2016 NIA Clinical Guidelines for Medical Necessity Review

HORIZON NJ

ULTRASOUND MANAGEMENT
Guidelines for Clinical Review Determination

Preamble
NIA is committed to the philosophy of supporting safe and effective treatment for patients. The medical necessity criteria that follow are guidelines for the provision of diagnostic imaging. These criteria are designed to guide both providers and reviewers to the most appropriate diagnostic tests based on a patient’s unique circumstances. In all cases, clinical judgment consistent with the standards of good medical practice will be used when applying the guidelines. Guideline determinations are made based on the information provided at the time of the request. It is expected that medical necessity decisions may change as new information is provided or based on unique aspects of the patient’s condition. The treating clinician has final authority and responsibility for treatment decisions regarding the care of the patient.

Guideline Development Process
These medical necessity criteria were developed by NIA for the purpose of making clinical review determinations for requests for diagnostic tests. The developers of the criteria sets included representatives from the disciplines of radiology, internal medicine, nursing, and cardiology. They were developed following a literature search pertaining to established clinical guidelines and accepted diagnostic imaging practices.

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CPT Codes: 76536

INTRODUCTION:

Thyroid, parathyroid and lymph nodes are the most commonly imaged areas of the head and neck region and ultrasound is the most appropriated imaging modality. Along with imaging minimally invasive procedures (fine needle aspiration) are performed on thyroid nodules clinically relevant lymph nodes and parathyroid. Besides the thyroid, parathyroid and lymph nodes, the salivary glands can be imaged.

APPROPRIATE INDICATIONS FOR A HEAD OR NECK ULTRASOUND

Thyroid Gland:
• To assist in diagnosing thyroid autoimmune disease.
• As a diagnostic tool for individuals with:
  o Thyroid nodules identified via palpation
  o Unexplained cervical adenopathy
  o Past history of radiation in the cervical region (annually)
  o Family history of carcinoma of the thyroid gland (annually)
• Evaluation of abnormalities detected by other imaging examinations.
• Staging tumors of the thyroid.
• Monitoring the thyroid bed and cervical nodal compartments after thyroidectomy.

Parathyroid Gland:
• To localize adenomas in preparation for surgery.

Salivary Gland:
• To localize and identify lesions within the submandibular salivary gland or superficial lobes of the parotid.
• To determine benign vs. malignant tumors.
• Sialolithiasis
• For suspected abscess

Cervical Lymph Nodes:
• To identify the size and complexity of cervical lymph nodes
• To differentiate benign vs. malignant nodes, although additional cytology may be needed to identify histological origin

Mass
• Evaluation of undiagnosed mass.

Other Indication:
• Follow up of an abnormality seen on prior imaging
ADDITIONAL INFORMATION RELATED TO HEAD AND NECK ULTRASOUND

**Thyroid Gland**
Ultrasound (US) of the thyroid gland is indicated to identify thyrotoxicosis, decipher between a benign versus malignant nodule present in or around the gland, and monitor disease progression or response to treatment.

**Parathyroid Gland**
When hyperparathyroidism is identified clinically, US of the parathyroid gland is used to localize adenomas in preparation for surgery. US appears to be the test of choice for this preoperative procedure, due in part to the fact that US is relatively inexpensive and does not emit radiating ions, but also because there is fair evidence that US is as effective at locating the lesion as the other standard imaging technique, nuclear scintigraphy.

**Salivary Glands**
Uses of US in imaging of the salivary glands are similar to those of the thyroid and parathyroid glands: to identify and/or localize masses or lesions and to assess for pathology. Because of the anatomical location of the salivary glands, only the most superficial regions can be visualized by US, namely the submandibular gland, the sublingual gland, and the superficial lobes of the parotid gland. The deep lobe of the parotid, as well as the minor salivary glands, is unable to be visualized by US. For these regions, MRI or CT is recommended as first line diagnostic modalities. US is also used to stage Sjogren’s disease.

**Masses of unknown origin**
In diagnosing head and neck masses or swellings of unknown origin, US can assist in making the initial diagnosis.

**REFERENCES**


CPT Codes: 76700, 76705, 76770, 76775

INTRODUCTION:

An abdominal ultrasound uses reflected sound waves to produce a picture of the organs and other structures in the upper abdomen. Sometimes a specialized ultrasound is ordered for a detailed evaluation of a specific organ or a specific section of the abdomen (e.g., upper quadrant, retroperitoneal or a complete study). An abdominal ultrasound can evaluate the: abdominal aorta, the gallbladder, the liver, the spleen, the pancreas, the kidneys and the spine.

INDICATIONS FOR AN ABDOMEN ULTRASOUND IN AN ADULT

 Suspected appendicitis:
- Right-sided mid or lower abdominal pain with at least one of the following:
  - Fever
  - Elevated WBC
  - Nausea
  - Guarding and/or rebound

 Non-hepatic or non-pulsatile mass/lesion(s):
- Abdominal mass of undetermined cause found on physical examination.
- Follow-up of diagnosed masses under surveillance or treatment at intervals ≥ 6 months.

 Gallbladder Disease:
- Symptoms suggestive of gallbladder disease including:
  - Right quadrant pain
  - Fever
  - Elevated WBC
  - Murphy’s sign
  - Jaundice
  - History of biliary surgery
  - Known cholelithiasis
  - New onset of jaundice in patient without pain.

 Hepatic Disease

 Inflammatory:
- Suspected inflammatory or infectious process involving the liver
- Follow-up of infectious lesion(s) in the liver to assess resolution
- Assess liver in systemic disease involving the liver, e.g., hemachromatosis
- Assess patient with inflammatory conditions at high risk for hepatocellular carcinoma, e.g., hereditary hemochromatosis, hepatitis C, etc.

 Mass Lesions:
- To determine if lesion identified on other imaging is cystic, solid or vascular
- To evaluate for liver metastases when elevated liver functions and known primary tumor
To follow known liver masses after anti-tumor treatment (≥ 6 month interval) or antibiotic treatment (interval depends on organisms).

**Suspected Ascites**

**Renal Disease:**

**Hematuria:**
- Hematuria (except young females with cystitis)
- Known or Suspected Kidney Stones
- Flank pain

**Acute Pyelonephritis:**
- Suspected acute pyelonephritis in adults presenting with:
  - Flank pain
  - Nausea and vomiting
  - Fever* (>38°, 100.4°F) or
  - Costovertebral angle tenderness
  - Fever may be absent in frail, older persons or in immunocompromised persons.

**Chronic Kidney Disease:**
- Newly diagnosed
- Progressive kidney disease or sudden change in kidney function
  - eGFR (estimated glomerular filtration rate)
  - Symptoms of urinary tract obstruction

**Family History of Polycystic Kidney Disease:**
- Screening ultrasound after age 20

**Kidney Transplant:**
- Increase in the serum creatinine levels
- Acute signs, symptoms of inflammatory process or infection in transplanted organ.
- Post operative/procedural
- Follow-up study may be needed to help evaluate a patient’s progress after treatment, procedure, intervention or surgery. Documentation requires a medical reason that clearly indicates why additional imaging is needed for the type and area(s) requested. Follow-up of a kidney abnormality seen on prior imaging

**Pancreas Disease:**

**Suspected Acute Pancreatitis:**
- Epigastric/upper abdominal pain of unknown etiology with acute onset that is rapidly increasing in severity, and is persistent without relief AND
  - Elevated serum amylase and/or lipase level

**Chronic Pancreatitis:**
- One or more of the following symptoms:
  - Epigastric pain that often radiates to the back, worsens after eating and may be relieved by sitting or standing upright or leaning forward
- Steatorrhea or floating stools
- Vitamin deficiency (fat-soluble vitamins)
- History of heavy alcohol use
- History of previous acute episodes of pancreatitis

**Other Pancreatic Lesions:**
- Suspected pancreatic necrosis
- Suspected pancreatic abscess
- Suspected pancreatic pseudocysts

**Splenic Disease**

**Splenomegaly:**
- For the measurement of spleen size to confirm splenomegaly or/and to document changes in spleen volume in patients with:
  - A known disease/condition that causes splenomegaly (e.g., myeloproliferative diseases, storage diseases, inflammatory diseases, infections, port hypertension) OR
  - Palpable spleen OR
  - Pain on the upper left side of the abdomen AND
  - Fatigue with shortness of breath OR
  - Frequent hiccups OR inability to eat a large meal

**Other Splenic Disease:**
- Suspected splenic infarction.
- Splenic and renal echogenicity comparison is indicated (usually appropriate) when examining left native or transplanted kidney.

**Other:**
- Follow up of an abnormality seen on prior imaging.

**Screening for an Abdominal Aortic Aneurysm:**
- One screening study for men 65 to 75 years old who currently or have a history of smoking.

**Non-screening studies for Abdominal Aortic Aneurysm:**
### ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria

#### Indications

<table>
<thead>
<tr>
<th>Abdominal Aortic Disease - Signs and/or Symptoms</th>
<th>Appropriate Use Score (4-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lower extremity claudication</td>
<td>A (7)</td>
</tr>
<tr>
<td>2. New onset abdominal or back pain</td>
<td>U (6)</td>
</tr>
<tr>
<td>3. Aneurysmal femoral or popliteal pulse</td>
<td>A (8)</td>
</tr>
<tr>
<td>4. Pulsatile abdominal mass</td>
<td>A (9)</td>
</tr>
<tr>
<td>5. Decreased or absent femoral pulse</td>
<td>A (7)</td>
</tr>
<tr>
<td>6. Abdominal or femoral bruit</td>
<td>A (7)</td>
</tr>
<tr>
<td>7. Evidence of atheroemboli in the lower extremities, including ischemic toes</td>
<td>A (8)</td>
</tr>
<tr>
<td>8. Erectile dysfunction</td>
<td>U (4)</td>
</tr>
<tr>
<td>9. Abnormal physiologic testing indicating aortoiliac occlusive disease</td>
<td>A (8)</td>
</tr>
<tr>
<td>10. Abnormal abdominal x-ray suggestive of aneurysm</td>
<td>A (8)</td>
</tr>
<tr>
<td>11. Presence of a lower extremity arterial aneurysm (e.g., femoral or popliteal)</td>
<td>A (8)</td>
</tr>
<tr>
<td>12. Presence of a thoracic aortic aneurysm</td>
<td>A (8)</td>
</tr>
</tbody>
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#### New or Worsening Symptoms

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year</th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
<td>U (4)</td>
<td>A (7)</td>
</tr>
<tr>
<td>15. Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
<td>U (4)</td>
<td>A (7)</td>
</tr>
<tr>
<td>16. Aneurysm 4.0 to 5.4 cm in diameter</td>
<td>U (4)</td>
<td>A (7)</td>
<td>A (7)</td>
</tr>
<tr>
<td>17. Aneurysm ≥ 5.5 cm in diameter</td>
<td>A (7)</td>
<td>A (7)</td>
<td>U (6)</td>
</tr>
</tbody>
</table>

#### Asymptomatic or Stable Symptoms, No or Slow Progression During First Year, Surveillance Frequency After First Year

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms, No or Slow Progression During First Year, Surveillance Frequency After First Year</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 23 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
<td>A (7)</td>
<td>A (7)</td>
</tr>
<tr>
<td>19. Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
<td>A (7)</td>
<td>A (7)</td>
</tr>
<tr>
<td>20. Aneurysm 4.0 to 5.4 cm in diameter</td>
<td>U (5)</td>
<td>A (7)</td>
<td>U (6)</td>
</tr>
<tr>
<td>21. Aneurysm ≥ 5.5 cm in diameter</td>
<td>A (8)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

#### Asymptomatic or Stable Symptoms, Rapid Progression During First Year, Surveillance Frequency After First Year

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms, Rapid Progression During First Year, Surveillance Frequency After First Year</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 23 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>A (7)</td>
<td>A (7)</td>
<td>U (4)</td>
</tr>
<tr>
<td>23</td>
<td>Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>A (8)</td>
<td>A (7)</td>
</tr>
<tr>
<td>24</td>
<td>Aneurysm 4.0 to 5.4 cm in diameter</td>
<td>A (8)</td>
<td>A (7)</td>
</tr>
<tr>
<td>25</td>
<td>Aneurysm ≥ 5.5 cm in diameter</td>
<td>A (9)</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

**Surveillance After Aortic Endograft or Aortoiliac Stenting**

**Baseline (Within 1 Month After the Intervention)**

| 26 | Aortic or iliac endograft | A (8) |
| 27 | Aortic and iliac artery stents | A (7) |

**New or Worsening Lower Extremity Symptoms After Baseline Exam**

| 28 | Aortic or iliac endograft | A (8) |
| 29 | Aortic and iliac artery stents | A (8) |

**Asymptomatic or Stable Symptom After Baseline Study, Surveillance Frequency During First Year.**

<table>
<thead>
<tr>
<th></th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Aortic endograft without endoleak stable and/or decreasing residual aneurysm sac size</td>
<td>n/a</td>
<td>U (5)</td>
</tr>
<tr>
<td>31</td>
<td>Aortic endograft with endoleak and/or increasing residual aneurysm sac size</td>
<td>U (6)</td>
<td>A (8)</td>
</tr>
<tr>
<td>32</td>
<td>Aortic or iliac artery stents</td>
<td>n/a</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

**Asymptomatic or Stable Symptom After Baseline Study, Surveillance Frequency After the First Year.**

<table>
<thead>
<tr>
<th></th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 24 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>Aortic endograft without endoleak stable and/or decreasing residual aneurysm sac size</td>
<td>n/a</td>
<td>A (7)</td>
</tr>
<tr>
<td>34</td>
<td>Aortic endograft with endoleak and/or increasing residual aneurysm sac size</td>
<td>A (8)</td>
<td>A (7)</td>
</tr>
<tr>
<td>35</td>
<td>Aortic or iliac artery stents</td>
<td>n/a</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

**INDICATIONS FOR AN ABDOMEN ULTRASOUND IN CHILDREN:***

**Suspected appendicitis:**
- Right-sided mid or lower abdominal pain with at least one of the following:
  - Fever
  - Elevated WBC
  - Nausea
  - Guarding and/or rebound

**Gallbladder Disease:**
- Symptoms suggestive of gallbladder disease including:
  - Right upper quadrant pain
  - Fever
  - Elevated WBC
  - Murphy’s sign
  - Jaundice
  - History of biliary surgery
Known cholelithiasis
New onset of jaundice in patient without pain.

**Hepatic Disease**

**Inflammatory**
- Suspected inflammatory or infectious process involving the liver
- Follow-up of infectious lesion(s) in the liver to assess resolution
- Assess liver in systemic disease involving the liver, e.g., hemachromatosis
- Assess patient with inflammatory conditions at high risk for hepatocellular carcinoma, e.g., hereditary hemochromatosis, hepatitis C, etc.

**Mass Lesions:**
- To determine if lesion identified on other imaging is cystic, solid or vascular
- To evaluate for liver metastases when elevated liver functions and known primary tumor
- To follow known liver masses after anti-tumor treatment (≥ 6 month interval) or antibiotic treatment (interval depends on organisms).

**Renal Disease:**

**Hematuria:**
- Traumatic microscopic hematuria (Note: CT or MRI is procedure of choice in macroscopic hematuria and traumatic setting).

**Urinary Tract Infection – age < 2 months:**
- Signs/symptoms of UTI with fever

**Urinary Tract Infection – age> 2 months:**
- Signs/symptoms of UTI with fever and poor response to treatment

**Urinary Tract Infection with atypical presentation – any age:**
- Any of the following signs/symptoms:
  - Poor response to antibiotics within 48 hours
  - Sepsis
  - Urinary retention
  - Poor urine stream
  - Increased serum creatinine
  - Non-E. Coli organism
  - Recurrent UTI

**Urinary Tract – Other**
- Persistent dysuria
- Enuresis
- Urinary frequency
- Anuria, decreased urinary output, or urinary retention
- Follow up of congenital anomalies of the urinary tract
- Failure to thrive

**Acute Pyelonephritis:**
- Suspected acute pyelonephritis in presenting with:
• Flank pain
• Nausea and vomiting
• Fever* (>38°, 100.4°F) or
• Costovertebral angle tenderness
• Fever may be absent in immunocompromised persons.

**Chronic Kidney Disease:**
• Newly diagnosed
• Progressive kidney disease or sudden change in kidney function
• eGFR (estimated glomerular filtration rate) decline >5 ml/min/1.73 m2 within one year or >10 ml/min/1.73 m2 within 5 years
• Symptoms of urinary tract obstruction

**Kidney Transplant:**
• Increase in the serum creatinine levels
• Acute signs, symptoms of inflammatory process or infection in transplanted organ.
• Post operative/procedural
• Follow-up study may be needed to help evaluate a patient’s progress after treatment, procedure, intervention or surgery. Documentation requires a medical reason that clearly indicates why additional imaging is needed for the type and area(s) requested. Follow-up of a kidney abnormality seen on prior imaging

**Pancreas Disease:**

**Suspected Acute Pancreatitis:**
• Epigastric/upper abdominal pain of unknown etiology with acute onset that is rapidly increasing in severity, and is persistent without relief AND
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**Chronic Pancreatitis:**
• One or more of the following symptoms:
  o Epigastric pain that often radiates to the back, worsens after eating and may be relieved by sitting or standing upright or leaning forward
  o Steatorrhea or floating stools
  o Vitamin deficiency (fat-soluble vitamins)
  o History of heavy alcohol use
  o History of previous acute episodes of pancreatitis

**Other Pancreatic Lesions:**
• Suspected pancreatic necrosis
• Suspected pancreatic abscess
• Suspected pancreatic pseudocysts

**Splenic Disease**

**Splenomegaly:**
• For the measurement of spleen size to confirm splenomegaly or/and to document changes in spleen volume in patients with:
• A known disease/condition that causes splenomegaly (e.g., myeloproliferative diseases, storage diseases, inflammatory diseases, infections, port hypertension) OR
• Palpable spleen OR
• Pain on the upper left side of the abdomen AND
• Fatigue with shortness of breath OR
• Frequent hiccups OR inability to eat a large meal

Other Splenic Disease:
• Suspected splenic infarction.
• Splenic and renal echogenicity comparison is indicated (usually appropriate) when examining left native or transplanted kidney.

Spine

Spinal Dysraphism – Child less than 6 months (unless acoustic window persists):
• Lumbosacral stigmata known to be associated with spinal dysraphism with one of the following present:
  • Midline or paramedian masses
  • Skin discolorations
  • Skin tags
  • Hair tufts
  • Hemangiomas
  • Pinpoint midline dimples
  • Paramedian deep dimples

Other Spine Lesions
• Caudal regression syndrome, including patients with sacral agenesis, or anal atresia or stenosis: OR
• Suspected defects such as cord tethering, diastematomyelia, hydromyelia and syringomyelia: OR
• Detection of injury, such as a hematoma after a spinal tap or birth injury, or posttraumatic leakage of cerebrospinal fluid: OR
• Visualization of fluid with characteristics of blood products within the spinal canal in patients with intracranial hemorrhage: OR
• Postoperative assessment for cord retethering.

Other:
• Follow up of an abnormality seen on prior imaging

REFERENCES


Hepatic Ultrasound


Testa, A., Lauritano, E.C., Giannuzzi, R., Pignataro, G., Casagranda, I., & Gentiloni


**Renal – Kidney and Adrenal References**


Aorta - Diaphragm – Spine References


**Gallbladder and Bile Duct References:**


Pancreas and Spleen References:


Introduction:

Ultrasound is safe and painless, and produces pictures of the inside of the body using sound waves. Ultrasound imaging, also called ultrasound scanning or sonography, involves the use of a small transducer (probe) and ultrasound gel placed directly on the skin. High-frequency sound waves are transmitted from the probe through the gel into the body. The transducer collects the sounds that bounce back and a computer then uses those sound waves to create an image. Ultrasound examinations do not use ionizing radiation (as used in x-rays), thus there is no radiation exposure to the patient. Because ultrasound images are captured in real-time, they can show the structure and movement of the body's internal organs, as well as blood flowing through blood vessels.

INDICATIONS FOR AN ULTRASOUND OF THE FEMALE PELVIS:

Genitourinary conditions:
- Signs and symptoms of suspected kidney stones
- Urinary incontinence
- Signs and symptoms of bladder function abnormality

Pain:
- Pelvic pain, etiology unknown

Menstrual abnormality:
- Dysmenorrhea (painful menses)
- Amenorrhea
- Menorrhagia
- Menometrorrhagia
- Metrorrhagia (irregular uterine bleeding)
- Delayed menses
- Vaginal bleeding in a prepubertal child
- Postmenopausal bleeding
- Imperforate hymen

Known or suspected Infection or Inflammation of the pelvis:
- Signs or symptoms of pelvic infection, inflammation, or abscess.
- Excessive bleeding, pain, or signs of infection after pelvic surgery, delivery, or abortion.

Other Indications:
- Pre-Pubertal Child
- Precocious puberty
- Localization of an intrauterine contraceptive device.
- Screening for malignancy in patients at increased risk.
- Pelvic organ prolapse.
- Follow-up of a previously detected abnormality.
- Evaluation, monitoring, and/or treatment of infertility patients
- Abnormal or technically limited physical-pelvic examination
- Congenital anomalies
- Foreign body localization
- Evaluation of ovarian, adnexal, or uterine abnormalities
- Evaluation of a hernia
- Guidance for interventional or surgical procedures.
- Follow up of a pelvic abnormality seen on prior imaging

**INDICATIONS FOR AN ULTRASOUND OF THE MALE PELVIS:**

**Genitourinary conditions:**
- Obstructive urinary symptoms.
- Signs and symptoms of suspected kidney stones.
- Urinary incontinence.
- Signs and symptoms of bladder function abnormality.
- Ureteral displacement or obstruction.
- Known or suspected tumor or mass.
- Follow-up of an abnormality noted on a previous study or examination

**Infertility:**
- Evaluation of infertility/seminal vesicles patients.

**Known or suspected infection, inflammatory disease or abscess:**
- Signs or symptoms of pelvic infection, inflammation or abscess.

**Other Indications:**
- Congenital anomalies.
- Foreign body localization.
- Evaluation of a hernia
- Evaluation of abnormal or technically limited physical-pelvic examination.
- Guidance for interventional or surgical procedures.
- Follow up of a pelvic abnormality seen on prior imaging

**ADDITIONAL INFORMATION:**

- **Ultrasound of the pelvis** should be performed only when there is a valid medical reason, and the lowest possible ultrasonic exposure settings should be used to gain the necessary diagnostic information. In some cases, additional or specialized examinations may be necessary.

- **Pelvic ultrasound** may be used in female adolescents to track developmental changes in uterine and ovarian morphology as a function of weight gain. The use of pelvic U/S allows for more objective estimates of weight gain requirements that are reliably linked to increasing reproductive maturity.
• **Doppler ultrasound** – Doppler ultrasound is a special ultrasound technique that evaluates blood flow through a blood vessel, including the body’s major arteries and veins in the abdomen, arms, legs and neck. A Doppler ultrasound study may be part of a pelvic ultrasound examination and can help the physician to see and evaluate:
  - blockages to blood flow (such as clots)
  - narrowing of vessels (which may be caused by plaque)
  - tumors and congenital malformation

• **Transabdominal ultrasound (TAUS)** – TAUS imaging has been evaluated to train the strength and endurance of the pelvic floor muscles (PFMs). Use of TAUS imaging is a helpful assessment and biofeedback tool for re-education and rehabilitation of the PFMs for the patient.

• **Limitations of Pelvic Ultrasound Imaging** - Ultrasound waves are disrupted by air or gas; therefore ultrasound is not an ideal imaging technique for the bowel or organs obscured by the bowel. In most cases, barium exams, CT scanning, and MRI are the methods of choice in this setting. Large patients are more difficult to image by ultrasound because tissue attenuates (weakens) the sound waves as they pass deeper into the body.

**The following Ultrasounds are not reviewed by NIA:**

• **Transvaginal ultrasound** - A transvaginal ultrasound is usually performed to view the endometrium or the lining of the uterus, including its thickness, and the ovaries. Transvaginal ultrasound also affords a good way to evaluate the muscular walls of the uterus, called the myometrium.

• **Transrectal ultrasound** - Transrectal ultrasound, a special study usually done to view the prostate gland, involves inserting a specialized ultrasound transducer into a man’s rectum.

• **Lower uterine segment (LUS) muscular thickness** assessed by transvaginal ultrasound is more reliable than entire LUS thickness measured by the transabdominal approach. The use of three-dimensional ultrasound should be considered for better reliability.

• **Ultrasound of the Uterus During Pregnancy (addressed under OB US and/or Biophysical Profile US).**

**REFERENCES**


CPT Codes: 76870

INTRODUCTION:

Scrotal ultrasound (US) may be useful in the identification and evaluation of structures within the scrotum. Scrotal abnormalities may be the result of disease, injury, or a physiologic anomaly.

APPROPRIATE INDICATIONS FOR A SCROTUM AND CONTENTS ULTRASOUND:

- Abnormality noted on other imaging studies (e.g., computed tomography, magnetic resonance imaging, positron emission tomography)
- Intersex conditions
- Male infertility
- Occult primary tumor detection in patients with metastatic germ cell tumor
- Palpable inguinal or scrotal mass
- Potential scrotal hernia
- Suspected testicular torsion
- Follow up of previous indeterminate scrotal US
- Undescended testes
- Scrotal asymmetry, swelling, or enlargement
- Scrotal pain
- Varicocele
- Trauma

INDICATIONS FOR SURVEILLANCE:

- Prior primary testicular neoplasms, leukemia, or lymphoma

ADDITIONAL INFORMATION RELATED TO ULTRASOUND OF THE SCROTUM

Scrotal abnormalities may be the result of disease, injury, or a physiologic anomaly. Abnormalities within the male reproductive tract may appear as scrotal masses or as intersex conditions. Masses may be of little significance or may represent life-threatening illnesses. Examples of these include inguinal or scrotal hernias, tumors, varicocele, acute epididymitis or epididymoorchitis, a torsioned spermatic cord or testicular appendage. Physical examination in combination with appropriate imaging of these tissues is important, as a surgical versus nonsurgical diagnosis must be clearly identified, especially in patients experiencing acute pain without having a history of trauma or previous scrotal mass.

An inguinal or scrotal hernia occurs when intestinal loops and/or omentum passes through thin or weakened spots in the groin muscle, resulting in a bulge in the groin or scrotal area. A scrotal mass may be an accumulation of fluids; abnormal tissue growth; or the swelling, inflammation, or hardening of the normal contents of the scrotum. A mass may be cancerous or caused by another condition.

A varicocele is the result of valvular dysfunction of the veins along the spermatic cord, which
prevents the proper flow of blood and swelling or widening of the veins.

Epididymitis is inflammation of the epididymis, the tube that connects the testicle with the vas deferens. Male infertility may be affected by testicular abnormalities such as microcirculation impairment, ischemia, or disease pathology.

Testicular torsion occurs when a testicle rotates, twisting the spermatic cord that brings blood to the scrotum. The reduced blood flow causes sudden, and often severe, pain and swelling.

Undescended testicles are the failure of the testicles to descend through the inguinal canal into the scrotum before birth. US has not been shown to be effective in the localization of undescended testes.

Testicular injuries can be divided into 3 broad categories based on the mechanism of injury. These categories include (1) blunt trauma, (2) penetrating trauma, and (3) degloving trauma. Such injuries are typically seen in males aged 15-40 years. Scrotal ultrasonography with Doppler flow evaluation is particularly helpful in determining the nature and extent of injury. This is especially true in blunt trauma cases, given the difficulty of scrotal examination and the repercussions of missing a testicular rupture.

REFERENCES:


INTRODUCTION:

A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While cerebrovascular ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

Complete Cerebrovascular Ultrasound studies are bilateral unless there is a specific clinical indication that warrants a limited study and investigate the common, external and internal carotid arteries as well as the vertebral arteries. 2D (Grayscale) and Doppler velocities are included.

A review of common clinical scenarios where cerebrovascular ultrasound is used follows. These scenarios are scored for appropriate use on a scale of 1-9. A median score of 7-9 indicates that this is an appropriate test for the specific indication. A median score of 4-6 indicates that there is unclear evidence as to the appropriateness of the test. A median score of 1-3 indicates that the test is not generally acceptable for the indication.

ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria

<table>
<thead>
<tr>
<th>ACCF et al. Criteria #</th>
<th>Indications</th>
<th>Appropriate Use Score (1-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation for Cerebrovascular Disease – Potential Signs and/or Symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>New or worsening hemispheric neurological symptoms (e.g., unilateral motor or sensory deficit, speech impairment, or amaurosis fugax) ( a ) Evaluation of transient ischemic attack or stroke</td>
<td>A (9)</td>
</tr>
<tr>
<td>2.</td>
<td>Hollenhorst plaque visualized on retinal examination</td>
<td>A (8)</td>
</tr>
<tr>
<td>3.</td>
<td>Lightheadedness or impaired vision in the setting of upper extremity exertion Evaluation for subclavian–vertebral steal phenomenon</td>
<td>A (7)</td>
</tr>
<tr>
<td>4.</td>
<td>Syncope of uncertain cause after initial cardiovascular evaluation ( d )</td>
<td>U (5)</td>
</tr>
<tr>
<td>5.</td>
<td>Suspected symptomatic vertebrobasilar occlusive disease in</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria
6. • Evaluation for suspected carotid artery dissection A (8)

7. • Pulsatile neck mass A (8)

8. • Cervical bruit
• No prior carotid artery assessment A (7)

### Evaluation for Cerebrovascular Disease—Asymptomatic With Comorbidities or Risk Factors for Carotid Artery Stenosis

9. • No cervical bruit
• Atherosclerotic disease in other vascular beds (e.g., lower extremity PAD, coronary artery disease, abdominal aortic aneurysm) (c) A (7)

10. • No cervical bruit
• History of neck irradiation ≥10 years ago U (5)

11. • Known renal fibromuscular dysplasia U (5)

### Prior to Open Heart Surgery

12. • Planned coronary artery bypass grafting (CABG) (c) U (6)

13. • Atherosclerotic disease in other vascular beds (e.g., lower extremity PAD, coronary artery disease, abdominal aortic aneurysm), or history of neck irradiation ≥10 years ago
• Planned valve repair/replacement surgery (without CABG) (c) U (6)

14. • Atherosclerotic risk factors present
• Planned valve repair/replacement surgery (without CABG) (c) U (6)

15. • No atherosclerotic risk factors
• Planned valve repair/replacement surgery (without CABG) (c) U (4)

### Follow-Up or Surveillance for Carotid Artery Stenosis – Asymptomatic*+

16. • Normal prior examination (no plaque, no stenosis) (c) (e) I (1)

#### Surveillance Frequency During First Year

<table>
<thead>
<tr>
<th>Surveillance</th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Plaque without significant stenosis of the ICA (plaque, normal ICA velocity) (e)</td>
<td>I (1)</td>
<td>I (1)</td>
<td>I (1)</td>
</tr>
<tr>
<td>18. Mild ICA stenosis (e.g., &lt;50%) (e)</td>
<td>I (1)</td>
<td>I (1)</td>
<td>I (1)</td>
</tr>
<tr>
<td>19. Moderate ICA stenosis (e.g., 50% to 69%) (e)</td>
<td>I (2)</td>
<td>U (6)</td>
<td>U (6)</td>
</tr>
</tbody>
</table>
20. • Severe ICA stenosis (e.g., 70% to 99%) (e)  

<table>
<thead>
<tr>
<th>Surveillance Frequency After First Year</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 24 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. • Plaque without significant stenosis of the ICA (plaque, normal ICA velocity) (e)</td>
<td>I (1)</td>
<td>I (3)</td>
<td>I (1)</td>
</tr>
<tr>
<td>22. • Mild ICA stenosis (e.g., &lt;50%) (e)</td>
<td>I (2)</td>
<td>U (5)</td>
<td>U (6)</td>
</tr>
<tr>
<td>23. • Moderate ICA stenosis (e.g., 50% to 69%) (e)</td>
<td>I (3)</td>
<td>A (7)</td>
<td>U (6)</td>
</tr>
<tr>
<td>24. • Severe ICA stenosis (e.g., 70% to 99%) (e)</td>
<td>A (7)</td>
<td>A (7)</td>
<td>U (6)</td>
</tr>
</tbody>
</table>

Surveillance After Carotid Artery Intervention

25. • Baseline (within 1 month) after carotid intervention  

Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year

<table>
<thead>
<tr>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. • Following normal ipsilateral ICA baseline study</td>
<td>I (2)</td>
<td>A (7)</td>
</tr>
<tr>
<td>27. • Following abnormal ipsilateral ICA baseline study</td>
<td>U (4)</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency After First Year

<table>
<thead>
<tr>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 24 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. • Following normal ipsilateral ICA baseline study</td>
<td>I (2)</td>
<td>A (7)</td>
</tr>
<tr>
<td>29. • Following abnormal ipsilateral ICA baseline study</td>
<td>U (4)</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

*In the setting of interval development of clinical symptoms in a previously asymptomatic patient or for rapid progression of stenosis during subsequent follow-up (e.g., stenosis category change during a limited period of time), more intensive surveillance may be indicated.

Periodic surveillance duplex ultrasound should be performed according to the severity of stenosis of the contralateral side.

**LIMITED STUDY INDICATIONS (CPT code: 93882)**

A limited study is indicated under the following circumstances:

1) Post intervention surveillance where the contralateral carotid is free of disease.
2) Post intervention where the contralateral carotid has less than 70% stenosis and the surveillance period on the contralateral carotid has been less than 9 months.
3) Emergent or urgent requests in the immediate postoperative or postprocedural period.

**ADDITIONAL CONSIDERATIONS**
a. Cerebrovascular ultrasound is rated as **Appropriate** for evaluation of vertebrobasilar occlusive disease. Other Ultrasound protocols including Transcranial Doppler and other imaging modalities such as MRI or CT may be indicated.

b. Carotid Ultrasound is rated as **Appropriate** for Carotid artery dissection. This is in the scenario of suspected carotid dissection as a continuation of dissection of the aortic arch or ascending aorta and is **Inappropriate** in the setting of trauma where distal dissection and intracranial extension cannot be diagnosed by Ultrasound. CT and MRI are used in this scenario.

c. The appropriateness for cerebrovascular duplex is rated as **Uncertain** for all scenarios prior to cardiac surgery. This excludes patients with cerebrovascular symptoms. In patients with cerebrovascular symptoms (prior hemispheric stroke, TIA, etc.) cerebrovascular duplex would be **Appropriate**. Routine scanning of asymptomatic patients and particularly those without atherosclerotic comorbidities is **Inappropriate**.

d. The use of Carotid Duplex in the evaluation for syncope without cardiac cause is rated as **Uncertain**. Cerebrovascular disease is a rare cause of syncope, but can be seen in severe and usually bilateral internal carotid stenosis, in severe vertebral basilar disease and in subclavian steal syndrome. Without cardiovascular risk factors or demonstrated atherosclerotic disease elsewhere the yield of Carotid Duplex in the evaluation of syncope is very low.

e. Clinical management of asymptomatic patients with demonstrated atherosclerotic disease requires periodic ultrasound surveillance. Any follow-up in patients with a normal baseline carotid ultrasound is **Inappropriate**. The frequency and appropriateness of testing intervals can change in the setting of new abnormalities on a surveillance study.

f. Screening studies are **Inappropriate** in the setting of a low Framingham risk score. Screening studies are also **Inappropriate** in patients with low or intermediate Framingham risk scores who have undergone other risk assessment imaging such as carotid IMT measurement or coronary artery calcium scoring.

**ADDITIONAL INFORMATION**

Definitions:

- **Claudication**: Reproducible muscle discomfort or fatigue occurring with exertion at the same workload and relieved with rest, typically due to arterial obstruction.
- **Cold extremity**: Reduced temperature from patient history or observed on physical examination by physician.
- **Physiological testing**: Evaluation of the peripheral circulation based on measurement of limb blood pressures with pulse volume recordings or Doppler waveforms, or other parameters without utilizing data from direct imaging of the blood vessels.
- **Resistant hypertension**: The failure to normalize blood pressure on 3 or more drug regimen with medications at maximum doses and at least 1 of the medications being a diuretic agent.

Abbreviations:

- ABI - ankle-brachial index
- ACE - angiotensin-converting enzyme inhibitor
- ARB - angiotensin II receptor blocker
- CABG - coronary artery bypass graft
- CT - computed tomography
- GI - gastrointestinal
- ICA - internal carotid artery
REFERENCES:


INTRODUCTION:

Transcranial Doppler ultrasonography (TDU) is a non-invasive technology that uses a handheld pulsed low-frequency Doppler transducer that enables recording of blood velocities from intracranial arteries through selected cranial foramina and thin regions of the skull. Analysis of the Doppler spectra allows display and calculation of peak systolic, peak diastolic, and mean velocities and pulse indices. Mapping of the sampled velocities as a color display of spectra in lateral, coronal and horizontal views locates the major brain arteries in three dimensions.

A complete transcranial study includes the investigation of the middle cerebral, anterior cerebral, posterior cerebral, terminal ICA, ICA siphon, ophthalmic artery, vertebral artery and basilar artery bilaterally where applicable. A study could be limited because of the limitations of the technique which have to do with obtaining adequate ultrasound windows. Patient factors that influence skull thickness such as race, age and gender influence the success of the technique.

Resistance, velocity and pulse all vary with changes in blood viscosity and variations in respiration. With hypoventilation vasodilatation occurs reducing resistance and increasing velocity. Anemia lowers viscosity and increases velocity. In a sickle cell patient a mean velocity in the MCA of greater than 200 cm/sec is abnormally high and is accompanied by a 40% stroke risk within 3 years.

Transcranial Doppler (TCD) or Transcranial Doppler Ultrasonography (TDU) is indicated in the following scenarios:

- The assessment of stroke risk of children 2-16 years of age with sickle cell anemia (rescreening at 6 month intervals) \(^1\)
- Management of infants of less than 30 days gestation and very low birth weight preterm infants \(^2\)

TCD is not specifically indicated or is superseded by more relevant modalities (such as MRA, CTA or Angiography):

- Assessing collateral blood flow and embolization during carotid endarterectomy; or
- Assessing patterns and extent of collateral circulation in persons with known regions of severe stenosis or occlusion, including persons with Moyamoya syndrome; or
- Assessing persons suspected of having patent foramen ovale/paradoxical embolism (symptoms include visual disturbance, weakness, hemiplegia, or slurred speech); or
- Assessing persons with suspected brain death; or
- Detecting arterio-venous malformations (AVMs) and studying their supply arteries and flow patterns; or
- Detecting microemboli in cerebral artery embolism; or
- Detecting severe stenosis in the major basal intra-cranial arteries for members who have neurological signs or symptoms or carotid bruits; or
- Diagnosing dissection of vertebral artery; or
- Evaluating and following persons with vasoconstriction of any cause, especially after subarachnoid hemorrhage; or
TCD is not indicated for the following scenarios:

- Assessing autoregulation, physiologic, and pharmacologic responses of cerebral arteries; or
- Brain tumors; or
- Diagnosing cerebral vein and sinus thrombosis and other conditions that involve venous pathology; or
- Diagnosing or monitoring response to anti-thrombotic therapy in ischemic cerebrovascular disease; or
- Epilepsy; or
- Evaluating adults with sickle cell anemia; or
- Evaluating ataxia, head trauma/skull fracture; or
- Evaluating children with neurofibromatosis; or
- Evaluating persons with dilated vasculopathies such as fusiform aneurysms; or
- Familial and degenerative diseases of the cerebrum, brainstem, cerebellum, basal ganglia and motor neurons (e.g., Parkinson’s disease); or
- Following placement of an intra-cerebral arterial stent; or
- Infectious and inflammatory conditions of the brain; or
- Migraine headaches; or
- Monitoring during cardiopulmonary bypass and other cerebrovascular and cardiovascular interventions, and surgical procedures other than carotid endarterectomy; or
- Predicting hemorrhagic transformation of ischemic infarction; or
- Predicting outcome in vertebrobasilar distribution stroke; or
- Psychiatric disorders; or
- Screening for carotid artery stenosis in asymptomatic adults; or
- Screening for stenosis of cerebral arteries in persons with fibromuscular dysplasia.

REFERENCES:


Ferro JL, Canhao P. Etiology, clinical features, and diagnosis of cerebral venous thrombosis. Last reviewed February 2013. UpToDate Inc. Waltham, MA.


Suwanwela N. Moyamoya disease: Etiology, clinical features, and diagnosis. Last reviewed January 2012. UpToDate Inc. Waltham, MA.


INTRODUCTION:

A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While duplex ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

A complete lower extremity arterial study is comprised of imaging of the common femoral, deep femoral (profunda), proximal mid and distal superficial femoral artery popliteal and trifurcation vessels (anterior, posterior tibial and peroneal arteries) in both legs. Duplex with spectral waveforms are included. Bypass grafts or interventional sites are investigated. The Ankle-Brachial index is included.

A review of common clinical scenarios where cerebrovascular ultrasound is used follows. These scenarios are scored for appropriate use on a scale of 1-9. A median score of 7-9 indicates that this is an appropriate test for the specific indication. A median score of 4-6 indicates that there is unclear evidence as to the appropriateness of the test. A median score of 1-3 indicates that the test is not generally acceptable for the indication.

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</thead>
<tbody>
<tr>
<td>Evaluation for Lower Extremity Atherosclerotic Disease – Potential Signs and/or Symptoms</td>
<td>A _ appropriate; I _ inappropriate; U _ uncertain</td>
<td></td>
</tr>
<tr>
<td>105.</td>
<td>Lower Extremity claudication</td>
<td>A (9)</td>
</tr>
<tr>
<td>106.</td>
<td>Leg/foot/toe pain at rest</td>
<td>A (9)</td>
</tr>
<tr>
<td>107.</td>
<td>Foot or toe ulcer or gangrene</td>
<td>A (9)</td>
</tr>
<tr>
<td>108.</td>
<td>Infection of leg/foot without palpable pulses</td>
<td>A (9)</td>
</tr>
<tr>
<td>109.</td>
<td>Suspected acute limb ischemia (e.g., cold, painful limb with pallor, pulselessness, paresthesia)</td>
<td>A (9)</td>
</tr>
<tr>
<td>110.</td>
<td>Nocturnal leg cramps</td>
<td>I (2)</td>
</tr>
<tr>
<td>111.</td>
<td>Normal pulses</td>
<td>I (2)</td>
</tr>
<tr>
<td>112.</td>
<td>Lack of hair growth on dorsum of foot or toes</td>
<td>I (2)</td>
</tr>
</tbody>
</table>

ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria
112. Normal pulses
   - Evidence of atheroemboli in the lower extremities

113. Lower Extremity Swelling
    - Normal pulses

114. Diabetes with peripheral neuropathy
    - Normal pulses

### Surveillance of Known Lower Extremity PAD

<table>
<thead>
<tr>
<th>New or Worsening Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>115. Normal Baseline Study</td>
</tr>
<tr>
<td>116. Abnormal baseline ABI (i.e., ABI ≤ 0.90)</td>
</tr>
</tbody>
</table>

### No Change in Symptom Status (No revascularization)

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year</th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>117. Normal baseline ABI (no stenosis)</td>
<td>I (1)</td>
<td>I (1)</td>
<td>I (1)</td>
</tr>
<tr>
<td>118. Mild or moderate disease (e.g., ABI &gt;0.4)</td>
<td>I (2)</td>
<td>I (2)</td>
<td>U (4)</td>
</tr>
<tr>
<td>119. Severe (e.g., ABI &lt;0.4)</td>
<td>I (3)</td>
<td>U (5)</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency After First Year</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 24 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>120. Normal baseline ABI (no stenosis)</td>
<td>I (1)</td>
<td>I (1)</td>
<td>I (2)</td>
</tr>
<tr>
<td>121. Mild or moderate disease (e.g., ABI &gt;0.4)</td>
<td>I (2)</td>
<td>I (2)</td>
<td>U (4)</td>
</tr>
<tr>
<td>122. Severe (e.g., ABI &lt;0.4)</td>
<td>U (4)</td>
<td>U (4)</td>
<td>I (3)</td>
</tr>
</tbody>
</table>

### Surveillance of Lower Extremity PAD After Revascularization (Duplex/ABI)

| 123. Baseline surveillance (within 1 month) |
| A (8) |

### New or Worsening Symptoms

| 124. After revascularization (angioplasty ± stent or bypass) |
| A (9) |

### Asymptomatic or Stable Symptoms

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year</th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>125. After angioplasty ± stent placement</td>
<td>I (2)</td>
<td>U (6)</td>
<td>U (6)</td>
</tr>
<tr>
<td>126. After vein bypass graft</td>
<td>U (6)</td>
<td>A (8)</td>
<td>U (6)</td>
</tr>
<tr>
<td>127. After prosthetic bypass graft</td>
<td>U (5)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
<tr>
<td>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency After First Year</td>
<td>Every 6 months</td>
<td>Every 12 months</td>
<td>Every 24 months or greater</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>128. • After angioplasty ± stent placement</td>
<td>I (3)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
<tr>
<td>129. • After vein bypass graft</td>
<td>U (5)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
<tr>
<td>130. • After prosthetic bypass graft</td>
<td>I (3)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

**Lower Extremity Artery Testing With ABI Only**

### Screening for Lower Extremity Atherosclerotic Disease - Potential Signs

| 131. • Diminished pulses | A (7) |
| 132. • Femoral Bruit | A (7) |

### Screening for Lower Extremity Atherosclerotic Disease – Asymptomatic With Comorbidities

| 133. • Age >50 years | A (7) |
| 134. • Age <50 years | U (5) |
| 135. • Age <50 years | U (5) |
| 136. • Cigarette smoking (current or past) | A (7) |
| 137. • Age >70 years | A (7) |

**Lower Extremity Artery Testing With Duplex Ultrasound Only**

### Evaluation for Groin Complication After Femoral Access

| 137. • Pulsatile groin mass | A (9) |
| 138. • Bruit or thrill over the groin | A (8) |
| 139. • Ecchymosis | U (4) |
| 140. • Significant hematoma | A (7) |
| 141. • Severe pain within groin post procedure | A (&) |

Duplex ultrasound of the lower extremities is **INDICATED** for the following:
- The diagnosis of the anatomic location of stenosis in peripheral vascular disease patients where the Ankle Brachial Index has been found to be .9 or less.
- Routine surveillance after femoral-popliteal or femoral-tibial-pedal bypass with a venous conduit. Minimal surveillance intervals are 3, 6 and 12 months then yearly.
- The evaluation of patients with acute lower extremity ischemia.

Duplex Ultrasound **MAY BE INDICATED** for the following but generally other imaging studies will be performed, making the ultrasound redundant or unnecessary.
- To select patients as candidates for endovascular intervention
- To select patients as candidates for surgical bypass and to select sites foe anastomosis.
- Routine surveillance after femoral-popliteal bypass with a synthetic conduit
ADDITIONAL INFORMATION:

Definitions:

Claudication: Reproducible muscle discomfort or fatigue occurring with exertion at the same workload and relieved with rest, typically due to arterial obstruction.

Cold extremity: Reduced temperature from patient history or observed on physical examination by physician.

Physiological testing: Evaluation of the peripheral circulation based on measurement of limb blood pressures with pulse volume recordings or Doppler waveforms, or other parameters without utilizing data from direct imaging of the blood vessels.

Resistant hypertension: The failure to normalize blood pressure on 3 or more drug regimen with medications at maximum doses and at least 1 of the medications being a diuretic agent.

Abbreviations:

ABI - ankle-brachial index
ACE - angiotensin-converting enzyme inhibitor
ARB - angiotensin II receptor blocker
CABG - coronary artery bypass graft
CT - computed tomography
GI - gastrointestinal
ICA - internal carotid artery
ICAVL - Intersocietal Commission for the Accreditation of Vascular Laboratories
IMT - intima-media thickness

Scanning protocols may be developed by the vascular laboratory but are based upon technical recommendations from appropriate societies (Intersocietal Commission for the Accreditation of Vascular Laboratories, ICVL or American College of Radiology, ACR). Interpretation of studies are performed by a physician according to standard diagnostic criteria adapted from the Ultrasound literature and are validated internally for accuracy as part of an ongoing quality assurance program. Testing should be performed by a credentialed Technologist (RVT or RVS) and interpreted by a credentialed physician (RVPI, ACR or RVT). Documentation of the use of optimal angle correction techniques and appropriate sample volume placement are necessary.

Literature Review:

Duplex ultrasound of the lower extremities is used in the diagnosis of arterial occlusive disease. It is not a cost effective screening tool and should only be utilized in patients with significant clinical evidence of peripheral vascular disease as determined by physical exam findings such as abnormal Ankle-Brachial Index or non-invasive testing.

Although duplex ultrasound produces images in either shades of black and white (2D or Greyscale) or color (Color Doppler), the majority of the important clinical information is gained through analysis of the velocity of blood flow. Quantitative criteria are used based on flow velocity (peak systolic velocity, peak systolic velocity ratios) before, within, and beyond a stenosis are compared. The presence of turbulence, pulsatility and plaque morphology are more qualitative observations.
Peak systolic velocity ratios are the most accurate method for diagnosing stenosis greater than 50%. A ratio of 2 is commonly used to diagnose a stenosis greater than 50%. Measurement of peak systolic velocity is operator dependent. The probe must be correctly oriented and the Doppler gate must be correctly aligned. Calcifications, stents and tortuous vessels can confound the measurement. The sensitivity and specificity for the diagnosis of a stenosis greater than 50% from the Iliac to the popliteal arteries is approximately 90-95%.

Duplex ultrasound has been evaluated for use as a preintervention tool. It has been shown to be an accurate method to predict the suitability of a lesion for angioplasty, 84-94%. It has been used as a substitute for intraoperative angiography to select a distal bypass site in infrapopliteal (infragenicular) bypass operations. This has been shown to be inferior to angiography and has shown no differences in outcomes.

Duplex ultrasound has been used for postrevascularization surveillance of graft patency with mixed results. Vein grafts fail either from the development of stenosis at the anastomoses, in the body of the graft or from proximal or distal disease progression. These may occur and be detectable by ultrasound even if the patient is asymptomatic and the ABI is unchanged. It has been shown that revision of these threatened grafts results in better outcomes. Duplex surveillance of vein grafts is widely accepted and necessary.

Duplex surveillance of synthetic grafts has not been as well defined. Several studies have failed to show an improved outcome where duplex guided the clinical decision making. Other studies have found some improvement in patency where duplex was used for graft surveillance. The lack of consistency of these studies represents not only the marginal utility of duplex in the surveillance of synthetic grafts but also technical factors inherent when a synthetic conduit is used.

Duplex surveillance of angioplasty procedures is of questionable value. Several studies have shown that increased velocities exist after a PTA procedure and that this does not influence patency. There are contradictory studies that suggest patency is influenced adversely by these increased velocities and predict early failure. Although it seems logical to assume that early detection of restenosis could improve outcomes this is unsupported by the literature at this point.

REFERENCES


INTRODUCTION:

A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While duplex ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

A complete upper extremity arterial study is comprised of imaging of the subclavian, axillary, brachial, ulnar and radial arteries. Duplex with spectral waveforms are included. Bypass grafts or interventional sites are investigated. The Ankle-Brachial index is usually not included.

A review of common clinical scenarios where cerebrovascular ultrasound is used follows. These scenarios are scored for appropriate use on a scale of 1-9. A median score of 7-9 indicates that this is an appropriate test for the specific indication. A median score of 4-6 indicates that there is unclear evidence as to the appropriateness of the test. A median score of 1-3 indicates that the test is not generally acceptable for the indication.

<p>| ACCF/ACR/AIUM/ASE/ASN/ICA/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria |
|---------------------------------|---------------------------------|-----------------------------|</p>
<table>
<thead>
<tr>
<th>ACCF et al. Criteria #</th>
<th>Indications</th>
<th>Appropriate Use Score (1-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>142.</td>
<td>Arm or hand claudication</td>
<td>A (8)</td>
</tr>
<tr>
<td>143.</td>
<td>Finger discoloration or ulcer</td>
<td>A (8)</td>
</tr>
<tr>
<td>144.</td>
<td>Unilateral cold painful hand</td>
<td>A (8)</td>
</tr>
<tr>
<td>145.</td>
<td>Raynaud’s phenomenon</td>
<td>U (5)</td>
</tr>
<tr>
<td>146.</td>
<td>Suspected positional arterial obstruction (e.g., thoracic outlet syndrome).</td>
<td>A (7)</td>
</tr>
<tr>
<td>147.</td>
<td>Upper extremity trauma with suspicion of vascular injury</td>
<td>A (8)</td>
</tr>
<tr>
<td>148.</td>
<td>Discrepancy in arm pulses or blood pressure discrepancy of &gt;20mm Hg between arms.</td>
<td>U (6)</td>
</tr>
<tr>
<td>149.</td>
<td>Periclavicular bruit</td>
<td>U (5)</td>
</tr>
<tr>
<td>150.</td>
<td>Pre-op radial artery harvest (e.g., for CABG)</td>
<td>A (7)</td>
</tr>
</tbody>
</table>
### Surveillance of Upper Extremity PAD After Revascularization

| 151. | Presence of pulsatile mass or hand ischemia after upper extremity vascular access. | A (8) |
| 152. | Presence of bruit after upper extremity access for intervention. | A (8) |

### New or Worsening Symptoms

| 153. | Baseline (within 1 month) | A (8) |
| 154. | After revascularization (stent or bypass) | A (8) |
| 155. | Post trauma | A (8) |

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year</th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>156.</td>
<td>After vein bypass graft</td>
<td>U (6)</td>
<td>A (7)</td>
</tr>
<tr>
<td>157.</td>
<td>After prosthetic bypass graft</td>
<td>I (3)</td>
<td>U (6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency After First Year</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 23 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>158.</td>
<td>After vein bypass graft</td>
<td>U (4)</td>
<td>A (7)</td>
</tr>
<tr>
<td>159.</td>
<td>After prosthetic bypass graft</td>
<td>U (4)</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

### ADDITIONAL CONSIDERATIONS:

The **Appropriate** indications for upper extremity arterial testing included claudication, ulcer, unilateral cold painful hand, suspected positional arterial obstruction, and trauma with suspicion of vascular injury.

The presence of Raynaud’s phenomenon was an **Uncertain** indication. A preoperative evaluation for a procedure such as radial artery harvest or suspected complication after an upper extremity arterial intervention was also **Appropriate** indications for testing.

Similar to the lower extremity, a baseline study after revascularization and new or worsening symptoms are **Appropriate** indications for upper extremity arterial testing.

The most **Appropriate** initial surveillance time interval after upper extremity revascularization with either vein or prosthetic bypass graft was at 12 months. A surveillance period of every 6 months after initial postoperative evaluation was most **Inappropriate** for asymptomatic patients.

### ADDITIONAL INFORMATION:

**Definitions:**

**Claudication:** Reproducible muscle discomfort or fatigue occurring with exertion at the same workload and relieved with rest, typically due to arterial obstruction.
**Cold extremity:** Reduced temperature from patient history or observed on physical examination by physician.

**Physiological testing:** Evaluation of the peripheral circulation based on measurement of limb blood pressures with pulse volume recordings or Doppler waveforms, or other parameters without utilizing data from direct imaging of the blood vessels.

**Resistant hypertension:** The failure to normalize blood pressure on 3 or more drug regimen with medications at maximum doses and at least 1 of the medications being a diuretic agent.

**Abbreviations:**

- ABI = ankle-brachial index
- ACE = angiotensin-converting enzyme inhibitor
- ARB = angiotensin II receptor blocker
- CABG = coronary artery bypass graft
- CT = computed tomography
- GI = gastrointestinal
- ICA = internal carotid artery
- ICAVL = Intersocietal Commission for the Accreditation of Vascular Laboratories
- IMT = intima-media thickness
- PAD = peripheral artery disease
- PVR = pulse volume recording

**REFERENCES**


INTRODUCTION:

A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While duplex ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

Interpretation of venous duplex examinations must use validated criteria to assess the presence and extent of venous thrombosis, vessel patency, valvular competence, and/or calf muscle pump function. Duplex ultrasonography for venous evaluation includes transverse gray scale imaging with transducer compressions and long axis spectral Doppler evaluation, with or without color imaging.

The interpretation and report must state the presence or absence of abnormalities in the vessels that were investigated. Disease if present, must be characterized according to its location, extent, severity, and in the case of venous thrombosis, age when possible.

A review of common clinical scenarios where cerebrovascular ultrasound is used follows. These scenarios are scored for appropriate use on a scale of 1-9. A median score of 7-9 indicates that this is an appropriate test for the specific indication. A median score of 4-6 indicates that there is unclear evidence as to the appropriateness of the test. A median score of 1-3 indicates that the test is not generally acceptable for the indication.

ACCF/ACR/AIUM/ASE/IAC/SCAI/SCVS/SIR/SVM/SVS/SVU 2013 Appropriate Use Criteria for Peripheral Vascular Ultrasound and Physiological Testing Part II

<table>
<thead>
<tr>
<th>ACCF et al. Criteria #</th>
<th>Indications</th>
<th>Appropriate Use Score (1-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A = appropriate; M = maybe appropriate; R = rarely appropriate</td>
<td></td>
</tr>
<tr>
<td><strong>Venous Duplex of the Upper extremities for Patency and Thrombosis</strong></td>
<td><strong>Limb Swelling</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>• Unilateral – Acute</td>
<td>A (9)</td>
</tr>
<tr>
<td>2.</td>
<td>• Unilateral – chronic, persistent</td>
<td>A (7)</td>
</tr>
</tbody>
</table>
| 3. | • Bilateral – acute  
• Suspected central venous obstruction | A (8) |
| 4. | • Bilateral—chronic, persistent  
• No alternative diagnosis identified (e.g., no CHF or anasarca from hypoalbuminemia)  
• Suspected central venous obstruction | A (7) |
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Nonarticular pain in the upper extremity (no indwelling upper extremity venous catheter)</td>
<td>M (5)</td>
</tr>
<tr>
<td>6.</td>
<td>Nonarticular pain in the upper extremity with indwelling upper extremity venous catheter</td>
<td>A (7)</td>
</tr>
<tr>
<td>7.</td>
<td>Tender, palpable cord in the upper extremity</td>
<td>A (8)</td>
</tr>
<tr>
<td>8.</td>
<td>Suspected pulmonary embolus (no indwelling upper extremity venous catheter)</td>
<td>M (4)</td>
</tr>
<tr>
<td>9.</td>
<td>Suspected pulmonary embolus with indwelling upper extremity venous catheter</td>
<td>M (6)</td>
</tr>
<tr>
<td>10.</td>
<td>Diagnosed pulmonary embolus (no indwelling upper extremity venous catheter)</td>
<td>M (4)</td>
</tr>
<tr>
<td>11.</td>
<td>Diagnosed pulmonary embolus with indwelling upper extremity venous catheter</td>
<td>M (6)</td>
</tr>
<tr>
<td>12.</td>
<td>Fever of unknown origin (no indwelling upper extremity venous catheter)</td>
<td>R (2)</td>
</tr>
<tr>
<td>13.</td>
<td>Fever with indwelling upper extremity venous catheter</td>
<td>R (4)</td>
</tr>
<tr>
<td>14.</td>
<td>New upper extremity pain or swelling while on anticoagulation.</td>
<td>A (7)</td>
</tr>
<tr>
<td>15.</td>
<td>New upper extremity pain or swelling not on anticoagulation (i.e., contraindication to anticoagulation)</td>
<td>A (7)</td>
</tr>
<tr>
<td>16.</td>
<td>Before anticipated discontinuation of anticoagulation treatment</td>
<td>M (5)</td>
</tr>
<tr>
<td>17.</td>
<td>Shortness of breath in a patient with known upper extremity DVT</td>
<td>R (3)</td>
</tr>
<tr>
<td>19.</td>
<td>Surveillance after diagnosis of upper extremity superficial phlebitis. Not on anticoagulation, phlebitis location ≤ 5 cm from deep vein junction.</td>
<td>M (4)</td>
</tr>
<tr>
<td>20.</td>
<td>In the absence of adequate leg vein for harvest</td>
<td>A (8)</td>
</tr>
<tr>
<td>21.</td>
<td>In the presence of adequate leg vein for harvest</td>
<td>M (4)</td>
</tr>
<tr>
<td>22.</td>
<td>Prior to pacemaker or implantable cardiac defibrillator</td>
<td>R (3)</td>
</tr>
</tbody>
</table>

**Limb Pain (without swelling)**

**Shortness of Breath**

**Fever**

**Known Upper Extremity Venous Thrombosis**

**Vein Mapping Prior to ByPass Surgery (Coronary or Peripheral)**

**Screening Examination for Upper Extremity DVT** (Screening examination performed in the absence of upper extremity pain or swelling.)
<table>
<thead>
<tr>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Prolonged ICU stay (e.g., &gt;4 days)</td>
</tr>
<tr>
<td>24. Prolonged ICU stay (e.g., &gt;4 days) with indwelling upper extremity venous catheter</td>
</tr>
<tr>
<td>25. Monitoring indwelling upper extremity venous catheter that is functional</td>
</tr>
<tr>
<td>26. In those with high risk: acquired, inherited, or hypercoagulable state.</td>
</tr>
<tr>
<td>27. Positive D-dimer test in a hospital inpatient</td>
</tr>
</tbody>
</table>

### Venous Duplex of the Upper extremities for Patency and Thrombosis

#### Limb Swelling

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Unilateral – Acute</td>
<td>A (9)</td>
</tr>
<tr>
<td>29. Unilateral – chronic, persistent</td>
<td>A (7)</td>
</tr>
<tr>
<td>30. Bilateral – acute</td>
<td>A (8)</td>
</tr>
<tr>
<td>31. Bilateral—chronic, persistent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No alternative diagnosis identified (e.g., no CHF or anasarca from hypoalbuminemia)</td>
</tr>
</tbody>
</table>

#### Limb Pain (without swelling)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>32. Nonarticular pain in the lower extremity (e.g., calf or thigh)</td>
<td>A (7)</td>
</tr>
<tr>
<td>33. Knee pain</td>
<td>M (4)</td>
</tr>
<tr>
<td>34. Tender, palpable cord in the lower extremity</td>
<td>A (8)</td>
</tr>
</tbody>
</table>

#### Shortness of Breath

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35. Suspected pulmonary embolus</td>
<td>A (8)</td>
</tr>
<tr>
<td>36. Diagnosed pulmonary embolus</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

#### Fever

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>37. Fever of unknown origin (no indwelling lower extremity venous catheter)</td>
<td>M (5)</td>
</tr>
<tr>
<td>38. Fever with indwelling lower extremity venous catheter</td>
<td>M (5)</td>
</tr>
</tbody>
</table>

#### Known Lower Extremity Venous Thrombosis

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>39. Surveillance of calf vein thrombosis for proximal propagation in patient with contraindication to anticoagulation (within 2 weeks of diagnosis)</td>
<td>A (7)</td>
</tr>
<tr>
<td>40. New lower extremity pain or swelling</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

#### Duplex Evaluation for Venous Incompetency

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>56. Active venous ulcer</td>
<td>A (9)</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>57.</td>
<td>• Healed venous ulcer</td>
</tr>
<tr>
<td>58.</td>
<td>• Spider veins (telangiectasias)</td>
</tr>
<tr>
<td>59.</td>
<td>• Varicose veins, entirely asymptomatic</td>
</tr>
<tr>
<td>60.</td>
<td>• Varicose veins with lower extremity pain or heaviness</td>
</tr>
<tr>
<td>61.</td>
<td>• Visible varicose veins with chronic lower extremity swelling or skin changes of chronic venous insufficiency (e.g., hyperpigmentation, lipodermatosclerosis)</td>
</tr>
<tr>
<td>62.</td>
<td>• Skin changes of chronic venous insufficiency without visible varicose veins (e.g., hyperpigmentation, lipodermatosclerosis)</td>
</tr>
<tr>
<td>63.</td>
<td>• Lower extremity pain or heaviness without signs of venous disease</td>
</tr>
<tr>
<td>64.</td>
<td>• Mapping prior to venous ablation procedure</td>
</tr>
<tr>
<td>65.</td>
<td>• Prior endovenous (great or small) saphenous ablation procedure with new or worsening varicose veins in the ipsilateral limb</td>
</tr>
<tr>
<td>66.</td>
<td>• Prior endovenous (great or small) saphenous ablation procedure with no residual symptoms</td>
</tr>
</tbody>
</table>

**ADDITIONAL CONSIDERATIONS:**

Lower extremity venous duplex ultrasound is **Appropriate** in the setting of limb swelling, non articular lower extremity pain with or without a palpable cord, pulmonary embolism, or when new pain or swelling occurs in the presence of known lower extremity DVT.

Testing with duplex ultrasound is also **Appropriate** in certain surveillance situations, such as calf vein thrombosis where anticoagulation is contraindicated and for early follow up of venous ablation surgery (first 10 days). Duplex ultrasound is **Appropriate** for surveillance of patients with superficial venous thrombosis where the thrombus is adjacent to its deep junction. Duplex ultrasound is **Appropriate** study when evidence of venous obstruction exist from venous physiologic testing (plethysmography). In these situations CPT code 93971 should be used where only the symptomatic limb is scanned.

Duplex ultrasound is felt to be **Appropriate** in the evaluation of suspected paradoxical embolism in a patient with an atrial septal defect or patent foramen ovale.

Lower extremity venous mapping prior to coronary or peripheral bypass surgery is **Appropriate**, but generally constitutes a limited study, (CPT code 93971).

Screening for DVT with duplex ultrasound in an asymptomatic patient is so rarely productive as to make it **Inappropriate**. These scenarios include, patients with prolonged ICU stay, positive D-Dimer, following orthopedic surgery, and those with a hypercoagulable state. Evaluation of
patients with fever of unknown origin may possibly be appropriate but there is little evidence to support this.

Duplex ultrasound evaluation for venous valvular insufficiency or venous reflux, with provocative maneuvers such as distal limb augmentation and/or Valsalva is **Appropriate** in the setting of significant clinical signs and symptoms of venous disease. These are active or healed ulcers, varicosities with lower extremity discomfort, swelling or chronic skin changes.

Duplex ultrasound **May Be Appropriate** for evaluation of the patient with significant though asymptomatic varicose veins or for the patient with lower extremity pain and swelling.

Duplex ultrasound is **Inappropriate** in the evaluation of patients with spider veins (telangiectasia) without other stigmata of venous disease. Duplex ultrasound is also **Inappropriate** for the patient with prior vein ablation and no residual symptoms (follow up duplex is indicated within 10 days of the procedure).

**ADDITIONAL INFORMATION:**

**Definitions:**

**Physiological testing:** Evaluation of the peripheral venous circulation based on measurement of limb blood flow using plethysmographic sensors (e.g., air, strain gauge, or photoplethysmography) with physiological maneuvers (e.g., limb positioning, limb exercise, tourniquet application), or other parameters, without utilizing data from direct imaging of the blood vessels.

**Screening examination:** Testing conducted to determine the presence or absence of disease in an asymptomatic patient.

**Surveillance examination:** Testing conducted to monitor disease progression based solely on the passage of time since initial diagnosis or revascularization (e.g., calf vein thrombosis with contraindication to anticoagulation). It is assumed that baseline testing has already been conducted

**Abbreviations:**

- ACR = American College of Radiology
- AVF = autogenous arteriovenous fistula (including venous transpositions)
- AVG = prosthetic arteriovenous graft
- CHF = congestive heart failure
- DVT = deep vein thrombosis
- IAC = Intersocietal Accreditation Commission
- ICU = intensive care unit
- IVC = inferior vena cava
- RPVI = registered physician in vascular interpretation
- RVT = registered vascular technologist
- RVS = registered vascular sonographer
- TIPS = transjugular intrahepatic portosystemic shunt

**REFERENCES**


CPT Codes:
93975 – Bilateral or Complete
93976 - Unilateral or Limited

INTRODUCTION:

A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While duplex ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

Renal Artery imaging involves the use of color Doppler to access flow disturbance and the presence of plaque and spectral Doppler to measure flow velocities from the renal artery ostium to the hilum. Doppler spectral waveforms are obtained from the segmental arteries of the renal parenchyma. Kidney length is noted. Multiple renal arteries are noted. Patency of the renal veins and any other abnormalities such as masses or cysts are documented.

A review of common clinical scenarios where cerebrovascular ultrasound is used follows. These scenarios are scored for appropriate use on a scale of 1-9. A median score of 7-9 indicates that this is an appropriate test for the specific indication. A median score of 4-6 indicates that there is unclear evidence as to the appropriateness of the test. A median score of 1-3 indicates that the test is not generally acceptable for the indication.

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<tr>
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<th>Appropriate Use Score (1-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal and Mesenteric Artery Duplex Evaluation of Renal Artery Stenosis – Potential Signs and/or Symptoms Creatinine Evaluation and/or Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>Malignant Hypertension (see Assumptions)</td>
<td>A (8)</td>
</tr>
<tr>
<td>35.</td>
<td>Resistant Hypertension (see Assumptions)</td>
<td>A (8)</td>
</tr>
<tr>
<td>36.</td>
<td>Worsening blood pressure control in long standing hypertensive patient.</td>
<td>A (8)</td>
</tr>
<tr>
<td>37.</td>
<td>Hypertension in younger patient (age &lt;35 years)</td>
<td>A (8)</td>
</tr>
<tr>
<td>38.</td>
<td>Unexplained size discrepancy between kidneys (&gt;1.5 cm; in longest dimension)</td>
<td>A (7)</td>
</tr>
<tr>
<td>39.</td>
<td>Unknown cause of azotemia (e.g., unexplained increase in</td>
<td>A (7)</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>40.</td>
<td>Increased creatine (&gt;50% baseline or above normal levels) after the administration of ACE/ARBs.</td>
<td>A (8)</td>
</tr>
<tr>
<td>41.</td>
<td>Acute renal failure with aortic dissection</td>
<td>A (8)</td>
</tr>
<tr>
<td>42.</td>
<td>Epigastric bruit</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

**Heart Failure of Unknown Origin**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>43.</td>
<td>Refractory CHF</td>
</tr>
<tr>
<td>44.</td>
<td>“Flash” pulmonary edema</td>
</tr>
</tbody>
</table>

**Screening for Renal Artery Stenosis - Asymptomatic**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>45.</td>
<td>Atherosclerotic vascular disease in other beds (e.g., peripheral artery disease) and well-controlled hypertension</td>
</tr>
<tr>
<td>46.</td>
<td>Unexplained size discrepancy between kidneys (&gt;1.5 cm; in longest dimension) as discovered by CT or ultrasound</td>
</tr>
</tbody>
</table>

**Evaluation for Mesenteric Artery Stenosis – Potential Signs and/or Symptoms Symptomatic**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>47.</td>
<td>Evaluation for acute abdominal pain &quot;out of proportion to exam&quot;</td>
</tr>
<tr>
<td>48.</td>
<td>Leukocytosis, “thumbprinting” pneumatosis or hemoconcentration, and acidosis with or without elevated amylase, alkaline phosphatase, or CPK</td>
</tr>
<tr>
<td>49.</td>
<td>Postprandial pain or weight loss not otherwise explained</td>
</tr>
<tr>
<td>50.</td>
<td>GI evaluation not yet undertaken</td>
</tr>
<tr>
<td>51.</td>
<td>Chronic constipation or diarrhea</td>
</tr>
<tr>
<td>52.</td>
<td>GI evaluation not yet undertaken</td>
</tr>
<tr>
<td>53.</td>
<td>Abdominal or epigastric bruit</td>
</tr>
</tbody>
</table>

**Follow-Up Testing for Renal Artery Stenosis - Asymptomatic**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>53.</td>
<td>Prior imaging indicates renal artery stenosis</td>
</tr>
<tr>
<td>54.</td>
<td>Determine hemodynamic significance</td>
</tr>
<tr>
<td>55.</td>
<td>Surveillance of known renal artery stenosis</td>
</tr>
</tbody>
</table>

**Surveillance After Renal or Mesenteric Artery Revascularization Asymptomatic**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>55.</td>
<td>Baseline surveillance (within 1 month) after revascularization</td>
</tr>
</tbody>
</table>

**New or Worsening Symptoms After Baseline**

<table>
<thead>
<tr>
<th></th>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>56.</td>
<td>After renal or mesenteric artery revascularization</td>
<td>A (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.</td>
<td>During first 12 months after endovascular revascularization</td>
<td>I (3)</td>
<td>U (6)</td>
<td>U (6)</td>
</tr>
<tr>
<td>58.</td>
<td>After first 12 months after endovascular revascularization</td>
<td>I (3)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency After First Year</th>
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<tbody>
<tr>
<td>56.</td>
<td>During first 12 months after endovascular revascularization</td>
<td>I (3)</td>
<td>U (6)</td>
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</tr>
<tr>
<td>58.</td>
<td>After first 12 months after endovascular revascularization</td>
<td>I (3)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

### ACCF/ACR/AIUM/ASE/IAC/SCAI/SCVS/SIR/SVM/SVS/SVU 2013 Appropriate Use Criteria

<table>
<thead>
<tr>
<th>ACCF et al. Criteria #</th>
<th>Indications</th>
<th>Appropriate Use Score (1-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A_ appropriate; M_ maybe inappropriate; R_ rarely appropriate</td>
<td></td>
</tr>
</tbody>
</table>

#### Duplex of the Hepatoportal System (Portal Vein, Hepatic Veins, Splenic Vein, Superior Mesenteric Vein, Inferior Cava) for Patency, Thrombosis, and Flow Direction

Evaluation of Hepatic Dysfunction or Portal Hypertension

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>86.</td>
<td>Abnormal liver function tests.</td>
<td>M (6)</td>
</tr>
<tr>
<td></td>
<td>No alternative diagnosis identified (e.g., medication related or infectious hepatitis)</td>
<td></td>
</tr>
<tr>
<td>87.</td>
<td>Cirrhosis with or without ascites</td>
<td>A (7)</td>
</tr>
<tr>
<td>88.</td>
<td>Jaundice</td>
<td>R (3)</td>
</tr>
<tr>
<td></td>
<td>As an initial diagnostic test</td>
<td></td>
</tr>
<tr>
<td>89.</td>
<td>Jaundice</td>
<td>M (6)</td>
</tr>
<tr>
<td></td>
<td>No alternative diagnosis identified after initial evaluation (e.g., no biliary obstruction)</td>
<td></td>
</tr>
<tr>
<td>90.</td>
<td>Hepatomegaly and/or splenomegaly</td>
<td>A (7)</td>
</tr>
<tr>
<td>91.</td>
<td>Portal hypertension</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

#### Surveillance Following Portal Decompression Procedure

<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>92.</td>
<td>Follow-up of a TIPS</td>
<td>A (8)</td>
</tr>
</tbody>
</table>

#### Evaluation of other Symptoms or Signs of Abdominal Vascular Disease

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>93.</td>
<td>Abdominal pain</td>
<td>M (4)</td>
</tr>
<tr>
<td>94.</td>
<td>Fever of unknown origin</td>
<td>R (3)</td>
</tr>
</tbody>
</table>

#### Evaluation of Other Symptoms or Signs of Abdominal Vascular Disease

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>95.</td>
<td>Pulmonary symptoms (suspected pulmonary embolus)</td>
<td>R (3)</td>
</tr>
</tbody>
</table>
96. • Cor Pulmonale

ADDITIONAL CONSIDERATIONS:

Renal artery
Duplex ultrasound is **Appropriate** in the evaluation of hypertension, increasing or elevated serum creatinine, and heart failure as described in the tables below. It is **Not Appropriate** for screening in an asymptomatic patient. Duplex ultrasound is also **Inappropriate** in the surveillance of known stenotic lesions in the absence of changing symptoms or laboratory findings.

Mesenteric/Celiac artery
The only **Appropriate** indication for evaluation of the mesenteric and celiac arteries for stenosis is postprandial pain and weight loss in patients who have undergone a gastrointestinal evaluation.

Surveillance after Renal, Mesenteric or Celiac artery revascularization
Surveillance after renal, mesenteric or celiac revascularization (Surgical or endovascular) is **Appropriate** at 1 month following the procedure to establish a baseline and any time there are new signs or symptoms. Surveillance is **Appropriate** after 12 months from the procedure.

Routine surveillance is **Not Appropriate** in the absence of recurrent or worsening symptoms.

Duplex evaluation of the Hepatoportal System
Duplex ultrasound evaluation is **Appropriate** for the evaluation of cirrhosis without ascites, hepatomegaly and/or splenomegaly, and portal hypertension. Duplex scanning is **Appropriate** in the surveillance after a transjugular intrahepatic portosystemic shunt (TIPS) procedure.

Duplex ultrasound is **Not Appropriate** in the initial evaluation of jaundice, but **May Be Appropriate** in cases where there are elevated liver enzymes and jaundice without a diagnosis identified after other evaluations. Hepatoportal duplex scanning is **Inappropriate** in the initial evaluation of abdominal pain, fever of unknown origin, cor pulmonale or pulmonary symptoms.

Duplex Ultrasound evaluation of the renal venous system
Isolated Renal Vein pathology is uncommon as a cause of genitourinary symptoms or signs. There are clinical indications rated as **Appropriate** for assessment of the native renal veins with duplex ultrasound. For indications of acute renal failure, acute flank pain and other symptoms compatible with renal vein thrombosis, renal venous duplex scanning may be **Appropriate**.

Renal venous duplex is **Inappropriate** for the evaluation of microscopic hematuria, fever of unknown origin and pulmonary symptoms. Renal venous duplex is **Inappropriate** for evaluation of abdominal bruises and hypertension where an arterial study would be more appropriate.

ADDITIONAL INFORMATION:
Definitions:

Claudication: Reproducible muscle discomfort or fatigue occurring with exertion at the same workload and relieved with rest, typically due to arterial obstruction.

Cold extremity: Reduced temperature from patient history or observed on physical examination by physician.
Physiological testing: Evaluation of the peripheral circulation based on measurement of limb blood pressures with pulse volume recordings or Doppler waveforms, or other parameters without utilizing data from direct imaging of the blood vessels.

Resistant hypertension: The failure to normalize blood pressure on 3 or more drug regimen with medications at maximum doses and at least 1 of the medications being a diuretic agent.

Abbreviations:

- ABI = ankle-brachial index
- ACE = angiotensin-converting enzyme inhibitor
- ACR = American College of Radiology
- ARB = angiotensin II receptor blocker
- AVF = autogenous arteriovenous fistula (including venous transpositions)
- AVG = prosthetic arteriovenous graft
- CABG = coronary artery bypass graft
- CHF = congestive heart failure
- CT = computed tomography
- DVT = deep vein thrombosis
- GI = gastrointestinal
- ICA = internal carotid artery
- ICAVL = Intersocietal Commission for the Accreditation of Vascular Laboratories
- IMT = intima-media thickness
- IVC = inferior vena cava
- PAD = peripheral artery disease
- PVR = pulse volume recording
- RPVI = registered physician in vascular interpretation
- RVT = registered vascular technologist
- RVS = registered vascular sonographer
- TIPS = transjugular intrahepatic portosystemic shunt

REFERENCES


INTRODUCTION:

A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While duplex ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

An abdominal Aortoiliac duplex examination should examine the native aorta with 2D sonography from the diaphragm to the groins bilaterally. Diameter measurements are made of the suprarenal, juxtarenal and infrarenal segments of the aorta and common and external iliac arteries. The internal iliac arteries are identified if possible. Measurements are made at the point of maximal diameter. Color duplex is used to determine patency. The presence of thrombus, residual lumen, dissection, flaps, pseudoaneurysms, wall defects, stenoses and occlusions are documented. Stenosis is confirmed by spectral Doppler waveform analysis.

Evaluation of endovascular stent grafts is somewhat more complex. Using gray scale or B-mode imaging the diameter of the residual aortic aneurysm is measured, the fixation sites are accessed and the residual sac is observed for areas of echolucency or motion/pulsation. Doppler is used to demonstrate patency of renal and mesenteric arteries, graft limbs, and runoff vessels. Color Doppler is used to detect any endoleak. Pulse wave spectral Doppler is used to detect any flow restrictions or turbulence that may indicate a technical problem.

Examination of the mesenteric and splanchnic arteries requires obtaining spectral waveforms from the celiac axis, splenic and hepatic arteries, and the superior and inferior mesenteric arteries.

As a screening examination this is by definition a limited study. A standard screening exam images the native aorta with 2D ultrasound beginning at the diaphragm and documents the maximal transverse and AP diameter. Color may be used to access patency and define the lumen. A gray scale image of the aorta should be recorded.

A review of common clinical scenarios where cerebrovascular ultrasound is used follows. These scenarios are scored for appropriate use on a scale of 1-9. A median score of 7-9 indicates that this is an appropriate test for the specific indication. A median score of 4-6 indicates that there is unclear evidence as to the appropriateness of the test. A median score of 1-3 indicates that the test is not generally acceptable for the indication.

<p>| ACCF/ACR/AIUM/ASE/ASN/ICAVAL/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria |
|-----------------------------------------------|-----------------|-------------------|
| ACCF et al. Criteria # | Indications | Appropriate Use Score (1-9) |
| A _ appropriate; I _ inappropriate; U _ uncertain | Aortic and Aortoiliac Duplex |</p>
<table>
<thead>
<tr>
<th></th>
<th>Abdominal Aortic Disease - Signs and/or Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>59.</td>
<td>• Lower extremity claudication</td>
</tr>
<tr>
<td>60.</td>
<td>• Nonspecific lower extremity discomfort</td>
</tr>
<tr>
<td>61.</td>
<td>• New onset abdominal or back pain</td>
</tr>
<tr>
<td>62.</td>
<td>• Aneurysmal femoral or popliteal pulse</td>
</tr>
<tr>
<td>63.</td>
<td>• Pulsatile abdominal mas</td>
</tr>
<tr>
<td>64.</td>
<td>• Decreased or absent femoral pulse</td>
</tr>
<tr>
<td>65.</td>
<td>• Abdominal or femoral bruit</td>
</tr>
<tr>
<td>66.</td>
<td>• Fever of unknown origin</td>
</tr>
<tr>
<td>67.</td>
<td>• Lower extremity swelling</td>
</tr>
<tr>
<td>68.</td>
<td>• Evidence of atheroemboli in the lower extremities, including ischemic toes</td>
</tr>
<tr>
<td>69.</td>
<td>• Erectile dysfunction</td>
</tr>
<tr>
<td>70.</td>
<td>• Abnormal physiologic testing indicating aortoiliac occlusive disease</td>
</tr>
<tr>
<td>71.</td>
<td>• Hypertension</td>
</tr>
<tr>
<td>72.</td>
<td>• Abnormal abdominal x-ray suggestive of aneurysm</td>
</tr>
<tr>
<td>73.</td>
<td>• Presence of a lower extremity arterial aneurysm (e.g., femoral or popliteal)</td>
</tr>
<tr>
<td>74.</td>
<td>• Presence of a thoracic aortic aneurysm</td>
</tr>
</tbody>
</table>

### New or Worsening Symptoms

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>82.</td>
<td>• Known abdominal aortic aneurysm (any size)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year</th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
<th>At 9 to 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>83.</td>
<td>• Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>I (1)</td>
<td>U (4)</td>
</tr>
<tr>
<td>84.</td>
<td>• Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>I (1)</td>
<td>U (4)</td>
</tr>
<tr>
<td>85.</td>
<td>• Aneurysm 4.0 to 5.4 cm in diameter</td>
<td>U (4)</td>
<td>A (7)</td>
</tr>
<tr>
<td>86.</td>
<td>• Aneurysm ≥ 5.5 cm in diameter</td>
<td>A (7)</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms, No or Slow Progression During First Year, Surveillance Frequency After First Year</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 23 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>87.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>I (2)</td>
<td>A (7)</td>
<td>A (7)</td>
</tr>
<tr>
<td>88.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>I (2)</td>
<td>A (7)</td>
<td>A (7)</td>
</tr>
<tr>
<td>89.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aneurysm 4.0 to 5.4 cm in diameter</td>
<td>U (5)</td>
<td>A (7)</td>
<td>U (6)</td>
</tr>
<tr>
<td>90.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aneurysm ≥ 5.5 cm in diameter</td>
<td>A (8)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptoms, Rapid Progression During First Year, Surveillance Frequency After First Year</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 23 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>91.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>A (7)</td>
<td>A (7)</td>
<td>U (4)</td>
</tr>
<tr>
<td>92.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>A (8)</td>
<td>A (7)</td>
<td>U (4)</td>
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<td></td>
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<td>A (8)</td>
<td>A (7)</td>
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<td>94.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aneurysm ≥ 5.5 cm in diameter</td>
<td>A (9)</td>
<td>U (5)</td>
<td>I (3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surveillance After Aortic Endograft or Aortoiliac Stenting</th>
<th>Baseline (Within 1 Month After the Intervention)</th>
</tr>
</thead>
<tbody>
<tr>
<td>95.</td>
<td></td>
</tr>
<tr>
<td>• Aortic or iliac endograft</td>
<td>A (8)</td>
</tr>
<tr>
<td>96.</td>
<td></td>
</tr>
<tr>
<td>• Aortic and iliac artery stents</td>
<td>A (7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New or Worsening Lower Extremity Symptoms After Baseline Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>97.</td>
</tr>
<tr>
<td>• Aortic or iliac endograft</td>
</tr>
<tr>
<td>98.</td>
</tr>
<tr>
<td>• Aortic and iliac artery stents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptom After Baseline Study, Surveillance Frequency During First Year.</th>
<th>At 3 to 5 months</th>
<th>At 6 to 8 months</th>
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</tr>
</thead>
<tbody>
<tr>
<td>99.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aortic endograft without endoleak stable and/or decreasing residual aneurysm sac size</td>
<td>I (3)</td>
<td>U (5)</td>
<td>U (6)</td>
</tr>
<tr>
<td>100.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aortic endograft with endoleak and/or increasing residual aneurysm sac size</td>
<td>U (6)</td>
<td>A (8)</td>
<td>A (7)</td>
</tr>
<tr>
<td>101.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aortic or iliac artery stents</td>
<td>I (2)</td>
<td>U (5)</td>
<td>U (6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asymptomatic or Stable Symptom After Baseline Study, Surveillance Frequency After the First Year.</th>
<th>Every 6 months</th>
<th>Every 12 months</th>
<th>Every 24 months or greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>102.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aortic endograft without endoleak stable and/or decreasing residual aneurysm sac size</td>
<td>I (3)</td>
<td>A (7)</td>
<td>U (5)</td>
</tr>
<tr>
<td>ACCF/AACR/AIUM/ASE/IAC/SCAI/SCVS/SIR/SVM/SVS/SVU 2013 Appropriate Use Criteria</td>
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<td><strong>Indications</strong></td>
<td><strong>Appropriate Use Score (1-9)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>A</strong> _ appropriate; <strong>M</strong> _ maybe appropriate; <strong>R</strong> _ rarely appropriate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Duplex of the IVC and Iliac Veins for Patency and Thrombosis Prior to IVC Filter Placement**

| 75. | Prior to IVC filter placement | M (6) |
| 76. | Lower extremity swelling – unilateral or bilateral-as a “stand-alone test” without venous duplex of the lower extremities | R (3) |
| 77. | Lower extremity swelling – unilateral or bilateral-combined routinely with a venous duplex of the lower extremities | M (4) |
| 78. | Lower extremity swelling – unilateral or bilateral-performed selectively – when the lower extremity venous duplex is normal | M (6) |
| 79. | Lower extremity swelling – unilateral or bilateral-performed selectively – when the lower extremity venous duplex is positive for acute proximal DVT | A (7) |
| 80. | Selectively – when the flow pattern in 1 or both common femoral veins is abnormal | A (8) |

**Evaluation for Suspected Pulmonary Embolus**

| 81. | Pulmonary symptoms (suspected pulmonary embolus) as a “stand-alone test” without a venous duplex of the lower extremities | R (2) |
| 82. | Pulmonary symptoms (suspected pulmonary embolus) – combined routinely with a venous duplex of the lower extremities | M (4) |

**Evaluation of Other Symptoms or Signs of Abdominal Vascular Disease**

| 83. | Abdominal pain | R (3) |
| 84. | Abdominal bruit | R (3) |
ADDITIONAL CONSIDERATIONS:

Duplex ultrasound is used for assessment of the Iliac Veins and Inferior Vena Cava most often in conjunction with an abnormal Lower extremity venous duplex. Scanning of the iliac veins is **Appropriate** when there is acute proximal femoral thrombus thought to extend superior to the inguinal ligament. An obstructive flow pattern, which is associated with lack of augmentation of femoral venous flow with expiration, suggests proximal obstruction. In patients with this finding during a lower extremity venous duplex study a scan of the iliac veins and IVC is warranted. Most often these are limited and/or unilateral studies as generally it is not necessary to fully evaluate the arterial system or scan the unaffected side.

Duplex evaluation of the iliac veins and IVC is **Not Appropriate** as a stand alone test for shortness of breath, limb swelling, or abdominal pain. It has some utility in the preprocedural planning in patients being considered for placement of a Vena Caval filter.

ADDITIONAL INFORMATION:

Definitions:

**Claudication**: Reproducible muscle discomfort or fatigue occurring with exertion at the same workload and relieved with rest, typically due to arterial obstruction.

**Cold extremity**: Reduced temperature from patient history or physical examination by physician.

**Physiological testing**: Evaluation of the peripheral circulation based on measurement of limb blood pressures with pulse volume recordings or Doppler waveforms, or other parameters without utilizing data from direct imaging of the blood vessels.

Abbreviations:

- **ABI** = ankle-brachial index
- **ACE** = angiotensin-converting enzyme inhibitor
- **ACR** = American College of Radiology
- **ARB** = angiotensin II receptor blocker
- **AVF** = autogenous arteriovenous fistula (including venous transpositions)
- **AVG** = prosthetic arteriovenous graft
- **CABG** = coronary artery bypass graft
- **CHF** = congestive heart failure
- **CT** = computed tomography
- **DVT** = deep vein thrombosis
- **GI** = gastrointestinal
- **ICA** = internal carotid artery
- **ICAVL** = Intersocietal Commission for the Accreditation of Vascular Laboratories
- **IMT** = intima-media thickness
- **IVC** = inferior vena cava
- **PAD** = peripheral artery disease
- **PVR** = pulse volume recording
RPVI = registered physician in vascular interpretation
RVT = registered vascular technologist
RVS = registered vascular sonographer
TIPS = transjugular intrahepatic portosystemic shunt

REFERENCES


CPT Codes:
93980 – Bilateral or Complete
93981 - Unilateral or Limited

INTRODUCTION:
A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While duplex ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

INDICATIONS FOR VENOUS DUPLEX ULTRASONOGRAPHY:
- Evaluation of erectile dysfunction, impaired erection or complete impotence.

INDICATIONS FOR PENILE COLOR CODED DUPLEX SONOGRAPHY (CCDS)* or DYNAMIC PENILE COLOR DUPLEX ULTRASOUND (D-PCDU):
- Evaluation of patients with erectile dysfunction unresponsive to oral medications.

* Penile color coded duplex sonography (CCDS) combined with the pharmaco-erection test represents an acceptable method of evaluating penile arterial and veno-occlusive function. Peak systolic velocity and a change in cavernous artery diameter are indicators of arterial inflow, while the pathologic end diastolic velocity and resistance index point out veno-occlusive dysfunction.

REFERENCES


INTRODUCTION:

A Duplex scan is an ultrasonic scanning procedure used to characterize the pattern and direction of blood flow in arteries or veins with the production of real-time images. While duplex ultrasound is a relatively safe and widely available modality it does have its particular shortcomings and specific indications. Obtaining a high quality study requires the interplay of a number of factors. There are established criteria that are important to consider in order to ensure reliable, interpretable and meaningful results.

The following table includes situations in which ultrasound duplex assessment of hemodialysis access sites is indicated. Note that NIA does not review requests for ultrasound studies to determine appropriate INITIAL placement of an access site; NIA reviews only requests for studies of hemodialysis sites already in place.

These scenarios are scored for appropriate use on a scale of 1-9. A median score of 7-9 indicates that this is an appropriate test for the specific indication. A median score of 4-6 indicates that there is unclear evidence as to the appropriateness of the test. A median score of 1-3 indicates that the test is not generally acceptable for the indication.

ACCF/ACR/AIUM/ASE/IAC/SCAI/SCVS/SIR/SVM/SVS/SVU 2013 Appropriate Use Criteria

<table>
<thead>
<tr>
<th>ACCF et al. Criteria #</th>
<th>Indications</th>
<th>Appropriate Use Score (1-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>107.</td>
<td>“Failure to mature” on basis of physical examination 0-6 weeks after placement</td>
<td>M (6)</td>
</tr>
<tr>
<td>108.</td>
<td>“Failure to mature” on basis of physical examination &gt;6 weeks after placement</td>
<td>A (8)</td>
</tr>
<tr>
<td>109.</td>
<td>Signs of access site malfunction during dialysis (e.g., low blood flows, kt/V, recirculation times, or increased venous pressure)</td>
<td>A (8)</td>
</tr>
<tr>
<td>110.</td>
<td>Mass associated with an AVF/AVG</td>
<td>A (8)</td>
</tr>
<tr>
<td>111.</td>
<td>Loss of palpable thrill of AVF/AVG</td>
<td>A (8)</td>
</tr>
<tr>
<td>112.</td>
<td>Arm swelling</td>
<td>A (8)</td>
</tr>
<tr>
<td>113.</td>
<td>Hand pain, pallor, and/or digital ulceration (i.e., evaluation for suspected arterial steal syndrome)</td>
<td>A (8)</td>
</tr>
<tr>
<td>114.</td>
<td>Cool extremity</td>
<td>R (3)</td>
</tr>
</tbody>
</table>
• Without pain, pallor, or ulceration

115. • Difficult cannulation by multiple personnel on multiple attempts

Asymptomatic

116. • Routine surveillance of a functioning AVF or AVG

ADDITIONAL CONSIDERATIONS:

Duplex ultrasound is **Appropriate** for vascular assessment of hemodialysis access when performed within three months of the access placement. It is **Inappropriate** to perform scans earlier than 3 months prior to access placement due to the potential for interval development of vascular lesions such as venous thrombosis. Following access placement the need for scans are largely dictated by clinical findings and performance of the access during dialysis.

Determination of failure to mature is **Appropriate** 6 months following access placement. Evaluation of signs of access malfunction in mature, previously functional access sites is **Appropriate** as is evaluation of a mass, loss of thrill, and arm swelling. Hand pain, pallor and ulceration are signs and symptoms of arterial steal which results from reversal of flow in the palmer arteries. It is **Appropriate** to use duplex ultrasound in the evaluation of that scenario. It is **Inappropriate** to use duplex ultrasound for surveillance of normal functioning access.

ADDITIONAL INFORMATION:

Assessment Prior to Access Site Placement CPT Code G0365 (Not managed by NIA)

- Pre-operative mapping study (upper extremity arterial and venous duplex) ≥ 3 months prior to access placement.
- Pre-operative mapping study (upper extremity arterial and venous duplex) < 3 months prior to access placement.

Definitions:

**Claudication**: Reproducible muscle discomfort or fatigue occurring with exertion at the same workload and relieved with rest, typically due to arterial obstruction.

**Cold extremity**: Reduced temperature from patient history or observed on physical examination by physician.

**KT/V** = Kt/V is another test that tells you how well dialysis is cleaning your blood. Kt/V is considered more accurate than URR because it takes into account your size, treatment time, blood flow rate, how much urea your body makes during dialysis and the extra urea and fluid removed in your dialysis session.

**Physiological testing**: Evaluation of the peripheral circulation based on measurement of limb blood pressures with pulse volume recordings or Doppler waveforms, or other parameters without utilizing data from direct imaging of the blood vessels.

**Resistant hypertension**: The failure to normalize blood pressure on 3 or more drug regimen with medications at maximum doses and at least 1 of the medications being a diuretic agent.
Abbreviations:

ACR = American College of Radiology
AVF = autogenous arteriovenous fistula (including venous transpositions)
AVG = prosthetic arteriovenous graft
CHF = congestive heart failure
DVT = deep vein thrombosis
IVC = inferior vena cava
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REFERENCES


Reviewed/Approved by Michael Pentecost, MD, Chief Medical Officer