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:
  - Severe and steady upper right quadrant pain WITH OR WITHOUT
    - Fever
    - Elevated WBC
    - Murphy’s sign
    - Jaundice
    - History of biliary surgery
    - Known cholelithiasis
  - New onset of jaundice in patient without pain.

Hepatic Disease

Inflammatory:
• Acute right upper quadrant abdominal pain and at least one of the following:
  o Suspected inflammatory or infectious process involving the liver
  o Follow-up of infectious lesion(s) in the liver to assess resolution
  o Assess liver in systemic disease involving the liver, e.g., hemachromatosis
  o Assess for hepatocellular carcinoma in patient with inflammatory conditions at high risk, e.g., hereditary hemachromatosis, 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:
• Microscopic or macroscopic hematuria (except young females with cystitis)

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

Chronic Kidney Disease:
• Newly diagnosed
• Progressive kidney disease
• 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

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.
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
  - With or without fever

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

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

Trauma:
- In the unstable patient for rapid assessment of free fluid, patient condition permitting. Chest radiograph, KUB, and FAST (Focused Abdominal Sonography for Trauma) scan are
complementary examinations. All are commonly performed in this setting, patient condition permitting.

**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:**

<table>
<thead>
<tr>
<th>ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria</th>
<th>Indications</th>
<th>Appropriate Use Score (4-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abdominal Aortic Disease - Signs and/or Symptoms</strong></td>
<td>A _ appropriate; U _ uncertain</td>
<td>A (7)</td>
</tr>
<tr>
<td>1</td>
<td>• Lower extremity claudication</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>• New onset abdominal or back pain</td>
<td>U (6)</td>
</tr>
<tr>
<td>3</td>
<td>• Aneurysmal femoral or popliteal pulse</td>
<td>A (8)</td>
</tr>
<tr>
<td>4</td>
<td>• Pulsatile abdominal mass</td>
<td>A (9)</td>
</tr>
<tr>
<td>5</td>
<td>• Decreased or absent femoral pulse</td>
<td>A (7)</td>
</tr>
<tr>
<td>6</td>
<td>• Abdominal or femoral bruit</td>
<td>A (7)</td>
</tr>
<tr>
<td>7</td>
<td>• Evidence of atheroemboli in the lower extremities, including ischemic toes</td>
<td>A (8)</td>
</tr>
<tr>
<td>8</td>
<td>• Erectile dysfunction</td>
<td>U (4)</td>
</tr>
<tr>
<td>9</td>
<td>• Abnormal physiologic testing indicating aortoiliac occlusive disease</td>
<td>A (8)</td>
</tr>
<tr>
<td>10</td>
<td>• Abnormal abdominal x-ray suggestive of aneurysm</td>
<td>A (8)</td>
</tr>
<tr>
<td>11</td>
<td>• Presence of a lower extremity arterial aneurysm (e.g., femoral or popliteal)</td>
<td>A (8)</td>
</tr>
<tr>
<td>12</td>
<td>• Presence of a thoracic aortic aneurysm</td>
<td>A (8)</td>
</tr>
<tr>
<td><strong>New or Worsening Symptoms</strong></td>
<td></td>
<td>A (9)</td>
</tr>
<tr>
<td>13</td>
<td>• Known abdominal aortic aneurysm (any size)</td>
<td></td>
</tr>
<tr>
<td>Asymptomatic or Stable Symptoms After Baseline Study, Surveillance Frequency During First Year</td>
<td>At 3 to 5 months</td>
<td>At 6 to 8 months</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>14</td>
<td>Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
</tr>
<tr>
<td>15</td>
<td>Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
</tr>
<tr>
<td>16</td>
<td>Aneurysm 4.0 to 5.4 cm in diameter</td>
<td>U (4)</td>
</tr>
<tr>
<td>17</td>
<td>Aneurysm ≥ 5.5 cm in diameter</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>
<td>18</td>
<td>Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
<td>A (7)</td>
</tr>
<tr>
<td>19</td>
<td>Women, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>n/a</td>
<td>A (7)</td>
</tr>
<tr>
<td>20</td>
<td>Aneurysm 4.0 to 5.4 cm in diameter</td>
<td>U (5)</td>
<td>A (7)</td>
</tr>
<tr>
<td>21</td>
<td>Aneurysm ≥ 5.5 cm in diameter</td>
<td>A (8)</td>
<td>A (7)</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>22</td>
<td>Men, aneurysm 3.0 to 3.9 cm in diameter</td>
<td>A (7)</td>
<td>A (7)</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)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Aortic or iliac endograft</td>
</tr>
<tr>
<td>27</td>
<td>Aortic and iliac artery stents</td>
</tr>
<tr>
<td></td>
<td>New or Worsening Lower Extremity Symptoms After Baseline Exam</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>28</td>
<td>• Aortic or iliac endograft</td>
</tr>
<tr>
<td>29</td>
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</table>

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<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>
<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>
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</table>

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<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>33</td>
<td>• Aortic endograft without endoleak stable and/or decreasing residual aneurysm sac size</td>
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</tr>
<tr>
<td>34</td>
<td>• Aortic endograft with endoleak and/or increasing residual aneurysm sac size</td>
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<tr>
<td>35</td>
<td>• Aortic or iliac artery stents</td>
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</tr>
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**INDICATIONS FOR AN ABDOMEN ULTRASOUND IN CHILDREN:**

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- Acute right upper quadrant abdominal pain and at least one of the following:
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- 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:**

- Isolated atraumatic microscopic or macroscopic hematuria with or without pain
- 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 febrile UTI

**Acute Pyelonephritis:**
- Suspected acute pyelonephritis in adults presenting with:
  - Flank pain
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- Suspected splenic infarction
- Splenic and renal echogenicity comparison is indicated (usually appropriate) when examining left native or transplanted kidney.
- Suspected splenic infarction

**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.
Trauma:

- In the unstable patient for rapid assessment of free fluid, patient condition permitting. Chest radiograph, KUB, and FAST (Focused Abdominal Sonography for Trauma) scan are complementary examinations. All are commonly performed in this setting, patient condition permitting.
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Hepatic Ultrasound


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Aorta - Diaphragm – Spine References


**Gallbladder and Bile Duct References:**


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**Pancreas and Spleen References:**


