

## Interventional Neurology Certification Examination Content Outline

The UCNS Interventional Neurology examination was established to determine the level of competence for Interventional Neurology specialists.

The following content outline is the blueprint for the development of the certification examination is available to examination candidates. The content outline consists of two primary categories followed by subcategories. The written examination consists of 200 multiple choice questions. Candidates must have a passing score in both content areas to become certified in Interventional Neurology.

<u>Content Area</u>	<u>Percentage of Questions</u>
I. Neurovascular Disease States, & Conditions	50%
II. Neurointerventional Procedures & Techniques	50%

### **I. Neurovascular Basics, Disease States, & Conditions**

#### **A. Cerebrovascular Anatomy**

1. Internal Carotid Artery
  - a. Carotid artery segments
  - b. Middle cerebral arteries
  - c. Anterior cerebral arteries
  - d. Lenticulostriate arteries
  - e. Ophthalmic arteries
  - f. Anterior choroidal artery
  - g. Posterior communicating artery
2. External Carotid artery
  - a. Ascending Pharyngeal Artery
  - b. Lingual Artery
  - c. Facial Artery
  - d. Occipital Artery
  - e. Auricular Artery
  - f. Internal Maxillary artery
  - g. Middle Meningeal Artery
  - h. Superficial Temporal Artery

3. Vertebrobasilar arterial system
    - a. Vertebral artery segments
    - b. Basilar artery
    - c. Posterior inferior cerebellar arteries
    - d. Anterior inferior cerebellar arteries
    - e. Superior cerebellar arteries
    - f. Thalamoperforator arteries
    - g. Pontine perforator arteries
  4. Spinal neurovascular anatomy
  5. Venous anatomy
    - a. Cervical cerebral
    - b. Spinal
  6. Important anastomoses
  7. Congenital anatomic variants
- B. Cerebrovascular Physiology
1. Cerebral blood flow and its regulation
  2. Physiology of hypoperfusion
  3. Collaterals
    - a. Circle of Willis
    - b. Choroidal vessels
    - c. Leptomeningeal vessels
    - d. Dural vessels
    - e. Artery-to-artery anastomoses
  4. Physiology of hyperperfusion
  5. Imaging-based assessments of cerebral perfusion including indications and limitations
    - a. CT Perfusion with/without automated post-processing
    - b. Catheter angiography
    - c. MRI and MR perfusion
- C. Cerebrovascular Diseases
1. Acute intracranial large artery occlusion related to thrombus and treatment
    - a. Posterior circulation
    - b. Anterior circulation
    - c. Acute intracranial large artery occlusion related to intracranial stenosis and treatment
    - d. Subacute/chronic intracranial atherosclerotic disease
    - e. Cervical carotid artery occlusion and stenosis
    - f. Crescendo TIAs
    - g. Intracranial vasculopathy: Non-atherosclerotic Spinal cord infarction
    - h. Traumatic vascular injuries
    - i. Cerebral venous sinus thrombosis

2. Intracranial hemorrhage
  - a. Supratentorial: Lobar
  - b. Supratentorial: Deep
  - c. Cerebellar
  - d. Brainstem
  - e. Intraventricular
3. Subarachnoid hemorrhage
  - a. Aneurysmal and non-aneurysmal
  - b. Cerebral aneurysms
  - c. Arteriovenous malformations
  - d. Dural AV fistulas
  - e. Cavernous malformations
  - f. Developmental venous anomalies
4. Carotid-cavernous fistulae

#### D. Neurovascular Trauma

1. Cervical, vertebral, and cerebral arterial dissections
2. Epidural hematoma
3. Subdural hematoma
4. Penetrating injuries

## II. Neurointerventional Procedures & Techniques

### A. General Catheterization & Angiography for Diagnosis

1. Cervico-cerebral angiography
2. Spinal angiography
3. Arterial access: Femoral
4. Arterial access: Radial
5. Pre-procedural care: Consent process
6. Pre-procedural care: Patient preparation
7. Post-procedural care: Arteriotomy Closure & Care
8. Analgesia, Anesthesia, and Sedation

### B. Digital Subtraction Angiography

1. Image acquisition and processing
2. Strengths and limitations of the technique
3. Indications relative to other imaging modalities
4. Risks and radiation safety
5. Contrast agent usage and complications

### C. Neurointerventional Pharmacology

1. Antiplatelet Agents: Aspirin
2. Antiplatelet Agents: Clopidogrel and ticagrelor
3. Antiplatelet agents: GpIIb/IIIa Inhibitors

4. Anticoagulants: Heparin & Low Molecular Heparinoids
  5. Anticoagulants: Warfarin
  6. Anticoagulants: Direct Thrombin and Factor X Inhibitors
  7. Fibrinolytic agents: Alteplase, Tenecteplase
  8. Reversal Agents
  9. Vasodilators: Nicardipine & Verapamil
  10. Vasodilators: Dantrolene
  11. ICP-lowering agents: Mannitol, hypertonic saline
  12. WADA agents: amytal, brexital
  13. Anaphylaxis management in the neuro-angio suite
  14. Heparin induced thrombocytopenia
- D. Neurointerventional Treatment of Acute Ischemic Stroke
1. Indications & Patient Selection
  2. Contraindications & Alternative Strategies
  3. Technique: Retrievers
  4. Technique: Direct aspiration
  5. Technique: Pharmacologic alternatives
- E. Neurointerventional Treatment of Extracranial Carotid Artery Pathology
1. Indications & Patient Selection
  2. Contraindications & Alternative Strategies
  3. Technique: Angioplasty & Stenting
  4. Technique: Covered Stenting for Pseudoaneurysms
  5. Technique: Stenting of Ostial Carotid Lesions
  6. Technique: Epistaxis and traumatic injuries to carotid arteries
- F. Neurointerventional Treatment of Extracranial Vertebral Artery Pathology
1. Indications & Patient Selection
  2. Contraindications & Alternative Strategies
  3. Technique: Stenting of Ostial Lesions
  4. Technique: Stenting of Cervical Canal Lesions
- G. Neurointerventional Treatment of Intracranial Atherosclerotic Stenosis
1. Indications & Patient Selection
  2. Contraindications & Alternative Strategies
  3. Technique: Balloon Angioplasty
  4. Technique: Stenting
- H. Neurointerventional Treatment of Cerebral Aneurysms
1. Indications & Patient Selection
  2. Contraindications & Alternative Strategies
  3. EVD: when to place, drain level settings
    - a. Intraprocedural troubleshooting EVD
  4. Technique: Coil Embolization
  5. Technique: Balloon Remodeling

6. Technique: Stent-assisted Embolization
  7. Technique: Flow Diversion Devices
  8. Technique: Intrasaccular flow diversion (WEB)
- I. Neurointerventional Treatment of Vasospasm
    1. Indications & Patient Selection
    2. Contraindications & Alternative Strategies
    3. Technique: Intra-arterial Vasodilators
    4. Technique: Balloon Angioplasty
    5. Technique: Retriever Angioplasty
  - J. Neurointerventional Treatment of Arteriovenous Malformations
    1. Indications & Patient Selection
    2. Contraindications & Alternative Strategies
    3. Technique: Liquid Embolization Agents
    4. Technique: Onyx v. NBCA
  - K. Neurointerventional Treatment of Tumors
    1. Indications & Patient Selection
    2. Contraindications & Alternative Strategies
    3. Technique: Liquid Embolization Agents
    4. Technique: Onyx v. NBCA
    5. Technique: Particle embolization
  - L. Neurointerventional Treatment of Dural AV Fistulas
    1. Indications & Patient Selection
    2. Classification systems
      - a. Borden
      - b. Cognard
      - c. Implications of Natural history of DAVF
    3. Contraindications & Alternative Strategies
    4. Technique: Trans-arterial
    5. Technique: Trans-venous
    6. Technique: Direct percutaneous embolization
  - M. Neurointerventional Treatment of Carotid Cavernous Fistulas
    1. Indications and patient selection
    2. Classification: Direct vs Indirect
    3. Contraindications and alternative strategies
    4. Technique: Transvenous and alternatives
  - N. Neurointerventional Treatment of Subdural Hematoma
    1. Indications & Patient Selection
    2. Contraindications and Alternative Strategies

O. Neurointerventional Treatment of Cerebral Venous Sinus Thrombosis

1. Indications & Patient Selection
2. Contraindications and Alternative Strategies

P. Provocative Testing

1. Wada
2. Balloon test occlusion
3. Pre-embolization pharmacological testing

Q. Neurointerventional Complications

1. Predictability, Preparation, & Prevention
  - a) Aneurysm Procedural Rupture
  - b) Vessel Perforation
  - c) Thromboembolic complication
  - d) Groin hematoma including retroperitoneal hematoma, abdomen compartment syndrome
  - e) Radial artery vasospasm/dissection
  - f) Access site pseudoaneurysm
  - g) Coagulopathy
2. Recognition & Immediate Care
3. Debriefing & Quality Improvement
4. Patient Safety Culture
5. Risk Management