This tool addresses common symptoms and symptom complexes. Imaging requests for patients with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or patient’s Primary Care Physician (PCP) may provide additional insight.

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 11/30/06
ABBREVIATIONS for ABDOMINAL GUIDELINES

AAA: abdominal aortic aneurysm
AFP: alpha-fetoprotein
ALT: alanine aminotransferase
AST: aspartate aminotransferase
BEIR: Biological Effects of Ionizing Radiation
BUN: blood urea nitrogen
CNS: central nervous system
CT: computed tomography
CTA: computed tomography angiography
DVT: deep venous thrombosis
ERCP: endoscopic retrograde cholangiopancreatography
FNH: focal nodular hyperplasia
GGT: Gamma-glutamyl transferase
GI: gastrointestinal
HCC: hepatocellular carcinoma
HU: Hounsfield units
IV: intravenous
KUB: kidneys, ureters, bladder (plain frontal supine radiograph of the abdomen)
LFT: liver function tests
MRCP: magnetic resonance cholangiopancreatography
MRA: magnetic resonance angiography
MRI: magnetic resonance imaging
mSv: millisievert
NAFLD: Nonalcoholic fatty liver disease
PA: posteroanterior projection
PET: positron emission tomography
RAS: Renal artery stenosis
RBC: red blood cell
SBFT: small bowel follow through
SPECT: single photon emission computed tomography
VC: virtual colonoscopy
WBC: white blood cell count
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• Abdominal imaging begins at the diaphragm and extends to the umbilicus or iliac crest.
• Pelvic imaging begins at the umbilicus and extends to the pubis.
• CT imaging is a more generalized modality
• MRI imaging is preferred as a more targeted study, in cases of renal failure, and in patients allergic to contrast.
• CT of each body part delivers about 10 mSv of ionizing radiation. For each 10 mSv radiation, the risk of developing a future cancer according to the BEIR VII report is 1:1000 to 1:2000 (chest x-ray PA/Lateral = 0.4mSv; KUB abdomen = 1.5 mSv).
  o Radiation exposure is particularly important in children and women of child bearing age.
  o Pediatric imaging should consider the use of ultrasound or MRI where it is a clinical option to avoid radiation exposure.
  o 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.
• Abdominal CT is usually performed with contrast (CPT 74160). Exceptions are noted in the individual guidelines.
  o Abdominal CT without and with contrast (CPT 74170) can be considered in oncology patients (see specific Oncology guidelines) and in patients with fatty liver and suspicion of a liver lesion.
• Fever of unknown origin; Unexplained weight loss—Refer to ONC-27~Medical Conditions with Cancer in the Differential Diagnosis in the Oncology guidelines.

**Pediatric guidelines:** The Abdomen guidelines are the same for both the pediatric population and the adult population, unless there are specific Pediatric guidelines (highlighted in yellow).

**GENERAL ABDOMINAL SIGNS/SYMPTOMS**

**AB-2~ABDOMINAL PAIN**

• 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 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.).**
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.

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%.*

In patients with suspicion for pancreatic disease (especially those with chronic alcohol abuse or chronic pancreatitis) and symptoms of persistent midepigastric pain (greater than 3 to 4 weeks with no improvement) or weight loss, CT of the abdomen with contrast (CPT 74160) is appropriate.

However, patients with nonspecific abdominal pain and less than three times the upper limit of normal elevation of amylase and lipase rarely have detectable pancreatic pathology* and should have a trial of conservative treatment (e.g. clear liquid diet) prior to considering advanced imaging of the pancreas.

In general, MRI is usually not indicated for evaluation of abdominal pain.

In patients with persistent epigastric pain (greater than 3 to 4 weeks with no improvement) despite medical treatment for reflux disease and upper endoscopy, CT of the abdomen with contrast (CPT 74160) is appropriate.

In all other patients who present with persistent abdominal pain (greater than 3 to 4 weeks with no improvement) with unremarkable endoscopy results, CT of the abdomen and pelvis with contrast (CPT 74160 and 72193) is appropriate.

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 is negative.

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 count.*
  
  *ACR Appropriateness Criteria, Acute Abdominal Pain, 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~ ACUTE FLANK PAIN, RULE OUT RENAL 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, 2005
- CT of the abdomen and pelvis without contrast (CPT 74150 and 72192) are the best imaging studies in the non-pregnant patient to rule out kidney stone.
- 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.

AB-5~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-6~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, 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 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.

  o References:
    - Am Fam Physician 2005;72:1229-1234 and 1241-1242
    - ACR Appropriateness Criteria, Left Lower Quadrant Pain, 2005

AB-7~LEFT UPPER QUADRANT PAIN

- 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 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 and Retroperitoneum, 1/1/02
AB-8~RIGHT LOWER QUADRANT PAIN, RULE OUT APPENDICITIS

- Children, 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 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 for Acute Abdominal Pain, 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.

AB-9~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, 2005
- In patients who have had cholecystectomy, or in patients with normal ultrasound, CT of the abdomen with contrast (CPT 74160) can be performed.

AB-10~MESENTERIC/COLONIC ISCHEMIA

- Also see PVD-5 Mesenteric ischemia under Aortic Disorders and Renal Vascular Disorders in the Peripheral Vascular Disease guidelines.
- Gastroenterologist evaluation may be helpful in determining this diagnosis.
- 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
- Mild to moderate abdominal pain, diarrhea or lower intestinal bleeding with minimal abdominal tenderness 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 more severe than clinical findings.*
  *Gastroenterology 2000 May;118(5):951-953

AB-11~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.).
• Children should be evaluated with ultrasound initially or MRI abdomen and pelvis without and with contrast (CPT 74183 and 72197).
• Pregnant women should be evaluated with MRI (contrast as requested).*
• Beyond 60 days postoperatively, see AB-2 Abdominal Pain.
  *ACR Appropriateness Criteria, Suspect Small Bowel Obstruction, 2005
  *ACR Appropriateness Criteria, Acute Abdominal Pain and Fever or Suspected Abdominal Abscess, 2006

MISCELLANEOUS ABDOMINAL ENTITIES

AB-12~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-13~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).
  o Ultrasound should be considered for children initially.
• For more significant trauma, CT abdomen and pelvis without and with contrast (CPT 74170 and 72193) may be used initially to determine patients who need hospitalization for observation. Ultrasound is less sensitive in trauma where the probability of injury is high.*
  *ACR Appropriateness Criteria, Blunt Abdominal Trauma, 2005
• 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 Ital Chir. 2002 Jan-Feb;73(1):65-68

• Patients with suspected Spigelian hernia (anterior abdominal wall hernia through the semilunar line), ventral hernia, or incisional hernia can have CT of the abdomen (and pelvis where applicable) with or without contrast (whichever the physician prefers).

• 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**
  o A controversial clinical entity thought to account for up to 5% of all groin injuries, especially among athletes involved in kicking sports.
  o Probably a chronic overuse injury involving posterior inguinal wall weakness, tearing of the transversus abdominis aponeurosis, and neuralgia.
  o Conservative management is performed initially. Some elite athletes require surgical intervention.
  o Ultrasound may show posterior inguinal wall bulging, but this is also seen in asymptomatic athletes.
  o Advanced imaging is not indicated.
  o The microtears described at surgery cannot be reliably diagnosed on imaging and therefore, **this condition remains a clinical diagnosis.**
  o Reference:

• **Noncontrast MRI is sufficient to evaluate a possible lipoma.** 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-16~LOWER EXTREMITY EDEMA

- Also see PVD-7 Lower Extremity Edema in the Peripheral Vascular Disease guidelines.
- Patients who present with lower extremity edema should have a venous duplex study as the initial imaging study to rule out deep venous thrombosis (DVT).
- In patients with negative venous duplex study and persistent unexplained unilateral or bilateral lower extremity edema, CT of the abdomen and pelvis with contrast (CPT 74160 and 72193), or CT scan of the pelvis (CPT 72193) alone can be performed.
- In patients with negative venous duplex study and unilateral calf edema, a dedicated ultrasound of the popliteal fossa to rule out popliteal (Baker's) cyst should be performed initially. If negative, CT or MRI of the lower extremity without contrast (CPT 73700 or 73718) can be performed.
- Diabetic muscle necrosis is rare but can present with acute painful swelling in the lower extremity muscles. MRI of the extremity (contrast as requested) is the diagnostic method of choice.
- If MRV (CPT 74185 and 72198) or CTV (CPT 74175 and 72191) is requested, the case should be sent for Medical Director review.

SPECIFIC ABDOMINAL ORGANS

AB-17~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
  - Noncontrast CT (CPT 74150) and chemical shift MRI (CPT 74181) have comparable performances in the evaluation of lipid content.
- Mass lesions larger than 6 cm or hormone-secreting tumors should be resected.*
  *ACR Appropriateness Criteria, Incidental Discovery of Adrenal Mass, 2005
  *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. 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.
  - If CT is contraindicated, chemical shift MRI (CPT 74181) can be performed.
o MRI can only reliably detect lipid rich adenomas.

- If CT of the abdomen with washout is indeterminate, MRI will not add significant information. Therefore, follow-up CT of the abdomen without contrast (CPT 74150) in 3 to 6 months and again at 12 months can be performed. Endocrine re-evaluation should be performed at one year.¹ ²

There is no good evidence supporting continued radiologic surveillance if the follow-up at 6-12 months shows no change in adrenal tumor size.²

¹J Clin Endocrinol Metab 2005;90(2):871-877
²Ann Intern Med 2003;138:424-429

- If CT with washout or MRI defines the lesion as a probable adenoma, follow-up imaging is not indicated.

- If CT is contraindicated and MRI is indeterminate, follow-up noncontrast abdominal MRI (CPT 74181) at 3 to 6 months and at 12 months can be performed.*


- 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.

- In patients with elevated catecholamines such as those with known or suspected pheochromocytoma, 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.

- 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 biochemical evidence of an adrenal cortical endocrine syndrome (e.g. Cushing’s syndrome, Conn’s syndrome), CT with bolus arterial phase (CPT 74160) can detect or exclude an adrenal mass in a high percentage of cases and should be the initial imaging study.

- CT of the abdomen without contrast (CPT 74150) is adequate to evaluate a possible myelolipoma.

**AORTA**

**AB-18~ABDOMINAL AORTIC ANEURYSM (AAA)**

- Also see PVD-5 Aortic Disorders and Renal Vascular Disorders 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. Suspicion for acute dissection requires emergent clinical evaluation and/or CT evaluation.
• Serial ultrasounds are used to follow aneurysm size in non-surgical, non-obese candidates who are asymptomatic and have aneurysms less than 5 cm in males and less than 4.5 cm in females.*
  *Circulation 2006;113:463-654
• 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
• CT of the abdomen and pelvis with contrast (CPT 74160 and 72193), without and with contrast (CPT 74170 and 72194), or CTA (CPT 74175 and 72191) is indicated for surgical candidates, or to evaluate suspected rupture or dissection.
• CT of the abdomen with contrast (CPT 74160) is indicated to follow asymptomatic obese patients.
• MRA (CPT 74185 and 72198) or CTA (CPT 74175 and 72191) of the abdomen and pelvis can be used for surgical planning if the vascular surgeon will substitute the study for aortography.
• 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 an AAA to screen for aneurysms in the remaining aorta.*
  *Am Fam Physician 2006;73:1198-1204 and 1205-1206

**AB-19—ENDOVASCULAR ABDOMINAL AORTIC ANEURYSM (AAA) REPAIR**

• Preoperative imaging in patients with AAA being considered for endovascular repair can include 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.
• MRA of the abdomen and pelvis (CPT 74185 and 72198) are also acceptable preoperative studies if there is a contraindication to CT.
• 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) or CTA of the abdomen and pelvis (CPT 74175 and 72191), four times within the first year postoperatively (usually at 30 days, 3 months, 6 months, and one year postoperatively), and then every year thereafter indefinitely.

**BOWEL**

**MESENTERIC/COLONIC ISCHEMIA—SEE AB-10**
**DIVERTICULITIS—SEE AB-6**
**BOWEL OBSTRUCTION—SEE AB-5**
AB-20–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.
- Children <age 14 should be initially evaluated with ultrasound or MRI without and with contrast (CPT 74183 and 72197).
- 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 enterography may be considered (CPT 74160 and 76377).¹
  - 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.²

¹Radiology 2006 Jan;238(1):128-134

- SPECT and PET are considered investigational.*
  *ACR Appropriateness Criteria, Crohn’s Disease, 2005

AB-21–GI BLEEDING

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

AB-22–DIARRHEA/CONSTIPATION AND IRRITABLE BOWEL

- Chronic diarrhea is generally a clinical diagnosis (history, physical, appropriate laboratory tests and stool sampling). Imaging may include barium studies or endoscopy. GI consultation is helpful in determining the appropriate imaging pathway.*
Chronic constipation is generally a clinical diagnosis (history, physical, appropriate laboratory tests and stool transit time). Imaging should initially include barium studies or colonoscopy. GI consultation is helpful in determining the appropriate imaging pathway.

Irritable bowel syndrome is frequently a diagnosis of exclusion.

- The criteria for making the clinical diagnosis includes abdominal pain, frequently with bloating, with any 2 of the following:
  - 1) relief of symptoms with defecation
  - 2) onset of symptoms associated with a change in frequency of stool (diarrhea, constipation or both)
  - 3) onset of symptoms with an associated change in the form of stool.

- Imaging is not necessary and patients benefit from GI consultation.*

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

Virtual colonoscopy (CT colonography) 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.

The current CPT code for virtual colonoscopy is either 0066T (for screening) or 0067T (for diagnostic virtual colonoscopy). Alternatively, this study may be coded as 74150 and 72192 (No 3-D reconstruction codes should be used).

*Gastroenterol 1999;116:1461-1463
*Gastroenterol 2000;119:1761-1778
*Obstet & Gynecol 2004;103:41-46
*Radiographics 2002;22:817-832
LIVER

AB-24~CIRRHOSIS AND LIVER SCREENING FOR
HEPATOCELLULAR CARCINOMA

- Liver screening with CT of the abdomen with contrast (triple phase—CPT 74170) or CT of the abdomen without and with contrast (CPT 74170) in patients with cirrhosis every year is appropriate.*
  
  *Am J Gastroenterol 2003;98(3):679-690

- If the criteria set forth in above bullet is otherwise met, and the provider is requesting a CTA Abdomen (CPT 74175), rather than (and not in addition to) the conventional CT Abdomen (CPT 74170), the alternative code (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).

AB-25~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.

- CT of the abdomen with contrast (CPT 74160) 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-- coded as CPT 74181) 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, 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 with contrast (CPT 74160) 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).
• 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.*
  

• 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.

• If a lesion is found as an incidental finding on ultrasound, triple phase CT (CPT 74170) is preferred to confirm a suspected hepatic hemangioma. 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.

• 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.

• 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

• An indeterminate liver lesion in a cirrhotic liver is best evaluated with MRI of the abdomen without and with contrast (CPT 74183).

• Small liver lesions (less than one centimeter) that are low density are probably cysts and are best evaluated with follow-up CT of the abdomen with contrast (CPT 74160) at 6 months, given that the vast majority of these are benign in the otherwise disease free patient (i.e. patients with no history of malignancy).

• Less than one centimeter lesions that are high density (hypervascular) can be further evaluated by MRI of the abdomen without and with contrast (CPT 74183).

• Nonalcoholic fatty liver disease (NAFLD):
  o Ultrasound is the preferred imaging study to evaluate for biliary disease or isolated liver lesion.
  o Distinguishing between fatty liver and steatohepatitis is made via biopsy rather than advanced imaging.*

  *Gastroenterology 2002 Nov;123(5):1705-1725
  *Internal Medicine Journal 2004;34:187-191
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 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 74160.

Patients with elevated alpha-fetoprotein (AFP) levels should have MRI of the abdomen without and with contrast (CPT 74183).

MRCP (CPT 74181) is appropriate in patients who are status post cholecystectomy and have a possible common bile duct stone.

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.*

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.*

*ACR Appropriateness Criteria, Jaundice, 2005

*Hepatology 2001;33(5):1321-1328
*Joffe S. Hemochromatosis. Updated March11, 2005
### AB-28~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.
- 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-29~PANCREATIC LESION

- CT of the abdomen with contrast with triphasic imaging (CPT code 74170), or CT of the 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.* 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.
  
- CT abdomen with contrast (CPT 74160) is used to evaluate a cystic pancreatic lesion such as pseudocyst or possible abscess.
- If cystadenocarcinoma is suspected, CT abdomen without and with contrast (CPT 74170) can be performed.
- 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 indeterminate.
- MRI and CT scan demonstrate similar accuracy in differentiating malignant from benign cystic pancreatic lesions. Suspected malignant lesions must be biopsied or resected to make a definitive diagnosis.

#### AB-30~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) 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 (CPT 74160) 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.

- 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-31 ~ PANCREATITIS**

- Ultrasound should be performed in every patient with acute pancreatitis.*
  
  *ACR Appropriateness Criteria, Acute Pancreatitis, 2006

- Patients with mild, uncomplicated acute pancreatitis usually require no imaging other than ultrasound evaluation for gallstones.

- CT of the abdomen with contrast (CPT 74160) or without contrast (CPT 74150) is useful to assess 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.*
    *ACR Appropriateness Criteria, Acute Pancreatitis, 2006

- Patients with an elevated amylase or lipase level (≥ 3 times normal is diagnostic) 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).*
  
  *ACR Appropriateness Criteria, Acute Pancreatitis, 2006

- 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, 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 may be helpful in determining the need for MRCP.
SPLEEN

AB-32 ~ 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, Oct. 2006
- Indeterminate ultrasound may require CT abdomen without and with contrast (CPT 74170).*
- Indeterminate CT may require MRI abdomen without and with contrast (CPT 74183).
  - If ultrasound is indeterminate, MRI can be used in pregnant women and in children for further evaluation.
  - CT abdomen and pelvis without and with contrast (CPT 74170 and 72194) is indicated in patients with blunt abdominal trauma with suspected splenic rupture.

RENAL

ACUTE FLANK PAIN, RULE OUT RENAL STONE- SEE AB-4

AB-33 ~ INDETERMINATE RENAL LESION

- A newly discovered renal mass (indeterminate by the initial test) should be evaluated next by ultrasound in order to rule out a simple cyst. Simple cysts (spherical or ovoid shape, absence of internal echoes, presence of a thin smooth wall, enhancement of the posterior wall) that meet these criteria do not need further imaging.*
  *Am Fam Physician 2001;63:288-294 and 299
- CT of the abdomen without and with contrast (CPT 74170) is recommended for the indeterminate renal lesion that cannot be adequately classified as benign by ultrasound. If the patient cannot tolerate IV contrast, then MRI of the abdomen without and with contrast (CPT 74183) is appropriate.
- If 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-34 ~ RENAL FAILURE

• Ultrasound is the preferred initial imaging study for patients with acute or chronic renal failure. Nephrology (or Urology) evaluation can be helpful in determining the need for advanced imaging.*
  *ACR Appropriateness Criteria, Renal Failure, 2005

AB-35 ~ RENOVASCULAR HYPERTENSION

• Also see PVD-5 Aortic Disorders and Renal Vascular Disorders in the Peripheral Vascular Disease guidelines.
• 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.*
• 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.*
• Doppler ultrasound is the most cost-effective exam for screening renovascular 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 competence 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:
  o Patients under 40 years old with hypertension, controlled or uncontrolled, to exclude fibromuscular dysplasia of the renal arteries.
  o 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 (≥140/90) within the first 20 weeks of pregnancy should have renal artery imaging following delivery, if the hypertension persists >12 weeks post partum.

*Current Cardiology Reports 2005;7:405-411
*Gibson P. Hypertension and Pregnancy. Updated June 8, 2006

**URINARY TRACT**

**AB-36 ~ 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), 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 workup 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.*

*ACR Appropriateness Criteria, Radiologic Investigation of Patients with Hematuria, 2006

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

Urology evaluation can be helpful in determining the need for advanced imaging in patients with recurrent urinary tract infections.

- Thorough diagnostic workup 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).
- Children 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, Imaging in Acute Pyelonephritis, 2005

**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 good as CT, but ultrasound quality is not as consistent and is facility dependent.
• Suspected urethral diverticulum should be evaluated by voiding cystourethography, retrograde urethography, or ultrasound.
  o Pelvic MRI without and with contrast (CPT 72197) can be performed in equivocal cases.
  *ACR Appropriateness Criteria, Recurrent Lower Urinary Tract Infection in Women, 2005
  o Also see PV-9 Periurethral Cysts and Urethral Diverticula in the Pelvic guidelines.
AB-2~ ABDOMINAL PAIN
Evidence Based Clinical Support

- 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. 2nd 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.

AB-4~ ACUTE FLANK PAIN, RULE OUT RENAL STONE
Evidence Based Clinical Support

- 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.
AB-8~ RIGHT LOWER QUADRANT PAIN, RULE OUT APPENDICITIS
Evidence Based Clinical Support

- 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

AB-10~ MESENTERIC/COLOnic ISCHEMIA
Evidence Based Clinical Support

- Chronic mesenteric ischemia is associated with postprandial pain and marked weight loss. Imaging studies include Doppler ultrasound, MRA and CTA.
- Colonic ischemia in patients with mild-to-moderate abdominal pain, diarrhea, or lower intestinal bleeding with minimal-to-moderate abdominal tenderness should be evaluated with barium enema or colonoscopy. Advanced imaging typically is not necessary unless the pain is very severe and located over the right colon.
AB-12~ BARIATRIC SURGERY
Evidence Based Clinical Support

- 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.

AB-16~ LOWER EXTREMITY EDEMA
Evidence Based Clinical Support

- 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.

AB-17~ ADRENAL CORTICAL LESIONS
Evidence Based Clinical Support

- 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 ± 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 ± 11. *

• Plasma free metanephrines are the most sensitive biochemical test for pheochromocytoma.

**AB-19~ENDOVASCULAR ABDOMINAL AORTIC ANEURYSM (AAA) REPAIR**
Evidence Based Clinical Support

• 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 3 months, 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.

**AB-20~INFLAMMARTORY BOWEL DISEASE-RULE OUT CROHN’S DISEASE**
Evidence Based Clinical Support

• Children less than age 14 should be initially evaluated with ultrasound although ultrasound is user dependent.
• MRI should be used in children and pregnant women as an alternative to CT to reduce exposure to ionizing radiation.
• 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.

**AB-24– CIRRHOSIS AND LIVER SCREENING**

**Evidence Based Clinical Support**

• 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.

**AB-26–LIVER LesION CHARACTERIZATION**

**Evidence Based Clinical Support**

• 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.
**AB-30~PANCREATIC PSEUDOCYSTS**
Evidence Based Clinical Support

- 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.

**AB-33~INDETERMINATE RENAL LESION**
Evidence Based Clinical Support

- 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.*
- 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

**AB-35 ~ RENOVASCULAR HYPERTENSION**
Evidence Based Clinical Support

- 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).
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.


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.


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.*


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.

AB-36 ~ HEMATURIA
Evidence Based Clinical Support

• 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.*

ABDOMINAL GUIDELINE REFERENCES

AB-2~Abdominal Pain
- ACR Practice Guidelines for the performance of an ultrasound examination of the abdomen or retroperitoneum 1/1/02

AB-3~Abdominal Sepsis (Suspected Abdominal Abscess)
- ACR Appropriateness Criteria, Acute Abdominal Pain 2006

AB-4~Acute Flank Pain, Rule Out Renal Stone
- ACR Appropriateness Criteria, Acute Onset Flank Pain 2005

AB-5~Bowel Obstruction
- ACR Appropriateness Criteria, Suspected Small Bowel Obstruction 2005

AB-6~Left Lower Quadrant Pain, Rule Out Diverticulitis
- ACR Appropriateness Criteria, Left Lower Quadrant Pain 2005

AB-7~Left Upper Quadrant Pain
- ACR Practice Guidelines for the performance of an ultrasound examination of the abdomen or retroperitoneum 1/1/02

AB-8~Right Lower Quadrant Pain, Rule Out Appendicitis
- ACR Appropriateness Criteria, Acute Abdominal Pain 2006

AB-9~Right Upper Quadrant Pain, Rule Out Cholecystitis
- ACR Appropriateness Criteria, Right upper quadrant pain 2005
AB-10~Mesenteric/Colonic Ischemia

AB-11~Post Operative Pain Within 60 Days Following Abdominal Surgery
  ➢ ACR Appropriateness Criteria, Suspect small bowel obstruction 2005
  ➢ ACR Appropriateness Criteria, Acute abdominal pain and fever or suspected abdominal abscess 2006

AB-13~Blunt Abdominal Trauma
  ➢ ACR Appropriateness Criteria, Blunt abdominal trauma 2005

AB-14~Hernias

AB-15~Lipoma

AB-17~Adrenal Cortical Lesions
  ➢ ACR Appropriateness Criteria, Incidental discovery of adrenal mass 2005

AB-18~Abdominal Aortic Aneurysm (AAA)
  ➢ Hirsch AT, Haskal ZJ, Hertzer NR, et al. ACC/AHA 2005 practice guidelines for the management of patients with peripheral arterial disease (lower extremity, renal,


### AB-20~Inflammatory Bowel Disease, Rule Out Crohn’s Disease or Ulcerative Colitis

- *ACR Appropriateness Criteria, Crohn’s disease* 2005

### AB-21~GI Bleeding


### AB-22~Diarrhea/Constipation and Irritable Bowel


### AB-23~Virtual Colonoscopy (VC)


### AB-24~Cirrhosis and Liver Screening for Hepatocellular Carcinoma


### AB-25~Jaundice

- *ACR Appropriateness Criteria, Jaundice* 2005
AB-26~Liver Lesion Characterization


AB-27~Elevated LFT’S

- *ACR Appropriateness Criteria, Jaundice* 2005

AB-29~Pancreatic Lesion

- *ACR Appropriateness Criteria, Acute pancreatitis* 2006

AB-31~Pancreatitis

- *ACR Appropriateness Criteria, Acute pancreatitis* 2006

AB-32~Spleen

- *ACR Practice Guidelines for the performance of an ultrasound examination of the abdomen or retroperitoneum* Oct. 2006

AB-33~Indeterminate Renal Lesion


AB-34~Renal Failure

- *ACR Appropriateness Criteria, Renal failure* 2005

AB-35~Renovascular Hypertension


AB-36~Hematuria
- ACR Appropriateness Criteria, Radiologic investigation of patients with hematuria 2006

AB-37~Urinary Tract Infection (UTI)
- ACR Appropriateness Criteria, Imaging in acute pyelonephritis 2005
- ACR Appropriateness Criteria, Recurrent lower urinary tract infection in women 2005

AB-2~Abdominal Pain, Evidence Based Clinical Support

AB-8~Right Lower Quadrant Pain, Rule Out Appendicitis, Evidence Based Clinical Support

AB-16~Lower Extremity Edema, Evidence Based Clinical Support

AB-17~Adrenal Cortical Lesions, Evidence Based Clinical Support

**AB-24~Cirrhosis and Liver Screening, Evidence Based Clinical Support**


**AB-33~Indeterminate Renal Lesion, Evidence Based Clinical Support**


**AB-35~Renovascular Hypertension, Evidence Based Clinical Support**


**AB-36~Hematuria, Evidence Based Clinical Support**