VASCULAR SURGERY

KNOWLEDGE & PERFORMANCE GOALS, STUDENT & RESIDENT DUTIES & RESPONSIBILITIES

During the academic year and during your rotation on Vascular Surgery at MUH and at the VA we want you to get the most out of it. According to your level of training, you should strive to master the following objectives for both knowledge and performance skills. Use this as a guide for your individual pursuit of knowledge. Although many of these may be covered in conferences, lectures, and rounds, you are responsible for filling in the gaps in your knowledge. Now that you are all grown up, no one is going to ‘spoon-feed’ you. You will be expected to READ! READ! READ! A wide variety of resources and clinical material will be at your disposal. Take advantage of them!

General guidelines for duties and clinical responsibilities have also been outlined for each PG year. Your chief resident or attending may, of course, assign others. Welcome!
KNOWLEDGE OBJECTIVES

3rd and 4th Year Medical Students.

You are responsible for reading the vascular surgery chapters in any standard surgical text. You should review the pertinent anatomy prior to participating in any surgical procedures. You must review and be familiar with the following concepts:

1. Vascular anatomy of the abdomen, neck and extremities.
2. Basic physiology of blood flow and hemodynamics.
3. Fluid and electrolytes
4. Renal physiology
5. Pathophysiology of atherosclerosis
6. Cerebrovascular disease and stroke: medical vs surgical treatment
7. The difference between vasculogenic claudication and other causes of leg pain.
8. Abdominal aortic aneurysms: Diagnosis and prognosis.
9. Basic vascular laboratory tests and results.
10. Acute arterial ischemia
11. Acute deep venous thrombosis and chronic venous insufficiency.
**KNOWLEDGE OBJECTIVES**

**Postgraduate Year One.** Following your rotation, you should be able to:

1. Describe human arterial and venous anatomy and related regional anatomy.
2. Describe basic arterial and venous hemodynamics.
3. Discuss the anatomy, pathology, and pathophysiology of the arterial wall.
4. Assess patients' vascular systems using appropriate skills in history-taking and clinical examination.
5. Describe life-threatening signs of vascular disease and indicate when immediate intervention is required.
6. Differentiate between the following diagnostic tools available for assessing vascular disease and explain the relative contribution of each:
   a. Angiography
   b. Computed axial tomographic (CAT) scanning
   c. Ultrasound
   d. Magnetic resonance imaging
7. Summarize the pathophysiology, clinical manifestations, and therapeutic options of specific categories of vascular disease:
   a. Venous disease
      (1) Thromboembolic disease
      (2) Pulmonary embolism
   b. Arterial disease
      (1) Atherosclerosis and its related disorders
      (2) Occlusive disease
      (3) Aneurysmal disease
   c. Interaction of cardiovascular and pulmonary systems
8. Discuss basic principles of Doppler ultrasound for performing bedside arterial and venous Doppler testing.
9. Outline the principles of noninvasive laboratory diagnosis; include a description of the role and limitations of the vascular laboratory.
   a. ABI/waveforms
   b. Carotid duplex
   c. Venous duplex
   d. PPG/LRR venous
   e. Graft flow studies
10. Outline the principles of care for ischemic limbs.
11. Summarize principles for the preoperative assessment and postoperative care of patients undergoing major vascular surgical procedures.
12. Outline the fundamental elements of nonoperative care of the vascular patient, including the role of risk assessment and preventive measures.
13. Describe the hemodynamics and pathophysiology of specific clinical symptoms:
   a. Claudication
   b. Transient ischemic attack (TIA)
   c. Stroke
   d. Mesenteric angina
   e. Angina pectoris
   f. Renovascular hypertension
   g. Arteriovenous (AV) fistula
14. Explain the concept of critical arterial stenosis.
15. Differentiate between acute arterial and acute deep venous occlusion.
16. Determine a plan for assessment of operative risk in these categories:
   a. Cardiac
   b. Pulmonary
   c. Renal
   d. Metabolic
   e. Levels of anesthetic risk
17. Describe the use of adjunctive measures such as:
   a. Antibiotics
   b. Thrombolytic agents
   c. Anticoagulants
   d. Antiplatelet agents
18. Explain the physiologic and organic manifestations of vascular disease, such as renovascular hypertension, portal hypertension, and renal failure.
KNOWLEDGE OBJECTIVES

Postgraduate Year Two. Be knowledgeable about all of the above. In addition, after completing your rotation you should be able to:

1. Review and describe the basic clinical manifestations of the following vascular disorders:
   a. Thromboembolic disease--arterial and venous
   b. Chronic venous insufficiency and lymphatic obstruction
   c. Portal hypertension
2. Differentiate between the following diagnostic tools available for assessing vascular disease and explain the relative contribution of each:
   a. Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA)
   b. Duplex scanning (ultrasonography)
3. Summarize the etiology, pathophysiology, and therapeutic options of specific categories of vascular disease:
   a. Venous disease
      (1) Varicose vein disease
      (2) Post-phlebitic syndrome
      (3) Portal hypertension
   b. Lymphatic disease
      (1) Anatomy of lymphatic system and lymphatic return
      (2) Congenital lymphatic anomalies
      (3) Acquired lymphatic disease
      (4) Operative procedures for correction of lymphatic disease
   c. Arterial disease
      (1) Aortic and other vascular aneurysms
      (2) Atherosclerotic vascular disease
      (3) Arterial embolic disease
      (4) Extracranial cerebrovascular disease
      (5) Visceral ischemic syndromes
      (6) Renovascular hypertension
      (7) Degenerative arterial disease
      (8) Trauma
      (9) Arteriovenous fistulas (local and cardiac hemodynamic effects)
4. Describe the natural history of medically-treated vascular disease in the following categories:
   a. Carotid arterial stenosis
   b. Abdominal aortic aneurysm
   c. Chronic femoral artery occlusion
5. Describe the role of anticoagulant agents, including antiplatelet agents, in the management of patients with vascular disease.
6. Analyze the role of the endothelium in atherosclerosis, thrombosis, and thrombolysis.
7. Discuss the principles of and contraindications for anticoagulation and thrombolytic therapy.
8. Describe the surgically correctable causes of hypertension and their diagnostic modalities.

9. Discuss the mechanics of action and the therapeutic role of the following pharmacologic types of agents:
   a. Vasopressors
   b. Anticoagulants
   c. Vasodilators
   d. Antiplatelet agents
   e. Adrenergic blocking agents
   f. Thrombolytics

10. Demonstrate knowledge of the general principles of vascular surgical technique including:
    a. Vascular control and suturing
    b. Endarterectomy
    c. Angioplasty
    d. Bypass grafting

11. Discuss clotting factors and how they interact including hypercoagulable states and coagulopathies.

12. Discuss the role of the following factors in maintaining homeostasis in the coagulation pathways:
    a. Protein S
    b. Platelet granules
    c. Protein C
    d. Endothelial cell
    e. Platelets
    f. Antithrombin III
KNOWLEDGE OBJECTIVES

Postgraduate Year Four/Five. Prior to your rotation you should be knowledgeable about all of the above. In addition, you should be able to:

1. Review and describe the basic clinical manifestations of congenital vascular diseases
2. Summarize the etiology, diagnosis, and therapeutic options of specific categories of vascular disease:
   a. Arterial disease
      (1) Inflammatory vascular disease and vasculitis
      (2) Arteriovenous fistulas or malformations
      (3) Neurovascular compression syndromes (thoracic outlet syndrome)
   b. Miscellaneous
      (1) Tumors
      (2) Sympathetic nervous system (e.g. causalgia, reflex sympathetic dystrophy)
3. Discuss the principles of angiography to include the following considerations:
   a. Indications and complications (including contrast-induced renal failure)
   b. Review principles and techniques of intraoperative angiography
   c. Review principles and techniques of emergency room angiography
5. Demonstrate awareness of the costs associated with providing surgical care to patients with vascular disorders.
6. Differentiate between different operative approaches to the vascular system to include:
   a. Incisions and exposure
   b. Handling of vascular tissues
   c. Principles of vascular bypass grafting
   d. Emergency vascular surgery
   e. Reoperative vascular surgery
   f. Principles of endarterectomy
7. Illustrate the operative exposure of the major vessels, including:
   a. Aortic arch
   b. Suprarenal aorta
   c. Proximal subclavian
   d. Infrarenal aorta
   e. Carotid artery
   f. Femoral artery
   g. Descending thoracic aorta
   h. Popliteal artery
8. Outline the indications for operations for claudication, abdominal aortic aneurysm, carotid stenosis, and amputation.
9. Describe the indications for balloon angioplasty and vascular stent placement with risks and complications.
10. Describe the pathogenesis and complications of aneurysmal disease.
11. Summarize the etiology, microbiology, and treatment of diabetic foot infection.
12. Categorize the prevention and management of operative and postoperative complications, including graft infections, ischemic bowel, graft thrombosis, and extremity ischemia.
13. Outline the manifestation of failing peripheral vascular grafts.
14. Discuss the principles of reoperative vascular surgery.
15. Outline procedure for managing vascular surgical emergencies such as acute tissue ischemia or major hemorrhage (traumatic or ruptured aneurysm).
16. Demonstrate a basic knowledge of the various types of graft and suture material available.
17. Analyze alternative measures for the diagnosis and management of renovascular hypertension.
18. Discuss alternative operative procedure for the management of portal hypertension.
19. Summarize the surgical techniques available for managing the following vascular disorders:
   a. Abdominal aortic bypass or aneurysmectomy
   b. Carotid stenosis
   c. Femoral-popliteal occlusion
   d. Tibial artery occlusion
20. Analyze the management of complex vascular problems considering the following factors:
   a. Morbidity and mortality
   b. Advanced surgical techniques
      (1) Endoscopy
      (2) Microvascular techniques
      (3) Endoluminal grafting
21. Review critical factors for decision making in vascular surgery:
   a. Risk:reward ratio
   b. Morbidity and mortality probability
   c. Preoperative and postoperative assessment
   d. Noninvasive laboratories, duplex scanning
   e. Role of advanced radiologic techniques: Angioplasty, CT scanning, MRI/MRA imaging
22. Apply the decision making process in analyzing complex vascular diseases, including the following:
   a. Cerebrovascular problems
   b. Mesenteric vascular disease
   c. Renovascular disease
   d. Aneurysmal disease
   e. Lower extremity arterial occlusion
   f. Venous disease
23. Outline the management of prosthetic graft infections, including:
   a. Diagnosis
   b. Use of alternate routes for revascularization
c. Use of alternative graft materials

24. Summarize complications of common major vascular procedures such as:
   a. Carotid endarterectomy
   b. Aortic reconstruction
   c. Lower extremity vascular reconstruction
PERFORMANCE OBJECTIVES, DUTIES, AND RESPONSIBILITIES FOR GENERAL SURGERY STUDENTS & RESIDENTS ON VASCULAR SURGERY

3rd YEAR AND 4TH YEAR MEDICAL STUDENTS
AND
POSTGRADUATE YEAR ONE

Performance Objectives

1. Following your rotation you should be able to demonstrate competence in basic surgical techniques, including:
   a. Knot tying
   b. Wound closure

2. Document participation by scrubbing in at least one:
   a. Aortic reconstruction
   b. Carotid endarterectomy and intraoperative duplex scan
   c. Lower extremity bypass
   d. Major amputation

3. Understand vascular laboratory testing by performing in the Vascular Laboratory:
   a. 2 sets of doppler-derived Ankle Brachial Indices (ABI), toe-pressures, and wave forms
   b. Observe one carotid duplex scan
   c. Observe one deep venous duplex exam

4. Demonstrate proficiency in venous access procedures by at least one:
   a. Central line placement
   b. Change of catheter over guidewire

5. Perform the preoperative assessment and postoperative care of patients undergoing major vascular surgical procedures by confirmed:
   a. Auscultation of a carotid bruit
   b. Palpation of an abdominal aortic aneurysm
   c. Palpation of a popliteal pulse
   d. Palpation of a lower extremity graft pulse
   e. Auscultation of a femoral bruit
3rd YEAR AND 4TH YEAR MEDICAL STUDENTS
AND
POSTGRADUATE YEAR ONE

Duties and Responsibilities

1. Attend daily AM and PM work rounds.
2. Write orders and complete daily assigned tasks. Sign all verbal orders given (PG-1 only).
3. Provide ward coverage for inpatients and write daily progress notes.
   Co-sign student notes. (PG-1 only)
4. Work up patients on the Vascular Service (inpatients and same day admissions).
5. Provide direct patient evaluation, assessment, and communicate with more senior person for problems. Participate in in-house call rotation as assigned and assure communication availability with superiors.
6. Attend outpatient clinic as assigned.
7. Attend following conferences:
   a. Basic Science Lecture Monday 7:00 am
   b. Grand Rounds Tuesday 7:00 am
   c. Vascular Conference Wednesday 8:00 AM
   d. Mortality and Morbidity Conference Thursday 6:30 AM
   e. Journal Club (check with chief resident) (PG-1 Only)
   f. Resident Lunch Conference Friday 12:00 PM (optional)
8. Interact with and instruct medical students (PG 1 only).
POSTGRADUATE YEAR TWO

Performance Objectives

Be proficient in all the above performance objectives for postgraduate year one. In addition:

1. Demonstrate skill in basic surgical techniques, including:
   a. Knowledge of instrumentation
   b. Incisions
   c. Closure of incisions
   d. Handling of graft material
2. Participate in surgery for venous disease, including:
   a. Ligation and stripping of varicose veins
   b. Management of venous stasis ulcers
   c. Management of venous thrombosis
3. Participate in amputations with specific attention to control of toxicity.
4. Demonstrate the ability to perform arterial access or arterio-venous access, including:
   a. Incisions
   b. Closure of incision
   c. Thrombectomy and revision

POSTGRADUATE YEAR TWO

Duties and Responsibilities

1. Attend daily AM and PM rounds.
2. Assist postgraduate year one in completing ward work, orders, and work-ups.
3. Assume primary responsibility for managing ICU patients including orders and daily progress notes.
4. Attend outpatient clinics as assigned.
5. Complete initial evaluation of inpatient consults prior to presentation to chief resident or attending.
6. Organize and run vascular conference.
7. Interact with and instruct medical students when appropriate.
8. Assure ICU/PACU beds are available postop as appropriate.
POSTGRADUATE YEAR FOUR/FIVE

Performance Objectives

Review and be proficient in all the above. In addition:

1. Obtain vascular control of diseased or traumatically occluded blood vessels using:
   a. Vascular clamps
   b. Vessel loop/Rummel tourniquet
   c. Balloon occlusion
   d. Digital compression
2. Participate in thromboendarterectomy and thrombectomy / thromboembolectomy.
3. Demonstrate appropriate vascular suture techniques.
4. Evaluate and manage sympathectomy procedures.
5. Demonstrate the appropriate incisions and exposure of:
   a. Abdominal aorta and its major branches
   b. Portal venous system
   c. Peripheral arterial system
   d. Carotid arterial system
   e. Arteriovenous fistula
6. Obtain vascular control of major vessels
   a. Aorta
   b. Vena cava
7. Participate in endarterectomy and bypass grafting.
8. Demonstrate ability to manage graft and suture materials.
9. Perform selected operative procedures or selected parts of the following operative procedures under supervision:
   a. Aortic aneurysm repair
   b. Carotid endarterectomy
   c. Aorto-iliac occlusive disease
   d. Femoral popliteal occlusive disease
   e. Correction of portal hypertension
   f. Peripheral vascular trauma
10. Discuss and demonstrate the role of adjunctive measures in operative procedures including angioscopy, thrombolytic therapy, and video-assisted procedures.

11. Select and use proper advanced techniques in managing patients with a variety of vascular disorders such as:
   a. Ruptured aortic aneurysm
   b. Central vascular trauma
   c. Suprarenal aortic aneurysm
   d. Renovascular hypertension
   e. Femoral tibial bypasses
12. Perform alternative methods of bypass grafting such as:
   a. Extra-anatomic bypass, principles and techniques
   b. Indirect revascularization
   c. In situ techniques
   d. Sequential and composite techniques
13. Manage prosthetic graft infections to include:
a. Diagnosis
b. Selection of alternate routes for revascularization
c. Selection of appropriate graft materials
d. Timing of interventions

14. Manage complications of common major vascular procedures such as:
   a. Carotid endarterectomy
   b. Aortic reconstruction
   c. Lower extremity vascular reconstruction
Postgraduate Year Four/Five

Duties and Responsibilities

1. Oversee evaluation and daily management of all vascular patients.
2. Participate in major vascular reconstructions as primary surgeon or assistant.
3. Communicate directly with attending regarding patient findings and care plans.
4. Insure appropriate informed consent is obtained and communicate with patient families as appropriate.
5. Communicate with nursing service representatives regarding daily management and discharge planning.
7. Provide daily instruction on patient care and evaluation to medical students.
8. Attend conferences as listed above.
9. Participate in call schedule as assigned.
10. Accomplish operative reports as primary surgeon within 24 hours.
11. Assign other administrative tasks to more junior residents as appropriate.
1. True or False

Kinetic, not viscous (Poiseuille’s law), energy losses account for most of the pressure drop across a stenosis.

2. The most useful method(s) of diagnosing deep venous thrombosis is/are

   a. clinical examination
   b. continuous wave Doppler wave form analysis
   c. duplex doppler ultrasound
   d. magnetic resonance angiography
   e. all of the above

3. True or False

Continuous wave doppler ultrasound has primary clinical applicability in obtaining pressure measurements, indices, and arterial wave form analysis.

4. Indications for duplex doppler study include all the following, except

   a. possible cerebrovascular disease
   b. initial evaluation of lower extremity claudication
   c. clinical suspicion of deep venous thrombosis
   d. follow-up of lower extremity autogenous vein arterial bypass
   e. renal artery exam when renovascular hypertension is suspected

5. A 57 year old diabetic has a 5th toe ulcer without forefoot sepsis, no palpable pulses and an ABI= 1.0. The following are applicable:

   a. gangrene is inevitable, followed by major amputation
   b. circulation is adequate to achieve wound healing
   c. determination of PPG-derived toe pressures better predicts forefoot perfusion
   d. transcutaneous pO2 or laser doppler determination of forefoot flow are not indicated

6. True or False

Most patients with acute popliteal or iliofemoral deep venous thrombosis will have diminished augmentation and respiratory variation of flow with poor compressibility of the vein during duplex scanning.
### Performance Objectives

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<td>4. a. Central line placement</td>
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<td>b. Change of catheter over guidewire</td>
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<td>5. a. Auscultation of a carotid bruit</td>
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**Resident Signature**