open reduction/internal fixation – surgical intervention with devices such as wires, metal plates or screws to hold the bones in alignment
   c. Traction – pulling force used to hold the bones in place, used for fractures of long bones
2. Sprain – sudden or unusual motion, ligaments torn
3. Strain – overstretching or tearing of muscle
4. Dislocation – bone displaced from proper position in joint
5. Whiplash – trauma to the cervical vertebra, usually from a car accident

B. Arthritis – inflammation of one or more joints
1. Rheumatoid – chronic, autoimmune disease, joint becomes swollen and painful, joint deformities common
2. Osteoarthritis – degenerative, occurs with aging, joints become large and painful, Rx with medications

C. Spinal defects – abnormal curvature
1. Kyphosis - hunchback
2. Lordosis - swayback
3. Scoliosis – lateral curvature

D. Bursitis – inflammation of bursa (joint sacs)

E. Herniated disk
1. Intervertebral disk ruptures or protrudes, putting pressure on spinal nerve, usually lumbo-sacral
2. Treat with bedrest, traction and surgery

F. Osteomyelitis – bone infection

G. Osteoporosis
1. 80% affected are women
2. Loss of bone mass leading to thin, porous bones that are prone to fracture
3. On x-ray, looks like swiss cheese
4. Prevented by dietary calcium

H. Rickets
1. Found in children
2. Caused by lack of vitamin D
3. Bones become soft
4. Rx with calcium, vitamin D and sunshine

I. Gout – uric acid deposited in joint cavity, mostly the great toe in men
J. Treatment and diagnosis
   1. Bone marrow aspiration – removal of bone marrow sample with a needle for diagnostic purposes
   2. Arthroscopy – examination of joint using arthroscope with fiber optic lens, most knee injuries treated with arthroscopy
   3. Radiography – x-ray of bones
Unit E: Skeletal System

Competency MD05: Analyze the anatomy and physiology of the skeleton.

Materials/Resources


Teaching/Learning Indicators: The following letters are used to indicate specific skills/areas required in the instructional activity.

<table>
<thead>
<tr>
<th>R</th>
<th>W</th>
<th>M</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>Writing</td>
<td>Math</td>
<td>Health professional/parent/community involvement</td>
</tr>
</tbody>
</table>
Objective MD05.01  Describe the structure of the bones.

Teaching/Learning Activities

- **Cognitive**  S
  Using a classroom skeleton or anatomical chart, review the anatomy of the bones.
  
  Given a drawing of the skeleton, (see Body Structures and Functions) or from the appendix of this guide (*Appendix MD05.01C*) have students label the bones and skull; and the long bone, using the “Skeletal Anatomy” list. (*Appendix MD05.01B and MD05.01D*)

- **Critical Thinking**  S, H
  Have students look at X-rays and name the bones that appear on the X-ray. Students must apply prior learning in order to identify the X-rays. You may also ask “Is it normal?” to see if students can pick out the fractures and pathology of abnormal films.
  
  Obtain discarded x-rays from doctors’ offices, clinics, and hospitals. Using an overhead projector, x-rays can be treated as transparencies. X-rays can be used to view bone structure as well as a diagnostic tool. (Hospitals, etc. purge their x-rays files periodically. Check to see when your health care agencies purge, in order to get films.)

- **Teamwork**  S, A
  Working in pairs, have students assemble and label a model skeleton. This may be done using materials chosen by the students. (Teacher may decide or may encourage student creativity.) This makes a good room decoration at Halloween.

- **Critical Thinking**  S, A
  Using a roll of newsprint, cut the paper the length of students. Working in pairs or small groups, have the students trace the body outline of a classmate. Have the students draw in the skeleton and label it. These skeletons can be saved and additional body systems added as the year progresses.
Objective MD05.01 Describe the structure of the bones.

Teaching/Learning Activities (Continued)

- **Cognitive**  S  
  Simon Says: Review for a test with “Simon Says.”  Teacher: Simon Says: 
  Touch your patella.

- **Critical Thinking**  S, H  
  Have students examine a bone.  Obtain bones from a butcher shop or grocery store.  
  Examine and discuss bone marrow, cartilage, ligaments, periosteum, etc. For variety, get different types of bones and cuts.

- **HOSA**  S  
  Have students participate in a simulation of the Medical Spelling event using the Terminology lists provided for this unit of instruction.

- **Critical Thinking**  S  
  Have students take the “Critical Thinking Quiz – The Skeletal System.” (Appendix MD05.01D)  Grade the quizzes in class, and call on students to explain the relationship among the three correct answers.

- **Special Needs**  
  Each student will reach the highest level of mastery in the least restrictive environment as recommended in the student’s IEP.
Objective MD05.02  Analyze the functions of the skeletal system.

Teaching/Learning Activities

- **Critical Thinking**  S, R, A  
  Have students read the text section on “Joints and Related Structures.” *(Body Structures and Functions)*
  
  Given what was learned from the text, have students construct a joint to demonstrate movement. Students may use materials of choice. Suggested materials: door hinge, wooden blocks, ball, cup, wooden spools, rubber bands, nails.

  Students should share their “joint” with the class, explaining the type of movement, and where their joint would be found in the body.

- **Technology**  S  
  Using the CD ROM which accompanies the textbook *(Body Structures and Functions)*, allow students time to explore functions of the skeletal system. Multiple choice questions, as well as fun games are available (concentration, hangman, etc.)

- **HOSA**  S, A  
  Using HOSA guidelines for Extemporaneous Writing, have the student write a paper entitled “How Your Bones Protect Your Body.”

- **Critical Thinking**  S  
  Bones as storage units: Remove the skin, muscle, etc. from an uncooked chicken leg. Place the bone in a container that has an air tight seal. Cover the bone with white vinegar. Cover and refrigerate for a couple of days. Observe the color change of the vinegar as nutrients are withdrawn from the bone. Examine the bone. It becomes very soft as the nutrients are removed.

- **Cognitive**  S  
  Have students quiz each other on the types of motion: flexion, extension, abduction, adduction, circumduction, rotation, pronation, and supination.

- **Special Needs**  
  Each student will reach the highest level of mastery in the least restrictive environment as recommended in the student’s IEP.
Objective MD05.03  Analyze characteristics and treatment of common skeletal disorders.

**Teaching/Learning Activities**

- **Cognitive**  
  Using the matching worksheet in the appendix, match the common fracture types with treatments. (*Appendix MD05.03A*)

- **Critical Thinking**  
  Have students apply a cast using real plaster cast materials: Using small branches from trees to make fractures, have students realign the ends and fragments, and apply a cast. Students will realize importance of immobility in the healing of a fracture.

- **Employability**  
  Arrange for a radiologic technologist to talk to the class regarding x-ray procedures used to diagnose fractures. In addition, ask the technologist to bring films that show kyphosis, lordosis, and scoliosis, as well as a normal spine – to explain/contrast the differences.

  Arrange for a physical therapist to talk to the class regarding rehabilitation of skeletal injuries and defects.

- **Technology**  
  Have students do an Internet search on the disorders “arthritis” and “osteoporosis.” The goal will be to fill out a summary chart comparing the two disorders. (*Appendix 005.03B*)

- **HOSA**  
  Have students participate in a Biomedical Debate on the topic “Osteoporosis vs. Arthritis.” One group should argue that Osteoporosis is worse, and the other that Arthritis is worse. Teams may use data from the Internet search in the preceding activity.

- **HOSA**  
  Singly or in pairs, assign students a topic related to the characteristics and treatment of skeletal disorders. Using the Extemporaneous Health Poster guidelines, have students create a poster illustrating the key points of the assigned topic.

  Have students share their posters in class, explaining/teaching their topic to the rest of the class.

  Suggested topics: Use the terminology list for “Disorders and Related Terminology.” There are 28 terms listed. Combine like terms as necessary to make sure that all terms are addressed in the posters.

- **Special Needs**  
  Each student will reach the highest level of mastery in the least restrictive environment as recommended in the student’s IEP.

Summer 2005  E.10
## Daily Lesson Plans

### Unit E: Skeletal System

**Lessons:** 5  
**Hours:** 7 ½ clock hours

<table>
<thead>
<tr>
<th>Steps</th>
<th>Lesson #1</th>
<th>Lesson #2</th>
<th>Lesson #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus and Review</strong></td>
<td>Review medical terminology from Unit A that pertains to the Skeletal System.</td>
<td>Play skeletal “Simon Says.”</td>
<td>Have students demonstrate their joint. See if the class can determine the type of joint, and give an example.</td>
</tr>
<tr>
<td><strong>Statement of Objectives</strong></td>
<td>MD05.01 Describe the structure of the bones.</td>
<td>MD05.02 Analyze the function of the skeletal system.</td>
<td>MD05.03 Analyze characteristics and treatment of common skeletal disorders.</td>
</tr>
<tr>
<td><strong>Teacher Input</strong></td>
<td>Using a classroom skeleton and anatomy overheads (E.24-E.26), review the anatomy of the skeletal system. Use x-rays as overheads to show how bones appear on x-rays.</td>
<td>Using the overheads, discuss the function of the skeletal system.</td>
<td>Using the overheads, briefly introduce students to common skeletal disorders. Assign the Health Poster activity, assigning topics for students to research and illustrate.</td>
</tr>
<tr>
<td><strong>Guided Practice</strong></td>
<td>In groups of 3-4, have students trace the outline of a classmate on a long sheet of newsprint, and then let the teams draw in the bones.</td>
<td>Go to the school’s computer lab and, using the CD ROM that came with the <em>Body Structures and Functions</em> textbook, have students complete the “Structure of the Skeletal System” activities.</td>
<td>Allow students time to research their topic using classroom or Internet resources, and create a plan for their poster.</td>
</tr>
<tr>
<td><strong>Independent Practice</strong></td>
<td>Homework - Using the skeletal anatomy list (MD05.01B) label the parts of the skeleton (MD05.01C) and the skull (MD05.01D).</td>
<td>Homework: Create a joint. The more creative, the better. Use any type of material. May work independently or in pairs.</td>
<td>Complete the health poster as assigned on posterboard. Prepare to describe the poster in class.</td>
</tr>
<tr>
<td><strong>Closure</strong></td>
<td>Give a 10-question skeletal anatomy spelling quiz. Give one bonus point for on the unit test for all students who spell all 10 terms correctly.</td>
<td>Review types of motion by explaining an activity and having students identify the motion. Examples: 1. Miss America wave. 2. Kicking a ball.</td>
<td>Remind students of homework assignment, and that they will be graded on their poster using the HOSA EHP rating sheet.</td>
</tr>
</tbody>
</table>

### Materials

- Skeleton
- Skeletal system overheads
- X-rays of bones
- Newsprint
- Handouts for homework
- Computer Lab
- *Body Structures and Functions* CD ROM
- Handouts
- Overheads
- EHP rating sheets
### Unit E: Skeletal System (Continued)

<table>
<thead>
<tr>
<th>Steps</th>
<th>Lesson #4</th>
<th>Lesson #5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus and Review</strong></td>
<td>* Poster presentations</td>
<td>Answer student questions before the test.</td>
</tr>
<tr>
<td><strong>Statement of Objectives</strong></td>
<td>MD05.03 Analyze characteristics and treatment of common skeletal disorders.</td>
<td>MD05.03 Analyze characteristics and treatment of common skeletal disorders.</td>
</tr>
<tr>
<td><strong>Teacher Input</strong></td>
<td>Allow students to review and teach the objective through the sharing and explanation of assigned posters. Class members should take notes on the poster content as they are presented. Teacher should assure that key points of each disorder/treatment are addressed on the student presentations. Posters should be put up around the classroom for students to see. They should be taken down immediately before the test.</td>
<td>TEST – Skeletal System</td>
</tr>
<tr>
<td><strong>Guided Practice</strong></td>
<td>Test review: In pairs – take the Critical Thinking quiz – The Skeletal System.</td>
<td>Take unit test.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grade test in class.</td>
</tr>
<tr>
<td><strong>Independent Practice</strong></td>
<td>Study for test.</td>
<td>Have students look up the answers to the questions they got wrong and turn in their corrected test.</td>
</tr>
<tr>
<td><strong>Closure</strong></td>
<td>Discuss answers to Critical Thinking quiz in class.</td>
<td>Introduce the next unit.</td>
</tr>
<tr>
<td></td>
<td>Review important points from each disease poster.</td>
<td>Make a reading assignment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use remaining class time for HOSA business/update.</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>Handouts – Critical Thinking Quiz</td>
<td>Test and key.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green pens for grading tests.</td>
</tr>
</tbody>
</table>
# Unit E: Skeletal System Terminology List*

1. abduction  
2. adduction  
3. appendicular skeleton  
4. axial skeleton  
5. ball and socket joint  
6. bursa  
7. circumduction  
8. compact bone  
9. diaphysis  
10. endosteum  
11. epiphysis  
12. extension  
13. flexion  
14. fontanel  
15. gliding joint  
16. hemopoiesis  
17. hinge joint  
18. joint  
19. medullary canal  
20. ossification  
21. osteocyte  
22. peristeme  
23. pivot joint  
24. pronation  
25. rotation  
26. spongy bone  
27. supination  
28. suture  
29. synovial fluid

* See also – Skeletal Anatomy terminology

## Disorders and Related Terminology

1. arthritis (rheumatoid and osteoarthritis)  
2. arthroscopy  
3. bone marrow aspiration  
4. bursitis  
5. closed reduction  
6. comminuted fracture  
7. compound fracture  
8. dislocation  
9. gout  
10. greenstick fracture  
11. herniated disk  
12. kyphosis  
13. lordosis  
14. open reduction/internal fixation  
15. osteomyelitis  
16. osteoporosis  
17. radiography  
18. rickets  
19. scoliosis  
20. simple fracture  
21. spiral fracture  
22. sprain  
23. strain  
24. traction  
25. whiplash

*Appendix MD05.01A*
Skeletal Anatomy - Terminology

You will be required to identify the following bones on a diagram of the skeleton:

1. skull
2. cervical vertebrae
3. clavicle
4. scapula
5. sternum
6. xiphoid process
7. humerus
8. ribs
9. radius
10. ulna
11. thoracic vertebrae
12. lumbar vertebrae
13. sacrum
14. coccyx
15. ilium
16. ischium
17. pubis
18. carpals
19. metacarpals
20. thumb
21. first digit
22. second digit
23. third digit
24. fourth digit
25. femur
26. patella
27. tibia
28. fibula
29. tarsals
30. metatarsals
31. phalanges
32. calcaneus

You will be required to identify the following parts of the skull:

1. parietal
2. frontal
3. occipital
4. temporal
5. nasal bone
6. zygomatic arch
7. infraorbital foramen
8. mental foramen
9. mandible
10. maxilla
11. vomer
12. mastoid process
13. styloid process
14. external auditory meatus
15. suture

You will be required to label the following parts of the long bone:

1. epiphyses
2. diaphysis
3. red marrow
4. spongy bone
5. compact bone
6. yellow marrow
7. periosteum
8. articular cartilage
9. medullary canal
The Skeleton

Appendix MD05.01C
Label and color the following parts of the skull:

parietal
frontal
occipital
temporal
nasal bone
zygomatic arch
infraorbital foramen
mental foramen
mandible
maxilla
vomer
mastoid process
styloid process
external auditory meatus
suture

Appendix MD05.01D
<table>
<thead>
<tr>
<th></th>
<th>tibia</th>
<th>ulna</th>
<th>fibula</th>
<th>femur</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>skull</td>
<td>rib cage</td>
<td>pelvis</td>
<td>vertebral column</td>
</tr>
<tr>
<td>2</td>
<td>mandible</td>
<td>frontal bone</td>
<td>temporal bone</td>
<td>occipital bone</td>
</tr>
<tr>
<td>3</td>
<td>ischium</td>
<td>scapula</td>
<td>ilium</td>
<td>pubis</td>
</tr>
<tr>
<td>4</td>
<td>humerus</td>
<td>ulna</td>
<td>radius</td>
<td>phalanges</td>
</tr>
<tr>
<td>5</td>
<td>suture</td>
<td>red marrow</td>
<td>spongy bone</td>
<td>yellow marrow</td>
</tr>
<tr>
<td>6</td>
<td>calcaneus</td>
<td>mandible</td>
<td>scapula</td>
<td>occipital</td>
</tr>
<tr>
<td>7</td>
<td>articular cartilage</td>
<td>red marrow</td>
<td>medullary cavity</td>
<td>epiphysis</td>
</tr>
<tr>
<td>8</td>
<td>cervical</td>
<td>lumbar</td>
<td>thoracic</td>
<td>sternum</td>
</tr>
<tr>
<td>9</td>
<td>maxilla</td>
<td>zygomatic</td>
<td>mandible</td>
<td>occipital</td>
</tr>
<tr>
<td>10</td>
<td>mental foramen</td>
<td>maxilla</td>
<td>occipital</td>
<td>nasal bone</td>
</tr>
<tr>
<td>11</td>
<td>patella</td>
<td>tibia</td>
<td>radius</td>
<td>humerus</td>
</tr>
<tr>
<td>12</td>
<td>phalanges</td>
<td>ribs</td>
<td>xiphoid process</td>
<td>vertebrae</td>
</tr>
<tr>
<td>13</td>
<td>coccyx</td>
<td>xiphoid process</td>
<td>ischium</td>
<td>vomer</td>
</tr>
<tr>
<td>14</td>
<td>scapula</td>
<td>calcaneus</td>
<td>sternum</td>
<td>ilium</td>
</tr>
</tbody>
</table>

*Appendix MD05.01E*
ANSWER KEY: Critical Thinking Quiz – The Skeletal System

Circle the term that does not belong with the other three.

1. tibia  ∘  ulna  ∘  fibula  ∘  femur
2. skull  ∘  rib cage  ∘  pelvis  ∘  vertebral column
3. mandible  ∘  frontal bone  ∘  temporal bone  ∘  occipital bone
4. ischium  ∘  scapula  ∘  ilium  ∘  pubis
5. humerus  ∘  ulna  ∘  radius  ∘  phalanges
6. suture  ∘  red marrow  ∘  spongy bone  ∘  yellow marrow
7. calcaneus  ∘  mandible  ∘  scapula  ∘  occipital
8. articular cartilage  ∘  red marrow  ∘  medullary cavity  ∘  epiphysis
9. cervical  ∘  lumbar  ∘  thoracic  ∘  sternum
10. maxilla  ∘  zygomatic  ∘  mandible  ∘  occipital
11. mental foramen  ∘  maxilla  ∘  occipital  ∘  nasal bone
12. patella  ∘  tibia  ∘  radius  ∘  humerus
13. phalanges  ∘  ribs  ∘  xiphoid process  ∘  vertebrae
14. coccyx  ∘  xiphoid process  ∘  ischium  ∘  vomer
15. scapula  ∘  calcaneus  ∘  sternum  ∘  ilium
MATCHING: Match common fracture types with treatments. Write the correct answer in each blank. *(An answer may be used more than once.)*

a. greenstick fracture  
   _____ 1. Surgical correction of a broken bone.

b. simple fracture  
   _____ 2. Bone is broken completely, but ends do not penetrate the skin.

c. compound fracture  
   _____ 3. Nonsurgical correction of broken bone and application of a cast.

d. comminuted fracture  
   _____ 4. A fracture in which the bone splinters, but the break is incomplete.

e. closed reduction  
   _____ 5. Bones are broken into many pieces.

f. open reduction  
   _____ 6. A fracture in which the bone ends penetrate the skin.

g. traction  
   _____ 7. A pulling force used to hold the bones in place.

_____ 8.  

*Appendix MD05.03A*
Answer Key: Fractures Worksheet

MATCHING: Match common fracture types with treatments. Write the correct answer in each blank.

a. greenstick fracture     b. simple fracture

c. compound fracture       d. comminuted fracture

e. closed reduction        f. open reduction

g. traction

___f__ 1. Surgical correction of a broken bone.

___b__ 2. Bone is broken completely, but ends do not penetrate the skin.

___e__ 3. Nonsurgical correction of broken bone and application of a cast.

___a__ 4. A fracture in which the bone splinters, but the break is incomplete.

___d__ 5. Bones are broken into many pieces.

___c__ 6. A fracture in which the bone ends penetrate the skin.

___g__ 7. A pulling force used to hold the bones in place.

___b__ 8.
# Disease Disorder Comparison Chart

<table>
<thead>
<tr>
<th>Name of Disease/Disorder</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Brief Description</td>
<td></td>
</tr>
<tr>
<td>Occurrence/statistics</td>
<td></td>
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<tr>
<td>Signs and Symptoms</td>
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</tr>
<tr>
<td>Diagnosis</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
</tr>
<tr>
<td>Prognosis</td>
<td></td>
</tr>
</tbody>
</table>

*Appendix MD05.03B*
Skeletal System

206 bones in the body

FUNCTIONS
1. Supports body and provides shape.
2. Protects internal organs.
3. Movement and anchorage of muscles.
4. Mineral storage. (Calcium and phosphorus)
5. Hemopoiesis

OSTEOCYTE – mature bone cell

BONE FORMATION

Embryo skeletal starts as osteoblasts (primitive embryonic cells) – then change to cartilage.

At 8 weeks, OSSIFICATION begins. (Mineral matter begins to replace cartilage) Infant bones soft because ossification not complete at birth.

FONTANEL - Soft spot on baby’s head
STRUCTURE OF LONG BONE

DIAPHYSIS – shaft
EPIPHYSES – ends

MEDULLARY CAVITY – center of shaft, filled with yellow bone marrow, which is mostly fat cells, also cells that form white blood cells.
ENDOSTEUM – lines marrow cavity

Shaft is made of COMPACT BONE – ends are SPONGY BONE. Ends contain red marrow where red blood cells are made.

PERIOSTEUM – tough, outside covering of bone – contains blood vessels, lymph vessels and nerves.

AXIAL & APPENDICULAR SKELETON

AXIAL – skull, spinal column, ribs, sternum, hyoid
APPENDICULAR – shoulder girdle, arms, pelvis, legs
Skull

1 frontal
2 parietal
2 temporal
1 occipital
1 ethmoid
1 sphenoid

2 nasal
1 vomer
2 inferior concha
2 maxilla
2 lacrimal
2 zygomatic
2 palatine
1 mandible
Spine – Vertebral Column

Encloses the spinal cord

Vertebrae – separated by pads of cartilage = intervertebral discs

Cervical vertebrae (7)

Thoracic vertebrae (12)

Lumbar vertebrae (5)

Sacrum

Coccyx
Ribs and Sternum

Sternum divided into 3 parts – bottom tip is XIPHOID PROCESS

12 pairs of ribs – first 7 are true ribs – connected to sternum by cartilage
- next 3 are false ribs – cartilage connects them to 7th rib (not sternum)
- next 2 are floating

Appendicular Skeleton

- clavicle – collar bone
- scapula – shoulder blade
- humerus – upper arm
- radius and ulna – lower arm
- carpals – wrist bones – held together by ligaments
- metacarpals – hand bones
- phalanges – fingers
- pelvis – 3 bones (ilium, ischium, and pubis)
- femur – upper leg, longest and strongest bone in body
- tibia and fibula – lower leg
- patella – kneecap
- tarsal bones – ankle
- calcaneus – heel bone
- metatarsals – foot bones

JOINTS
Joints are points of contact between 2 bones – classified according to movement:

SYNOVIAL FLUID – lubricating substance in joints

♦ BALL AND SOCKET JOINT – bone with ball-shaped head fits into concave socket of 2\textsuperscript{nd} bone. Shoulders and hips.

♦ HINGE JOINTS – move in one direction or plane. Knees, elbows, outer joints of fingers.

♦ PIVOT JOINT – those with an extension rotate on a 2\textsuperscript{nd}, arch shaped bone. Radius and ulna, atlas and axis.

♦ GLIDING JOINTS – flat surfaces glide across each other. Vertebrae of spine.

♦ SUTURE – immovable joint

Types of Motion

- FLEXION
- EXTENSION
- ABDUCTION
- ADDUCTION
- CIRCUMDUCTION
- ROTATION
- PRONATION
- SUPINATION
Disorders of the Bones and Joints

FRACTURE – a break

Treated by:

- CLOSED REDUCTION – cast or splint applied
- OPEN REDUCTION – surgical intervention with devices such as wires, metal plates or screws to hold the bones in alignment (internal fixation)
- TRACTION – pulling force used to hold the bones in place – used for fractures of long bones

CLOSED or SIMPLE fracture – bone broken, broken ends do not break the skin

OPEN or COMPOUND – broken bones pierce the skin, can lead to infection

GREENSTICK – in children, bone bent and splintered but never completely separates

COMMINUTED – splintered or broken into many pieces

SPIRAL – bone twists, resulting in one or more breaks

DISLOCATION – bone displaced from proper position in joint

SPRAIN – sudden or unusual motion, ligaments torn but joint not dislocated

STRAIN – overstretching or tearing muscle

RADIOGRAPHY – x-ray, for diagnosis evaluation of bones
Diseases of Bones

BURSITIS – inflammation of a bursa – joint sacs

ARTHITIS – inflammation of one or more joints
- RHEUMATOID ARTHRITIS – chronic, autoimmune disease – joints become swollen and painful, joint deformities common
- OSTEOARTHRITIS – degenerative, occurs with aging, 80% Americans affected, joint becomes enlarged and painful.

GOUT – increase of uric acid deposited in joint cavity, mostly the great toe in men.

RICKETS – found in children, caused by lack of Vitamin D, bones become soft. Treated with calcium, Vitamin D and sunshine.

HERNIATED DISC – intervertebral disc ruptures or protrudes, putting pressure on spinal nerve, usually lumbar-sacral region, treated with bedrest, traction and surgery.

WHIPLASH – trauma to the cervical vertebra, usually from a car accident
Abnormal curvatures of the spine:

- **KYPHOSIS** – hunchback
- **LORDOSIS** – swayback
- **SCOLIOSIS** – lateral curvature

**OSTEOPOROSIS** – 80% of those affected are women. Mineral density of bone is reduced 35% - 65%. The loss of bone mass leaves the bone thinner, porous and more prone to fracture. (On x-ray, looks like swiss cheese.) Prevented by dietary calcium.

**OSTEOMYELITIS** – bone infection

Diagnosis and Treatment:

- **ARTHROSCOPY** – examination into joint using arthroscope with fiber optic lens, most knee injuries treated with arthroscopy.
- **BONE MARROW ASPIRATION** – removal of marrow sample with a needle for diagnostic purposes.