

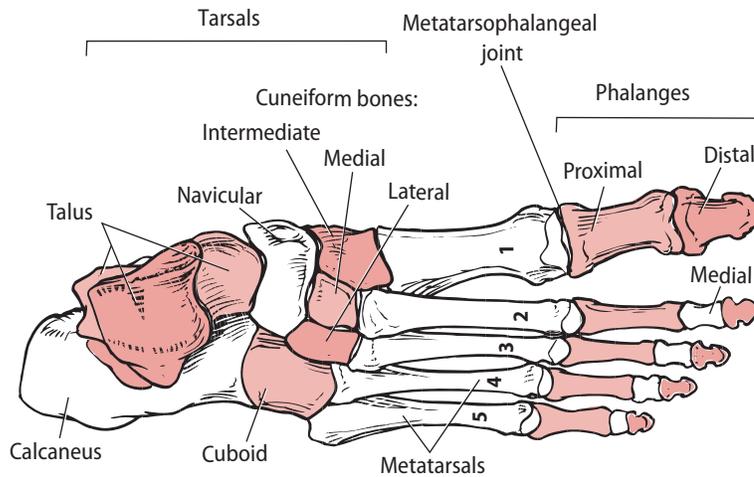
2016



**Optum Learning:
Comprehensive Anatomy
and Physiology for
ICD-10-CM and ICD-10-PCS Coding**

Contents

Introduction	1
Welcome to Comprehensive Anatomy and Physiology for ICD-10-CM and ICD-10-PCS Coding	1
Summary	11
Chapter 1. Introduction to the Human Body	13
Anatomy Overview	13
Figure 1.1: Tissue	14
Figure 1.2: Anatomical Position	17
Figure 1.3: Body Planes	19
Figure 1.4: Motion	20
Summary	21
Knowledge Assessment Questions	22
Chapter 2. ICD-10-CM: Integumentary System	25
Anatomic Overview	25
Figure 2.1: Skin	25
Figure 2.2: Hair and Glands	26
Figure 2.3: Nail	27
Anatomy and Physiology and the ICD-10-CM Code Set	27
Figure 2.4: Surface and Solid Lesions	32
Figure 2.5: Sac Lesions	38
Figure 2.6: Four Stages of Pressure Ulcers	42
Figure 2.7: Degrees of Burns	46
Summary	47
Knowledge Assessment Questions	48
Chapter 3. ICD-10-CM: Skeletal System and Articulations	51
Anatomic Overview	51
Figure 3.1: Cranium	52
Figure 3.2: Facial Bones	53
Figure 3.3: Vertebrae	54
Figure 3.4: Spine	55
Figure 3.5: Ribs and Sternum	56
Figure 3.6: Shoulder/Upper Extremity	56
Figure 3.7: Hand	57
Figure 3.8: Right Coxal Bone	58
Figure 3.9: Right Tibia and Fibula, Anterior View	58
Figure 3.10: Right Foot, Dorsal	59
Figure 3.11: Synovial Joint Structures	60
Anatomy and Physiology and the ICD-10-CM Code Set	61
Figure 3.12: Tears of Meniscus	68
Figure 3.13: Kyphosis and Lordosis	81
Figure 3.14: Scoliosis and Kyphoscoliosis	81
Summary	83
Knowledge Assessment Questions	84
Chapter 4. ICD-10-CM: Muscular System	87
Anatomic Overview	87
Figure 4.1: Joint Structures	89
Figure 4.2: Muscles of the Face	91
Figure 4.3: Eye Musculature	92
Figure 4.4: Associated Regions of Pain due to Neck Injuries	93

Figure 3.10: Right Foot, Dorsal

Articulations

Articulations, or joints, join two bones together and allow for movement in response to muscle contractions. There are three classifications of joints based on the structure or type of tissue the joint is composed of, including:

- Fibrous
- Cartilaginous
- Synovial

Fibrous joints are held together by dense tissue and are limited in movement by the length of that tissue. Most of these types of articulations are immovable or slightly moveable at best. There are three types of fibrous joints: sutures, or seams, between bones held together by connective tissue, such as those found in the cranium; gomphosis, a second type of fibrous joint, is found only as a tooth in its socket; and syndesmoses are bones joined by a **ligament**. The articulation between the tibia and fibula is an example of syndesmoses.

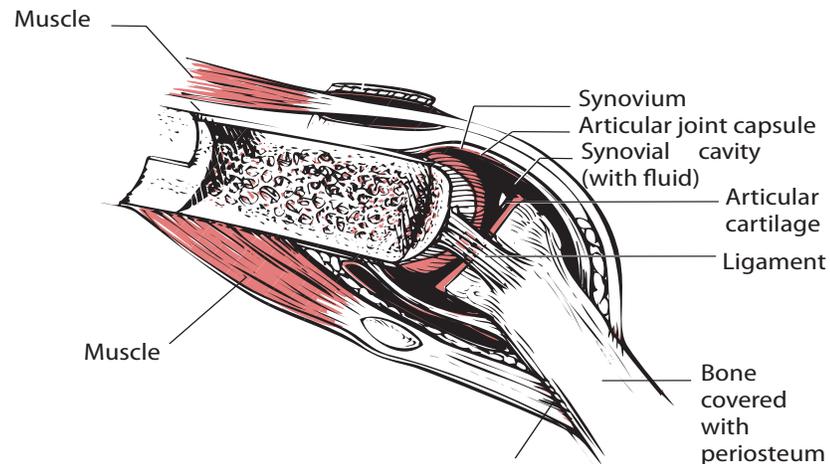
Cartilaginous joints are joined by cartilage. The first rib to the sternum is a cartilaginous articulation, as are the intervertebral joints and pubic symphysis. These types of joints do provide for some movement, albeit extremely minimal.

The majority of joints in the human body are synovial. These are free moving and therefore structurally more complex than the preceding two types. Synovial articulations all have a fluid-filled cavity separating the bones it joins. This cavity is called the synovial cavity, and the fluid is synovial fluid. The joint cavity is surrounded by a two-layer capsule called the articular capsule. The external layer of the capsule is a dense connective tissue that is contiguous with the periosteum of the related bones. The internal layer is a synovial membrane that covers all surfaces within the joint cavity except for the opposing bone surfaces. Articular cartilage covers those surfaces. Synovial joints are also unique in that they are reinforced by ligaments.



DEFINITIONS

ligament. Fibrous tissue binding joints together connecting bone to bone or bone to cartilage.

Figure 3.11: Synovial Joint Structures**DEFINITIONS**

opposition. Act of touching the thumb to the tips of each finger on the same hand.

Synovial joints can be further classified by the movements they allow, including:

- **Ball-and-socket:** Head of a long bone ("ball") and depression of another bone ("socket") joint. The shoulder (humeral head and glenoid depression of the scapula) and hip joints (femoral head and acetabulum of a coxa bone) are ball-and-socket articulations.
- **Condyloid:** Protrusion of one bone meets a depression of another to form this type of joint. Examples are the wrist (radius and carpals) and knuckles (metacarpal and proximal phalange).
- **Hinge:** Convex portion of a bone meets with the concave part of another to form a hinge joint. The elbow and knee are large hinge joints.
- **Pivot:** Rounded or pointed protrusion of one bone fits into a ring composed of bone or bone and ligaments of another bone. The articulation between the C1 and C2 vertebrae that allows the head to move back and forth is a pivot joint.
- **Planar:** Flat surfaces of two bones glide against one another. The joints between the short carpals (intercarpal joint) and tarsals (intertarsal joint) are planar.
- **Saddle:** One bone has a depression shaped somewhat like an equestrian saddle; the joint is formed by a second bone straddling that depression. An example of this type of articulation is where the trapezium meets the metacarpal of the thumb. This joint allows the unique **opposition** of the human thumb.

Common migraine pain can last three to four days. In addition to classic and common, migraine headache can take several other forms:

- **Basilar artery migraine:** Disturbance of the basilar artery; occurs primarily in adolescent and young adult women.
- **Hemiplegic migraine:** Characterized by temporary paralysis on one side of the body. Familial hemiplegic migraine (FHM) has been linked to mutations of specific genes on chromosomes 1 and 19. Sporadic hemiplegic migraine (SHM) is FHM without the familial connection and that particular genetic mutation.
- **Menstrual migraine:** Associated with hormonal changes inherent to the menstrual cycle.
- **Ophthalmoplegic migraine:** Presents with pain around the eye; often is associated with a droopy eyelid, double vision, and other visual problems.

Migraine complications may include associated cerebral infarction in which the migraine adversely disrupts circulation, resulting in significant ischemia with subsequent infarction (stroke).

Neurological Effects of Vascular Conditions

Many vascular conditions with neurologic effects previously coded as circulatory conditions in ICD-9-CM will now be coded as nervous system conditions. Conversely, paralytic sequelae of cerebral infarct/stroke are classified in ICD-10-CM to chapter 9, "Diseases of the Circulatory System." Code categories G45 and G46 contain expanded subclassifications that include specific types of vascular conditions with updated terminology. In some cases, conditions previously separately classified have been combined and in other cases conditions previously classified to other specified (.8) codes or "ill-defined" codes in ICD-9-CM have been assigned unique codes in ICD-10-CM. These reclassifications provide greater specificity by which to differentiate certain TIA syndromes by type or affected anatomic site.

Coding for Neurovascular Effects of Vascular Conditions

ICD-9-CM		ICD-10-CM	
435.8	Other specified transient cerebral ischemias	G45.1	Carotid artery syndrome (hemispheric)
		G45.2	Multiple and bilateral precerebral artery syndromes
435.2	Subclavian steal syndrome	G45.8	Other transient cerebral ischemic attacks and related syndromes
435.8	Other specified transient cerebral ischemias	G45.8	Other transient cerebral ischemic attacks and related syndromes
		G46.0	Middle cerebral artery syndrome
		G46.1	Anterior cerebral artery syndrome
		G46.2	Posterior cerebral artery syndrome
437.8	Other ill-defined cerebrovascular disease	G46.3	Brain stem stroke syndrome
		G46.4	Cerebellar stroke syndrome
		G46.5	Pure motor lacunar syndrome
		G46.6	Pure sensory lacunar syndrome
		G46.7	Other lacunar syndromes
		G46.8	Other vascular syndromes of brain in cerebrovascular diseases

Transient cerebral ischemia or attack (TIA) describes episodes of focal neurological symptoms. A typical transient ischemic event may last between two and 15 minutes, yet resolve within 24 hours. The most common cause of a TIA-type event is **embolization** due to cardiovascular causes, including rheumatic heart disease, arrhythmia, valve disease, endocarditis, and myocardial infarction. Transient cerebral ischemia may be identified by affected vessel, such as the **basilar** or **vertebral**

INTERESTING A & P FACT

The term hemicrania derives from the Greek word hemicranios, meaning half of the head.



DEFINITIONS

basilar artery. Major cerebral artery (origin) inferior to the pons that (insertion) divides into the posterior cerebral arteries and the superior cerebellar artery.

embolization. Forming of a circulatory obstruction out of circulating matter or particle (e.g., blood clot or plaque) and associated physiologic disruptions.

lacunar. Pertaining to discontinuity of space within an anatomical structure; pits, depressions, or hollows.

motor. Of or relating to a motor nerve; one that causes or imparts motion.

precerebral artery. Artery that flows to the cerebrum but is not located within the cerebrum.

sensory. Of or relating to the senses; including vision, hearing, tactile sense, or taste.

vertebral artery. Major cervical artery (origin) branching from the subclavian arteries to (insertion) the basilar artery.

**DEFINITIONS**

circle of Willis. Circular network of arteries that supply blood to the brain.

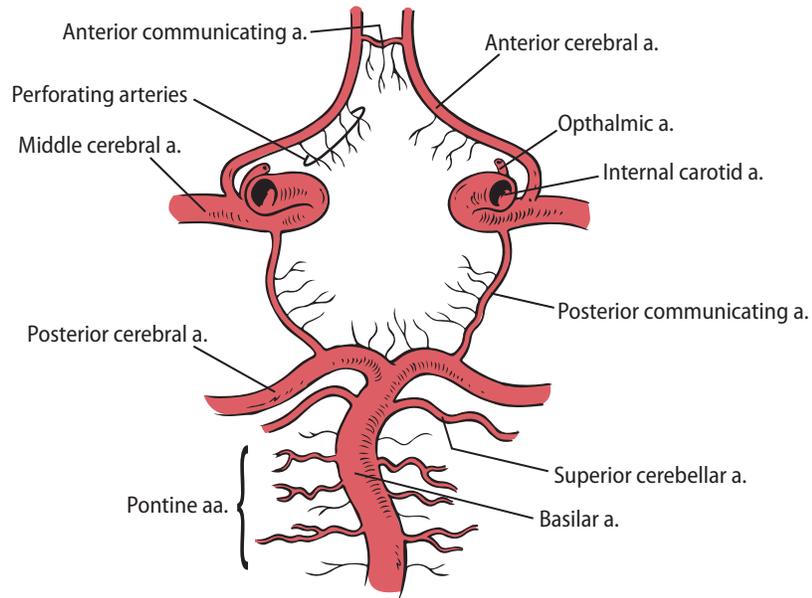
**CODING AXIOM**

ICD-10-CM Official Coding Guideline I. C. 6. a. states "Dominant/Nondominant Side—Should the affected side be documented, but not specified as dominant or nondominant, and the classification system does not indicate a default, code selection is as follows:

- For ambidextrous patients, the default should be dominant.
- If the left side is affected, the default is non-dominant.
- If the right side is affected, the default is dominant."

arteries. The primary function of the vertebral and basilar arteries is to supply the brain with oxygen-rich blood. The paired vertebral arteries (right and left) together with the basilar artery are often referred to as the vertebrobasilar system. These vessels connect with the **circle of Willis**, a vascular network of five bilateral arteries.

Figure 5.11: Circle of Willis



Vascular syndromes specified as middle, anterior, or posterior artery in nature indicate conditions in which the blood supply from the affected artery is restricted, leading to a reduction of the function of the portions of the brain supplied by that vessel. Presenting symptoms are often represented by impairment in the brain functions performed by the affected area of the brain. For example, cerebellar stroke syndrome is so named for the characteristic manifestations associated with cerebellum-mediated functions. When disease compromises the vasculature of the cerebellum, the associated physiological functions of the cerebellum that control hearing and balance are disrupted, resulting in hearing loss, dizziness, and ataxia.

Lacunar strokes, ischemic attacks, and other vascular syndromes originate due to disease processes in intracerebral vessels, most commonly occlusions of the branches of a larger artery (e.g., middle cerebral, posterior cerebral, basilar). Lacunar cerebrovascular events tend to occur in the deeper, smaller vessel branches within the brain.

Chapter 8. ICD-10-CM: Blood and Blood-Forming Organs

1. What are the three main functions of blood?

- a. **Transportation**
- b. **Regulation**
- c. **Protection**

Rationale: Blood serves many purposes that can be divided into three main functions: transportation, regulation, protection.

2. What are the formed elements found in blood?

- a. **Red blood cells**
- b. **White blood cells**
- c. **Platelets**

Rationale: There are formed elements, consisting of red blood cells, white blood cells, and platelets, and plasma, in which the formed elements “float.”

3. The **plasma** is the liquid that suspends the formed elements.

Rationale: There are formed elements, consisting of red blood cells, white blood cells, and platelets, and plasma, in which the formed elements “float.”

4. Erythrocytes are also known as **red blood cells**.

Rationale: Red blood cells, or erythrocytes, make up more than 99 percent of the formed elements.

5. The red blood cells’ main function is to carry **oxygen** to cells and transport some **carbon dioxide** away.

Rationale: Red blood cells travel throughout the body delivering oxygen and removing some of the carbon dioxide the cells release.

6. **Hemoglobin** is the protein responsible for the red color of blood.

Rationale: The protein molecules, known as **hemoglobin**, are responsible for the blood’s color. When the RBCs are carrying oxygen, the blood appears bright red; when the hemoglobin is de-oxygenated, the blood appears blue when viewed through blood vessel walls.

7. What are the four blood types?

- a. **A**
- b. **B**
- c. **AB**
- d. **O**

Rationale: The blood type group is determined by identifying up to two antigens on the surface of an erythrocyte. These antigens are known as antigen A and antigen B. The absence or presence of these determine the four blood types:

- **A:** Antigen A is present.
- **B:** Antigen B is present.
- **AB:** Both antigens are present.
- **O:** Neither antigen is present.

PCS Description	Anatomical Term
Basilic Vein, Left Basilic Vein, Right	Includes: Median antebrachial vein Median cubital vein
Bladder	Includes: Trigone of bladder
Brachial Artery, Left Brachial Artery, Right	Includes: Inferior ulnar collateral artery Profunda brachii Superior ulnar collateral artery
Brachial Plexus	Includes: Axillary nerve Dorsal scapular nerve First intercostal nerve Long thoracic nerve Musculocutaneous nerve Subclavius nerve Suprascapular nerve
Brachial Vein, Left Brachial Vein, Right	Includes: Radial vein Ulnar vein
Brain	Includes: Cerebrum Corpus callosum Encephalon
Breast, Bilateral Breast, Left Breast, Right	Includes: Mammary duct Mammary gland
Buccal Mucosa	Includes: Buccal gland Molar gland Palatine gland
Carotid Bodies, Bilateral Carotid Body, Left Carotid Body, Right	Includes: Carotid glomus
Carpal Joint, Left Carpal Joint, Right	Includes: Intercarpal joint Midcarpal joint
Carpal, Left Carpal, Right	Includes: Capitate bone Hamate bone Lunate bone Pisiform bone Scaphoid bone Trapezium bone Trapezoid bone Triquetral bone
Celiac Artery	Includes: Celiac trunk
Cephalic Vein, Left Cephalic Vein, Right	Includes: Accessory cephalic vein
Cerebellum	Includes: Culmen
Cerebral Hemisphere	Includes: Frontal lobe Occipital lobe Parietal lobe Temporal lobe

PCS Description	Anatomical Term
Cerebral Meninges	Includes: Arachnoid mater Leptomeninges Pia mater
Cerebral Ventricle	Includes: Aqueduct of Sylvius Cerebral aqueduct (Sylvius) Choroid plexus Ependyma Foramen of Monro (intraventricular) Fourth ventricle Interventricular foramen (Monro) Left lateral ventricle Right lateral ventricle Third ventricle
Cervical Nerve	Includes: Greater occipital nerve Spinal nerve, cervical Suboccipital nerve Third occipital nerve
Cervical Plexus	Includes: Ansa cervicalis Cutaneous (transverse) cervical nerve Great auricular nerve Lesser occipital nerve Supraclavicular nerve Transverse (cutaneous) cervical nerve
Cervical Vertebra	Includes: Spinous process Vertebral arch Vertebral foramen Vertebral lamina Vertebral pedicle
Cervical Vertebral Joint	Includes: Atlantoaxial joint Cervical facet joint
Cervical Vertebral Joints, 2 or more	Includes: Cervical facet joint
Cervicothoracic Vertebral Joint	Includes: Cervicothoracic facet joint
Cisterna Chyli	Includes: Intestinal lymphatic trunk Lumbar lymphatic trunk
Coccygeal Glomus	Includes: Coccygeal body
Colic Vein	Includes: Ileocolic vein Left colic vein Middle colic vein Right colic vein
Conduction Mechanism	Includes: Atrioventricular node Bundle of His Bundle of Kent Sinoatrial node
Conjunctiva, Left Conjunctiva, Right	Includes: Plica semilunaris

Appendix D.

Root Operation Conversion Table

Documented Procedure	PCS Root Operation		Key Objective of Procedure/Comment
Common Suffixes			
-centesis	Drainage	9	
-desis	Fusion	G	
-ectomy	Excision	B	Cutting out or off, without replacement, a portion
	Resection	T	Cutting out or off, without replacement, all of a body part
-exeresis	Extraction	D	
-lysis	Release	N	
-oscopy	Inspection	J	
-otomy	Division	8	Cutting into body part w/o taking out fluids and/or gases to separate or transect a body part
	Drainage	9	Taking out fluids and/or gases
-pexy	Repair	Q	Restoring to normal anatomy or function —Used only when no other root operation is applicable
	Reposition	S	Move body part to a new location (e.g., free flaps)
-plasty	Repair	Q	Restoring to normal anatomy or function —Used only when no other root operation is applicable
	Replacement	DVC R	Putting in/on biological/synthetic material to take the place and/or function of a body part
	Supplement	DVC U	Putting in/on biologic/synthetic material to reinforce and/or augment the function of a body part
-plication	Restriction	V	
-rraphy	Repair	Q	
-stasis	Control	3	
-tripsy	Fragmentation	F	
Common Procedures			
Adenoidectomy			5th character Approach = X External
partial	Excision	B	Coded separately from concomitant tonsillectomy
total	Resection	T	Coded separately from concomitant tonsillectomy
Adhesiolysis	Release	N	
Advancement (flap)	Reposition	S	Move body part to a new location (e.g., free flaps)
	Transfer	X	Move body part to another location to take over the function , still connected to its vascular and nervous supply
Amniocentesis	Drainage	9	See table 109.
Amputation (extremity)	Detachment	6	
Anastomosis	Bypass	1	

DVC Root operation for procedures that always involve a device.