

## Physician's Vascular Interpretation Examination Content Outline

### (Outline Summary)

#	Domain	Subdomain	Percentage
1	Cerebrovascular	Extracranial Carotid Intracranial Carotid	15%
2	Abdominal	Aortoiliac Liver Mesenteric Renal	15%
3	Peripheral Arterial - Duplex Imaging	Bypass Graft Dialysis Access Interpretation of Duplex Imaging Postoperative Endovascular Intervention	15%
4	Peripheral Arterial - Physiologic	Ankle Brachial Index/Pulse Volume Recording Digital Evaluation	20%
5	Peripheral Venous	Vein Mapping Venous Thrombosis/Obstruction Venous Insufficiency Testing	20%
6	Laboratory Technology and Operations	Patient Care Physics and Instrumentation Quality Assurance	15%

### (Detailed Outline)

1.	Cerebrovascular 15%	Knowledge and/or skill of the cerebrovascular system
1.A.	Extracranial Carotid	
1.A.1.	Interpret extracranial carotid exams	Knowledge of normal vascular anatomy
1.A.2.	Assess carotid vessels after intervention, (i.e., carotid endarterectomy or stent)	Knowledge of blood pressure, flow, and regulation of vascular resistance
1.A.3.	Assess the effect of contralateral disease	Knowledge of fluid dynamics, laminar and turbulent flow, fluid energy, and effects of stenosis
1.A.4.	Include plaque description when interpreting exams	Knowledge of anatomic variants
1.A.5.	Grade stenosis other than bulb/internal carotid artery, (i.e., common carotid artery, external carotid artery, vertebral artery and subclavian artery)	Knowledge of incidental findings Knowledge of pathologic anatomy Apply velocity criteria for grading stenosis of the extracranial and intracranial portions of the cerebrovascular circulation
1.A.6.	Comment on incidental findings	Understand the physiology of the cerebral vascular bed

1.A.7.	Incorporate cardiac disease impact on carotid waveforms	Incorporate patient-specific anatomy and understand its impact on diagnostic conclusion
1.A.8.	Assess nonatherosclerotic vascular disease	Apply transcranial Doppler diagnostic criteria for brain death, vasospasm, arterial venous malformation, and emboli detection
<b>1.B.</b>	<b>Intracranial Carotid</b>	
1.B.1.	Interpret intracranial carotid exams	Modify diagnosis of vertebral artery disease based on waveform analysis Identify findings for planning operations or interventions Recognize nonatherosclerotic vascular disease Discriminate normal post-operative/intervention changes Knowledge of sickle cell anemia diagnostic criteria
<b>2.</b>	<b>Abdominal 15%</b>	<b>Knowledge and /or skill of the abdominal system</b>
<b>2.A.</b>	<b>Aortoiliac</b>	
2.A.1.	Evaluate aneurysmal disease	Knowledge of normal vascular anatomy
2.A.2.	Interpret aortoiliac ultrasound studies	Knowledge of blood pressure, flow, and regulation of vascular resistance
2.A.3.	Evaluate occlusive disease	Knowledge of fluid dynamics, laminar and turbulent flow, fluid energy, and effects of stenosis
2.A.4.	Interpret post-endovascular aneurysm repair ultrasound studies	Modify interpretation post-intervention
2.A.5.	Use color Doppler for evaluation of endoleaks	Knowledge of anatomic variants
2.A.6.	Use power Doppler for evaluation of endoleaks	Knowledge of incidental findings Knowledge of pathologic anatomy Knowledge of the effects of fasting on superior mesenteric artery stenosis
<b>2.B.</b>	<b>Liver</b>	
2.B.1.	Interpret hepatoportal studies	Recognize nonatherosclerotic vascular disease
<b>2.C.</b>	<b>Mesenteric</b>	
2.C.1.	Interpret mesenteric ultrasound studies	Recognize abnormal blood flow patterns using waveform analysis
2.C.2.	Use modified criteria for post-stent evaluation	Understand Doppler principles
2.C.3.	Interpret testing for celiac compression	Understand the physiology of the internal organ circulation and hepatoportal venous system
<b>2.D.</b>	<b>Renal</b>	
2.D.1.	Use renal-aortic ratio to grade stenosis	Apply velocity criteria for grading stenosis
2.D.2.	Use velocity criteria to grade stenosis	Calculate and understand waveform indices, e.g., resistive indices
2.D.3.	Report on resistive indices	Modify diagnosis based on patient comorbidities
2.D.4.	Interpret renal ultrasound studies	Understand the role and limitations of contrast agents
2.D.5.	Assess renal allografts	Understand the normal and abnormal flow patterns associated with renal allografts
<b>3.</b>	<b>Peripheral Arterial - Duplex Imaging 15%</b>	<b>Knowledge and /or skill of the peripheral arterial system-duplex imaging</b>
<b>3.A.</b>	<b>Bypass Graft</b>	
3.A.1.	Apply a criteria for evaluating stenosis	Knowledge of normal vascular anatomy

3.A.2.	Image native circulation above and below bypass graft	<p>Knowledge of blood pressure, flow, and regulation of vascular resistance</p> <p>Knowledge of fluid dynamics, laminar and turbulent flow, fluid energy, and effects of stenosis</p> <p>Knowledge of anatomic variants</p> <p>Knowledge of arterial steals</p> <p>Knowledge of bypass grafts, stents and percutaneous angioplasty</p> <p>Knowledge of incidental findings</p> <p>Knowledge of pathologic anatomy</p> <p>Understand the normal and abnormal flow patterns associated with dialysis access</p> <p>Knowledge of aneurysm and pseudoaneurysm</p> <p>Knowledge of ultrasound guidance during a procedure</p> <p>Knowledge velocity criteria for grading stenosis</p> <p>Understand Doppler principles</p> <p>Understand provocative maneuvers</p> <p>Understand entrapment syndromes</p>
3.A.3.	Interpret surveillance of bypass graft with vein conduit	
3.A.4.	Interpret surveillance of stents	
3.A.5.	Interpret surveillance of bypass graft with prosthetic conduit	
<b>3.B.</b>	<b>Dialysis Access</b>	
3.B.1.	Interpret venous mapping for pre-dialysis access	
3.B.2.	Evaluate for access problems	
3.B.3.	Interpret arterial exams for pre-dialysis access	
3.B.4.	Evaluate existing access before and after intervention	
3.B.5.	Evaluate central veins	
3.B.6.	Evaluate arteriovenous access for aneurysms	
3.B.7.	Interpret access surveillance	
3.B.8.	Use volume flow measurements	
<b>3.C.</b>	<b>Interpretation of Duplex Imaging</b>	
3.C.1.	Interpret peripheral arterial ultrasound studies	
3.C.2.	Apply velocity criteria to grade stenosis	
3.C.3.	Assess for peripheral arterial aneurysms	
3.C.4.	Treat pseudoaneurysms in the vascular laboratory	
3.C.5.	Assess for arterial trauma	
3.C.6.	Use a protocol for provocative maneuvers to assess for popliteal artery entrapment	
<b>3.D.</b>	<b>Postoperative Endovascular Intervention</b>	
3.D.1.	Image native circulation above and below intervention	
3.D.2.	Apply velocity criteria for stenosis/restenosis	
3.D.3.	Use protocols that are modified to assess the stented vessel	
3.D.4.	Use ultrasound guidance during procedures	
3.D.5.	Assess for stent fracture	
<b>4.</b>	<b>Peripheral Arterial - Physiologic 20%</b>	<b>Knowledge and /or skill of the peripheral arterial system-physiologic</b>
<b>4.A.</b>	<b>Ankle Brachial Index/Pulse Volume Recording</b>	

4.A.1.	Report the level of disease	Understand the use of photoplethysmography (PPG), plethysmography, and laser Doppler Knowledge of TcPo2 testing Knowledge of methods of pressure measurement and their limitations Understand entrapment syndromes Understand qualitative Doppler waveform analysis Understand quantitative Doppler waveform analysis Knowledge of arterial steals Modify interpretation based on patient comorbidities Knowledge of provocative maneuvers (i.e., exercise, thoracic outlet and cold immersion)
4.A.2.	Interpret qualitative Doppler waveform analysis	
4.A.3.	Interpret segmental pressure studies	
4.A.4.	Interpret quantitative Doppler waveform analysis	
4.A.5.	Interpret pulse volume recordings	
4.A.6.	Interpret exercise studies	
<b>4.B.</b>	<b>Digital Evaluation</b>	
4.B.1.	Interpret toe pressures	
4.B.2.	Interpret finger pressures to evaluate for arterial steal	
4.B.3.	Evaluate for thoracic outlet syndrome	
4.B.4.	Interpret Raynaud disease testing	
4.B.5.	Interpret transcutaneous oxygen tension (TcPo2) testing	
<b>5.</b>	<b>Peripheral Venous 20%</b>	<b>Knowledge and /or skill of the peripheral venous system</b>
<b>5.A.</b>	<b>Vein Mapping</b>	Knowledge of normal vascular anatomy Knowledge of venous hemodynamics and flow, and effects of intravascular and extravascular processes Knowledge of anatomic variants Knowledge of incidental findings Knowledge of pathologic anatomy Knowledge of venous insufficiency and reflux Knowledge of photoplethysmography (PPG) to identify venous insufficiency Venous testing after intervention Knowledge of positioning to assess venous reflux Knowledge of superficial and deep venous systems perforating veins Knowledge of lymphatic system Knowledge of ultrasound guidance during a procedure Understand Doppler principles Understand provocative maneuvers Understand entrapment syndromes
5.A.1.	Comment on compressibility of the veins	
5.A.2.	Report on vein diameter	
5.A.3.	Comment on anatomic variants	
5.A.4.	Interpret venous ultrasound studies	
<b>5.B.</b>	<b>Venous Thrombosis/Obstruction</b>	
5.B.1.	Assess for deep vein thrombosis	
5.B.2.	Assess for anatomic variants	
5.B.3.	Examine for nonthrombotic venous compression	
5.B.4.	Assess waveforms for cardiac comorbidities	
5.B.5.	Assess waveforms for central venous obstruction	
5.B.6.	Routinely examine the inferior vena cava and iliac veins	
<b>5.C.</b>	<b>Venous Insufficiency Testing</b>	
5.C.1.	Assess for superficial venous reflux	
5.C.2.	Assess for deep venous incompetence	
5.C.3.	Assess for perforating veins	
5.C.4.	Assess for superficial venous thrombus	

6.	Laboratory Technology and Operations 15%	Knowledge and /or skill of laboratory technology and operations
<b>6.A.</b>	<b>Patient Care</b>	
6.A.1.	Address patient safety issues	Ability to recognize artifacts
6.A.2.	Collect and evaluate patient satisfaction scores	Correlate information with previous tests Knowledge of advanced imaging techniques, (i.e., harmonics and spatial compounding)
<b>6.B.</b>	<b>Physics and Instrumentation</b>	Knowledge of ALARA (as low as reasonably achievable) principles and bioeffects
6.B.1.	Identify Doppler waveform characteristics	Knowledge of continuous wave, pulsed wave, and B-mode imaging
6.B.2.	Recognize artifacts	Knowledge of contrast agents
6.B.3.	Apply color Doppler principles	Knowledge of Doppler principles
6.B.4.	Apply pulsed wave Doppler principles	Knowledge of patient satisfaction surveys, reimbursement and hospital experience
6.B.5.	Apply continuous wave Doppler principles	Knowledge of quality assurance programs
6.B.6.	Apply power Doppler principles	Knowledge of ultrasound principles
6.B.7.	Implement a preventative maintenance program	Ability to provide direct feedback to technical staff on the quality of images/data presented
6.B.8.	Interpret and obtain video images	Knowledge to select the appropriate transducer for the exam
6.B.9.	Use ultrasound contrast agents	Understand patient care, procedural planning, and outcome assessment
<b>6.C.</b>	<b>Quality Assurance</b>	Understand report generation and PACS
6.C.1.	Implement a quality assurance program	Understand the indications for vascular lab testing and reporting standards
6.C.2.	Participate in regular quality assurance	Understand the use of specificity, sensitivity, predictive value, and accuracy calculations and comparison with a referenced standard
6.C.3.	Determine percent accuracy	Understand vascular lab accreditation and requirements
		Ensure appropriate indications
		Recognize and communicate critical findings to referring physician
		Assess agreement between preliminary and final reports