

## **ABDOMEN IMAGING GUIDELINES**

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### **MedSolutions, Inc. Clinical Decision Support Tool for Advanced Diagnostic Imaging**

Common symptoms and symptom complexes are addressed by this tool. Imaging requests for patients with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician may provide additional insight.

***This version incorporates MSI accepted revisions prior to 11/30//08***

## ABBREVIATIONS for ABDOMEN GUIDELINES

<b>AAA</b>	<b>abdominal aortic aneurysm</b>
<b>ACE</b>	<b>angiotensin-converting enzyme</b>
<b>ACTH</b>	<b>adrenocorticotrophic hormone</b>
<b>AFP</b>	<b>alpha-fetoprotein</b>
<b>ALT</b>	<b>alanine aminotransferase</b>
<b>AST</b>	<b>aspartate aminotransferase</b>
<b>BEIR</b>	<b>Biological Effects of Ionizing Radiation</b>
<b>BUN</b>	<b>blood urea nitrogen</b>
<b>CNS</b>	<b>central nervous system</b>
<b>CT</b>	<b>computed tomography</b>
<b>CTA</b>	<b>computed tomography angiography</b>
<b>DVT</b>	<b>deep vein thrombosis</b>
<b>ERCP</b>	<b>endoscopic retrograde cholangiopancreatography</b>
<b>FNH</b>	<b>focal nodular hyperplasia</b>
<b>GFR</b>	<b>glomerular filtration rate</b>
<b>GGT</b>	<b>gamma glutamyl transferase</b>
<b>GI</b>	<b>gastrointestinal</b>
<b>HCC</b>	<b>hepatocellular carcinoma</b>
<b>HU</b>	<b>Hounsfield units</b>
<b>IAA</b>	<b>iliac artery aneurysm</b>
<b>IV</b>	<b>intravenous</b>
<b>KUB</b>	<b>Kidneys, ureters, bladder (plain frontal supine abdominal radiograph)</b>
<b>LFT</b>	<b>liver function tests</b>
<b>MRCP</b>	<b>magnetic resonance cholangiopancreatography</b>
<b>MRA</b>	<b>magnetic resonance angiography</b>
<b>MRI</b>	<b>magnetic resonance imaging</b>
<b>mSv</b>	<b>millisievert</b>
<b>NAFLD</b>	<b>nonalcoholic fatty liver disease</b>
<b>PA</b>	<b>posteroanterior projection</b>
<b>PET</b>	<b>positron emission tomography</b>
<b>RAS</b>	<b>renal artery stenosis</b>
<b>RBC</b>	<b>red blood cell</b>
<b>SBFT</b>	<b>small bowel follow through</b>
<b>SPECT</b>	<b>single photon emission computed tomography</b>
<b>VC</b>	<b>virtual colonoscopy</b>
<b>PFT</b>	<b>pulmonary function tests</b>
<b>WBC</b>	<b>white blood cell</b>
<b>ZES</b>	<b>Zollinger-Ellison Syndrome</b>

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## ABDOMEN IMAGING GUIDELINES

### AB-1~GENERAL GUIDELINES

- Imaging is the final arbiter in the evaluation and does not substitute for a careful history and physical exam along with pertinent laboratory tests. Other imaging studies should be considered such as plain film or ultrasound before advanced imaging.
- Abdominal imaging begins at the diaphragm and extends to the umbilicus or iliac crest.
- Pelvic imaging begins at the iliac crest and extends to the pubis.
- CT imaging is a more generalized modality
  - Abdominal CT is usually performed with contrast (CPT 74160). Exceptions are noted in the individual guidelines.
  - Abdominal CT without and with contrast (CPT 74170) can be considered in patients with fatty liver who have suspicion of a liver lesion.
- MRI imaging is preferred as a more targeted study, in cases of renal failure, and in patients allergic to contrast.
  - MRI of the abdomen with contrast only is essentially never performed. If contrast is indicated, MRI abdomen without and with contrast (CPT 74183) should be performed.
  - Pregnant women should be evaluated by ultrasound or MRI where it is a clinical option to avoid radiation exposure.
- Abdominal CT or MRI can be considered to further evaluate abnormalities seen on other imaging modalities such as plain x-ray, ultrasound, etc.
- **Fever of unknown origin; Unexplained weight loss**—Refer to ONC-28~Medical Conditions with Cancer in the Differential Diagnosis in the Oncology guidelines.
- **Suspected ascites should be initially evaluated by ultrasound.** Ultrasound results can then determine the need for peritoneal fluid analysis or further imaging specific to the findings.\*
  - Shah R and Fields JM. Ascites. eMedicine, updated February 21, 2007. <http://www.emedicine.com/med/topic173.htm>. Accessed November 11, 2008

## GENERAL ABDOMINAL SIGNS/SYMPTOMS (ALPHABETICAL ORDER)

### AB-2~ABDOMINAL PAIN, NONSPECIFIC

- Ultrasound should be the initial imaging study in patients who present with right upper quadrant pain, left upper quadrant pain or epigastric pain, since ultrasound is useful in detecting gallbladder and other hepatobiliary pathology, renal lesions, ascites, splenic pathology, and sometimes adrenal lesions. If an ultrasound is nondiagnostic or an abnormality is found that warrants further imaging, the information provided by ultrasound can help determine the most appropriate advanced imaging modality (CT vs MRI vs MRCP, etc.).\*

*\*ACR Practice Guidelines for the Performance of an  
Ultrasound examination of the abdomen or retroperitoneum, revised 2007*

- Ultrasound should be the initial imaging study in women with ovaries or uterus intact who present with generalized abdominal or lower abdominal pain, in order to rule out gynecological pathology.
- In general, if advanced imaging is indicated, MRI should be used in pregnant women with acute abdominal pain and equivocal ultrasound.\*
  - \*AJR 2005 Feb;184:452-458
  - In other adult patients, MRI is usually not indicated for evaluation of abdominal pain, unless guidelines under Specific Abdominal Organs are met (see AB-21 through AB-44).
- CT scans of the abdomen and pelvis with contrast (CPT 74160 and 72193) can be performed for any of the following:
  - Abnormal lab such as WBC greater than 10,000 or abnormal stool analysis
  - Persistent fever
  - Failure of conservative treatment for 3-4 weeks including clinical re-evaluation
  - Documented rebound tenderness or guarding on a recent physical exam
  - Persistent abdominal pain (greater than 4 weeks with no improvement) with unremarkable endoscopy and/or barium enema results
  - Non diagnostic recent endoscopy and/or barium study
- GI specialist evaluation can be helpful in determining the appropriate imaging pathway.
- Repeat imaging in patients with unchanged symptoms is not appropriate.
- Patients with severe abdominal pain disproportionate to clinical findings should undergo mesenteric CTA or MRA (CPT 74175 or 74185) if plain x-rays and/or abdominal CT are negative (see AB- 9 Mesenteric/Colonic Ischemia).
- CT of abdomen and/or pelvis may be performed to evaluate abnormalities detected on plain abdominal x-rays that require further clarification.

### **AB-3~ABDOMINAL SEPSIS (SUSPECTED ABDOMINAL ABSCESS)**

- CT abdomen and/or pelvis with contrast (CPT 74160 and/or 72193) is indicated when the patient has a palpable mass or suspicious abdominal symptoms with fever and/or elevated white blood cell count.\*
  - \*ACR Appropriateness Criteria, Acute abdominal pain and fever or suspected abdominal abscess, 2006
- Ultrasound may be useful in follow-up of known fluid collections, especially with catheter drainage, provided the patient is stable or improving. Serial CT scans with contrast (CPT 74160 and/or 72193) are also appropriate.

### **AB-4~EPIGASTRIC PAIN, DYSPEPSIA, GASTRITIS, and POSTPRANDIAL FULLNESS**

- Ultrasound should be the initial imaging study in patients who present with epigastric pain, since ultrasound is useful in detecting gallbladder and other hepatobiliary pathology, renal lesions, ascites, splenic pathology, and sometimes adrenal lesions. If an ultrasound is nondiagnostic or an abnormality is found that warrants further imaging, the information provided by ultrasound can help determine the most appropriate advanced imaging modality (CT vs MRI vs MRCP, etc.).\*

*\*ACR Practice Guidelines for the Performance of an ultrasound examination of the abdomen or retroperitoneum, revised 2007*

- Patients <55 with epigastric pain/dyspepsia should initially have 4 to 8 weeks of conservative treatment with antisecretory medication and/or *H. Pylori* treatment.
  - Patients who fail conservative treatment benefit from GI consultation, and upper endoscopy should be considered.
  - Non-invasive imaging is of low yield.\*  
*\*Am J Gastro 2005;100:2324-2337*
- Patients ≥ 55 with epigastric pain/dyspepsia who present with anemia, weight loss, progressive dysphagia, bleeding, family history of GI cancer, abnormal labs, or history of GI disease should undergo initial endoscopy.
  - Evaluation by a GI specialist should be strongly considered.
  - Advanced imaging usually proceeds based upon the GI consultation.\*  
*\*Am J Gastro 2005;100:2324-2337*
- Symptoms that fail to respond to conservative treatment with antisecretory and/or *H. pylori* medications should be evaluated by upper GI series or endoscopy.
  - GI consultation is helpful, and advanced imaging should not be used as the initial study unless there is clinical evidence for tumor.\*  
*\*South Med J 2001;94(2):184-189*
- If pancreatic disease is suspected, refer to AB-37~Pancreatitis
- CT of abdomen and/or pelvis may be performed to evaluate abnormalities detected on plain abdominal x-rays that require further clarification.

### **AB-5~FLANK PAIN, RULE OUT RENAL STONE**

- If renal stone is not at the top of the differential diagnosis, ultrasound should be performed as the initial imaging study.
- If renal stone is at the top of the differential diagnosis, CT scans of the abdomen and pelvis without contrast (CPT 74150 and 72192) are the best imaging studies in the non-pregnant patient to evaluate kidney stone.
- In pregnant patients and children, ultrasound or MR urography (MRI abdomen and pelvis, contrast as requested) is the best initial study to avoid radiation exposure.\*

*\*ACR Appropriateness Criteria, Acute Onset Flank Pain, 2007*

- CT urogram (CT abdomen and pelvis without and with contrast—CPT 74170 and 72194) should be performed, if requested, in patients over 40 years old with flank pain and documented hematuria on 2 of 3 urinalysis specimens.
- Serial CT scans to determine the passage or dissolution (of uric acid stones) of kidney stones are acceptable if they do not exceed three scans in a six week period. If the stone has been seen on the pelvic CT portion of the CT scan, the subsequent CT scan(s) should only include the pelvis. Urology evaluation can be helpful in determining the need for serial CT scans.
- Post-procedure follow-up should be performed with x-rays of the abdomen every 6 to 12 months in asymptomatic patients unless the patient had uric acid stones.\*
  - Noncontrast CT abdomen and/or pelvis (CPT 74150 and/or 72192) can be used to follow-up patients with uric acid stones.
  - CT abdomen and pelvis without and with contrast (CPT 74170 and 72194) can be performed if there were surgical complications or the patient develops unusual symptoms.\*

\*Wolf J. *Nephrolithiasis*. eMedicine, February 15, 2006, <http://www.emedicine.com>. Accessed September 18, 2007

## AB-6~GASTROENTERITIS

- Gastroenteritis is generally defined as diarrhea with nausea and vomiting and usually with a viral or bacterial etiology.
- If laboratory studies and physical examination reveal an acute abdomen suggesting bowel obstruction, toxic megacolon (abdominal swelling, fever, tachycardia, elevated white blood cell count), or perforation, CT abdomen and pelvis without and with contrast (CPT 74170 and 72194) can be performed.
- When history, physical exam and laboratory results do not suggest a specific etiology for persistent nausea and vomiting, a one to two week trial of conservative treatment, which might include antiemetics and dietary modifications, is indicated. Plain x-rays should be done to rule out bowel obstruction.
  - Upper GI series and/or endoscopy should be performed if there is failure to improve with conservative treatment and plain films are nondiagnostic.\*
    - \* *Am Fam Physician* 2007 July 1;76(1):76-84
- Barium studies and/or endoscopy are indicated if diarrhea lasts more than 1 to 2 weeks, there is failure to improve with conservative treatment, GI bleeding is present, or there are abnormal labs including stool analysis and/or culture
  - Also see AB 26 Diarrhea/Constipation and Irritable Bowel
- GI consultation is helpful in evaluating diarrhea lasting more than 1 to 2 weeks, failure of conservative management, GI bleeding, or abnormal labs including stool analysis and/or culture.
- **References:**
  - Diskin A. *Gastroenteritis*. eMedicine, April 10, 2007, <http://www.emedicine.com>. Accessed September 28, 2007
  - *Am Fam Physician* 2007 July 1;76(1):76-84

## AB-7~LEFT LOWER QUADRANT PAIN, RULE OUT DIVERTICULITIS

- Patients with known diverticulosis and/or suspected diverticulitis who present with any one of the following clinical findings: severe abdominal pain, palpable mass on examination, nausea/vomiting, fever, significant abdominal tenderness to palpation, or elevated white blood cell count, should proceed to CT of the abdomen and pelvis with contrast (CPT 74160 and 72193) in order to rule out significant inflammation or complications of diverticulitis such as abscess or perforation, prior to invasive diagnostic procedures such as colonoscopy.
- Patients with diabetes, renal failure, or the very elderly should be evaluated initially with CT abdomen and pelvis with contrast (CPT 74160 and 72193), or without contrast (CPT 74150 and 72192) for those with renal failure.
- Patients who present with mild to moderate abdominal pain, but without significant clinical findings may benefit from a 5 to 7 day trial of antibiotic therapy and close observation prior to considering advanced imaging.
- Pelvic ultrasound is the initial imaging study of choice for women of child bearing age (<45 years old) who still have ovaries or uterus intact, for detecting gynecologic abnormalities that may cause left lower quadrant pain.
- CT abdomen and pelvis with contrast (CPT 74160 and 72193) are the preferred imaging tests for the evaluation of suspected complicated diverticulitis to identify extracolonic disease that might warrant an interventional procedure.
- Patients with mild pain and heme positive stools or rectal bleeding should proceed to colonoscopy first, since advanced imaging with CT is rarely helpful in the initial evaluation of these patients.
- **References:**
  - *Society for Surgery of the Alimentary Tract. Surgical Treatment of Diverticulitis. Revised 5/2003. <http://www.ssat.com>. Accessed November 20, 2006*
  - *Am Fam Physician 2005;72:1229-1234 and 1241-1242*
  - *ACR Appropriateness Criteria, Left Lower Quadrant Pain, 2008*
  - *Cooperman A, Sherif A. Diverticulitis. Updated July 7, 2006 <http://www.emedicine.com>. Accessed November 20, 2006*

## AB-8~LEFT UPPER QUADRANT PAIN

- Ultrasound should be the initial imaging study in patients who present with, left upper quadrant pain, since ultrasound is useful in detecting gallbladder and other hepatobiliary pathology, renal lesions, ascites, splenic pathology, and sometimes adrenal lesions. If an ultrasound is nondiagnostic or an abnormality is found that warrants further imaging, the information provided by ultrasound can help determine the most appropriate advanced imaging modality (CT vs MRI vs MRCP, etc.).\*
  - \**ACR Practice Guidelines for the Performance of an Ultrasound examination of the abdomen or retroperitoneum, revised 2007*

## AB-9~MESENTERIC/COLONIC ISCHEMIA

- Also see PVD- 6 Mesenteric ischemia under Aortic Disorders and Renal Vascular Disorders, and Visceral Artery Aneurysms in the Peripheral Vascular Disease guidelines.
- GI evaluation may be helpful in determining this diagnosis.
- Chronic mesenteric ischemia is associated with postprandial pain and marked weight loss.
- In patients with chronic postprandial abdominal pain and weight loss with a negative abdominal/pelvic CT, abdominal CTA (CPT 74175) or MRA (CPT 74185) can be obtained.\*

*\*World J Gastroenterol 2006 May;12(20):3243-3247*

- Patients with minimal abdominal tenderness on physical examination and mild to moderate abdominal pain, diarrhea or lower intestinal bleeding suggesting colonic ischemia should be evaluated by barium enema or colonoscopy initially.
  - MRA/CTA are not helpful unless symptomatology is localized to the right colon and pain is out of proportion to clinical findings.\*

*\*Gastroenterology 2000 May;118(5):951-953*

## AB-10~POST OPERATIVE PAIN WITHIN 60 DAYS FOLLOWING ABDOMINAL SURGERY

- CT abdomen and pelvis with contrast (CPT 74160 and 72193) can be performed in patients with suspected postoperative complications (e.g. bowel obstruction, abscess, anastomotic leak, etc.).
- Pregnant women should be evaluated with MRI (contrast as requested).\*
- Beyond 60 days postoperatively, see AB-2 Abdominal Pain, Nonspecific.

*\*ACR Appropriateness Criteria, Suspect Small Bowel Obstruction, 2005*

*\*ACR Appropriateness Criteria, Acute Abdominal Pain and Fever or Suspected Abdominal Abscess, 2006*

## AB-11~RIGHT LOWER QUADRANT PAIN, RULE OUT APPENDICITIS

- Women of childbearing age and pregnant patients may be evaluated first with ultrasound if local expertise exists. If positive, no further diagnostic imaging is necessary. If negative or equivocal, CT with contrast (CPT 74160 and 72193) or without contrast (CPT 74150 and 72192) can be performed.
  - MRI without and with contrast (CPT 74183 and 72197) or without contrast (CPT 74181 and 72195) can be performed for pregnant patients if ultrasound is equivocal.
  - **References:**
    - *AJR 2004 Sept;183:671-675*
    - *Radiology 2006 Mar;238(3):891-899*
- If appendicitis is strongly suspected, CT of the abdomen and pelvis either with contrast (CPT 74160 and 72193) or without contrast (CPT 74150 and 72192) should be performed in all patients except pregnant patients (see above).\*

\*ACR Appropriateness Criteria, Acute abdominal pain and fever or suspected abdominal abscess, 2006

- If appendicitis is not at the top of the differential diagnosis, then women less than 45 years old who have ovaries or uterus intact and present with right lower quadrant pain should have ultrasound of the pelvis performed initially to rule out gynecological pathology.
- If the appendix is absent, follow guidelines in AB-2, Abdominal Pain, Nonspecific.

### **AB-12~RIGHT UPPER QUADRANT PAIN, RULE OUT CHOLECYSTITIS**

- Right upper quadrant ultrasound is generally the imaging study of choice in the patient with acute right upper quadrant pain, with or without fever, if the gallbladder has not been removed.\*
  - \*ACR Appropriateness Criteria: Right Upper Quadrant Pain, 2007
  - \*Barnes DS. Gallbladder and Biliary Tract Disease. The Cleveland Clinic Disease Management Project. July 9, 2002. <http://www.clevelandclinicmeded.com/diseasemanagement>
  - Accessed November 20, 2006
- In patients who have had cholecystectomy, or in patients with normal ultrasound, CT of the abdomen with contrast (CPT 74160) can be performed.

### **UMBILICAL DISCHARGE – SEE AB-44 PATENT URACHUS**

### **MISCELLANEOUS ABDOMINAL ENTITIES (ALPHABETICAL ORDER)**

#### **AB-13~ABDOMINAL LYMPHADENOPATHY**

- Patients with lymphadenopathy localized to the abdomen and found incidentally on previous imaging without associated fever, weight loss, pain, GI bleeding, or other intraabdominal findings to raise the suspicion of malignancy, can have one follow-up CT abdomen with contrast (CPT 74160) or CT abdomen and pelvis with contrast (CPT 74160 and 72193) two months following the original imaging study.
  - If enlarged lymph node(s) persist, biopsy should be considered to establish a histological diagnosis.\*
    - \*Am Fam Physician 2001 Jan;63(1)
    - \*Kanwar V. Lymphadenopathy. eMedicine, June 28, 2006. <http://www.emedicine.com>. Accessed September 20, 2007
    - \*Gow K. Lymph Node Disorders. eMedicine, May 15, 2006. <http://www.emedicine.com>. Accessed September 20, 2007

#### **AB-14~BARIATRIC SURGERY**

- Patients who have had obesity surgery and present with fever, abdominal pain, abdominal distention, frequent vomiting, or suspected incisional hernia should undergo CT of the abdomen and pelvis with contrast (CPT 74160 and 72193).

- Patients who have had obesity surgery within the past six months and present with acute or progressive shortness of breath and suspicion of pulmonary embolus should have CT of the chest with contrast (CPT 71260) or chest CTA (CPT 71275).

### AB-15~BLUNT ABDOMINAL TRAUMA

- Significant trauma should be evaluated in the Emergency Department.
- Trauma with low probability of intra-abdominal injury should have ultrasound initially and any positive findings can be further evaluated with CT abdomen and/or pelvis without and with contrast (CPT 74170 and/or 72194).
- For more significant trauma or blunt renal trauma associated with hematuria,<sup>1,2</sup> CT abdomen and pelvis without and with contrast (CPT 74170 and 72194) may be used initially to determine patients who need hospitalization for observation.<sup>3</sup>

<sup>1</sup> Geehan DM and Santucci RA. *Renal Trauma*. eMedicine, June 12, 2006, <http://www.emedicine.com>. Accessed September 11, 2007

<sup>2</sup> Smith J. *Kidney, Trauma*. eMedicine, Feb 21, 2007, <http://www.emedicine.com>. Accessed September 11, 2007

<sup>3</sup> *ACR Appropriateness Criteria, Blunt Abdominal Trauma, 2005*

### AB-16~GAUCHER'S DISEASE

- See also PN-6.3 Gaucher's Disease in the Peripheral Nerve Disorders guidelines
- **Imaging for follow-up:**
  - **Patients not on enzyme therapy:** MRI abdomen without contrast (CPT 74181) and MRI lower extremity without contrast (CPT 73718) every 12 to 24 months
  - **Patients on enzyme therapy:**
    - Not achieved therapeutic goals: MRI abdomen without contrast (CPT 74181) and MRI lower extremity without contrast (CPT 73718) every 12 months
    - Achieved therapeutic goals: MRI abdomen without contrast (CPT 74181) and MRI lower extremity without contrast (CPT 73718) every 12 to 24 months
    - Change in dose of medication or clinical complication: MRI abdomen without contrast (CPT 74181) and MRI lower extremity without contrast (CPT 73718)
  - Patients with active bone disease may require more frequent monitoring than once a year.
- **References:**
  - *Current Medical Research and Opinion* 2006;22(6):1045-1064
  - *Semin Hematol* 2004 Oct;41(4 Suppl 5):15-22

## AB-17~HERNIAS

- Patients without prior inguinal hernia surgery who present with lower abdominal or groin pain and suspected inguinal hernia may benefit from evaluation by a surgeon. Imaging (ultrasound, CT, MRI) can be helpful when physical exam is inconclusive. Ultrasound has a very high sensitivity and specificity (88%-100%) for evaluating inguinal and femoral hernias.\* Ultrasound identified the pathology in a groin (either hernia or lipoma) without a palpable bulge at an accuracy of 75%.\*

*\*Ann R Coll Surg Eng 2003 May;85(3):174-177*

*\*Ann Ital Chir.2002 Jan-Feb;73(1):65-68*

*\*Surg Endosc 2002 Apr;16(4):659-662*

- Patients with known or suspected Spigelian hernia (anterior abdominal wall hernia through the semilunar line), ventral hernia, or incisional hernia can be evaluated by ultrasound initially, but CT of the abdomen (and pelvis if below the umbilicus) with contrast (CPT 74160 ± 72193) or without contrast (CPT 74150 ± CPT 72192) may be necessary for definitive evaluation.
- Patients with suspected recurrent inguinal hernia after inguinal hernia surgery can have CT of the pelvis with contrast (CPT 72193) or without contrast (CPT 72192) (whichever the physician prefers).
- **Sportsman's Hernia**
  - A controversial clinical entity thought to account for up to 5% of all groin injuries, especially among athletes involved in kicking sports.
  - Probably a chronic overuse injury involving posterior inguinal wall weakness, tearing of the transversus abdominis aponeurosis, and neuralgia.
  - Conservative management is performed initially. Some elite athletes require surgical intervention.
  - Ultrasound may show posterior inguinal wall bulging, but this is also seen in asymptomatic athletes.
  - Advanced imaging is not indicated.
  - The microtears described at surgery cannot be reliably diagnosed on imaging and therefore, **this condition remains a clinical diagnosis.**
  - **Reference:**
    - Robinson P. *Imaging of Athletic Pubalgia*. Presented at: 33<sup>rd</sup> Annual Radiology Refresher Course of the International Skeletal Society, September 13-16, 2006; Vancouver, British Columbia, Canada.
    - Manthey D and Nicks BA. *Hernias*. eMedicine, January 3, 2007. <http://www.emedicine.com>. Accessed September 11, 2007

## AB-18~LIPOMA

- **Subcutaneous lipoma** does not require imaging for diagnosis
  - Evaluation by a dermatologist or surgeon is helpful in determining the need for advanced imaging.
  - If the clinical exam is equivocal, ultrasound should be performed initially.
  - Noncontrast MRI can be performed if surgery is planned.
- Lipomas in other locations (not subcutaneous) should be evaluated by ultrasound or CT without and with contrast.
  - Lesions with Hounsfield units less than -50 HU do not require additional imaging except for surgical planning.\*
    - \*Scott-Conner CEH and Radebold K. *Lipomas*. eMedicine, April 17, 2006. <http://www.emedicine.com>. Accessed September 11, 2007
- Noncontrast MRI can be considered if ultrasound and/or CT are equivocal, or for preoperative planning.

MRI shows a discrete, homogeneous fatty mass with few or no thin septa and minimal or no areas of high T2 signal. *AJR* 2004;182:733-739

## AB-19~LOWER EXTREMITY EDEMA

- Also see PVD- 7.3 Lower Extremity Edema in the Peripheral Vascular Disease guidelines.

## AB-20~ZOLLINGER-ELLISON SYNDROME (ZES)

- The initial imaging for evaluation of elevated serum gastrin (normal value is <100 pg/ml) and/or abnormal gastric acid secretory test should be Somatostatin Receptor Scintigraphy (sensitivity of >95%).
  - If the serum gastrin is not elevated and there is no abnormal gastric acid secretory test, then no advanced imaging is needed.
- Surgical consultation is helpful in determining the appropriate imaging pathway.
- CT abdomen with contrast (CPT 74160) or MRI abdomen without and with contrast (CPT 74183) have a specificity approaching 100%, but sensitivity of only 20%-59% in detecting gastrinoma.
- **References:**
  - Roy P. *Zollinger-Ellison Syndrome*. eMedicine, July 5, 2006. <http://www.emedicine.com>. Accessed September 20, 2007
  - Kahn S. *Zollinger-Ellison Syndrome*. eMedicine, September 18, 2006. <http://www.emedicine.com>. Accessed September 20, 2007

## SPECIFIC ABDOMINAL ORGANS

### AB-21~ADRENAL CORTICAL LESIONS

- **AB-21.1 Adrenal Cortical Lesions**
  - CT of the abdomen without contrast (CPT 74150) is the imaging study of choice in patients with no history of malignancy, no symptoms, and a lesion less than 3 cm.
    - If the Hounsfield number is less than 10 HU, malignancy is unlikely and no follow-up is required.\*  
*\*J Clin Endocrinol Metab 2005 Feb;90(2):871-877*
    - If CT with washout or MRI defines the lesion as a benign lesion-adenoma, myelolipoma, hematoma or cyst, follow-up imaging is not indicated.\*  
*\*AJR 2007;189:1119-1123*  
*\*AJR 2008 May;190:1163-1168*
  - Mass lesions larger than 6 cm or hormone-secreting tumors should be resected.\*  
*\*ACR Appropriateness Criteria, incidentally discovered adrenal mass, 2007*  
*\*AJR 2005;185:684-688*
  - If the lesion cannot definitely be characterized as a benign adenoma on noncontrast CT, CT of the abdomen with contrast (CPT 74160) with washout calculated can be performed to help distinguish benign adenoma from other lesions such as metastases.
    - If CT is contraindicated, chemical shift MRI (CPT 74181) can be performed.
    - Noncontrast CT (CPT 74150) and chemical shift MRI (CPT 74181) have comparable performances in the evaluation of lipid content.
  - **INDETERMINATE LESION:** CT of the abdomen with washout (CPT 74160) can be performed. MRI will not add significant information and MRI is not indicated unless there is a history of malignancy of a cell type that would reasonably spread to the adrenals or there is evidence of a hormone-secreting adrenal tumor.
    - Follow-up at 3 to 6 months, at 12 months, and at 24 months from the initial finding of the lesion can be performed.
    - Endocrine re-evaluation should be performed at one year.<sup>1,2</sup>
    - There is no good evidence supporting continued radiologic surveillance if the follow-up at 24 months shows no change in adrenal tumor size.<sup>2</sup>  
*<sup>1</sup>J Clin Endocrinol Metab 2005;90(2):871-877*  
*<sup>2</sup>Ann Intern Med 2003;138:424-429*
  - If CT is contraindicated and MRI is indeterminate, follow-up noncontrast abdominal MRI (CPT 74181) at 3 to 6 months, at 12 months and at 24 months from the initial finding of the lesion can be performed.\*  
*\*Ann Intern Med 2003;138:424-429*
  - **In the oncology patient,** CT without and with contrast (CPT 74170) (malignant lesions show slow enhancement with delayed washout after IV contrast) or MRI of the abdomen (contrast as requested; default CPT code 74183) is appropriate for evaluation of an adrenal lesion.

- Biopsy may be considered if pheochromocytoma is excluded.
- **AB-21.2 Adrenal Endocrine Tumors**
  - In patients with signs/symptoms of an adrenal cortical endocrine syndrome (e.g. Cushing's syndrome, Conn's syndrome), evaluation may include dexamethasone suppression, serum ACTH level, serum aldosterone/renin, and/or virulizing hormone levels, and 24 hour urine for adrenal hormones.\*
    - Normal Values:
      - Aldosterone: 3-10 ng/dl (supine); 5-30 ng/dl (upright)
      - Cortisol: at 8am: 250-850 nmol/L  
at 4pm: 110-390 nmol/L  
at 10pm: 50% of 8am value

\*Uwaifo GI and Fojo AT. Adrenal Carcinoma. eMedicine, May 26, 2006. <http://www.emedicine.com>. Accessed September 11, 2007
  - CT with bolus arterial phase (CPT 74160) can be performed if lab studies confirm adrenal cortical endocrine syndrome\*
    - J Clin Endocrinol Metab 2008 Sept;93(9):3266-3281
  - **Pheochromocytoma**
    - Signs/symptoms include flushing spells and/or poorly controlled hypertension.
    - Elevated plasma metanephrines support the diagnosis of pheochromocytoma.
    - If plasma metanephrines are not elevated, a 24-hour urine for catecholamine and metanephrine levels should be obtained prior to considering advanced imaging.
    - If catecholamine and metanephrine levels are not elevated in a 24- hour urine, then no advanced imaging is indicated unless unexplained symptoms suggestive of pheochromocytoma persist.<sup>1,2</sup>
    - If possible, 24-hour urine for catecholamines and metanephrines should be obtained after an episode of sign/symptoms (e.g. following a hypertensive crisis).
      - Sensitivity for diagnosing pheochromocytoma is 99.7% with this approach.<sup>1,2</sup>
        - <sup>1</sup> Vuquin P. Pheochromocytoma. eMedicine, June 5, 2006. <http://www.emedicine.com>. Accessed September 18, 2007
        - <sup>2</sup> Sweeney A. Pheochromocytoma. eMedicine, Sept 11, 2007. <http://www.emedicine.com>. Accessed September 18, 2007
    - Chemical shift MRI (CPT 74181) is the preferred imaging study for possible pheochromocytoma, since the tumor lights up brightly on T2 weighted images; however MRI abdomen (contrast as requested) can be performed.
    - In patients with elevated catecholamines/metanephrines, great care should be exercised when considering IV contrast administration. These patients are known to have hypertensive crises with the bolus injection of IV contrast.

## AORTA

### AB-22~ABDOMINAL AORTIC ANEURYSM (AAA) and ILIAC ARTERY ANEURYSM (IAA)-FOLLOW UP of KNOWN ANEURYSMS and PRE-OP EVALUATION

- **AB-22.1 Abdominal Aortic Aneurysm (AAA)**
  - Also see PVD-6 Aortic Disorders, Renal Vascular Disorders, and Visceral Artery Aneurysms in the Peripheral Vascular Disease guidelines.
  - Ultrasound is the preferred initial imaging study in the non-obese patient to screen for AAA or to evaluate a pulsatile abdominal mass.
  - The Society for Vascular Surgery and the Society for Vascular Medicine and Biology recommend yearly ultrasound studies for aneurysms between 3 to 4 cm, ultrasound studies every 6 months if aortic diameter is between 4 to 4.5 cm, and referral to a vascular specialist if aortic diameter is greater than 4.5 cm.\*
    - \* *J Vasc Surg* 2004;39:267-269
    - \* *The Internet Journal of Thoracic and Cardiovascular Surgery* 2006;7(2)
  - Patients with AAA's smaller than 4 cm in diameter should be followed by ultrasound every 2 to 3 years.\*
    - \* *Cardiosource Review Journal* November 2006, pp.73-77
    - \* *Circulation* 2006;113:463-654
  - CT of the abdomen with contrast (CPT 74160) is indicated to follow asymptomatic obese patients using the same imaging timeline used for ultrasound in non-obese patients.
  - There is insufficient evidence-based data to support using advanced imaging to screen for thoracic aortic aneurysm in patients with known abdominal aortic aneurysm.
  - **Preoperative imaging if endovascular or open repair of AAA is being considered:** CT of the abdomen and pelvis without and with contrast (CPT 74170 and 72194) or CTA (CPT 74175 and 72191). The without contrast portion can help evaluate thrombus and calcification in the aneurysm.
- **AB-22.2 Iliac Artery Aneurysm (IAA)**
  - Iliac artery aneurysms are most commonly associated with aortic aneurysms.
  - Isolated IAA's are rare.
    - The incidence is estimated to be 6.58/100,000 for men and 0.26/100,000 for women in the U.S.<sup>1</sup>
  - Isolated IAA's are frequently bilateral at time of presentation.
  - The majority of patients are male and between 50 and 70 years old.<sup>2</sup>
  - The normal size of the iliac artery is <1cm. IAA's rarely rupture when <2cm.<sup>2</sup>
  - The average size of an IAA is 4 to 5 cm, and the average size of a ruptured aneurysm is estimated at 6 cm.<sup>1</sup>
  - Surgical intervention should be considered when an IAA exceeds 3 to 4 cm.<sup>2</sup>
  - Evaluation of a suspected IAA should begin with ultrasound.

- If ultrasound is equivocal, CT pelvis with contrast (CPT 72193) can be performed.
- If IAA is found, referral to a Vascular surgeon is appropriate.
  - Follow-up imaging studies can be performed at the discretion of the vascular specialist.
    - <sup>1</sup>Turk J Med Sci 2002;32:267-269
    - <sup>2</sup>J Endovascular Surgery 1997;4(4):370-375
- **Preoperative imaging:** at the discretion of the operating surgeon

## AB-23~ABDOMINAL AORTIC ANEURYSM (AAA) and ILIAC ARTERY ANEURYSM (IAA)--POST ENDOVASCULAR or OPEN AORTIC REPAIR

- **Open Aortic repair:**
  - Surveillance CT of the abdomen and pelvis with contrast (CPT 74160 and 72193) should be performed every 3 to 5 years after open repair of a AAA to screen for aneurysms in the remaining aorta.\*
    - \*Am Fam Physician 2006;73:1198-1204 and 1205-1206
- **Endovascular (Stent) Aortic repair:**
  - Postoperative imaging of patients who have undergone endovascular repair can include CT of the abdomen and pelvis (contrast as requested, although without and with contrast [CPT 74170 and 72194] is the usual), CTA of the abdomen and pelvis (CPT 74175 and 72191), or MRA of the abdomen and pelvis (CPT 74185 and 72198), although MRA is not the preferred study.
  - Routine imaging studies are obtained at 1 month, 6 months, and 12 months following repair, then every year.\*
  - An additional study at 3 months can be performed if there was evidence of endoleak on the 1 month study.
    - \*Radvany MG and Seguritan V. Abdominal Aortic Aneurysm, Diagnosis. eMedicine, May 5, 2006, <http://www.emedicine.com>. Accessed December 3, 2007
- **Iliac Repair:**
  - In patients who are status post endovascular repair of an isolated IAA, ultrasound, CT pelvis (CPT 72193 or 72194), or CTA pelvis (CPT 72191) can be performed every 6 months.\*
    - \* J Endovascular Surgery 1997;4(4):370-375

## AB-24~AORTIC DISSECTION

- See CH-30 Thoracic Aortic Dissection or Aneurysm in the Chest Guidelines
- Suspicion for acute dissection should be handled as a medical emergency.

## BOWEL (ALPHABETICAL ORDER)

DIVERTICULITIS – SEE AB-7

MESENTERIC/COLONIC ISCHEMIA – SEE AB- 9

### AB-25~BOWEL OBSTRUCTION

- Plain x-rays of the abdomen (obstructive series) should be obtained as the initial study in patients with suspected bowel obstruction.
- CT of the abdomen and pelvis with contrast (CPT 74160 and 72193) may be used to confirm the presence and site of an obstruction if plain x-rays are abnormal or equivocal.
- CT with contrast (CPT 74160 and 72193) may also be indicated if there is a high index of suspicion for bowel obstruction (abdominal pain, vomiting, constipation, abdominal distention, failure to pass flatus), especially in patients with prior history of abdominal surgery, history of malignancy, or patients with current hernias.\*

*\*ACR Appropriateness Criteria, Suspected Small Bowel Obstruction, 2005*

### AB-26~DIARRHEA/CONSTIPATION AND IRRITABLE BOWEL

- **Diarrhea** in the absence of fever, weight loss, abnormal physical examination findings, fecal incontinence, GI bleeding, or abnormal labs including stool analysis, should be treated conservatively initially or endoscopy should be performed.
  - Diarrhea associated with any of the above signs/symptoms may require imaging depending on the highest probable concern.
  - GI consultation is helpful in determining the appropriate imaging pathway.
  - If advanced imaging is indicated, CT scans of abdomen and pelvis with contrast (CPT 74160 and 72193) are appropriate.
- **References:**
  - *Gastroenterol* 1999;116:1461-1463
  - *Gastroenterol* 2004;127:287-293
- **Constipation** in the absence of family history of inflammatory bowel disease or cancer, onset of constipation after age 50, acute onset of constipation in the elderly, GI bleeding, fever, substantial pain, vomiting, weight loss, rectal pain, abnormal lab studies, or abnormal physical examination findings should be treated conservatively and advanced imaging is not indicated.
  - Patients who fail to respond to treatment or have any of the above abnormal findings should undergo barium enema or endoscopy.
  - GI consultation is helpful in determining the appropriate imaging pathway.
  - **References:**
    - *Am Fam Physician* 2002 June;65(11):2283-2290
    - *J Fam Practice* 2007 June;56(6 Suppl):S13-S20
    - *Gastrointest Endosc* 2005 Aug;62(2):199-201

- MRI Defecography for constipation should be considered investigational. It may be appropriate if ordered for preoperative evaluation for the planning of complex pelvic reconstruction.\*

\**Obstet Gynecol* 2004;103:41-46

\**Radiographics* 2002;22:817-832

- **Bloating and/or Irritable bowel syndrome**

- Irritable bowel syndrome is frequently a diagnosis of exclusion and is often associated with bloating or abdominal fullness.
  - The criteria for making the clinical diagnosis includes the following:
    - Abdominal pain
    - Onset of symptoms associated with a change in frequency of stool (diarrhea, constipation or both)
    - Onset of symptoms with an associated change in the form of stool.
    - Relief of symptoms with defecation
  - If the above symptoms occur in a patient under age 50 and are associated with alarm symptoms such as fever, anemia, weight loss, GI bleeding, frequent nocturnal symptoms, or failure of a 6-8 week trial of conservative therapy, work-up should include laboratory studies and flexible sigmoidoscopy prior to considering advanced imaging.
  - Patients ≥ age 50 with or without alarm symptoms should be evaluated with endoscopy initially.
  - GI consultation is helpful in determining the appropriate imaging pathway, since advanced imaging is often not indicated in these patients.
  - **References:**
    - *Am Fam Physician* 2003 May;67(10):2157-2162
    - Serper M. *Irritable bowel syndrome: evidence-based evaluation and management.* Patient Care Online, July 16, 2007, <http://www.patientcareonline.com>. Accessed September 20, 2007
    - EI-Baba M. *Irritable Bowel Syndrome.* eMedicine, July 31, 2007, <http://www.emedicine.com>. Accessed September 20, 2007
    - *Gastroenterol* 2000;119:1761-1778

### AB-27~GI BLEEDING

- GI bleeding should be evaluated initially by endoscopy or barium studies unless endoscopy is contraindicated.\*
- \**Gastroenterol* 2000;118:197-200

### AB-28~INFLAMMATORY BOWEL DISEASE RULE OUT CROHN'S DISEASE or ULCERATIVE COLITIS

- Colonoscopy or barium studies are the preferred imaging studies for the initial evaluation of suspected early Crohn's disease or ulcerative colitis when pathology is limited to the mucosa.
- CT of the abdomen and pelvis with contrast (CPT 74160 and 72193) are the best studies for assessing mesenteric and extra-intestinal extent of disease.

- CT of the abdomen and pelvis with contrast (CPT 74160 and 72193) are the best studies for evaluation of possible abscess, bowel perforation, fistula formation, or acute inflammation in the patient with known Crohn's disease or ulcerative colitis and an acute exacerbation (abdominal pain).
- Endoscopic ultrasound, rectal ultrasound or MRI (CPT 72197) may be considered in the setting of rectal pathology (either inflammatory or neoplastic) to evaluate for peri-rectal involvement.
- Suspected small bowel Crohn's should be initially evaluated with small bowel follow through (SBFT), barium study, and/or ileoscopy. If these are inconclusive or if obstructive disease is expected, CT enteroclysis may be considered (CPT 74160).<sup>1</sup>
  - Capsule Endoscopy (CPT 91110) may be considered if SBFT and/or ileoscopy are inconclusive, and NON-obstructive small bowel Crohn's is present. Capsule endoscopy is particularly effective for detecting proximal and early mucosal disease.<sup>2</sup>
    - <sup>1</sup>Radiology 2006 Jan;238(1):128-134*
    - <sup>2</sup>Cigna HealthCare Coverage Position. Subject: Capsule Endoscopy, Revised February 15, 2007*
  - If advanced imaging is indicated, MRI Enterography (CPT 74183) may be performed, especially in young patients to avoid radiation, to monitor response to immunomodulatory agents, and to differentiate acute phase disease from remission.\*
    - \*Curr Opin Gastroenterol 2008 March;24(2):135-140*
- SPECT and PET are considered investigational.\*
  - \*ACR Appropriateness Criteria, Crohn's Disease, 2005*

## AB-29~CT COLONOGRAPHY (CTC)

- Certain payers consider CTC investigational and their coverage policies will take precedence over MedSolutions' guidelines. Prior authorization does not guarantee payment of the study.
- **CTC for Screening (CPT 0066T):**
  - CTC can be used for screening for colorectal cancer (CRC) every 5 years in average-risk individuals age 50 years or older.
    - Average risk is defined as:
      - Individuals with no history of adenoma and inflammatory bowel disease and negative for first degree family history of CRC.\*
        - \*CA Cancer J Clin 2008;58:130-160*
- **CTC for Diagnosis (CPT 0067T) can be used in:**
  - Patients who have failed conventional colonoscopy
  - Patients on anticoagulants who cannot have the anticoagulation withheld
  - Patients with severe medical conditions that preclude conventional colonoscopy.

- **Reference:**

- Barish MA, Zalis ME, Harris GJ. *CT Colonography: Current Status and Economics*. *Imaging Economics*, June 2006. <http://www.imagingeconomics.com>. Accessed November 30, 2006

## LIVER

### AB-30~CIRRHOSIS AND LIVER SCREENING FOR HEPATOCELLULAR CARCINOMA (HCC); LIVER TRANSPLANT

- Hepatitis B carriers with or without cirrhosis, non-hepatitis B patients with cirrhosis, and any patient with high risk for hepatocellular carcinoma (HCC) should undergo liver screening with ultrasound every 6 to 12 months.
  - Any liver lesion less than 1 cm should be followed with ultrasound every 3 to 6 months for 2 years and, if stable, ultrasound should be performed every 6 to 12 months.
  - Liver lesions over 1 cm should be evaluated per AB-32 Liver Lesion Characterization
- A liver lesion that is negative on biopsy should be followed with ultrasound or CT abdomen without and with contrast (CPT 74170) every 3 to 6 months until the lesion resolves, displays diagnostic characteristics of HCC, or repeat biopsy is positive for HCC.
- **Reference:**
  - *Hepatology* 2005 Nov;42(5):1208-1236
- If the criteria outlined above are fulfilled, and the provider is requesting a CTA abdomen (CPT 74175), rather than (and not in addition to) the conventional CT abdomen (CPT 74170), CTA abdomen (CPT 74175) may be authorized.
- Any suspicious findings on CT scan should be evaluated with MRI of the abdomen without and with contrast (CPT 74183).
- **Liver Transplant:**
  - Individuals on the **liver transplant waiting list** can undergo advanced imaging per that institution's protocol as long as the studies do not exceed the following:
    - CT or MRI abdomen (CPT 74170 or 74183) every six months
    - CT chest (CPT 71260) every year
    - MRI Bone Marrow Blood Supply (CPT 77084) or bone scan every year.
  - Preoperative studies immediately prior to liver transplant:
    - CT or MRI abdomen (CPT 74170 or 74183)—if CT abdomen was most recently done while on the transplant waiting list, then MRI abdomen should be done immediately prior to transplant and vice versa
    - CT pelvis (CPT 72193)
    - CTA abdomen (CPT 74175) or MRA abdomen (CPT 74185)\*
      - \**RadioGraphics* 2004;24:1367-1380
    - CT chest (CPT 71260)
    - MRI Bone Marrow Blood Supply (CPT 77084) or bone scan
  - Postoperative studies:
    - CT abdomen and pelvis without and with contrast (CPT 74170 and 72194) can be performed for the following:

- Unexplained fever, abdominal pain, anemia, bleeding, weight loss, lymphadenopathy, enlarged spleen or liver, or other suspected postoperative complication
- Biopsy of the involved organ should be performed if Post Transplant Lymphoproliferative Disease (PTLD) is suspected
- Routine use of imaging is not recommended to screen for PTLD
- **Reference:**
  - *Evidence based clinical practice guideline for management of post transplant lymphoproliferative disease (PTLD) following solid organ transplant.* National Guideline Clearing House. Feb 4, 2003.  
[http://www.guideline.gov/summary/summary.aspx?ss=15&doc\\_id=4131&nbr=3167](http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=4131&nbr=3167). Accessed November 11, 2008
- CTA (74175) or MRA (74185) abdomen may be done for preoperative evaluation of the liver for the removal of tumors or for liver transplant surgery.
  - Also see ONC~13 Upper GI Cancers in the Oncology guidelines.
  - **Reference:**
    - *RadioGraphics* 2004;24:1367-1380

## AB-31~JAUNDICE

- Ultrasound is the preferred initial imaging study for patients with obstructive jaundice (i.e. high direct or conjugated bilirubin level) to visualize the biliary ductal system, and often demonstrates the level and cause of any obstruction.
  - Normal Values:
    - Bilirubin (total) 0.2-1.0 mg/dl
    - Bilirubin (conjugated) 0-0.2 mg/dl
- CT of the abdomen without and with contrast (CPT 74170) is preferred in obese patients, patients with large amounts of intestinal gas, patients who present with painless jaundice, or patients who present with acute abdominal pain and one of following: fever, previous biliary surgery, or known cholelithiasis.
- MR cholangiopancreatography (MRCP CPT 74181 or S8037) may be used to assess the extent and cause of intrahepatic bile duct obstruction suggested by either ultrasound or CT if further characterization is warranted. MRCP can help identify the course and drainage pattern of the pancreatic duct and is useful in diagnosing congenital anomalies such as pancreas divisum, and annular pancreas, and in detection of strictures, fistulas, and intraductal calculi prior to surgery.
- MRCP is also useful when there are contraindications to the use of IV contrast for CT imaging. Specialist evaluation is helpful in determining the need for MRCP.
- Abdominal CT without and with contrast (CPT 74170) or abdominal MRI (CPT 74183) with MRCP (CPT 74181) for patients with contraindications to CT\* can be used to evaluate jaundice with high likelihood of malignancy (insidious onset, weight loss, fatigue).

*\*ACR Appropriateness Criteria, Jaundice, 2008*

## AB-32~LIVER LESION CHARACTERIZATION

- Suspected hepatomegaly should be evaluated by ultrasound initially.
- A suspected liver lesion should be evaluated by ultrasound initially.
- A liver lesion with typical ultrasound and/or contrast enhanced CT features of a simple cyst or hemangioma may be classified as benign and does not require follow-up imaging.\*  
*\*Radiology 2000 Jan;214(1):167-172*
- A liver lesion with typical CT features of a malignant mass does not require additional imaging. Confirmation with biopsy under ultrasound or CT guidance is indicated.
- PET scan is not indicated to evaluate a liver lesion in a patient with no prior history of confirmed malignancy.
- **AB-32.1 Hemangioma**
  - If a lesion >1cm is found as an incidental finding on ultrasound or other imaging, triple phase CT (CPT 74170) is preferred to confirm a suspected hepatic hemangioma.\*  
*\*Hepatology 2005 Nov;42(5):1208-1236*
  - Most hemangiomas are easily diagnosed with CT scan.
  - MRI of the abdomen without and with contrast (CPT 74183) should be reserved for equivocal lesions.
    - In one study, the diagnosis of hemangioma was established by ultrasound in 57% of patients, by CT scan in 73%, and by MRI in 84%.\*  
*\*J Am Coll Surg 2003 Sep;197(3):392-402*
  - CT angiography of the abdomen (CPT 74175) is useful as a preoperative study in patients with large hemangiomas considered for resection.
- **AB-32.2 Hepatic Adenoma or Focal Nodular Hyperplasia**
  - MRI of the abdomen without and with contrast (CPT 74183) is the imaging study of choice to evaluate a possible hepatic adenoma or focal nodular hyperplasia (FNH).
  - For FNH lesions being followed by serial imaging, MRI of the abdomen without and with contrast (CPT 74183) can be performed annually for 3 years. If no changes occur, imaging is discontinued.
    - Lesions greater than 3 cm should be biopsied for definitive diagnosis.\*  
*\*AJR 2004;182:1227-1231*
- **AB-32.3 Cirrhotic Liver**
  - An indeterminate liver lesion in a cirrhotic liver is best evaluated with MRI of the abdomen without and with contrast (CPT 74183).
- **AB-32.4 Nonalcoholic fatty liver disease (NAFLD):**
  - Ultrasound is the preferred imaging study to evaluate for biliary disease or isolated liver lesion.
  - Distinguishing between fatty liver and steatohepatitis is made via biopsy rather than advanced imaging. Imaging (US, CT or MRI) is not useful to differentiate benign steatosis from steatohepatitis.\*

\*Gastroenterology 2002 Nov;123(5):1705-1725

\*Internal Medicine Journal 2004;34:187-191

\*CMAJ 2005 March;172(7):899-905

\*Am Fam Physician 2006 June;73(11):1961-1968

- **AB-32.5 Liver Lesion <1 cm**
  - Any Liver lesion less than 1 cm should be followed with ultrasound every 3 to 6 months for 2 years, if stable, ultrasound should be performed every 6 to 12 months.
  
- **AB-32.6 Liver Lesion ≥1cm**
  - Liver lesions ≥1cm may be evaluated by CT abdomen without and with contrast (CPT 74170) or MRI abdomen without and with contrast (CPT 74183).
  - If the lesion appearance is typical of hepatocellular carcinoma (HCC), the lesion should be treated as HCC.
  - If further characterization of a one centimeter or larger liver lesion found on CT is needed, MRI of the abdomen without and with contrast (CPT 74183) can be performed.
  - Lesions that are unable to be characterized as either benign or typical of malignancy on CT or MRI should be biopsied.
  - Lesions ≥1cm with a negative biopsy can have repeat ultrasound or CT abdomen without and with contrast (CPT 74170) every 3 to 6 months until the lesion resolves, displays diagnostic characteristics of HCC, or repeat biopsy is positive.
  - **Reference:**
    - Hepatology 2005 Nov;42(5):1208-1236

### **AB-33~ELEVATED LIVER FUNCTION (LFT) LEVELS**

- The enzymes included in this category are AST, ALT, alkaline phosphatase, GGT, and bilirubin.
- Patients with elevation of AST and/or ALT less than two times normal should have repeat levels performed in three to four weeks prior to considering advanced imaging.
- Patients on lipid lowering medications (statins) or other medications known to cause elevated LFT's should have those medications stopped for at least 4 weeks and the LFT levels repeated prior to considering advanced imaging.
- Patients with persistently elevated LFT's or LFT's less than three times normal should have ultrasound as the initial imaging study.
  - If a liver or pancreatic mass is seen, CT of the abdomen without and with contrast (CPT 74170) is appropriate.
  - If biliary dilatation or other nonspecific abnormality is seen, CT of the abdomen with contrast (CPT 74160) is appropriate.
- If biliary dilatation is seen on ultrasound or CT, MRCP (CPT 74181) may be appropriate.

- Specialist evaluation can be helpful in determining the need for MRCP because ERCP is both diagnostic and therapeutic if biliary stone is a high probability.
- Patients with known cancer and suspected liver metastases should have CT of the abdomen without and with contrast (CPT 74170) or CT of the abdomen with contrast (CPT 74160) (whichever the physician prefers). Default CPT code should be 74170.
- Patients with elevated alpha-fetoprotein (AFP) levels should have MRI of the abdomen without and with contrast (CPT 74183).
- CT of the abdomen with contrast (CPT 74160) is appropriate in patients who present with painless jaundice. MRI/MRCP are accurate but should be reserved for patients with contraindications to CT.\*

*\*ACR Appropriateness Criteria, Jaundice, 2008*

- **Hemochromatosis:**

- The diagnosis is made by biopsy.
- Specialist (GI or Hematologist) evaluation is helpful.
- MRI without contrast (CPT 74181) is used to confirm liver iron stores and for following treatment.\*

*\*Hepatology 2001;33(5):1321-1328*

*\*Joffe S. Hemochromatosis. Updated March 11, 2005*

*<http://www.emedicine.com>. Accessed November 20, 2006*

### **AB-34~RULE OUT LIVER METASTASIS**

- CT of the abdomen with contrast (CPT 74160) is a sensitive modality that is preferred to MRI to screen for liver metastasis and/or metastases in the adrenal glands, retroperitoneum, and other abdominal organs.
- MRI of the abdomen without and with contrast (CPT 74183) can be used to image lesions that are indeterminate on CT scan or if CT is contraindicated.
- MRI of the abdomen without and with contrast (CPT 74183) should be considered as the initial imaging study in the setting of elevated AFP with a suspected liver lesion. CT of the abdomen without and with contrast (CPT 74170) can be approved if requested by the physician's office.

## PANCREAS

### AB-35~PANCREATIC LESION

- **Pancreatic cyst, incidental:**
  - For pancreatic cystic lesions < 1cm in size, thin slice abdominal CT (CPT 74170) is indicated one year from the original discovery and then every year
    - MRI and CT demonstrate similar accuracy in differentiating malignant from benign cystic pancreatic lesions
  - Pancreatic cystic lesions measuring 1-2 cm should be evaluated by endoscopic ultrasound (EUS) and MRCP or ERCP
    - If EUS and MRCP or ERCP do not show mural nodules, dilated main duct (>6mm), or positive cytology, and pancreatitis, worsening of diabetes or jaundice are not present, then abdominal CT (CPT 74170) can be performed as follows:
      - Every 6-12 months for lesions measuring 1-2 cm
      - Every 3-6 months for lesions measuring 2-3 cm
  - Pancreatic cystic lesions should be resected if any of the following apply:
    - Lesions > 3cm
    - Evidence of mural nodules
    - Dilated main duct
    - Positive cytology
    - Development of pain
    - Worsening diabetes
    - Jaundice
    - Preoperative imaging studies should be requested by the operating surgeon
  - **Reference:**
    - *Pancreatology* 2006;6:17-32
- **Pancreatic mass or suspected metastatic disease to pancreas:**
  - CT abdomen with contrast with triphasic imaging (CPT 74170), or CT abdomen without and with contrast (CPT 74170) is indicated to evaluate a pancreatic mass, since the majority of primary pancreatic tumors and other tumors metastatic to the pancreas will enhance following IV contrast.\*
    - \**Radiographics* 1998 Mar-April;18(2):369-378
  - For pancreatic necrosis following pancreatitis, CT abdomen with contrast (CPT 74160) or without contrast (CPT 74150) can be performed.\*
    - \**ACR Appropriateness Criteria, Acute Pancreatitis, 2006*
  - MRI of the abdomen without and with contrast (CPT 74183) may be useful in cases where CT scan is contraindicated. MRI is no more accurate than CT for the follow-up of pancreatic cystic lesions.

## AB-36~PANCREATIC PSEUDOCYSTS

- There are no established guidelines for the serial imaging of pancreatic pseudocysts. CT of the abdomen with contrast (CPT 74160) should be obtained initially.\*
  - In patients with minimal symptoms, CT of the abdomen with contrast (CPT 74160) or without and with contrast (CPT 74170) every two weeks or so up to six weeks total can be obtained.
  - After six weeks, CT scan should be every four weeks.
  - Abdominal CT without and with contrast (CPT 74170) can be obtained earlier if symptoms worsen, if ascites or pleural effusion develops, if serum amylase increases, or if drainage of the cyst is planned.
  - Endoscopic ultrasound has increasingly become an important imaging modality in evaluating pseudocysts.
    - \*Federle MP and Anne VS. *Pancreatic pseudocyst*. In Federle MP, Jeffrey RB, Desser TS, et. al. (Eds.). *Diagnostic Imaging Abdomen*, 1<sup>st</sup> Ed. Salt Lake City, Amirsys and Elsevier Publishers, 2004, pp. 11:3;24-25
- MR cholangiopancreatography (MRCP—CPT 74181) may be obtained for preoperative planning if cyst drainage is being considered.
- MRCP is useful in detecting or excluding pancreatic duct trauma and pseudocysts in patients with pancreatic trauma.

## AB-37~PANCREATITIS

- **Suspected Pancreatitis:**
  - Symptoms of mild epigastric pain described as uncomfortable without guarding should be evaluated initially by ultrasound and serum lipase/amylase.
  - If amylase/lipase are elevated but are less than three times the upper limits of normal, and ultrasound does not demonstrate an abnormality to explain the signs and symptoms (e.g. gallstones, common duct stone, etc.), then CT abdomen with contrast (CPT 74160) can be performed.
  - If ultrasound suggests pancreatitis, then advanced imaging is not necessary.
  - **Reference:**
    - *Am J Gastroenterol* 2006;101:2379-2400
- **Known Acute Pancreatitis:**
  - The diagnosis of acute pancreatitis is made by fulfilling two of the following three conditions:
    - 1) Typical pain (acute onset of epigastric pain radiating to the back that is persistent without relief, frequently associated with nausea and vomiting, and associated with severe epigastric tenderness and/or guarding)
    - 2) Lipase and/or amylase greater than or equal to three times the upper limit of normal
    - 3) Typical characteristics of pancreatitis on CT abdomen
  - If the diagnosis of acute pancreatitis is made based on 1) and 2) above, then advanced imaging is not indicated except in the following circumstances:

- CT abdomen with contrast (CPT 74160) or without contrast (CPT 74150) can be performed if there are suspected intraabdominal complications in patients with severe, acute pancreatitis. These complications include peripancreatic effusions, pseudocysts, abscess, and pancreatic necrosis.
  - MRI without and with contrast (CPT 74183) can be obtained if CT is contraindicated or equivocal.
- Patients with an elevated amylase (normal range 0-99 U/L) or lipase level [normal range 0-59 U/L] greater than or equal to three times normal who have any of the following: fever, elevated WBC, palpable mass, or who do not improve with medical therapy should have a CT abdomen with contrast (CPT 74160).
- MR cholangiopancreatography (MRCP—CPT 74181) should be considered for:
  - Patients with known or suspected gallstone pancreatitis to screen for those patients who would benefit from ERCP.
  - Patients with recurrent, acute pancreatitis with no known cause.
  - MRCP can help identify the course and drainage pattern of the pancreatic duct and is useful in diagnosing congenital anomalies such as pancreas divisum and annular pancreas, and in the detection of strictures, fistulas, and intraductal calculi prior to surgery. MRCP is also useful when there are contraindications to the use of IV contrast for CT imaging.
  - Specialist evaluation is helpful in determining the need for MRCP.
- **References:**
  - *Am J Gastroenterol* 2006;101:2379-2400
  - *Am Fam Physician* 2007 May;75(10):1513-1520
  - *ACR Appropriateness Criteria, Acute Pancreatitis, 2006*
- **Chronic pancreatitis suspected**
  - If chronic pancreatitis is **suspected** as evidenced by recurrent characteristic pancreatic pain, symptoms of maldigestion/malabsorption that improve with digestive enzymes, and/or abnormal laboratory studies suggesting pancreatic dysfunction, then plain abdominal x-ray (KUB) and ultrasound should be performed initially.
  - If x-ray and ultrasound are nondiagnostic for changes consistent with chronic pancreatitis, then CT abdomen without and with contrast (CPT 74170) or MRCP (CPT 74181) can be performed if findings will affect management decisions.
    - Diagnostic findings on ultrasound include pancreatic stones as evidenced by intra-pancreatic hyperreflective echoes with acoustic shadows.
  - If CT or MRCP is nondiagnostic, then endoscopic ultrasound with biopsy should be performed.
    - Diagnostic findings on CT include pancreatic stones as evidenced by intra-pancreatic calcifications.

- **Reference:**
  - *Gastroenterology* 2001;120:682-707
- **Known Chronic pancreatitis including Hereditary Pancreatitis:**
  - There is no evidence-based data supporting screening for pancreatic cancer in patients with a history of chronic pancreatitis, including those with hereditary pancreatitis.\*
    - \* *Screening for pancreatic cancer. U.S. Preventive Services Task Force. Screening for Pancreatic Cancer, Updated February 2004*

## SPLEEN

### AB-38~SPLEEN

- **Splenomegaly** is usually the result of systemic disease, and diagnostic studies are directed toward identifying the causative disease.
  - Complete blood count with differential, LFT's, and peripheral blood smear examination should be performed prior to considering advanced imaging.
  - Suspected splenomegaly should be evaluated by ultrasound initially.\*
    - \* *ACR Practice Guidelines for the Performance of an Ultrasound examination of the abdomen or retroperitoneum, revised 2007*
  - If ultrasound is indeterminate or shows an abnormality, CT abdomen without and with contrast (CPT 74170) can be performed.\*
    - \*Kaplan LJ, Coffman D. *Splenomegaly. eMedicine Updated October 5 2004 <http://www.emedicine.com> Accessed November 21, 2006*
    - If ultrasound is indeterminate, MRI can be used in pregnant women for further evaluation.
  - If CT is indeterminate or contraindicated, MRI abdomen without and with contrast (CPT 74183) can be performed.
- **Incidental Finding of Splenic Lesion(s):**
  - If an incidental splenic lesion is seen on a non-abdominal imaging study (e.g. chest CT, thoracic MRI, etc.), abdominal ultrasound should be performed if the lesion has cystic qualities.
  - CT abdomen (either with contrast [CPT 74160] or without and with contrast [CPT 74170]) can be performed if ultrasound is nondiagnostic or the lesion does not have cystic qualities.
  - If CT is indeterminate or contraindicated, MRI abdomen without and with contrast (CPT 74183) can be performed.
  - There is no evidence-based data to support performing serial CT or MRI scans to follow patients with incidental splenic lesions.
- **Trauma:**
  - CT scans of the abdomen and pelvis without and with contrast (CPT 74170 and 72194) are indicated in patients with blunt abdominal trauma with suspected splenic rupture or in patients with penetrating trauma to the left upper quadrant.

## RENAL (ACUTE FLANK PAIN, RULE OUT RENAL STONE- SEE AB- 5)

### AB-39~INDETERMINATE RENAL LESION

- Newly discovered renal mass > 1cm (indeterminate by the initial test):
  - Ultrasound should be performed initially.
    - If the lesion is consistent with a simple cyst on ultrasound (spherical or ovoid shape, absence of internal echoes, presence of a thin smooth wall, enhancement of the posterior wall) no further imaging is indicated.\*  
*\*Am Fam Physician 2001;63:288-294 and 299*
  - Lesions > 1cm that are not characterized as a simple cyst by ultrasound can be evaluated by CT of the abdomen without and with contrast (CPT 74170).
    - If the patient cannot tolerate IV contrast, then MRI of the abdomen without and with contrast (CPT 74183) is appropriate.
  - If CT or MRI characterizes the lesion as benign, no further imaging is necessary
  - If the initial follow-up CT or MRI is still indeterminate, follow-up imaging should be performed in 3 to 6 months, then annually for 5 years in older patients. In younger patients, longer annual follow-up is needed.\*  
*\*Radiographics 2004;24:5101-5115*
  - If a lesion has been characterized as a hyperdense renal cyst, follow-up CT scan should be performed in 3 to 6 months.
- Newly discovered renal mass < 1 cm
  - CT abdomen without and with contrast (CPT 74170) with ultra-thin cuts should be performed
    - If CT demonstrates a simple cyst or other benign lesion, no further imaging is necessary
  - If CT is indeterminate, MRI abdomen without and with contrast (CPT 74183) can be performed.
    - If MRI demonstrates a benign lesion, no further imaging is necessary
- If the initial follow-up CT or MRI is still indeterminate, follow-up imaging should be performed in 3 to 6 months, then annually for 5 years in older patients. In younger patients, longer annual follow-up is needed.\*  
*\*Radiographics 2004; 24:5101-5115*
- If a lesion has been characterized as a hyperdense renal cyst, follow-up CT scan should be performed in 3 to 6 months.

### AB-40~RENAL FAILURE

- Ultrasound is the preferred initial imaging study for patients with acute or chronic renal failure.
- Nephrology or Urology evaluation is helpful in evaluating patients with GFR <30 ml/min/1.73m<sup>2</sup> to determine the need for advanced imaging.\*  
*\*ACR Appropriateness Criteria, Renal Failure, 2008*  
*\*Am J Kidney Dis 2002;39(2 Suppl 1):S46-S75*

## AB-41~RENOVASCULAR HYPERTENSION

- The clinical information provided should include a list of the current blood pressure medications and at least two or three serial blood pressure measurements. It is suggested that home blood pressure should be considered to rule out “white coat syndrome” and other secondary causes of resistant hypertension.\*

*\*N Engl J Med 2006 July;355:385-392*

- No imaging is required for patients with hypertension that is easily controlled with one or two blood pressure medications with the exceptions listed in “Other considerations for imaging evaluation”-see below in this section.
- In patients with uncontrolled or resistant hypertension (>140/90 without history of diabetes or renal disease or >130/80 with diabetes or renal disease on three or more blood pressure medications-including diuretics), MRA (CPT 74185) or CTA (CPT 74175) of the abdomen is indicated. It is suggested that home blood pressure should be considered to rule out “white coat syndrome” and other secondary causes of resistant hypertension.\*

*\* N Engl J Med 2006 July;355:385-392*

- Doppler ultrasound is the most cost-effective exam for screening reno-vascular hypertension and can be used as the initial screening tool for medically controlled patients with clinical suspicion of renovascular disease. However, ultrasound results are highly dependant on the expertise of the local facility/radiologist.\*

*\*AJR 2005;184:931-937*

- Other considerations for imaging evaluation:\*

**Abdominal MRA (CPT 74185) or CTA (CPT 74175) may be indicated for the following:**

- Patients under 40 years old with hypertension, controlled or uncontrolled, to exclude fibromuscular dysplasia of the renal arteries.
- Patients > age 55 with sudden onset of significant hypertension (not specifically defined but >160/100 is considered severe).
- Patients with previously stable hypertension who experience progressively worsening hypertension, increase in creatinine, or worsening renal function (especially after the administration of an ACE inhibitor or with angiotensin receptor blocking agent). These are the patients that benefit most from renal artery stenting, since renal parenchyma is preserved and eventual kidney dialysis can hopefully be avoided.
- Unexplained atrophic kidney or discrepancy in size between kidneys of greater than 1.5 cm.
- Recurrent (flash) pulmonary edema.
- Co-existing diffuse atherosclerotic vascular disease, especially in heavy smokers.
- Women who develop hypertension ( $\geq 140/90$ ) within the first 20 weeks of pregnancy should have renal artery imaging following delivery, if the hypertension persists >12 weeks post partum.

*\*The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of HBP. NIH Publication*

No. 04-5230 August 2004

\*N Engl J Med 2006;355:385-392

\*Current Cardiology Reports 2005;7:405-411

\*Gibson P. Hypertension and Pregnancy. Updated June 8, 2006

<http://www.emedicine.com>. Accessed November 20, 2006

## URINARY TRACT

### AB-42~HEMATURIA

- The distinction between microhematuria and gross hematuria is no longer used as a criterion for guidelines to determine which patients need imaging evaluation.
- If a dipstick test is positive for blood, a blood creatinine level and complete urinalysis with microscopic exam should be performed prior to imaging studies.
  - The American Urological Association defines microscopic hematuria as 3 or more RBC's per high power field from 2 of 3 urinalysis specimens.
- Women <40 years of age with evidence of urinary tract infection (urinary frequency, burning on urination, fever, elevated WBC >10,000) should receive at least a 3 day regimen of antibiotics followed by repeat complete urinalysis with microscopic exam. If the hematuria resolves, advanced imaging is not indicated.
- Patients with evidence of primary generalized renal disease (elevated creatinine or urinalysis showing red cell casts, greater than 2+ protein on dipstick, dysmorphic red blood cells, or 24 hour urine protein >500 mg per 24 hrs) should have renal ultrasound in order to determine renal volume and morphology prior to considering advanced imaging.
  - Nephrology or Urology evaluation can be helpful in determining the need for advanced imaging.
- In all remaining patients with hematuria verified by complete urinalysis with microscopic exam, and absence of acute flank pain, CT urogram (CPT 74170 and 72194) is indicated.
- The American Urological Association recommends imaging of the upper urinary tract (CT urogram [CPT 74170 and 72194]), urine cytology, and cystoscopy for patients over 40 years old with documented hematuria on 2 of 3 urinalysis specimens.
  - This applies to all patients over 40 years old whether there is painless hematuria or flank pain with hematuria.
  - CT studies ordered by Urology should be contrast as requested.
- Patients who have had a thorough work up for hematuria with no etiology found should have repeat urinalysis, urine cytology, and blood pressure measurements at 6, 12, 24 and 36 months. Repeat imaging is not necessary, as studies have found no cancer on repeat imaging.\*

\*N Engl J Med 2003;348:2330-2338

\*ACR Appropriateness Criteria, Hematuria, 2005

\*Am Fam Physician 2006;73:1748-1754 and 1759

## **AB-43~URINARY TRACT INFECTION (UTI)**

- Urology evaluation can be helpful in determining the need for advanced imaging in patients with recurrent urinary tract infections.
- Thorough diagnostic work up includes CT urogram (CPT 74170 and 72194), cystoscopy, and voiding cytourethrography.
- Males with first time urinary tract infection may benefit from Urology evaluation and CT urogram.
- Pregnant women should be evaluated initially by ultrasound and if further imaging is necessary, MRI abdomen and pelvis (contrast as requested).

### **Upper urinary tract**

- Uncomplicated acute pyelonephritis does not require imaging prior to antibiotic treatment unless the patient has a history of kidney stones, prior renal surgery, or repeated pyelonephritis.
- No advanced imaging is indicated in patients with uncomplicated pyelonephritis.
- If there is no response to medication after 72 hours, ultrasound should be performed initially. CT without and with contrast (CPT 74170 and 72194) may be indicated.
- Diabetics and immunocompromised patients should be evaluated with CT abdomen and pelvis without and with contrast (CPT 74170 and 72194) within 24 hours of initiating antibiotics if there is no clinical improvement.\*

*\*ACR Appropriateness Criteria, Acute Pyelonephritis, 2008*

### **Lower urinary tract**

- Urology evaluation is helpful in women with recurrent lower urinary tract infections (2 or more infections occurring in the preceding 12 months and confirmed by cultures).
- Plain x-rays can detect bladder calculi, which can be a cause of recurrent lower tract infection, and should be the initial study.
- Complicated recurrent UTI can be evaluated with CT abdomen and pelvis without and with contrast (CPT 74170 and 72194). The combination of ultrasound and plain x-rays can be as accurate as CT, but ultrasound quality is not as consistent and is operator dependent.
- Unexplained dysuria (failure of conservative treatment and/or presence of normal urinalysis) and/or increased urinary frequency may benefit from Urology evaluation and cystoscopy prior to considering advanced imaging.
- Suspected urethral diverticulum should be evaluated by voiding cystourethrography, retrograde urethrography, or ultrasound.
  - Pelvic MRI without and with contrast (CPT 72197) can be performed in equivocal cases.

*\*ACR Appropriateness Criteria, Recurrent Lower Urinary Tract Infection in Women, 2008*

- Also see PV-10 Periurethral Cysts and Urethral Diverticula in the Pelvic guidelines.

## AB-44~PATENT URACHUS

- **Patent urachus** which is suspected due to umbilical discharge should initially be evaluated by ultrasound.
  - The urachus is a “tube” connecting the fetal bladder to the umbilical cord. It is usually obliterated during fetal growth, but if it remains patent, there can be a connection between the bladder and the umbilicus.
- CT Pelvis with contrast (CPT 72193) can be performed if ultrasound is equivocal or if needed for surgical planning.

## EVIDENCE BASED CLINICAL SUPPORT

### Evidence Based Clinical Support AB-2~ABDOMINAL PAIN

- After low back, headache, and musculoskeletal pain, abdominal pain is the fourth most frequent chronic pain syndrome. In many patients, even an extensive work up does not reveal the cause of pain.
- A review of over 10,000 patients with acute abdominal pain found that 28% had appendicitis, 9.7% had cholecystitis, 4.1% had small bowel obstruction, 4% had a gynecological disorder, 2.9% had pancreatitis, 2.9% had renal colic, 2.5% had peptic ulcer disease, 1.5% had cancer, 1.5% had diverticular disease, and 9% had other conditions. A specific diagnosis was not established in 34% of cases.\*  
*\*de Dombal FT. Diagnosis of acute abdominal pain. 2<sup>nd</sup> Ed. New York, Churchill Livingstone, 1991*
- A review of 70 patients with chronic abdominal pain for greater than 12 weeks who underwent laparoscopy showed adhesions in 39 patients, hernia in 13, adhesions from adjacent structures in 6, appendix pathology in 5, endometriosis in 3, gallbladder pathology in 2, and 10 patients with no obvious pathology.
- After 12 weeks postoperatively, 71% of patients had long term relief of pain.\*  
*\*Surgery 2003 Oct;134(4):549-554*
- Questions such as “Does taking a deep breath aggravate your symptoms?” and “Does twisting your back aggravate your symptoms?” are a positive indication of abdominal symptoms of musculoskeletal origin.

### Evidence Based Clinical Support AB-5~FLANK PAIN, RULE OUT RENAL STONE

- The classic presentation of renal stone disease involves acute onset of flank pain sometimes with radiation to the groin, hematuria, and possible nausea/vomiting.
- Calcium stones comprise 85% of all kidney stones and are composed of calcium oxalate and phosphate. The majority of calcium stones are radiopaque (i.e. they would show up on a plain x-ray), but not all.
- Uric acid stones and cystine stones comprise 9% of all kidney stones and are radiolucent and thus cannot be seen on plain x-ray.
- Most patients who form one calcium stone will eventually form another, with the average rate of new stone formation about one stone every 2 or 3 years. Calcium stone disease is strongly familial.
- The absence of hematuria does not rule out a kidney stone.
- Unenhanced CT has a very high, >95% sensitivity and specificity for urinary tract calculi and allows for delineation of other potential causes of the patient's symptoms. In addition, CT scan accurately determines the presence of hydronephrosis caused by urethral obstruction due to kidney stones.

**Evidence Based Clinical Support**  
**AB-11~RIGHT LOWER QUADRANT PAIN, RULE OUT APPENDICITIS**

- The differential diagnosis of acute right lower quadrant pain includes appendicitis, Crohn's disease, epiploic appendagitis, infectious ileitis, mesenteric adenitis, omental infarction, right-sided diverticulitis, Meckel's diverticulitis, and intestinal ischemia.
- The diagnosis of appendicitis is generally made by patient history, physical exam findings, and lab results (including urinalysis in all patients and pregnancy test for women of childbearing age).
- The classic presentation of appendicitis includes sudden onset of epigastric/periumbilical pain which then moves to the right lower quadrant, possible nausea/vomiting, low grade fever (100-101 degrees), leukocytosis (11,000-15,000), and localized tenderness/guarding/rebound in the right lower quadrant at McBurney's point. However, low grade fever is present in only 67%- 69% of patients.
- Patients with atypical clinical findings or an unclear diagnosis may require imaging with CT or ultrasound.
- CT can decrease the false-negative rate for appendectomy. In a study of 146 patients with clinically suspected appendicitis who also underwent CT scanning, the false-negative appendectomy rate was only 4%\* compared to the historical false negative rate of 20% in patients taken to surgery on clinical suspicion alone.  
*\*Am J Gastroenterol 1998;93:768-771*
- The highest clinical misdiagnosis of appendicitis occurs in young women in whom acute gynecologic conditions are common and may mimic appendicitis.
- The sensitivity of CT and US for diagnosing acute appendicitis is 93% and 77%, respectively.\*  
*\*Radiology 2002;225:131-136*
- CT scan without contrast has a sensitivity of 86%, specificity of 98%, positive predictive value of 97%, and negative predictive value of 98% in diagnosing appendicitis.\*  
*\*Br J Radiol 2002;75:721-725*

**Evidence Based Clinical Support**  
**AB-14~BARIATRIC SURGERY**

- There are a variety of methods used in bariatric, or obesity, surgery. Restrictive surgery includes vertical banded gastroplasty (using bands and staples to create a small stomach pouch), gastric banding, and laparoscopic gastric banding. Combined restrictive and malabsorptive surgery includes Roux-en-Y bypass (the jejunum or ileum is directly connected to the small stomach pouch thereby bypassing a portion of the small intestine) or biliopancreatic diversion.
- There is a relatively high (>10%) complication rate for obesity surgery.
- Complications include pulmonary embolus, infection, and leakage from the GI tract, bleeding, bowel obstruction, incisional hernias and gallstones.

### Evidence Based Clinical Support AB-19~LOWER EXTREMITY EDEMA

- Lower extremity edema is caused by venous or lymphatic obstruction.
- Unilateral lower leg swelling can be caused by deep venous thrombosis (DVT), thrombophlebitis, or even a popliteal cyst.
- Bilateral lower extremity edema can be caused by deep venous thrombosis (DVT), thrombophlebitis, chronic lymphangitis, and external compression of the iliac veins from a mass or even from a large bladder caused by prostate hypertrophy. Abdominal lesions such as a large pancreatic pseudocyst compressing the inferior vena cava can also cause lower extremity edema.
- Systemic medical conditions such as congestive heart failure, nephrotic syndrome (marked proteinuria >3.5 g/Day and severe hypoalbuminemia <2g/dL), hypothyroidism (myxedema usually manifested by pretibial edema), and even lesions in the CNS affecting the vasomotor fibers on one side of the body can cause lower extremity edema.
- There is an association between bilateral leg edema in obese primary care patients and obstructive sleep apnea and modest pulmonary hypertension.\* The etiology of the leg edema is largely unknown.

*\*Arch Intern Med 2000 Aug14-28;160(15):2357-2362*

### Evidence Based Clinical Support AB-21~ADRENAL CORTICAL LESIONS

- Most incidentally discovered adrenal nodules (incidentalomas) are benign if there is no underlying malignancy, the lesion is less than 3 cm in diameter, and there are no symptoms.
- The incidence of these lesions in the general population is 2%.
- One in 4000 adrenal masses is malignant. Masses <3cm are rarely functional tumors. 25% of adrenal masses >6cm are adrenal cortical cancer.
- The mean attenuation value of adrenal adenomas is 8 HU  $\pm$  18. 29% of adenomas have attenuation values higher than 10 HU.
- Tumors found incidentally in the adrenal glands on CT are likely to represent adenomas or hyperplasia if they are <4 cm in diameter and have HU values <20.\*

*\*J Clin Endocrinol Metab 2005;90:871-877*

- Mean attenuation value of metastases to the adrenal gland is 34 HU  $\pm$  11.\*

*\*Ann Intern Med 2003;138:424-429*

- Plasma free metanephrines are the most sensitive biochemical test for pheochromocytoma.
- Over 50% washout of contrast material on a 10-minute delayed CT scan is diagnostic of an adenoma. This is the most sensitive and specific study because it can detect both lipid rich (70% of adenomas) and lipid poor (30% of adenomas) adenomas.
- Two large retrospective studies of adrenal masses, found incidentally on other imaging, reported no cancers in a 24 month period of time following the original

discovery of the mass in patients with no personal history of cancer and no evidence of a hormone secreting adrenal tumor.

*\*Ann Intern Med 2003;138:424-429*

**Evidence Based Clinical Support**  
**AB-23~ABDOMINAL AORTIC ANEURYSM (AAA) and ILIAC ARTERY ANEURYSM (IAA) POST ENDOVASCULAR or OPEN AORTIC REPAIR**

- Patient selection for endovascular AAA repair is based on the anatomy of the aneurysm. Precise measurements of the aorta and iliac arteries must be obtained.
- Women with smaller diameter AAA tend to rupture earlier.
- A commonly used preoperative protocol involves CT scan of the abdomen and pelvis or CTA , followed by aortography.
- Another protocol uses ultrasound and MRA of the abdomen and pelvis with contrast.
- Endoleak, in which there is persistent bleeding into the original aneurysm sac, is the most common complication of endovascular AAA repair and occurs in 2.4%-45% of patients. The presence of an endoleak can cause progressive enlargement of the AAA and eventual rupture. Therefore, early detection and monitoring of endoleaks is important.
- Postoperative imaging protocols generally involve CT scan of the abdomen and pelvis within the first 30 days postoperatively, at 6 months, 12 months, and every year thereafter.
- Since the durability of endovascular grafts is not yet known, surveillance CT scans should continue every year indefinitely, since some grafts have developed fractures, suture disruption, and wear holes over time.
- Several studies comparing duplex ultrasound to CT scan in the surveillance of endovascular aneurysm repair have shown poor sensitivity of ultrasound (42.9%) compared with CT scan in detecting endoleaks.

**Evidence Based Clinical Support**  
**AB-28~INFLAMMATORY BOWEL DISEASE RULE OUT CROHN'S DISEASE or ULCERATIVE COLITIS**

- MRI is preferable in patients expected to need repeated follow-up exams.
- Small bowel Crohn's disease may benefit from capsule endoscopy and/or CT enterography. Capsule endoscopy should be avoided in known or suspected obstructive disease. With either test barium study and ileoscopy should precede their use.

**Evidence Based Clinical Support**  
**AB-29~CT COLONOGRAPHY (CTC)**

- Out of the 3120 patients who underwent primary VC screening, 87% of the results were negative, 13% were positive, and 8% of patients underwent therapeutic conventional colonoscopy. Patients were referred for polypectomy if

VC showed a polyp at least 6mm in size. Patients with smaller polyps (6-9mm) were offered the option of continued surveillance with VC or polypectomy.\*

*\*N Engl J Med 2007;357:1403-1412*

- A large comparative study has shown that CT colonography produced similar rates of detection for advanced neoplasia as conventional colonoscopy and is an effective method for colorectal screening.
  - Although these results support the efficacy and safety of CTC for colorectal cancer screening, there are only limited follow-up data available so far for patients who underwent CTC and opted to have follow-up surveillance screening for polyps 6 to 9 mm in size.
  - In addition, specific criteria need to be developed to ensure that physicians are adequately trained and quality metrics for programs are in place.
  - **Reference:**
    - *N Engl J Med 2007;357:1403-1412*

<b>Evidence Based Clinical Support</b> <b>AB-30~CIRRHOSIS AND LIVER SCREENING FOR HEPATOCELLULAR</b> <b>CARCINOMA (HCC); LIVER TRANSPLANT</b>
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- Worldwide, 90% of cases of hepatocellular carcinoma (HCC) occur in patients with cirrhosis, with an annual incidence in cirrhotics of 2%-6%. In the U.S., 56% of cases of hepatocellular carcinoma occur in patients with cirrhosis.
- Risk factors for HCC in cirrhotics are male gender, age >50, macronodular cirrhosis, and large cell dysplasia.
- Hemochromatosis is associated with a substantial risk of hepatocellular carcinoma once cirrhosis has developed. Patients with alcoholic cirrhosis, alpha antitrypsin deficiency, or tyrosinemia are also at increased risk of hepatocellular carcinoma.
- HCC is most prevalent in patients with cirrhosis due to hepatitis B and especially hepatitis C. (Hepatitis C was the etiology of cirrhosis in 63% of patients with HCC in one study).
- A study comparing screening alpha-fetoprotein (AFP), ultrasound, and CT scan in patients with established cirrhosis found that the sensitivity of CT scan (88%) was significantly higher than AFP >20 ng/ml (62%) and ultrasound (59%) for detecting HCC.\*  
*\*Am J Gastroenterol 1999 Oct;94(10):2988-2993*
- HCC is best detected by triple phase CT scanning.
- Clinically unsuspected HCC was found in 14% of 430 patients with cirrhosis referred for liver transplantation.\* In this study, the sensitivity of triphasic CT was only 59%.  
*\*Radiology 2000 Dec;217(3):743-749*
- Serum AFP levels higher than 300-500 micrograms/L are very specific for HCC, but serum AFP values are not sensitive for detection of most small tumors. In one study, 55% of patients with cirrhosis and HCC had normal serum AFP levels.

**Evidence Based Clinical Support**  
**AB-32~LIVER LESION CHARACTERIZATION**

- Liver lesions can be categorized as cystic or solid. Cystic lesions are usually benign. The most common benign lesions are hemangioma, focal nodular hyperplasia, and hepatic adenoma.
- Malignant lesions can be primary hepatocellular carcinoma or metastases from other primary tumors.
- Hemangiomas are congenital vascular malformations and are the most common solid benign hepatic tumors.

**Evidence Based Clinical Support**  
**AB-35~PANCREATIC LESION**

- The finding of an incidental pancreatic cyst is common. A retrospective study of incidental cysts, defined as mucinous cystic neoplasm or branched intraductal papillary mucinous neoplasm, found no change in lesions less than 3 cm over 2 years of follow up and recommended that asymptomatic individuals without evidence of main pancreatic duct dilation or without intracystic or mural nodules could be followed at 2 year intervals from the date the initial cyst was diagnosed. Any growth, symptoms or initial evidence suspicious for malignancy should undergo EUS or have surgical excision.  
*\*Am J Gastroenterol 2008 July;103(7):1657-1662*
- The most common tumors to metastasize to the pancreas are renal cell carcinoma and lung carcinoma. Melanoma, breast, ovarian, colon, and thyroid carcinoma can also metastasize to the pancreas.

**Evidence Based Clinical Support**  
**AB-36~PANCREATIC PSEUDOCYSTS**

- Pseudocysts are collections of tissue, fluid, debris, pancreatic enzymes, and blood which develop one to four weeks after the onset of acute pancreatitis. They form in approximately 15% of patients with acute pancreatitis. Pseudocysts are preceded by pancreatitis in 90% of cases and by trauma in 10%. Pseudocysts resolve spontaneously in 40%-50% of patients. Therefore, up to 50% of pseudocysts can be managed nonoperatively.
- Pancreatic pseudocysts larger than 5 cm or present for longer than six weeks should be considered for drainage.

**Evidence Based Clinical Support**  
**AB-39~INDETERMINATE RENAL LESION**

- A retrospective study of 102 sonographically indeterminate renal masses which were then evaluated by CT scan showed that 13% were malignant, 85% were benign, and 2% remained indeterminate.\*

*\*J Comput Assist Tomogr 2002 Sep-Oct;26(5):725-727*

- CT remains the major method of imaging and characterizing cystic renal lesions. A change of <10 HU from pre to post contrast images is usually considered typical of a benign cyst.\*

\*Radiographics 2004;24:5101-5115

<p><b>Evidence Based Clinical Support</b>  <b>AB-41~RENOVASCULAR HYPERTENSION</b></p>
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- In the general hypertensive population, the prevalence of renovascular disease varies between 1% and 5%. However, the prevalence of renal artery stenosis (RAS) increases to 20%-40% with specific clinical characteristics.
- Patients with the following clinical features associated with renal artery stenosis (RAS) are often considered for further evaluation:\*
  - Abrupt onset of hypertension before age 40 (suggestive of fibromuscular dysplasia).
  - Abrupt onset of hypertension or progressive worsening of hypertension at or after age 50 (suggestive of atherosclerotic RAS).
  - Accelerated or malignant hypertension (defined as very high blood pressure with end organ damage such as papilledema, retinal hemorrhage, heart failure, renal failure, or hypertensive encephalopathy).
  - Refractory hypertension (diastolic blood pressure consistently >100 but the JNC-7\* has defined refractory as BP >140/90 for patients without diabetes or renal disease and >130/80 for patients with diabetes or renal disease on three or more blood pressure medications).

\*The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of HBP.  
 NIH Publication No. 04-5230 August 2004

- Unexplained azotemia (abnormally high BUN), or azotemia induced by treatment with ACE inhibitors is suggestive of atherosclerotic RAS.
- Unilateral small kidney.
- Abdominal bruit, flank bruit, or both.
- Carotid, coronary, or peripheral vascular disease.
- Unexplained congestive heart failure with normal left ventricular function, or acute pulmonary edema.

\*N Engl J Med 2001 Feb;344(6):431-442

- Atherosclerotic renal artery disease is present in 7% of the general population over age 65, and in 20%-45% of patients with coronary artery disease or aortoiliac disease.
- JNC-7\* has defined severe hypertension to include the importance of systolic blood pressure (BP). Based on their recommendations, the definition of uncontrolled BP has been redefined as >140/90 for patients without diabetes or renal disease, and >130/80 for patients with diabetes or renal disease. Systolic hypertension is associated with the prediction of hypertension complications.

\*The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.  
 NIH Publication No. 04-5230 August 2004

- Medication-resistant hypertension in one study is defined as no decrease in blood pressure after institution of two-drug therapy, and uncontrolled hypertension is defined as diastolic blood pressure > 110. The prevalence of renal artery stenosis in the medication-resistant hypertension population is 20%.\*  
*\*AJR 2003 Dec;181:1653-1661*
- The clinical success rate of renal angioplasty of atherosclerotic stenosis is 40%-70%.
- The positive predictive value of MRA for predicting clinical success after angioplasty is very low. The advantage of MRA is the high negative predictive value (i.e. absence of false-negative exams).\*  
*\*AJR 2005;184:931-937*
- Captopril renography has 92% sensitivity in detecting renal artery stenosis, but has decreased accuracy in patients with bilateral disease or renal impairment. In addition, interference from concurrent antihypertensive medication, especially ACE inhibitors, and the lack of facilities equipped to perform this study, have limited the availability of this imaging study.\*  
*\*J Nucl Med 2003 Oct;44(10):1574-1581*
- Ultrasound has a sensitivity of 56%-95% in detecting renal artery stenosis, but is highly operator dependent.
- There is no statistically significant difference between MR angiogram and multidetector row CT angiogram in the detection of hemodynamically significant RAS. (MRA sensitivity 98%, specificity 94%; CTA sensitivity 96%, specificity 96%).\*  
*\*Radiology 2003 March;226(3):798-811*
- Patients with significant renal artery stenosis on MRA or CTA still need to have conventional arteriography performed if stents are placed.

<p><b>Evidence Based Clinical Support</b> <b>AB-42~HEMATURIA</b></p>
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- Urologic cancers (mainly of bladder and prostate) account for approximately 5% of cases of microscopic hematuria.
- In a referral-based study of 100 men less than 40 years old with microscopic hematuria, no bladder cancers were identified by cystoscopy.\*  
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### ABDOMINAL GUIDELINE REFERENCES

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