



American Board of Psychiatry and Neurology, Inc.

A Member Board of the American Board of Medical Specialties (ABMS)

SUBSPECIALTY CERTIFICATION EXAMINATION IN VASCULAR NEUROLOGY

Content Blueprint

Number of questions: 220 questions	Percent
01. Basic science aspects of vascular neurology	4-6%
02. Risk factors and epidemiology	8-12%
03. Clinical features of cerebrovascular diseases	8-12%
04. Evaluation of the patient with cerebrovascular disease	13-17%
05. Causes of stroke	18-22%
06. Complications of stroke	4-6%
07. Treatment of patients with stroke	28-32%
08. Recovery, regenerative approaches, and rehabilitation	4-6%
TOTAL	100%

Note: A more detailed content outline is shown below



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Content Outline

Content Areas	
01.	Basic science aspects of vascular neurology
A.	Vascular neuroanatomy
1.	Extracranial arterial anatomy
2.	Intracranial arterial anatomy
3.	Collaterals
4.	Alterations of vascular anatomy
5.	Venous anatomy
6.	Spinal cord vascular anatomy
7.	Specific vascular-brain anatomic correlations
8.	End vessel syndromes
B.	Stroke pathophysiology
1.	Cerebral blood flow
a.	Vascular smooth muscle control
b.	Vasodilation and vasoconstriction
c.	Autoregulation
d.	Vasospasm
e.	Rheology
f.	Blood flow in stroke
2.	Blood-brain barrier in stroke
3.	Coagulation cascade
a.	Clotting factors
b.	Platelet function
c.	Endothelium function
d.	Biochemical factors
4.	Metabolic and cellular consequences of ischemia
a.	Ischemic cascade
b.	Reperfusion changes
c.	Electrophysiology
d.	Gene regulation
5.	Inflammation and stroke
6.	Brain edema and increased ICP
a.	Secondary effects



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	7.	Restoration and recovery following stroke
	8.	Secondary consequences from intracranial bleeding
C.		Neuropathology of stroke
	1.	Vascular neuropathology
	2.	Atherosclerosis and atherosclerotic plaque
	3.	Brain and meningeal biopsy
	a.	Indications
	4.	Pathological/imaging/clinical correlations
02.		Prevention, risk factors, and epidemiology
A.		Populations at risk for stroke
	1.	Non-modifiable risk factors
	2.	Age, gender, ethnicity, geography, family history
B.		Modifiable risk factors for stroke
	1.	Hypertension
	2.	Diabetes mellitus
	3.	Cholesterol
	4.	Homocysteine
	5.	Obesity
	6.	Alcohol abuse
	7.	Tobacco use
	8.	Drug abuse
	9.	Exercise and other lifestyle factors
C.		Infections predisposing to stroke
D.		Genetic factors predicting stroke
E.		Stroke as a complication of other medical illness
F.		Special populations at risk for stroke
	1.	Children and adolescents
	2.	Young adults
	3.	Pregnancy
G.		Stroke education programs and regional health services
	1.	Screening
	2.	Medical economics
	3.	Primary versus high risk prevention
	4.	National stroke programs
H.		Concepts of clinical research
	1.	Use and interpretation of statistics
	2.	Clinical trial design and methodology
	3.	Understanding the medical literature



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	4.	Rules of evidence and guidelines
	5.	Rating instruments and stroke scales
I.		Outcomes
	1.	Prognosis
	2.	Mortality and morbidity of stroke subtypes
03.		Clinical features of cerebrovascular diseases
A.		Neuro-otology
	1.	Head and neck pathology
	2.	Vertigo and hearing loss in stroke
B.		Neuro-ophthalmology
	1.	Retinal changes of vascular disease, including arterial hypertension and retinal embolism
	2.	Other ocular manifestations of vascular disease
	a.	Ischemic oculopathy
	b.	Horner syndrome
	c.	Cavernous sinus syndrome
	3.	Disorders of ocular motility
	4.	Visual field defects
C.		Transient ischemic attack (TIA)
	1.	General features of TIA
	2.	Carotid circulation TIA including amaurosis fugax
	3.	Vertebrobasilar circulation TIA
	4.	Asymptomatic carotid bruit or stenosis
	5.	Differential diagnosis of TIA
D.		Ischemic stroke syndromes—cerebral hemispheres
	1.	Cortical stroke syndromes
	a.	Branch cortical artery syndromes
	b.	Watershed syndromes
	2.	Subcortical stroke syndromes
	a.	Lacunar strokes
	b.	Striatocapsular infarctions
	c.	Multiple lacunar infarcts
	3.	Major hemispheric syndromes
	a.	Internal carotid artery occlusion
	b.	Middle cerebral, anterior cerebral, or posterior cerebral artery
	4.	Behavioral and cognitive impairments following stroke
	5.	Bi-hemispheric stroke, including hypotensive events
	6.	Multifocal or diffuse disease



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E.	Ischemic stroke syndromes—brainstem and cerebellum
1.	Basilar artery occlusion
a.	Locked-in syndrome
b.	Major brainstem strokes
2.	Vertebral artery occlusion
3.	Branch brainstem stroke syndromes
4.	Syndromes from cerebellar arteries (brainstem/cerebellum)
5.	Top-of-the-basilar syndromes
6.	Thalamic syndromes
F.	Ischemic stroke syndromes of the spinal cord
G.	Vascular dementia (vascular cognitive impairment) and vascular cognitive syndromes
1.	Multi-infarction (multiple subcortical infarctions)
2.	White matter disease (leukoaraiosis, Binswanger subcortical leukoencephalopathy)
H.	Features differentiating hemorrhagic or ischemic stroke
I.	Intracerebral hemorrhage
1.	Hypertension
2.	Cerebral amyloid angiopathy
3.	Coagulopathy/bleeding diatheses
4.	Locations
a.	Putamen
b.	Thalamus
c.	Lobar and white matter
d.	Brainstem
e.	Cerebellum
J.	Subarachnoid hemorrhage
1.	Saccular aneurysms
2.	Other aneurysms
3.	Unruptured aneurysm
4.	Trauma
K.	Vascular malformations
1.	Hemorrhage
2.	Other presentations
L.	Primary intraventricular hemorrhage
M.	Subdural or epidural hematoma
N.	Venous thrombosis
1.	Cavernous sinus



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2.	Superior sagittal sinus
3.	Other sinus
4.	Cortical thrombophlebitis
5.	Deep cerebral veins
O.	Carotid cavernous or dural fistulas
P.	Pituitary apoplexy
Q.	Hypertensive encephalopathy and eclampsia
R.	Clinical presentations of primary and multisystem vasculitides
S.	Hypoxia-ischemia
1.	Cardiac arrest
2.	Carbon monoxide poisoning
3.	Cortical laminar necrosis
4.	Other
T.	Brain death
U.	MELAS and metabolic disorders causing neurologic symptoms
V.	Nonstroke presentations of vascular disease
W.	Cardiovascular diseases
1.	Heart disease, including coronary artery disease
2.	Cardiac complications of stroke
3.	Peripheral arterial disease
4.	Aortic disease
5.	Venous disease
X.	Vascular presentations of other diseases of the central nervous system
Y.	Infectious diseases and stroke
Z.	Migraine
04.	Evaluation of the patient with cerebrovascular disease
A.	Evaluation of the brain and spinal cord
1.	Computed tomography of brain
a.	Acute changes of ischemic stroke
b.	Acute changes of hemorrhagic stroke
c.	Chronic changes of stroke
d.	Complications of stroke
e.	Vascular imaging by CT
f.	Differential diagnosis by CT
g.	CT perfusion
h.	MR perfusion
2.	Computed tomography of spine and spinal cord
3.	Magnetic resonance imaging of brain



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	a.	MRI sequences—T1, T2, FLAIR, DWI, PWI, gradient echo
	b.	MR spectroscopy
	c.	Acute changes of ischemic stroke
	d.	Acute changes of hemorrhagic stroke
	i.	Changes affected by time
	e.	Functional MRI
	f.	Vascular imaging by CT
	g.	Vascular imaging by MRI
4.		PET and SPECT
5.		EEG and evoked potentials—stroke
	a.	Changes in stroke
	b.	Complications of stroke
	c.	Monitoring
6.		Examination of the CSF
7.		ICP monitoring
B.		Evaluation of the vasculature—occlusive or non-occlusive
1.		Arteriography and venography
	a.	Cerebral
	b.	Spinal cord
2.		Extracranial ultrasonography
	a.	Duplex and other imaging
	b.	Collateral flow challenges
	c.	Monitoring
3.		Intracranial ultrasonography
	a.	Collateral flow changes
	b.	Contrast enhancement
	c.	Monitoring
4.		CT angiography and CT venography
5.		MR angiography and MR venography
C.		Evaluation of the heart and great vessels
1.		Electrocardiography
	a.	Monitoring
	b.	Holter and event monitors
2.		TTE and TEE
	a.	Contrast-enhanced studies
3.		Other chest imaging studies
	a.	Chest x-ray
	b.	Chest CT



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	c.	Chest MRI
4.		Other studies
	a.	Blood pressure monitoring
	b.	Blood cultures
	c.	Testing for ischemic heart disease
	d.	Peripheral artery disease
D.		Other diagnostic studies
1.		Hematologic studies
	a.	Blood count
	b.	Platelet count
	c.	Special coagulation studies
	d.	Antiplatelet (aspirin, clopidogrel) resistance studies
2.		Immunological studies
	a.	Inflammatory markers
	b.	Other autoimmune studies (multisystem)
	c.	Serologic studies
3.		Biochemical studies
	a.	Glucose
	b.	Cholesterol
	c.	Blood gases
	d.	Hepatic and renal tests
4.		Urine tests
5.		Biopsies
6.		Evaluation for the complications of stroke
7.		Evaluation for the consequences of stroke
	a.	Swallowing
	b.	Orthopedic
	c.	Other
8.		Genetic testing
05.		Causes of stroke
A.		Atherosclerosis—ischemic stroke
	1.	Evaluation of patients prior to non-cerebrovascular operations
	2.	Asymptomatic bruit or stenosis
	3.	Aortic atherosclerosis
B.		Non-atherosclerotic vasculopathies—ischemic stroke
	1.	Non-inflammatory
	a.	Dissection
	b.	Moyamoya disease



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	c.	Fibromuscular dysplasia
	d.	Trauma
	e.	Radiation-induced vasculopathy
	f.	Saccular aneurysm
	g.	Other
2.		Infectious
	a.	Syphilis
	b.	Herpes zoster
	c.	AIDS
	d.	Cysticercosis
	e.	Bacterial meningitis
	f.	Aspergillosis
	g.	Mucormycosis
	h.	Cat-scratch disease
	i.	Behçet syndrome
	j.	Other
3.		Inflammatory, non-infectious (angiitis)
	a.	Isolated CNS vasculitis
	b.	Multisystem vasculitis
	c.	Cogan syndrome
	d.	Eales disease
	e.	Polyarteritis nodosa
	f.	Wegener granulomatosis with polyangiitis
	g.	Eosinophilic granulomatosis with polyangiitis (Churg-Strauss syndrome)
	h.	Takayasu disease
	i.	Systemic lupus erythematosus
	j.	Scleroderma
	k.	Rheumatoid arthritis
	l.	Mixed connective tissue disease
	m.	Ulcerative colitis and regional enteritis
	n.	Sarcoidosis
	o.	Other
C.		Migraine
D.		Other causes of ischemic stroke
	1.	Kawasaki disease
	2.	Lyme disease
	3.	Susac syndrome



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E.	Genetic and metabolic causes of stroke
1.	CADASIL
2.	MELAS
3.	Fabry-Anderson disease
4.	Homocystinuria
5.	Kearns-Sayre syndrome
6.	Myoclonus epilepsy with ragged red fibers
7.	Ehlers-Danlos syndrome, type IV
8.	Marfan syndrome
9.	CARASIL
10.	Other monogenetic small vessel brain diseases
11.	Other
F.	Drugs that cause stroke, including drugs of abuse
G.	Cerebral amyloid angiopathy—infarction or hemorrhage
H.	Cardioembolic causes of stroke
1.	Atrial fibrillation
2.	Cardiovascular procedures and operations
3.	Acute myocardial infarction
4.	Dilated cardiomyopathy
5.	Rheumatic mitral or aortic stenosis
6.	Infective endocarditis
7.	Libman-Sacks endocarditis
8.	Non-bacterial thrombotic endocarditis
9.	Mechanical or bioprosthetic valves
10.	Atrial myxoma
11.	Sick sinus syndrome
12.	Mitral valve prolapse
13.	Patent foramen ovale, including atrial septal aneurysm
14.	Congenital heart diseases, including cyanotic heart disease
15.	Other
I.	Prothrombotic causes of stroke
1.	Inherited
a.	Sickle cell disease
b.	Factor V Leiden—activated protein C resistance
c.	Prothrombin gene mutation
d.	Protein S, C, antithrombin
e.	Thalassemia
f.	Iron deficiency anemia



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	g. Others
2.	Acquired
	a. Pregnancy
	b. Cancer
	c. Dehydration
	d. Thrombocytosis
	e. Thrombotic thrombocytopenic purpura
	f. Heparin-induced thrombocytopenia and thrombosis (HITT)
	g. Leukemia
	h. Disseminated intravascular coagulation
	i. Nephrotic syndrome
	j. Hemolytic uremic syndrome
	k. Sepsis and inflammation
	l. Other
3.	Autoimmune causes of thrombosis
	a. Lupus and lupus anticoagulant, Sneddon syndrome and antiphospholipid antibodies
	b. Others
4.	Iatrogenic/drugs/toxins
	a. Antineoplastic
	b. Prothrombotic agents
	c. Others
J.	Bleeding diatheses
1.	Inherited
	a. Hemophilia
	b. Sickle cell disease
	c. Thalassemia
	d. von Willebrand's disease
	e. Others
2.	Acquired
	a. Leukemia
	b. Thrombocytopenia
	c. Disseminated intravascular coagulation
	d. Others
3.	Systemic diseases
4.	Iatrogenic/drugs/toxins
	a. Anticoagulants
	b. Antiplatelet aggregating agents



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	c.	Thrombolytic agents
	d.	Drugs of abuse
	e.	Others
K.		Aneurysms
	1.	Saccular
	2.	Infected
	3.	Traumatic
	4.	Neoplastic
	5.	Dolichoectatic
	6.	Dissecting
L.		Vascular malformations
	1.	Arteriovenous
	2.	Developmental venous anomaly
	3.	Cavernous
	4.	Telangiectasia
	5.	Dural arteriovenous fistula
M.		Trauma and intracranial bleeding
N.		Moyamoya disease and syndrome
O.		Hypertensive hemorrhage
P.		Other causes of hemorrhage
	1.	Vasculitis
	2.	Tumors
	a.	Primary
	b.	Metastatic
	3.	Iatrogenic
Q.		Genetic diseases causing hemorrhagic stroke
06.		Complications of stroke
A.		Early neurologic complications
	1.	Brain edema, increased ICP, and herniation
	2.	Hydrocephalus
	3.	Seizures
	4.	Hemorrhagic transformation
	5.	Recurrent infarction
	6.	Recurrent hemorrhage
	7.	Other
B.		Early medical complications
	1.	Cardiac
	2.	Gastrointestinal



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3.	Pulmonary
4.	Electrolyte
5.	Other
C.	Chronic neurologic sequelae
D.	Chronic medical sequelae
07.	Treatment of patients with stroke
A.	Outpatient management
1.	Patient educational materials
B.	Medical therapies to prevent stroke
1.	Antiplatelet agents
a.	Aspirin
b.	Clopidogrel
c.	Ticlopidine
d.	Dipyridamole
e.	Cilostazol
f.	Prasugrel
g.	Ticagrelor
h.	Others
2.	Anticoagulant agents
a.	Warfarin
b.	Heparin
c.	LMW heparins
d.	Direct thrombin inhibitors
e.	Factor X inhibitors
3.	Thrombolytic agents
4.	Neuroprotective agents and other acute treatments
5.	Cardioactive agents
6.	Medications to prevent stroke by treating risk factors
a.	Hyperlipidemia
b.	Diabetes mellitus
c.	Hypertension
d.	Smoking
e.	Hyperhomocysteinemia
f.	Antiinflammatory
g.	Alcohol dependence and detoxification
7.	Medications to treat autoimmune diseases and vasculitis
8.	Medications to treat complications of stroke
a.	Anticonvulsants



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	b.	Antidepressants
	c.	Brain edema and increased ICP
	i.	Hypertonic saline
	ii.	Mannitol
9.		Medications to improve or restore neurologic function or to augment rehabilitation
10.		Medications to prevent rebleeding or vasospasm following a hemorrhage
	a.	Aminocaproic acid
	b.	Tranexamic acid
	c.	Nimodipine
11.		Antimigraine medications
12.		Vitamins
13.		Interactions between medications
C.		Hyperacute treatment of ischemic stroke
	1.	Emergency department
	a.	Intravenous thrombolytics
	b.	Intra-arterial thrombolytics
	c.	Mechanical thrombectomy
	d.	Anticoagulants and antiplatelet agents
	e.	Antihypertensives
	f.	Anticonvulsants
	g.	Other
	2.	Hospitalization – general management
	a.	Prevention of recurrent stroke
	b.	Prevention of deep vein thrombosis and pulmonary embolism
	c.	Blood pressure management
	d.	Treatment of complications
	e.	Treatment of comorbid diseases
	f.	Treatment of risk factors for stroke
	g.	Other
	3.	Intensive care unit
	a.	Osmotic agents
	b.	Steroids
	c.	Sedation
	d.	Blood products
	e.	Anti-vasospasm therapy



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	f.	Management of ventriculostomy
	g.	Temperature control
	h.	Antiarrhythmics
	i.	Ventilator management
	j.	Pressors
	k.	Antibiotics
	l.	Other
	4.	Neurosurgical management
	a.	Hemorrhage
		i. Evacuation
		ii. Ventriculostomy
	b.	Ruptured aneurysms
		i. Management of vasospasm
	c.	Vascular malformations
	d.	Surgical treatment of brain edema – decompressive craniectomy
	e.	Other
D.		Chronic care
	1.	Antidepressants
	2.	Sedatives
	3.	Stimulants
E.		Treatment of venous thrombosis
F.		Treatment of spinal cord vascular disease
G.		Treatment of pituitary apoplexy
H.		Professionalism, ethics, systems-based practice
	1.	Palliative care
	2.	End-of-life decisions
	3.	Advanced directives, informed consent, regulations
	4.	Other
08.		Recovery, regenerative approaches, and rehabilitation
	A.	Functional assessment
	B.	Regeneration and plasticity
	C.	Predicting outcomes
	D.	Pharmacologic effects on recovery
	E.	Rehabilitation principles
	F.	Emerging approaches