Anatomy for ICD-10-CM
Part 3: Neurology

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Objectives

• Understand the structure and function
• Review common terminology
• ICD-10-CM changes related to the neurological system
• Study common diseases and disorders
Overview

- The nervous system acts as a control center for the entire body.
- Directs every body system and controls all movement, sensation, thought, and emotion.
- Decides how best to respond to internal and external stimuli.

Structure

- Divided into two subdivisions:
  - Central nervous system (CNS)
    - Consists of brain and spinal cord
  - Peripheral nervous system (PNS)
    - Consists of 12 pairs of cranial nerves and 31 pairs of spinal nerves
Central Nervous System

• Protection
  – The brain is protected by the cranium or skull.
  – The spinal cord is protected by the vertebrae of the spine.

• Additional protection
  – Connective tissue membranes (meninges)
  – Cerebrospinal fluid

The Brain

• Primary controller of the body
  – Estimated that the brain is made up of 50 – 100 billion nerve cells!

• Four main parts
  – Cerebrum
  – Diencephalon
  – Cerebellum
  – Brain stem
Cerebrum

- Largest part of the brain
- Divided into four sections and controls higher brain function such as thoughts and actions.
  - Frontal lobe
  - Parietal lobe
  - Occipital lobe
  - Temporal lobe

Diencephalon

- Also known as the “inter brain”
- Consists of:
  - Thalamus
  - Hypothalamus
Cerebellum

- Second largest part of the brain
- Also known as the small brain
- Controls the coordination of voluntary motor movement, balance, posture, and muscle tone
- Located just above the brain stem in the back of the brain

Brain Stem

- Located in the posterior part of the brain
- Serves as a conduit for nerve connections to pass through to the rest of the body
- Has three major structures
  - Midbrain
  - Pons
  - Medulla oblongata
Spinal Cord

- Begins at the occipital bone
- Extends down to the first and second lumbar vertebrae
- Primary function is to transmit neural signals between the brain and the rest of the body

Peripheral Nervous System

- Accounts for all neural tissue and expands out from the brain and spinal cord
- Connects the central nervous system to limbs and organs
- Divided into two systems
  - Somatic
  - Autonomic
Cranial Nerves

- 12 pairs of cranial nerves
  I. Olfactory – smell
  II. Optic – vision
  III. Oculomotor – eyelid/eyeball movement, pupil dilation
  IV. Trochlear - turns eye downward and laterally
  V. Trigeminal – chewing, face, mouth, touch, pain

Cranial Nerves

VI. Abducens – turns eye laterally
VII. Facial – facial expression, secretion of tears and saliva, taste
VIII. Auditory (vestibulocochlear) – hearing, equilibrium
IX. Glossopharyngeal – taste, senses carotid blood pressure
X. Vagus – senses aortic blood pressure, slows heart rate, stimulates digestive organs, taste
Cranial Nerves

XI. Spinal accessory – controls trapezius and sternocleidomastoid, controls swallowing movements

XII. Hypoglossal – controls tongue movements

Spinal Nerves

• Spinal nerves run through the gaps between adjacent vertebrae entering the back and the front of the spinal cord as spinal nerve roots.

• Spinal cord is divided into segments according to the nerve roots that branch off of it.

• There are 31 pairs of spinal nerves.
Spinal Nerves

- 8 pairs of cervical nerves
- 12 pairs of thoracic nerves
- 5 pairs of lumbar nerves
- 5 pairs of sacral nerves
- 1 pair of coccygeal nerves

Nerve Plexus

- Spinal nerves join together in plexuses.
- A plexus is an interconnection of fibers, which form new combinations as the “named” or peripheral nerves.
Autonomic System

- Divided into three parts
  - Sympathetic nervous system
  - Parasympathetic nervous system
  - Enteric nervous system

Sympathetic Nervous System

- Directs response to external danger
- Increases adrenaline with the sense of excitement.
- “Flight or fight” response
Parasympathetic Nervous System

- Functions in the opposite way of the sympathetic system
- Relaxes the body
  - Rest
  - Digest

Enteric Nervous System

- Regulates all aspects of the digestive system
- Operates independently from the brain and spinal cord
Nerves

- **Afferent nerves**
  - Carry sensory impulses to the brain from other parts of the body.

- **Efferent nerves**
  - Carry sensory impulses away from the brain to other parts of the body.

Cells of the Nervous System

- **Neurons**
  - Cell body
  - Dendrites
  - Axon

- **Neuroglia (glial cells)**
  - Astrocytes
  - Oligodendrocytes
  - Microglia
  - Ependymal cells
Neurons

- Neurons are specialized cells that transmit information throughout the body.
- Two forms:
  - Electrical
  - Chemical
- Different types are responsible for different tasks.

Neuroglias

- Neuroglias are cells that support and protect neurons.
- Also known as glial cells.
- Schwann cells work much the same way; however, they support the peripheral nervous system.
Synapse

- The structure that allows a neuron to pass electrical or chemical signal to another cell.
- Two different types:
  - Chemical synapse
  - Electrical synapse

Diseases and Disorders

- Some common disorders of the nervous system include:
  - Alzheimer’s Disease
  - Epilepsy
  - Migraines
  - Cerebrovascular disease
  - Paralysis
Alzheimer’s Disease

• Alzheimer’s disease is a form of dementia.
  – Loss of brain function
  – Progressive disease
  – Affects memory, thinking, and behavior

• Risk factors:
  – Age
  – Family history
  – Genetic

Alzheimer’s Disease

• ICD-10-CM
  – G30.- Alzheimer’s disease requires four characters to report the highest level of specificity
    • Use additional code to identify:
      – Delirium, if applicable (F05)
      – Dementia with behavioral disturbance (F02.81)
      – Dementia without behavioral disturbance (F02.80)
Alzheimer’s Disease

- ICD-10-CM
  - G30.0 Alzheimer’s disease with early onset
  - G30.1 Alzheimer’s disease with late onset
  - G30.8 Other Alzheimer’s disease
  - G30.9 Alzheimer’s disease, unspecified

Epilepsy

- A brain disorder where neurons send abnormal signals to the body.
- Causes can include:
  - Illness
  - Brain injury
  - Abnormal brain development
- Having a seizure does not indicate a person has epilepsy.
Types of Epilepsy

• Localization-related (focal)(partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset
• Localization-related (focal)(partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures
• Localization-related (focal)(partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures
• Generalized idiopathic epilepsy and epileptic syndromes
• Other generalized epilepsy and epileptic syndromes
• Special epileptic syndromes
• Other epilepsy and seizures
• Epilepsy, unspecified

ICD-10-CM Guidelines

• The guidelines in ICD-10-CM state:
  – the following terms are to be considered equivalent to intractable:
    • Pharmacoresistant (pharmacologically resistant)
    • Treatment resistant
    • Refractory (medically) and poorly controlled
Status Epilepticus

- The term status epilepticus can be coded when documentation indicates that the patient has had an uninterrupted seizure for greater than 30 minutes.

ICD-10-CM

- Code choice selections include:
  - Type of epilepsy
  - Intractable or not intractable
  - With or without status epilepticus
ICD-10-CM Examples

| Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, not intractable, with status epilepticus | G40.001 |
| Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, not intractable, with status epilepticus | G40.101 |
| Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable, with status epilepticus | G40.201 |

| Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, not intractable, without status epilepticus | G40.009 |
| Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, not intractable, without status epilepticus | G40.109 |
| Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable, without status epilepticus | G40.209 |

| Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, intractable, with status epilepticus | G40.011 |
| Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, intractable, with status epilepticus | G40.111 |
| Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, intractable, with status epilepticus | G40.211 |

Migraines

- Form of vascular headache
- Prompts the release of chemicals from nerve fibers coiled around the large arteries of the brain
- Very severe, often debilitating
- Classified to symptoms they produce
Types of Migraines

• Migraine without aura
• Migraine with aura
• Hemiplegic migraine
• Persistent migraine aura without cerebral infarction
• Persistent migraine aura with cerebral infarction
• Chronic migraine without aura
• Ophthalmoplegic migraine
• Menstrual migraine
• Other migraine
• Migraine, unspecified

ICD-10-CM Guidelines

• Due to the classification of an intractable migraine, the guidelines in ICD-10-CM state:
  – The following terms are to be considered equivalent to intractable:
    • Pharmacoresistant (pharmacologically resistant)
    • Treatment resistant
    • Refractory (medically) and poorly controlled
ICD-10-CM

- Code choice selections include:
  - Type of migraine
  - If aura is present or not
  - Intractable or not intractable
  - With or without status migrainosus (lasting more than 72 hours)

ICD-10-CM Examples

<table>
<thead>
<tr>
<th>Migraine without aura, not intractable, with status migrainosus</th>
<th>G43.001</th>
<th>Migraine with aura, not intractable, with status migrainosus</th>
<th>G43.101</th>
<th>Menstrual migraine, not intractable, with status migrainosus</th>
<th>G43.d01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine without aura, not intractable, without status migrainosus</td>
<td>G43.009</td>
<td>Migraine with aura, not intractable, without status migrainosus</td>
<td>G43.109</td>
<td>Menstrual migraine, not intractable, without status migrainosus</td>
<td>G43.d09</td>
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<tr>
<td>Migraine without aura, intractable, with status migrainosus</td>
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<td>Migraine with aura, intractable, with status migrainosus</td>
<td>G43.111</td>
<td>Menstrual migraine, intractable, with status migrainosus</td>
<td>G43.d11</td>
</tr>
<tr>
<td>Migraine without aura, intractable, without status migrainosus</td>
<td>G43.019</td>
<td>Migraine with aura, intractable, without status migrainosus</td>
<td>G43.119</td>
<td>Menstrual migraine, intractable, without status migrainosus</td>
<td>G43.d19</td>
</tr>
</tbody>
</table>
Cerebrovascular Disease

- Cerebrovascular accident (CVA), or stroke, occurs when the brain does not receive enough oxygen to function properly
- Two types of cerebrovascular accidents: ischemic, hemorrhagic

Types of Cerebrovascular Disease

- Cerebral infarction due to thrombosis of unspecified precerebral artery
- Cerebral infarction due to embolism of precerebral arteries
- Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries
- Cerebral infarction due to thrombosis of cerebral arteries
- Cerebral infarction due to embolism of cerebral arteries
- Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries
- Cerebral infarction due to cerebral venous thrombosis, nonpyogenic
- Other cerebral infarction
- Cerebral infarction, unspecified
ICD-10-CM

• Code choice selections include:
  – Type of cerebrovascular disease
  – Site

ICD-10-CM Examples

<table>
<thead>
<tr>
<th>Cerebral infarction due to unspecified occlusion or stenosis of right vertebral arteries</th>
<th>I63.211</th>
<th>Cerebral infarction due to embolism of right anterior cerebral artery</th>
<th>I63.421</th>
<th>Cerebral infarction due to unspecified occlusion or stenosis of right middle cerebral artery</th>
<th>I63.511</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebral infarction due to unspecified occlusion or stenosis of left vertebral arteries</td>
<td>I63.212</td>
<td>Cerebral infarction due to embolism of left anterior cerebral artery</td>
<td>I63.422</td>
<td>Cerebral infarction due to unspecified occlusion or stenosis of left middle cerebral artery</td>
<td>I63.512</td>
</tr>
<tr>
<td>Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries</td>
<td>I63.219</td>
<td>Cerebral infarction due to embolism of unspecified anterior cerebral artery</td>
<td>I63.429</td>
<td>Cerebral infarction due to unspecified occlusion or stenosis of unspecified middle cerebral artery</td>
<td>I63.519</td>
</tr>
</tbody>
</table>
ICD-10-CM Guidelines

• Use additional code to identify presence of:
  – alcohol abuse and dependence (F1Ø.-)
  – exposure to environmental tobacco smoke (Z77.22)
  – history of tobacco use (Z87.891)
  – hypertension (I1Ø–I15)
  – occupational exposure to environmental tobacco smoke (Z57.31)
  – tobacco dependence (F17.-)
  – tobacco use (Z72.Ø)

Diseases and Disorders

• Cerebral palsy
  – Happens when the areas of the brain that control movement and posture do not develop correctly or get damaged

• Hemiplegia
  – Refers to complete paralysis of one entire side of the body

• Paraplegia
  – Refers to paralysis of the lower extremities. if only one limb is affected it is known as monoplegia
Laterality and Dominant/Nondominant Side

- Affecting unspecified side
- Affecting right dominant side
- Affecting left dominant side
- Affecting right nondominant side
- Affecting left nondominant side

ICD-10-CM Guidelines

- Assignment of whether the dominant or nondominant side is affected should be guided by documentation in the medical record.
  - Should this information not be available in the record, and the classification system does not include a default, the default should be dominant?
  - For ambidextrous patients, the default should also be dominant.
ICD-10-CM

- Code choice selections include:
  - Type of paralytic syndrome
  - Laterality
  - Dominant or nondominant side affected, as necessary

### ICD-10-CM Examples

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Code</th>
<th>Description</th>
<th>G81.00</th>
<th>G82.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spastic quadriplegic cerebral palsy</td>
<td>G80.0</td>
<td>Flaccid hemiplegia affecting unspecified side</td>
<td>G81.00</td>
<td>G82.50</td>
</tr>
<tr>
<td>Spastic diplegic cerebral palsy</td>
<td>G80.2</td>
<td>Flaccid hemiplegia affecting right dominant side</td>
<td>G81.01</td>
<td>G82.51</td>
</tr>
<tr>
<td>Spastic hemiplegic cerebral palsy</td>
<td>G80.3</td>
<td>Flaccid hemiplegia affecting left dominant side</td>
<td>G81.02</td>
<td>G82.52</td>
</tr>
<tr>
<td>Athetoid cerebral palsy</td>
<td>G80.4</td>
<td>Flaccid hemiplegia affecting right nondominant side</td>
<td>G81.03</td>
<td>G82.53</td>
</tr>
<tr>
<td>Ataxic cerebral palsy</td>
<td>G80.4</td>
<td>Flaccid hemiplegia affecting left nondominant side</td>
<td>G81.04</td>
<td>G82.54</td>
</tr>
</tbody>
</table>
Coma

- A coma is a state of deep sleep in which a patient is unable to wake, respond to normally painful stimuli, light or sound, and does not initiate voluntary actions.
- Glasgow coma scale is used as a scoring system to quantify the level of consciousness of a patient in a coma.

Glasgow Coma Scale

- Three separate components are measured on the scale:
  - Best eye response (E)
  - Best verbal response (V)
  - Best motor response (M)
ICD-10-CM

• Code selection includes:
  – the score for each component.
  – when the assessment was performed.

ICD-10 Example

| Unspecified coma | R40.20 | Coma scale, best verbal response, confused conversation | R40.224-
|------------------|--------|---------------------------------------------------------|--------|
| Coma scale, eyes open, never | R40.211- | Coma scale, best verbal response, oriented | R40.225-
| Coma scale, eyes open, to pain | R40.212- | Coma scale, best motor response, none | R40.231-
| Coma scale, eyes open, to sound | R40.213- | Coma scale, best motor response, extension | R40.232-
| Coma scale, eyes open, spontaneously | R40.214- | Coma scale, best motor response, abnormal | R40.233-
| Coma scale, best verbal response, none | R40.221- | Coma scale, best motor response, flexion withdrawal | R40.234-
| Coma scale, best verbal response, incomprehensible words | R40.222- | Coma scale, best motor response, localizes pain | R40.235-
| Coma scale, best verbal response, inappropriate words | R40.223- | Coma scale, best motor response, obeys commands | R40.236- |
Glasgow Coma Scale

• These codes require a seventh character extension to provide details as to when the assessment was made:
  – 0 = unspecified time
  – 1 = in the field (EMT or ambulance)
  – 2 = at arrival to emergency department
  – 3 = at hospital admission
  – 4 = 24 hours or more after hospital admission

Glasgow Coma Scale

• Per the ICD-10-CM guidelines, the seventh character should match for all codes.
• A code from each category is needed to complete the scale.
Conclusion

Some basic knowledge of how the nervous system works will greatly assist in code selection at the highest level of specificity in ICD-10-CM.

All staff involved in the coding process should either take an intensive A&P class or take a refresher course to update skills.