



CLINICAL GUIDELINES

Abdomen Imaging Guidelines

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eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for individuals with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or individual's Primary Care Physician (PCP) may provide additional insight.

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Abbreviations for Abdomen Imaging Guidelines

AAA	abdominal aortic aneurysm
AASLD	American Association for the Study of Liver Diseases
ACE	angiotensin-converting enzyme
ACG	American College of Gastroenterology
ACR	American College of Radiology
ACTH	adrenocorticotrophic hormone
AFP	alpha-fetoprotein
AGA	American Gastroenterological Association
ALT	alanine aminotransferase
ASGE	American Society for Gastrointestinal Endoscopy
AST	aspartate aminotransferase
AUA	American Urological Association
BEIR	Biological Effects of Ionizing Radiation
BUN	blood urea nitrogen
CAG	Canadian Association of Gastroenterology
CNS	central nervous system
CT	computed tomography
CTA	computed tomography angiography
CTC	computed tomography colonography (aka: virtual colonoscopy)
DVT	deep vein thrombosis
ERCP	endoscopic retrograde cholangiopancreatography
EUS	endoscopic ultrasound
FNH	focal nodular hyperplasia
GFR	glomerular filtration rate
GGT	gamma glutamyltransferase
GI	gastrointestinal
HCC	hepatocellular carcinoma
HCPCS	Healthcare Common Procedural Coding System (commonly pronounced: "hix pix")

HU	Hounsfield units
IAA	iliac artery aneurysm
IV	intravenous
KUB	kidneys, ureters, bladder (plain frontal supine abdominal radiograph)
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 (CT colonography)
PFT	pulmonary function tests
WBC	white blood cell
ZES	Zollinger-Ellison Syndrome

AB-1: General Guidelines

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AB-1.0: General Guidelines

- A current clinical evaluation (within 60 days) is required before advanced imaging can be considered. The clinical evaluation may include a relevant history and physical examination, appropriate laboratory studies, and non-advanced imaging modalities such as plain x-ray or ultrasound. Other meaningful contact (telephone call, electronic mail or messaging) by an established individual can substitute for a face-to-face clinical evaluation.

AB-1.1: Overview

- GI Specialist evaluations can be helpful, particularly in determining mesenteric/colonic ischemia, diarrhea/constipation, irritable bowel syndrome (IBS), or need for MRCP.
- 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.
- Clinical concerns at the dividing line can be providers' choice (abdomen and pelvis; abdomen or pelvis).

AB-1.2: CT Imaging

- CT imaging is a more generalized modality. CT Abdomen is usually performed with contrast (CPT® 74160):
 - ◆ Oral contrast has no relation to the IV contrast administered. Coding for contrast only refers to IV contrast. There is no coding for oral contrast.
 - ◆ Exceptions are noted in these guidelines, and include:
 - CT Abdomen with contrast (CPT® 74160) or without and with contrast (CPT® 74170) with suspicion of a solid organ lesion (liver, kidney, pancreas, spleen).
 - Please refer to the specific guideline for the lesion in question for specific guidance.
 - CT Abdomen without contrast (CPT® 74150) or CT Abdomen and Pelvis without contrast (CPT® 74176) if there is renal insufficiency/failure, or a documented allergy to contrast. It can also be considered for diabetics or the very elderly.
 - CT Abdomen and Pelvis without and with contrast (CPT® 74178 – CT Urogram) for certain urologic conditions (e.g. hematuria)
 - ◆ Shellfish allergy:
 - It is commonly assumed that an allergy to shellfish infers iodine allergy, and that this implies an allergy to CT iodinated contrast media. However, this is NOT true. Shellfish allergy is due to tropomyosins. Iodine plays no role in these allergic reactions. Allergies to shellfish do not increase the risk of reaction to IV contrast any more than that of other allergens.

- ◆ CT Abdomen and Pelvis, usually with contrast (CPT® 74177), should be considered when signs or symptoms are generalized, or involve a lower quadrant of the abdomen.
- ◆ CT Enterography (CPT® 74177) combines CT imaging with large volumes of ingested neutral bowel contrast material to allow visualization of the small bowel.
- ◆ CT Enteroclysis
 - A tube is placed through the nose or mouth and advanced into the duodenum or jejunum. Bowel contrast material is infused through the tube and CT imaging is performed either with or without intravenous contrast.
 - CT Enteroclysis is used to allow visualization of the small bowel wall and lumen. CT Enteroclysis may allow better or more consistent distention of the small bowel than CT Enterography.
 - Report by assigning: CPT® 74176 or CPT® 74177
- ◆ Triple-phase CT
 - 3 phases of a triple-phase CT are:
 - 1) Hepatic arterial phase,
 - 2) Portal venous phase, and
 - 3) Washout or delayed acquisitions phase.
 - It should be noted that, in general, a precontrast or noncontrast CT is usually not needed in a standard triple-phase CT, except in those individuals previously treated with locoregional embolic or ablative therapies. Other specific instances in which a prior noncontrast CT may be indicated for the evaluation of liver lesions are noted in **AB-29.1: Liver Lesion Characterization.**
- CT Colonography (CTC)
 - ◆ There are 3 CPT® codes for CTC:
 - CPT® 74263: Screening CTC (only used for screening procedures)
 - CPT® 74261: CTC without contrast
 - CPT® 74262: CTC with contrast
 - ◆ See: **AB-25: CT Colonography (CTC)** for further indications for these procedures

AB-1.3: MR Imaging

- MRI may be preferred as a more targeted study in cases of renal failure, in individuals allergic to intravenous CT contrast, and as noted in these guidelines.
- ◆ MRI Abdomen with contrast only is essentially never performed. If contrast is indicated, MRI Abdomen without and with contrast (CPT® 74183) should be performed.
- ◆ For pregnant women ultrasound or MRI without contrast should be used to avoid radiation exposure. The use of gadolinium contrast agents is limited during pregnancy, as gadolinium contrast agents cross the placenta and enter the amniotic fluid with unknown long term effects on the fetus.
 - See: **AB-1.12** for additional discussion of this issue

- MR Elastography (CPT® 76391) replaces MRI Abdomen (CPT® 74183 or CPT® 74181) for requests for MR Elastography liver (See: **AB-45: Liver Elastography**)

AB-1.4: MR Enterography and Enteroclysis Coding Notes

- In the absence of written payer claims/billing guidelines, MR Enterography or Enteroclysis is reported in one of two ways:
 - ◆ MRI Abdomen without and with contrast (CPT® 74183), or
 - ◆ MRI Abdomen without and with contrast (CPT® 74183) and MRI Pelvis with and without contrast (CPT® 72197)

AB-1.5: Ultrasound

- Ultrasound, also called sonography, uses high frequency sounds waves to image body structures.
 - ◆ The routine use of 3D and 4D rendering, (post-processing), in conjunction with ultrasound is considered investigational.
 - ◆ All ultrasound studies require permanently recorded images either stored on film or in a Picture Archiving and Communication System (PACS).
 - ◆ The use of a hand-held or any Doppler device that does not create a hard-copy output is considered part of the physical examination and is not separately billable. This exclusion includes devices that produce a record that does not permit analysis of bi-directional vascular flow.
- Duplex scan describes an ultrasonic scanning procedure for characterizing the pattern and direction of blood flow in arteries and veins with the production of real-time images integrating B-mode 2D vascular structures, Doppler spectral analysis, and color flow Doppler imaging.
 - ◆ The minimal use of color Doppler alone, when performed for anatomical structure identification during a standard ultrasound procedure, is not separately reimbursable.

AB-1.6: Abdominal Ultrasound

- Complete abdominal ultrasound (CPT® 76700) includes all of the following required elements:
 - ◆ Liver, gallbladder, common bile duct, pancreas, spleen, kidneys, upper abdominal aorta, and inferior vena cava.
 - ◆ If a particular structure or organ cannot be visualized, the report should document the reason.
- Limited abdominal ultrasound (CPT® 76705) is without all of these required elements and can refer to a specific study of a single organ, a limited area of the abdomen, or a follow-up study.

- ◆ Further, CPT® 76705 should:
 - Be assigned to report follow-up studies once a complete abdominal ultrasound (CPT® 76700) has been performed; and
 - Be assigned to report ultrasonic evaluation of diaphragmatic motion; and
 - Be reported only once per individual imaging session; and
 - Not be reported with CPT® 76700 for the same individual for the same imaging session.

AB-1.7: Retroperitoneal Ultrasound

- Complete retroperitoneal ultrasound (CPT® 76770) includes all of the following required elements:
 - ◆ Kidneys, lymph nodes, abdominal aorta, common iliac artery origins, inferior vena cava.
 - ◆ For urinary tract indications, a complete study can consist of kidneys and bladder.
- Limited retroperitoneal ultrasound (CPT® 76775) studies are without all of these required elements and can refer to a specific study of a single organ, a limited area of the abdomen, or a follow-up study.
 - ◆ Further, CPT® 76775 should:
 - Be assigned to report follow-up studies once a complete retroperitoneal ultrasound (CPT® 76770) has been performed; and
 - Be reported only once per individual imaging session; and
 - Not be reported with CPT® 76770 for the same individual for the same imaging session.

AB-1.8: CT-, MR-, Ultrasound-guided Procedures

See: **Preface-4.2: CT-, MR-, or Ultrasound-Guided Procedures** in the Preface Imaging Guidelines

AB-1.9: Contrast-Enhanced Ultrasound

Ultrasound with contrast (CEUS, CPT® 76978, CPT® 76979) is an emerging technology that may be as good, if not better, than CT or MRI in certain circumstances. Abdominal Imaging Guidelines address its use as appropriate. CPT® 76978 refers to the initial imaging of the first lesion, and CPT® 76979 refers to additional lesions that are imaged subsequently.

AB-1.10: Quantitative MRI

- Quantitative MR analysis of tissue composition (CPT® 0648T, 0649T, 0697T and 0698T)
 - ◆ These CPT codes are investigational and experimental for coverage purposes.
 - ◆ See: **Preface-4.8: Quantitative MR Analysis of Tissue Composition** and **AB-29.2 Fatty Liver** for further discussion of these modalities.

AB-1.11: RADCAT Grading System

- The RADCAT (Radiology Report Categorization) Grading System was developed in order to communicate to ordering physicians (most commonly in the ER setting), the relative urgency of a radiologic finding. It is not related to the LI-RADs reporting system, nor does it necessarily imply the need for follow-up imaging, as opposed to clinical follow-up. The rating system is as follows:
 - ◆ RADCAT 1: Normal Result
 - ◆ RADCAT 2: Routine Result
 - ◆ RADCAT 3: Result with recommendation for non-urgent routine follow-up
 - ◆ RADCAT 4: Priority Result
 - ◆ RADCAT 5: Critical Result

AB-1.12: Pregnancy Considerations for Imaging

The American College of Obstetricians and Gynecologists has issued guidelines with regards to imaging during pregnancy and lactation. Their recommendations are as follows:¹⁵

- Ultrasonography and magnetic resonance imaging (MRI) are not associated with risk and are the imaging techniques of choice for the pregnant patient, but they should be used prudently and only when use is expected to answer a relevant clinical question or otherwise provide medical benefit to the patient.
- With few exceptions, radiation exposure through radiography, computed tomography (CT) scan, or nuclear medicine imaging techniques is at a dose much lower than the exposure associated with fetal harm.
 - ◆ If these techniques are necessary in addition to ultrasound or MRI or are more readily available for the diagnosis in question, they should not be withheld from a pregnant patient.
- The use of gadolinium contrast with MRI should be limited; it may be used as a contrast agent in a pregnant patient only if it significantly improves diagnostic performance and is expected to improve fetal or maternal outcome.
- With regards to iodinated IV contrast media, “it is generally recommended that contrast only be used if absolutely required to obtain additional diagnostic information that will affect the care of the fetus or woman during pregnancy”.

References

1. Faerber EN, Benator RM, Browne LP, et al. ACR–SPR Practice Parameter For The Safe And Optimal Performance Of Fetal Magnetic Resonance Imaging (MRI) *American College of Radiology*. Published 2014.
2. ACR Practice Guideline for Imaging Pregnant or Potentially Pregnant Adolescents and Women with Ionizing Radiation. American College of Radiology. Published 2014.
3. Runyon BA. Management of adult patients with ascites due to cirrhosis: An update. *Hepatology*. 2009;49(6):2087-2107.(revised 2012).
4. Berzigotti A, Ashkenazi E, Reverter E, et al. Non-Invasive Diagnostic and Prognostic Evaluation of Liver Cirrhosis and Portal Hypertension. *Disease Markers*. 2011;31(3):129-138.
5. Choi J-Y, Lee J-M, Sirlin CB. CT and MR Imaging Diagnosis and Staging of Hepatocellular Carcinoma: Part II. Extracellular Agents, Hepatobiliary Agents, and Ancillary Imaging Features. *Radiology*. 2014;273(1):30-50. doi:10.1148/radiol.14132362.
6. Chiorean L, Tana C, Braden B, et al. Advantages and Limitations of Focal Liver Lesion Assessment with Ultrasound Contrast Agents: Comments on the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) Guidelines. *Medical Principles and Practice*. 2016;25(5):399-407. doi:10.1159/000447670.
7. Claudon M, Dietrich C, Choi B, et al. Guidelines and Good Clinical Practice Recommendations for Contrast Enhanced Ultrasound (CEUS) in the Liver – Update 2012. *Ultraschall in der Medizin - European Journal of Ultrasound*. 2012;34(01):11-29. doi:10.1055/s-0032-1325499.
8. Beyer L, Wassermann F, Pregler B, et al. Characterization of Focal Liver Lesions using CEUS and MRI with Liver-Specific Contrast Media: Experience of a Single Radiologic Center. *Ultraschall in der Medizin - European Journal of Ultrasound*. 2017;38(06):619-625. doi:10.1055/s-0043-105264.
9. Trillaud H, Bruel J-M, Valette P-J, et al. Characterization of focal liver lesions with SonoVue®-enhanced sonography: International multicenter-study in comparison to CT and MRI. *World Journal of Gastroenterology*. 2009;15(30):3748. doi:10.3748/wjg.15.3748.
10. Marrero JA, Kulik LM, Sirlin CB, et al. Diagnosis, Staging, and Management of Hepatocellular Carcinoma: 2018 Practice Guidance by the American Association for the Study of Liver Diseases. *Hepatology*. 2018;68(2):723-750. doi:10.1002/hep.29913.
11. Baig, Mudassar. "Shellfish Allergy and Relation to Iodinated Contrast Media: United Kingdom Survey." *World Journal of Cardiology* 6, no. 3 (2014): 107-111. doi:10.4330/wjc.v6.i3.107.
12. Schabelman, Esteban, and Michael Witting. "The Relationship of Radiocontrast, Iodine, and Seafood Allergies: A Medical Myth Exposed." *The Journal of Emergency Medicine* 39, no. 5 (2010): 701-07. doi:10.1016/j.jemermed.2009.10.014.
13. Beckett, Katrina R., Andrew K. Moriarity, and Jessica M. Langer. "Safe Use of Contrast Media: What the Radiologist Needs to Know." *RadioGraphics* 35, no. 6 (2015): 1738-750. doi:10.1148/rg.2015150033.
14. Swenson DW, Baird GL, Portelli DC, Mainiero MB, Movson JS. Pilot study of a new comprehensive radiology report categorization (RADCAT) system in the emergency department. *Emergency Radiology*. 2017;25(2):139-145. doi:10.1007/s10140-017-1565-8.
15. Guidelines for diagnostic imaging during pregnancy and lactation. Committee Opinion No. 723. American College of Obstetricians and Gynecologists. *Obstet Gynecol*. 2017;130:e210–6.
16. Longo SA, Moore RC, Canzonieri BJ, Robichaux A. Gastrointestinal conditions during pregnancy. *Clin. Colon Rectal Surg*. 2010;23(2):80-89. doi:10.1055/s-0030-1254294.

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AB-2.1: Red Flag Signs and Symptoms

- In “red flag” situations, the imaging indications may vary from the usual imaging pathway.
- Red flags include any one of the following:
 - ◆ History of malignancy with a likelihood or propensity to metastasize to abdomen
 - ◆ Fever (≥ 101 degrees Fahrenheit)
 - ◆ Elevated WBC $>10,000$, or above the upper limit of normal for the particular lab reporting the result
 - ◆ Palpable mass of clinical concern and/or without benign features
 - ◆ GI bleeding, overt or occult, not obviously hemorrhoidal
 - ◆ Abdominal tenderness documented as moderate or severe
 - ◆ Peritoneal signs, such as guarding or rebound tenderness
 - ◆ Suspected complication of bariatric surgery
 - ◆ Notation by the ordering provider that the patient has a “surgical abdomen”
- Please note, “red flag” criteria may be applicable for initial and follow-up advanced imaging requests under any AB guideline pathway if currently present with respect to the specific imaging request.

AB-2.2: Acute/Persistent (Non-Chronic) Lower Abdominal Pain

- Left Lower Abdominal Pain (including suspected diverticulitis) <6 months duration
 - ◆ CT Abdomen and Pelvis with contrast
 - If ANY Red Flag present (See: **AB-2.1: Red Flag Signs and Symptoms**)
 - In the absence Red Flags, any one of the following:
 - Age ≥ 65
 - The presence of LLQ tenderness specifically noted on physical examination, and diverticulitis is specified as a diagnostic consideration
 - Immunocompromised individual (e.g., on immunosuppressive therapy, history of HIV)
 - If prior abdominal and pelvic US has been performed and demonstrates a need for additional imaging OR if they do not explain the source of pain
 - CBC, Basic Metabolic Panel, C-Reactive Protein or other inflammatory marker, Pregnancy Test, and Urinalysis have been performed (Note: it is not necessary for all the above tests to be performed, but, in the absence of other indications for advanced imaging, lab must be performed in relation to the current complaint, in order to direct imaging).
 - For follow-up imaging of acute diverticulitis if symptoms or elevated WBC persists despite treatment
 - For follow-up of complicated diverticulitis, including confirmed abscess, fistulae, free fluid, or perforation (See: **AB-3: Abdominal Sepsis/Suspected Abdominal Sepsis**).
 - For follow-up of diverticulitis treated with radiologic intervention (e.g. drainage procedure)

- Note: Per ASCRS, colonic endoscopic evaluation is recommended to confirm the diagnosis after resolution of acute diverticulitis to exclude malignancy, especially when initial CT scan supports abscess, shouldering, or shelf-like appearance of a presumed inflammatory mass, obstruction, mesenteric or retroperitoneal adenopathy.
- ◆ Pregnant individuals
 - US abdomen and/or pelvis should be considered initially to avoid ionizing radiation.
 - MRI abdomen and MRI pelvis without contrast if red flags are present or US is nondiagnostic. (See: **AB-1.12**)
- Right Lower Abdominal Pain (including suspected appendicitis)
 - ◆ CT Abdomen and Pelvis with or without contrast
 - If ANY Red Flag present or age ≥ 65 (See: **AB-2.1: Red Flag Signs and Symptoms**)
 - For Alvarado Score of ≥ 4
 - For AIR (Appendicitis Inflammatory Response Score) of ≥ 5
 - In the absence of the above:
 - Immunocompromised individual (e.g., on immunosuppressive therapy, history of HIV)
 - US of the abdomen and pelvis has been performed and is nondiagnostic or negative or indicates a need for further advanced imaging
 - CBC or CRP (or other inflammatory marker such as ESR or fecal calprotectin) have been performed related to this episode
 - ◆ Pregnant individuals
 - Abdominal US and/or Pelvic US initial imaging
 - MRI abdomen and pelvis without contrast if red flags or if initial US is nondiagnostic.
 - See above statement regarding CT and contrast during pregnancy.
- For Chronic lower abdominal pain (≥ 6 months), see: **AB-2.6: Chronic Abdominal Pain**
- For follow-up imaging for conservatively treated acute appendicitis, see: **AB-2.7 Non-Operative Treatment of Acute Appendicitis**.
- For Rectal Pain (Proctalgia) see: **PV-11.1: Pelvic Pain/Dyspareunia**, Female, Proctalgia Syndromes and **PV-19.1: Male Pelvic Disorders, Proctalgia Syndromes**.
- For pain described as pelvic, see: **PV-11.1** or other appropriate sections based on likely etiology.

CPT® Codes for AB-2.2			
CPT® 74150	CT Abdomen without contrast	CPT® 76700	Ultrasound, complete Abdomen
CPT® 74160	CT Abdomen with contrast	CPT® 76705	Ultrasound, limited Abdomen
CPT® 74176	CT Abdomen and Pelvis without contrast	CPT® 76830	Ultrasound, Transvaginal
CPT® 74177	CT Abdomen and Pelvis with contrast	CPT® 76856	Ultrasound, complete Pelvis
CPT® 74181	MRI Abdomen without contrast	CPT® 72195	MRI Pelvis without contrast
CPT® 74183	MRI Abdomen without and with contrast	CPT® 72197	MRI Pelvis without and with contrast

Background and Supporting Information

- The Alvarado Score for appendicitis risk is comprised of the following parameters with points assigned based on their presence, as follows:

Migration of pain	1 point
Anorexia	1 point
Nausea/vomiting	1 point
Right lower quadrant tenderness	1 point
Rebound pain	1 point
Temperature > 99.1	1 point
WBC > 10,000	2 points
PMNs ≥ 75%	1 point

- ◆ Low Risk: <4
- ◆ Moderate Risk: 4-7
- ◆ High Risk: ≥8

➤ Appendicitis Inflammatory Response Score (AIR)

Vomiting	1 point
Right iliac fossa pain	1 point
Rebound tenderness	Light – 1 point Medium – 2 points Strong – 3 points
Febrile (temperature ≥ 101.3)	1 point
PMNs	70-84% - 1 point $\geq 85\%$ - 2 points
WBC	10-14.9 – 1 point ≥ 15 – 2 points
CRP	10-49 – 1 point >50 – 2 points

- ◆ Low Probability: 0-4
- ◆ Mild Probability: 5-8
- ◆ High Probability: 9-12

AB-2.3: Right Upper Quadrant Pain including Suspected Gallbladder Disease

- For Pregnant Women, see: **AB-1.12**
- For all others:
 - ◆ Abdominal ultrasound (complete or limited) is the initial diagnostic test in the absence of red flags.
 - ◆ CT Abdomen with contrast, or MRCP/MRI (MRI Abdomen without or without and with contrast) if ultrasound is equivocal or nondiagnostic, or if red flags are present (see: **AB-27.1** for MRCP coding)
- Hepatobiliary System Imaging (HIDA) with OR without pharmacologic intervention (CPT® 78226 or CPT® 78227) can be considered:
 - ◆ If there is right upper quadrant pain or epigastric pain and there is a suspicion of gallbladder disease, with a normal, or equivocal or non-diagnostic recent ultrasound
 - NOTE: If findings on US suggest acute cholecystitis in a symptomatic individual (presence of gallstones with gallbladder wall thickening, Murphy's sign, and peri-cholecystic fluid) then a HIDA scan is generally not needed.
 - If the HIDA without pharmacologic intervention (CPT® 78226) is initially performed and is normal or inconclusive, the site can convert the study to HIDA with pharmacologic intervention (CPT® 78227). The member will not need to return for a second study with injection of a pharmaceutical.

- ◆ Suspected bile leak after trauma or surgery.
- ◆ Monitoring of liver regeneration
- ◆ Assessment of liver transplant
- ◆ Assessment of choledochal cyst
- ◆ Pre-operative assessment prior to partial hepatectomy.
- ◆ Chronic acalculous cholecystitis, biliary dyskinesia, functional gallbladder disease, or sphincter of Oddi dysfunction can be imaged with a HIDA with or without pharmacologic intervention (CPT® 78226 or CPT® 78227)

AB-2.4: Left Upper Quadrant (LUQ) Pain

- Most common causes which may be more specifically evaluated:
 - ◆ Splenic etiologies:
 - Suspected trauma, or splenomegaly
 - See: **AB-34: Spleen**
 - Suspected infarct or abscess (severe pain and tenderness, fever, history of atrial fibrillation)
 - CT Abdomen without and with contrast or with contrast (CPT® 74170 or CPT® 74160)
 - ◆ Pancreatic etiologies:
 - Suspected pancreatitis
 - See: **AB-33.1: Acute Pancreatitis**
 - ◆ Renal etiologies
 - Suspected nephrolithiasis
 - See: **AB-4.1: Suspected Renal/Ureteral Stone**
 - Suspected pyelonephritis or abscess
 - See: **AB-40.1: Upper (Pyelonephritis)**
 - ◆ Suspected small or large bowel etiologies (e.g., ischemia, obstruction, volvulus, diverticulitis)
 - CT Abdomen (CPT® 74160) or CT Abdomen and Pelvis (CPT® 74177)
 - ◆ Gastric etiologies
 - If there is concern for peptic ulcer disease, or if the complaint is dyspepsia, without any red flags suggesting possible perforation or penetration, endoscopy would be the best study for assessing these potential conditions. See: **EGD-1** in the EGD guidelines
 - If there is concern for a more urgent gastric problem, such as perforation, or any red flag is present, then a CT Abdomen (CPT® 74160) or CT Abdomen and Pelvis (CPT® 74177) can be approved.
 - ◆ Suspected aortic dissection
 - See: **PVD-6.7: Aortic Dissection and Other Aortic Conditions** in the Peripheral Vascular Disease Imaging Guidelines
 - ◆ Unknown etiology, simply reported as LUQ pain
 - LUQ pain with any red flag: CT Abdomen or CT Abdomen and Pelvis (CPT® 74160 or CPT® 74177) can be approved.
 - LUQ pain without any red flags
 - Prior to advanced imaging, an adequate history and physical examination, with lab work to include: CBC, chemistry profile including electrolytes,

BUN, creatinine, LFTs (ALT, AST, alkaline phosphatase and bilirubin) lipase, amylase, and urinalysis, should be performed with the intention of trying to establish a potential etiology.

- If these evaluations and lab studies are negative or inconclusive for establishing a potential etiology which can be more specifically evaluated as described above, a CT Abdomen or CT Abdomen and Pelvis (CPT® 74160 or CPT® 74177) can be approved

Background and Supporting Information

LUQ pain is more difficult to categorize with regard to imaging as there are many potential etiologies, which might be better evaluated with different imaging procedures.

AB-2.5: Epigastric Pain and Dyspepsia

- Epigastric pain with red flags: (non-pregnant individuals)
 - ◆ ANY of the following:
 - Ultrasound Abdomen (CPT® 76700 or CPT® 76705)
 - CT Abdomen with contrast (CPT® 74160)
 - MRCP/MRI Abdomen with and without contrast (CPT® 74183) (See: **AB-27.1** for MRCP coding)
- Epigastric pain without red flags or dyspepsia (defined by the ACG and CAG as predominant epigastric pain lasting at least one month and can be associated with any upper gastrointestinal symptoms such as epigastric fullness, nausea, vomiting, or heartburn):

(Note: Those individuals with abnormal laboratory tests or physical findings should also be assessed under the appropriate guidelines for those findings, e.g. LFTs, jaundice, etc.)

 - ◆ Ultrasound Abdomen (CPT® 76700 or CPT® 76705) to assess for biliary/pancreatic disease
 - ◆ CT Abdomen (CPT® 74160) or MRI Abdomen (CPT® 74183), or MRCP (CPT® 74181 or CPT® 74183), may be appropriate to evaluate positive findings on ultrasound. The use of these advanced imaging procedures to evaluate the ultrasound findings may be specifically addressed in the dedicated guideline.
 - ◆ CT Abdomen (CPT® 74160), or MRI Abdomen (CPT® 74183) for persistent symptoms after a negative or inconclusive upper gastrointestinal endoscopy and ultrasound as well as ONE of the following:
 - Test and treat for *Helicobacter pylori* (*H. pylori*) and a trial of acid suppression with a proton pump inhibitor (PPI) for 4–8 weeks if eradication is successful, but symptoms do not resolve OR
 - An empiric trial of acid suppression with a PPI for 4–8 weeks.
- NOTE: See imaging for pregnant women **AB-1.12**

AB-2.6: Chronic Abdominal Pain

- Evaluation of Chronic Abdominal Pain (defined as continuous or intermittent symptoms >6 months)
 - ◆ If red flag symptoms are present:
 - CT Abdomen with contrast (CPT® 74160) or CT Abdomen and Pelvis with contrast (CPT® 74177)
 - ◆ In the absence of red flag symptoms:
 - Epigastric Pain and Dyspepsia
 - See: **AB-2.5: Epigastric Pain and Dyspepsia**
 - Right Upper Quadrant Pain
 - See: **AB-2.3: Right Upper Quadrant Pain including Suspected Gallbladder Disease**
 - Left Upper Quadrant Pain
 - See: **AB-2.4: Left Upper Quadrant (LUQ) Pain**
 - Nonspecific, generalized or lower abdominal pain
 - CT Abdomen with contrast (CPT® 74160) or CT Abdomen and Pelvis with contrast (CPT® 74177) as requested (include pelvis for lower abdominal complaints or findings) for the following:
 - Initial laboratory assessment (see below) is negative or does not provide specific causes for more directed workup (for example, colonoscopy or EGD if iron deficiency anemia is found, or CT Urogram if urinalysis shows hematuria)
 - CBC with differential, chemistry profile including electrolytes, glucose, creatinine, BUN and liver chemistries, ESR, urinalysis amylase and lipase (for generalized or upper abdominal complaints), thyroid function tests, and serology testing for celiac (if celiac is suspected)

AB-2.7: Non-operative Treatment of Acute Appendicitis

- Recurrent symptoms or routine post-treatment follow-up, if requested:
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177)

(Note: Non-operative treatment of acute appendicitis is increasingly utilized. There is an approximately 2% chance of a pathologic finding not initially identified prior to treatment (e.g. Crohn's Disease or an appendiceal neoplasm such as a carcinoid). In view of this, some authors suggest a follow-up imaging study in asymptomatic patients, post-antibiotic treatment.)

AB-2.8: Non-chronic Nonspecific Abdominal Pain With No Localizing Findings

- Nonspecific abdominal pain can have multiple etiologies and be a diagnostic dilemma. Often, the history, physical examination, and laboratory data can guide subsequent workup in individuals presenting with abdominal pain (e.g. RUQ pain would lead to US for the evaluation of cholecystitis). If, despite an initial history and physical examination the clinical suspicion cannot be localized, and there is no specific indication of a significant concern for serious pathology (e.g., no red flags) then further workup and appropriate imaging may be directed by the results of initial lab studies or the results of non-advanced imaging relevant to and ordered for the evaluation of the current complaint being investigated.
- When possible, please use the more specific guideline, depending on clinical presentation and the differential diagnosis offered by the provider:
 - ◆ **AB-2.3: Right Upper Quadrant Pain including Suspected Gallbladder Disease**
 - ◆ **AB-2.4: Left Upper Quadrant (LUQ) Pain**
 - ◆ **AB-2.5: Epigastric Pain and Dyspepsia**
 - ◆ **AB-2.6: Chronic Abdominal Pain**
 - ◆ **AB-4: Flank Pain, Rule Out or Known Renal/Ureteral Stone**
 - ◆ **AB-5.1: Gastroenteritis**
 - ◆ **AB-6: Mesenteric/Colonic Ischemia**
 - ◆ **AB-7: Post-Operative Pain With-in 60 Days Following Abdominal Surgery – Abdominal Procedure**
 - ◆ **AB-20: Bowel Obstruction and Gastroparesis**
 - ◆ **AB-21: Diarrhea, Constipation, and Irritable Bowel**
 - ◆ **AB-23: Inflammatory Bowel Disease Rule Out Crohn's Disease or Ulcerative Colitis**
 - ◆ **AB-33: Pancreatitis**
- Evaluation of Nonspecific Abdominal Pain:
 - ◆ US Abdomen and/or Pelvis
 - ◆ CT Abdomen and Pelvis with contrast:
 - Age ≥65
 - Any Red Flag
 - If a prior US Abdomen and/or Pelvis performed for the current complaint is unrevealing or does not explain the pain
 - Preliminary labs such as CBC, electrolytes, lipase or amylase, urinalysis, ESR or CRP, or LFT's are unrevealing or do not point to a specific etiology that would otherwise direct more appropriate imaging (such as findings suggestive of pancreatitis or biliary tract disease). Note: All the specific laboratory studies listed are not required, but there should be some studies performed relating to the current episode in order to help direct imaging appropriately. (Note: Pregnancy test should be performed prior to CT in all appropriate reproductive age females)

- ◆ Special Populations:
 - Pregnant women:
 - US Abdomen and/or Transvaginal and/or complete Pelvis as the initial study
 - If US is equivocal OR ANY Red Flag:
 - MRI Abdomen and/or Pelvis without contrast

References

1. Cartwright S and Knudsen M. Evaluation of Acute Abdominal Pain in Adults. *Am Fam Physician*. 2008 Apr 1;77(7):971-978.
2. Moayyedi PM, Lacy BE, Andrews CN, et al. ACG and CAG Clinical Guideline: Management of Dyspepsia. *Am J Gastroenterol*.
3. Fashier J and GITU A. Diagnosis and Treatment of Peptic Ulcer Disease and H. pylori infection. *Am Fam Physician* 2015 Feb 15;91 (4): 236-242.
4. Talley NJ, Vakil N, and the Practice Parameters Committee of the American College of Gastroenterology. Guidelines for the management of dyspepsia. *American Journal of Gastroenterology*, 2005; 100:2324–2337.
5. ACR Appropriateness Criteria® left lower quadrant pain — suspected diverticulitis *The American College of Radiology*. Revised 2014). National Guideline Clearinghouse.
6. Yarmish GM, Smith MP, Rosen MP, et al. Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® right upper quadrant pain. *J Am Coll Radiol*. 2014; 11(3): 316–32.
7. Continuing Medical Education: July 2017: ACG and CAG Clinical Guideline: Management of Dyspepsia. *The American Journal of Gastroenterology*. 2017;112(7):987-987. doi:10.1038/ajg.2017.190.
8. Ringel-Kulka, Tamar, et. al. Evaluation of Chronic Abdominal Pain in Adults. Nov 28, 2018. Epocrates (Content by British Medical Journal).
9. Charles, G, Chery, M, King Channell, M. Chronic Abdominal Pain: Tips for the Primary Care Provider. *Osteopathic Family Physician*; Jan/Feb, 2019.11(1).
10. Mendelson R. Diagnostic tests: Imaging for chronic abdominal pain in adults. *Australian Prescriber*. 2015;38(2):49-54. doi:10.18773/austprescr.2015.019.
11. Sakorafas GH. Interval routine appendectomy following conservative treatment of acute appendicitis: Is it really needed. *World Journal of Gastrointestinal Surgery*. 2012;4(4):83. doi:10.4240/wjgs.v4.i4.83.
12. Talan DA, Saltzman DJ, Deugarte DA, Moran GJ. Methods of conservative antibiotic treatment of acute uncomplicated appendicitis. *Journal of Trauma and Acute Care Surgery*. 2019;86(4):722-736. doi:10.1097/ta.0000000000002137.
13. Jang T, Chauhan V, Cundiff C, Kaji AH. Assessment of emergency physician–performed ultrasound in evaluating nonspecific abdominal pain. *The American Journal of Emergency Medicine*. 2014;32(5):457-460. doi:10.1016/j.ajem.2014.01.004.
14. Gans SL, Pols MA, Stoker J, Boermeester MA. Guideline for the Diagnostic Pathway in Patients with Acute Abdominal Pain. *Digestive Surgery*. 2015;32(1):23-31. doi:10.1159/000371583.
15. Lameris W, Randen AV, Es HWV, et al. Imaging strategies for detection of urgent conditions in patients with acute abdominal pain: diagnostic accuracy study. *Bmj*. 2009;338(jun26 2). doi:10.1136/bmj.b2431.
16. American College of Radiology. ACR Appropriateness Criteria. Acute Nonlocalized Abdominal Pain. 2018.
17. DiSaverio S, Podda M, De Simone B, et. al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES (World Society of Emergency Surgery) Jerusalem guidelines. *World J Emerg Surg*. 2020;15:27. doi:10.1186/s13017-020-00306-3.
18. Garcia EM, Camacho MA, Karolyi DR, et. al. ACR Appropriateness Criteria® right lower quadrant pain – suspected appendicitis. *J Am Coll Radiol*. 2018;15(11S):S373-S387. doi:10.1016/j.jacr.2018.09.033.
19. Longo SA, Moore RC, Canzonieri BJ, Robichaux A. Gastrointestinal conditions during pregnancy. *Clin. Colon Rectal Surg*. 2010; 23(2):80-89. doi:10.1055/s-0030-1254294.
20. Guidelines for diagnostic imaging during pregnancy and lactation. Committee Opinion No. 723. American College of Obstetricians and Gynecologists. *Obstet Gynecol*. 2017;130:e210–6.
21. Von-Mühlen B, Franzon O, Beduschi MG, Kruehl N, Lupselo D. AIR score assessment for acute appendicitis. *Arg Bras Cir Dig*. 2015;28(3):171-173. doi:10.1590/S0102-672020150003000006.
22. Snyder MJ, Guthrie M, Cagle S. Acute appendicitis: efficient diagnosis and management. *Am Fam Physician*. 2018;98(1):25-33.
23. Hall J, Hardiman K, Lee S, et. al. The American Society of Colon and Rectal Surgeons clinical practice guidelines for the treatment of left-sided colonic diverticulitis. *Dis Colon Rectum*. 2020;63:728-747. doi:10.1097/DCR.0000000000001679.
24. Wilkins T, Embry K, George R. Diagnosis and management of acute diverticulitis. *Am Fam Physician*. 2013;87(9):612-620.
25. Schultz JK, Azhar N, Binda GA, et. al. European Society of Coloproctology: guidelines for the management of diverticular disease of the colon. *Colorectal Disease*. 2020;22(2):5-28. doi:10.1111/codi.15140.
26. Strate LL, Morris AM. Epidemiology, pathophysiology, and treatment of diverticulitis. *Gastroenterology*. 2019;156:1282-1298. doi:10.1053/j.gastro.2018.12.033.
27. Schreyer AG, Layer G. S2K guidelines for diverticular disease and diverticulitis: diagnosis, classification, and therapy for the radiologist. *Rofo*. 2015;187(8):676-84. doi:10.1055/s-0034-1399526.

AB-3: Abdominal Sepsis (Suspected Abdominal Abscess)

AB-3.1: Abdominal Sepsis

- CT Abdomen, or CT Pelvis, or CT Abdomen and Pelvis with contrast (CPT® 74160, or CPT® 72193, or CPT® 74177) for abdominal symptoms associated with fever and/or elevated white blood cell count.¹
 - ◆ See: **AB-2.1: Red Flag Signs and Symptoms** for “red flags”
- CT Abdomen and Pelvis with contrast (CPT® 74177) interval imaging as requested for intraperitoneal abscess.
- Serial Ultrasound (CPT® 76705) or CT Abdomen, CT Pelvis, or CT Abdomen and Pelvis with contrast (CPT® 74160, or CPT® 72193, or CPT® 74177) studies may be performed for follow-up of known abnormal fluid collections, especially following catheter drainage. The interval can be days, weeks, or months, based on the clinical course of the individual.

Reference

1. ACR Appropriateness Criteria® Acute (nonlocalized) Abdominal Pain and Fever or Suspected Abdominal Abscess. *American College of Radiology, Published 2012. Rev. 2018.*

AB-4: Flank Pain, Rule Out or Known Renal/Ureteral Stone

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AB-4.2: Observation of Known Renal/Ureteral Stone(s)	26
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AB-4.0: Ultrasound

- Retroperitoneal ultrasound (CPT® 76770 or CPT® 76775) can be used in place of CT Abdomen and Pelvis at any of the initial or follow-up indications, if requested by Provider.

AB-4.1: Suspected Renal/Ureteral Stone(s)

- Suspected renal/ureteral stone with symptoms in non-pregnant adults (flank pain/renal colic)^{1,2}
 - ◆ CT Abdomen and Pelvis without contrast (CPT® 74176)
- Suspected renal/ureteral stone in pregnant women (flank pain/renal colic)^{3,4}
 - ◆ Ultrasound (CPT® 76770 or CPT® 76775) or MRI Abdomen and Pelvis without contrast (CPT® 74181 and CPT® 72195)
 - The use of gadolinium contrast agents is contraindicated during pregnancy unless the specific need for that procedure outweighs risk to the fetus.
- Suspected renal/ureteral stone in children (flank pain/renal colic)
 - ◆ See: **PEDAB-4: Flank Pain, Renal Stone** in the Pediatric Abdomen Imaging Guidelines
- Suspicion renal/ureteral stones (flank pain/renal colic) with hematuria
 - ◆ CT Abdomen and Pelvis without contrast (CPT® 74176) or CT Urogram (CPT® 74178)

AB-4.2: Observation of Known Renal/Ureteral Stone(s)

- Radiopaque Stones
 - ◆ Initial follow-up imaging:
 - Retroperitoneal ultrasound (CPT® 76770 or CPT® 76775) and KUB X-ray
 - ◆ Subsequent follow-up imaging:
 - If initial follow-up ultrasound and KUB are negative, and there is no hematuria and individual is asymptomatic:
 - See: **AB-4.4: Annual Surveillance**
 - If initial follow-up ultrasound and KUB demonstrates hydronephrosis, retained stone, or if the individual has persistent hematuria, or is symptomatic:
 - CT Abdomen and Pelvis without contrast (CPT® 74176)
- Non-radiopaque Stones (i.e. radiolucent)
 - ◆ Initial follow-up imaging:
 - CT Abdomen and Pelvis without contrast (CPT® 74176)
 - ◆ Subsequent follow-up imaging:
 - If CT is negative:
 - See: **AB-4.4: Annual Surveillance**
 - If CT demonstrates a retained stone, hydronephrosis, or if the individual is being evaluated for surgery:
 - Further imaging can be considered on an individual basis

Background and Supporting Information

- Radiopaque versus radiolucent stones on plain radiograph:
 - ◆ Radiopaque
 - Calcium-based stones (70-80%)
 - Struvite stones (triple phosphate) (usually opaque but variable – 15-20%)
 - ◆ Radiolucent
 - Uric acid (5-10%)
 - Cystine (1-3%)
 - Medication stones (e.g. indinavir) (1%)

AB-4.3: Follow-Up of Treated Renal/Ureteral Stone

- Post-shock wave lithotripsy (SWL):
 - ◆ Retroperitoneal ultrasound (CPT® 76770 or CPT® 76775) is the appropriate initial follow-up imaging.
 - ◆ Retroperitoneal ultrasound (CPT® 76770 or CPT® 76775) and/or CT Abdomen and Pelvis (contrast as requested) may be indicated for:
 - Individuals who are symptomatic
 - Individuals with hydronephrosis
 - Individuals who have residual fragments
 - ◆ Individuals treated by SWL who have passed fragments, are asymptomatic and without hydronephrosis can be followed according to **AB-4.4: Annual Surveillance**.
- Post-medical expulsive therapy (MET):
 - ◆ Retroperitoneal ultrasound for individuals treated by MET who have passed a stone and are symptomatic.
 - ◆ CT Abdomen and Pelvis (contrast as requested) if hydronephrosis is demonstrated with ultrasound.
 - ◆ Individuals treated by MET who have passed a stone and are asymptomatic can be followed according to **AB-4.4: Annual Surveillance**.
- Post-ureteroscopic extraction with an intact stone:
 - ◆ Retroperitoneal ultrasound for individuals without symptoms
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177) for individuals with symptoms or hydronephrosis demonstrated on ultrasound
 - ◆ Individuals without symptoms or without hydronephrosis demonstrated on ultrasound can be followed according to **AB-4.4: Annual Surveillance**.
- Post-ureteroscopic extraction requiring fragmentation of the stone(s):
 - ◆ Retroperitoneal ultrasound for individuals without symptoms
 - ◆ CT Abdomen and Pelvis without contrast (CPT® 74176) for individuals without symptoms, but hydronephrosis demonstrated on ultrasound
 - ◆ Individuals without symptoms or without hydronephrosis demonstrated on ultrasound can be followed according to **AB-4.4: Annual Surveillance**.
 - ◆ Retroperitoneal ultrasound and KUB for individuals with symptoms and a radiopaque stone

- ◆ CT Abdomen and Pelvis without contrast (CPT® 74176) for individuals with symptoms and a non-radiopaque stone
- Retroperitoneal ultrasound and/or CT Abdomen and Pelvis (contrast as requested) may be indicated for individuals with persistent symptoms and/or hydronephrosis.

AB-4.4: Annual Surveillance

- Annual surveillance for stable individuals who have a history of stones may be indicated to assess for stone growth or formation of new stones:
 - ◆ Plain X-ray (KUB) should be performed for individuals with radiopaque stones
 - ◆ Retroperitoneal ultrasound (CPT® 76770 or CPT® 76775) is the preferred modality for individuals with non-radiopaque stones

AB-4.5: Nuclear Kidney Imaging

- Nuclear kidney imaging (CPT® 78707, CPT® 78708, or CPT® 78709) can be considered for evaluation of any of the following:^{5,6}
 - ◆ Recurrent flank pain when CT and ultrasound are non-diagnostic.
 - ◆ Prior imaging (CT or ultrasound) shows hydronephrosis and to determine if this truly obstructive in nature.

References

1. Fulgham PF, Assimos DG, Pearle MS, et al. Clinical Effectiveness Protocols for Imaging in the Management of Ureteral Calculous Disease: AUA Technology Assessment. *The Journal of Urology*. 2013;189(4):1203-1213.
2. Dubinsky TJ, Sadro CT. Acute Onset Flank Pain–Suspicion of Stone Disease. *Ultrasound Quarterly*. 2012;28(3):239-240.
3. Faerber EN, Benator RM, Browne LP, et al. ACR–SPR Practice Parameter for the Safe and Optimal Performance of Fetal Magnetic Resonance Imaging (MRI). *American College of Radiology*. (Revised 2015).
4. Faerber EN, Abramson SJ, Benator RM, et al. ACR Practice Guideline for Imaging Pregnant or Potentially Pregnant Adolescents and Women with Ionizing Radiation. *American College of Radiology*. (Revised 2013).
5. Banks KP, Green ED, Brown RKJ, et al. ACR–SPR Practice Guideline for the Performance of Renal Scintigraphy. (Revised 2017). *American College of Radiology*.
6. Remer EM, Papanicolaou N, Casalino DD, et al. American College of Radiology Appropriateness Criteria – Renal Failure. *American College of Radiology*. (Revised 2013).
7. Pearle MS, Godfarb DS, Assimos DG. Medical management of kidney stones: AUA guideline. *American Urological Association (AUA)*. 2019.
8. Assimos D, Krambeck A, Miller NL, et al. Surgical Management of Stones: American Urological Association/Endourological Society Guideline, PART I. *Journal of Urology*. 2016;196(4):1153-1160. doi:10.1016/j.juro.2016.05.090.
9. Assimos D, Krambeck A, Miller NL, et al. Surgical Management of Stones: American Urological Association/Endourological Society Guideline, PART II. *Journal of Urology*. 2016;196(4):1161-1169. doi:10.1016/j.juro.2016.05.091.
10. Cheng PM, Moin P, Dunn MD, Boswell WD, Duddalwar VA. What the radiologist needs to know about urolithiasis: part 1 – pathogenesis, types, assessment, and variant anatomy. *AJR Am J Roentgenol*. 2012;198(6):W540-7. doi:10.2214/AJR.10.7285.

AB-5: Gastroenteritis

AB-5.1: Gastroenteritis

- CT Abdomen and Pelvis with contrast (CPT® 74177) if:
 - ◆ Acute abdomen suggesting bowel obstruction, toxic megacolon (abdominal swelling, fever, tachycardia, elevated white blood cell count), or perforation
 - ◆ Bloody stools
 - ◆ Immunocompromised
 - ◆ Previous gastric bypass
 - ◆ Any “Red Flag” (See: **Red Flag Signs and Symptoms**)

Background and Supporting Information

Gastroenteritis is a nonspecific term which denotes a constellation of symptoms including, to a varying degree, nausea, vomiting, diarrhea, and abdominal pain. It is usually caused by infectious agents such as norovirus. The broad differential of such symptoms evades establishing a guideline to evaluate gastroenteritis, as a specific entity, from an imaging standpoint.

Reference

1. Scorza K, Williams A, Phillips D, et al. Evaluation of Nausea and Vomiting. *American Family Physician*, 2007, 76(1):76-84. Vol. 92, No. 11.
DuPont HL, Practice Parameters of the American College of Gastroenterology. Guideline on acute infectious diarrhea in adults. *The American Journal of Gastroenterology*, 1997; 92: 1962-1975.

AB-6: Mesenteric/Colonic Ischemia

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AB-6.1: Mesenteric Ischemia

- Suspicion of acute mesenteric ischemia, ONE of the following:
 - ◆ CTA Abdominal and/or Pelvic (Mesenteric) (CPT® 74174, or CPT® 74175, or CPT® 72191) (preferable), **or**
 - ◆ MRA Abdominal and/or Pelvic (CPT® 72198 and/or CPT® 74185), **or**
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177).
- Post-procedure surveillance imaging following invasive treatment for mesenteric ischemia (celiac, superior mesenteric, and inferior mesenteric angioplasty with or without stenting, or mesenteric artery bypass grafting):
 - ◆ Baseline Duplex ultrasound (CPT® 93975 or CPT® 93976) within 1 month of the procedure
 - ◆ Duplex ultrasound (CPT® 93975 or CPT® 93976) at 6 months, 12 months, 18 months, and then annually thereafter
 - ◆ CT Abdomen or Abdomen and Pelvis with contrast (CPT® 74160 and CPT® 74177) or CTA Abdomen or Abdomen and Pelvis (CPT® 74174 or CPT® 74175) or MRA Abdomen (CPT® 74185) and if requested, MRA Pelvis (CPT® 72198):
 - For symptoms suggesting recurrent ischemia OR
 - In the absence of symptoms, following a Duplex Ultrasound if, on the Duplex study:
 - Celiac axis:
 - PSV >370 cm/s or a substantial increase from the post-treatment baseline PSV (substantial increase has not been defined) or demonstration of restenosis ≥70%
 - Superior mesenteric artery:
 - PSV >420 cm/s, or a substantial increase from the post-treatment baseline PSV (substantial increase has not been defined) or demonstration of restenosis of ≥70%
 - Inferior mesenteric artery:
 - Substantial increase from the post treatment baseline PSV (substantial increase has not been defined).

Background and Supporting Information

- Typical presentation of mesenteric ischemia is based on severe abdominal pain out of proportion to findings on physical exam, usually in individuals with underlying risk factors including cardiovascular disease, atrial fibrillation, hypertension, etc.

AB-6.2: Colonic ischemia (including ischemic colitis)

- CT Abdomen and Pelvis with contrast (CPT® 74177) is considered the first imaging modality in order to assess the distribution and phase of the colitis, and it can be performed if abdominal pain **and**:
 - ◆ Rectal bleeding; **or**
 - ◆ Moderate or severe tenderness; **or**
 - ◆ Fever (≥ 101 degrees); **or**
 - ◆ Guarding, rebound tenderness, or other peritoneal signs; **or**
- Elevated WBC as per the testing laboratory's range Repeat imaging for asymptomatic or improving individuals, including routine post-operative imaging, is generally not needed.
- CTA Abdomen (CPT® 74175) or CTA Abdomen and Pelvis (CPT® 74174) or MRA Abdomen (CPT® 74185) and if requested, MRA Pelvis (CPT® 72198) can be performed for suspicion of right sided or pancolonic ischemia (as suggested on the initial CT Abdomen and Pelvis or by history/physical examination)

Background and Supporting Information

- Suspicion of colonic ischemia based on sudden cramping abdominal pain accompanied by urgency to defecate and passage of bright red blood, maroon blood, or bloody diarrhea, with risk factors including cardiovascular disease, diabetes mellitus, kidney disease, previous abdominal surgery, use of constipating medications, COPD, and atrial fibrillation.
- As noted in the ACG Clinical Guideline:
 - ◆ “ In contrast to AMI (*acute mesenteric ischemia*) in which conventional mesenteric angiography or CTA plays an essential role, vascular imaging studies are not indicated in most patients with suspected CI (*colonic ischemia*) because by the time of presentation, colon blood flow has usually returned to normal and the observed changes are not from ongoing ischemia but rather reflect the ischemic insult with or without reperfusion injury”

References

1. Fidelman N, Funaki BS, Ray CE, et al. Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® radiologic management of mesenteric ischemia. *American College of Radiology (ACR)*; 2011 (Revised 2016).
2. Menke J. Diagnostic Accuracy Of Multidetector CT In Acute Mesenteric Ischemia: Systematic Review And Meta-Analysis. *Radiology*. 2010; 256: 93-101.
3. Olivia IB, Davarpanah AH, Rybicki FJ, et al. AI ACR Appropriateness Criteria- Imaging of Mesenteric Ischemia 2018. *The American College of Radiology*.
4. Brandt LJ, Feuerstadt P, Longstreth GF, et al. Epidemiology, Risk Factors, Patterns of Presentation, Diagnosis, and Management of Colonic Ischemia. *American College of Gastroenterology*. 2015; 110: 18-44.
5. Bala M, Kashuk J, Moore EE, et al. Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery. *World Journal of Emergency Surgery*. 2017;12(1). doi:10.1186/s13017-017-0150-5.
6. Zierler RE, Jordan WD, Lal BK, et al. The Society for Vascular Surgery practice guidelines on follow-up after vascular surgery arterial procedures. *Journal of Vascular Surgery*. 2018;68(1):256-284. doi:10.1016/j.jvs.2018.04.018.
7. Peck MA, Conrad MF, Kwolek CJ, Lamuraglia GM, Paruchuri V, Cambria RP. Intermediate-term outcomes of endovascular treatment for symptomatic chronic mesenteric ischemia. *Journal of Vascular Surgery*. 2010;51(1). doi:10.1016/j.jvs.2009.06.064.
8. Cai W, Li X, Shu C, et al. Comparison of Clinical Outcomes of Endovascular Versus Open Revascularization for Chronic Mesenteric Ischemia: A Meta-analysis. *Annals of Vascular Surgery*. 2015;29(5):934-940. doi:10.1016/j.avsg.2015.01.010.
9. Alahdab F, Arwani R, Pasha AK, et al. A systematic review and meta-analysis of endovascular versus open surgical revascularization for chronic mesenteric ischemia. *Journal of Vascular Surgery*. 2018;67(5):1598-1605. doi:10.1016/j.jvs.2017.12.046.

AB-7: Post-Operative Pain Within 60 Days Following Abdominal Surgery – Abdominal Procedure

AB-7.1: Post-Op Pain within 60 Days

- CT Abdomen and/or Pelvis with contrast (CPT® 74177, or CPT® 74160, or CPT® 72193) can be performed for suspected postoperative/post procedure complications (For example: bowel obstruction, abscess or anastomotic leak).
- Beyond 60 days postoperatively, see: **AB-2: Abdominal Pain**
- See: **AB-42.3: Liver Transplant, Post-Transplant Imaging** for post-transplant indications and imaging

Reference

1. ACR Appropriateness Criteria® acute (nonlocalized) abdominal pain and fever or suspected abdominal abscess. *American College of Radiology*. Published 2012. Rev. 2018.

AB-8: Abdominal Lymphadenopathy

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AB-8.1: Abdominal Lymphadenopathy

- History of malignancy
 - ◆ Refer to oncology guidelines specific for that known malignancy
 - ◆ Biopsy may be considered
- Clinical or lab findings suggesting a lymphoproliferative disorder:
 - ◆ Biopsy
 - ◆ PET/CT (CPT® 78815) may be considered prior to biopsy in order to determine a more favorable site for biopsy, when a prior biopsy was nondiagnostic, or a relatively inaccessible site is contemplated which would require invasive surgical intervention for biopsy attempt.
Clinical note: Due to its relative lack of specificity as well as higher cost, PET is a less efficient alternative to biopsy.
- Clinical or laboratory findings suggesting benign etiology, and no history of malignancy:
 - ◆ CT Abdomen and Pelvis (CPT® 74177) for 3-month follow-up.
 - ◆ If no changes at 3 months, 2 additional follow-up scans (at 6 months and one year) can be approved.
 - ◆ If no changes by one year, the finding can be considered benign. No further imaging.
- If a follow-up CT demonstrates a concerning change, biopsy should be performed. If biopsy is inconclusive, PET/CT (CPT® 78815) can be approved

AB-8.2: Inguinal Lymphadenopathy

There is no evidence-based support for advanced imaging of clinically evidenced inguinal lymph adenopathy without biopsy.

- High suspicion of lymphoma: See **ONC-27: Non-Hodgkin Lymphomas** and **ONC-28: Hodgkin Lymphoma** in the Oncology Imaging Guidelines
- Prior history of malignancy: See **ONC-31: Metastatic Cancer, Carcinoma of Unknown Primary Site, and Other Types of Cancer** in the Oncology Imaging Guidelines

Background and Supporting Information

- Localized inguinal lymphadenopathy should prompt:
 - ◆ Search for adjacent extremity injury or infection
 - ◆ 3 to 4 weeks of observation if clinical picture is benign
 - ◆ Excisional or image guided core needle biopsy under ultrasound or CT guidance of most abnormal lymph node if condition persists or malignancy suspected
- Generalized inguinal lymphadenopathy should prompt:
 - ◆ Diagnostic work-up, including serological tests, for systemic diseases and
 - ◆ Excisional or image guided core needle biopsy under ultrasound or CT guidance of most abnormal lymph node if condition persists or malignancy suspected.

AB-8.3: Sclerosing Mesenteritis and Mesenteric Panniculitis

- For new or worsening clinical symptoms, or if not previously performed:
 - ◆ CT Abdomen and Pelvis without and with contrast (CPT® 74178)
- Requests for follow-up imaging in asymptomatic individuals or for sequential imaging to monitor for the development of malignancy:
 - ◆ Further imaging in these scenarios is not supported in the absence of worsening or new clinical symptoms.
- PET imaging is not indicated for the evaluation of Sclerosing Mesenteritis or Mesenteric Panniculitis

Background and Supporting Information

- Sclerosing mesenteritis and mesenteric panniculitis are rare, incompletely understood entities that are characterized by an idiopathic inflammatory condition of the mesentery, with radiologic findings including:
 - ◆ Fatty mass lesion in the small intestinal mesentery
 - ◆ “Halo” (fat ring) surrounding lymph nodes or vessels
 - ◆ Lymph nodes in the fatty mass
 - ◆ A “pseudocapsule”
 - ◆ “Misty” mesentery
 - ◆ Calcifications from fat necrosis
- Sclerosing mesenteritis may represent a spectrum of diseases (retractile mesenteritis, mesenteric panniculitis, and mesenteric lipodystrophy), or may be stages of one disease with progression.
- The chronic inflammation may result in fibrosis with a mass effect and can involve the gut (causing obstruction), the mesenteric vessels, and other intra-abdominal or retroperitoneal organs. The etiology is uncertain, but may be secondary to trauma (previous abdominal surgery), an autoimmune process, ischemia, infection, and possibly may represent a paraneoplastic syndrome secondary to a malignancy, though this is controversial.
- There is an increased prevalence of malignancy in individuals with sclerosing mesenteritis, and this has resulted in requested for sequential imaging in stable or asymptomatic individuals. In addition, requests may be made to assess the clinical response in those undergoing active treatment.
- However, studies have reported that the data on potentially developing a subsequent malignancy is inconclusive and thus “it does not seem justified to subject patients with MP, especially those in whom other associations such as abdomino-pelvic surgery may explain the MP findings, to multiple follow-up CT scans with the aim of detecting a future malignancy”¹. This recommendation is supported by other authors.^{2,3,4,5}
- In addition, there is no correlation between radiologic and clinical findings, and management decisions are guided by the severity and type of symptoms. Thus, sequential radiologic imaging to assess treatment response is not recommended.²

References

1. Nyberg L, Björk J, Björkdahl P, Ekberg O, Sjöberg K, Vigren L. Sclerosing mesenteritis and mesenteric panniculitis – clinical experience and radiological features. *BMC Gastroenterology*. 2017;17(1). doi:10.1186/s12876-017-0632-7.
2. Akram S, Pardi DS, Schaffner JA, Smyrk TC. Sclerosing Mesenteritis: Clinical Features, Treatment, and Outcome in Ninety-Two Patients. *Clinical Gastroenterology and Hepatology*. 2007;5(5):589-596. doi:10.1016/j.cgh.2007.02.032.
3. Green MS, Chhabra R, Goyal H. Sclerosing mesenteritis: a comprehensive clinical review. *Annals of Translational Medicine*. 2018;6(17):336-336. doi:10.21037/atm.2018.07.01.
4. Catlow J, Twemlow M, Lee T. PWE-141 Should we reimaging mesenteric panniculitis? *Small Bowel*. 2017. doi:10.1136/gutjnl-2017-314472.386.
5. Halligan S, Plumb A, Taylor S. Mesenteric panniculitis: systematic review of cross-sectional imaging findings and risk of subsequent malignancy. *European Radiology*. 2016;26(12):4531-4537. doi:10.1007/s00330-016-4298-2.
6. Protin-Catteau L, Thiéfin G, Barbe C, Jolly D, Soyer P, Hoeffel C. Mesenteric panniculitis: review of consecutive abdominal MDCT examinations with a matched-pair analysis. *Acta Radiologica*. 2016;57(12):1438-1444. doi:10.1177/0284185116629829.
7. Bazemore AW and Smucker DR. Lymphadenopathy and malignancy. *American Family* 2002, 66(1), 2103-2111.
8. Heller M, Harisinghani M, Neitlich J, et al. Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 3: White Paper of the ACR Incidental Findings Committee II on Splenic and Nodal Findings. *American College of Radiology*, Volume 10, Issue 11, Pages 833-839, November 2013.
9. Gaddey HL, Riegel AM. Unexplained Lymphadenopathy: Evaluation and Differential Diagnosis. *American Family Physician*. 2016 Dec 1;94(11):896-903.

AB-9: Bariatric Surgery and Percutaneous Gastrostomy

AB-9.1: Bariatric Surgery	40
AB-9.2: Percutaneous Gastrostomy	40

AB-9.1: Bariatric Surgery

- Pre-operative Assessment:
 - ◆ Abdominal ultrasound (CPT® 76700 or CPT® 76705) to assess the liver and gallbladder
- Post-operative complications:
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177) or CT Abdomen with contrast (CPT® 74160) may be used for individuals who have had weight loss surgery and present with suspected complications including:
 - Weight loss failure
 - Heartburn
 - Nausea or vomiting
 - Abdominal pain
 - Fever
 - Abdominal distension
 - Suspected hernia
- Note: Internal hernias in patients who have had Roux-en-Y gastric bypasses may have intermittent and relatively mild abdominal symptoms which require immediate evaluation with CT imaging.
- See: **AB-7: Post-Operative Pain Within 60 Days Following Abdominal Surgery – Abdominal Procedure**

Background and Supporting Information

- Bariatric procedures include gastric banding, gastric bypass, sleeve gastrectomy, and biliopancreatic diversion procedures.
- Though abdominal pain in post-operative bariatric patients may be gallbladder-induced and an ultrasound would be helpful for this diagnosis, the complications of bariatric surgery can become quickly life-threatening, and so any request for CT imaging in the post-operative bariatric individual should not be delayed with recommendations for ultrasound, even if the examination does not indicate any “red flags”.

AB-9.2: Percutaneous Gastrostomy

- Percutaneous Endoscopic Gastrostomy (PEG)
 - ◆ CT or MRI is generally not needed pre-operatively for PEG placement.
 - ◆ CT Abdomen with or without contrast (CPT® 74160 or 74150):
 - For pre-operative assessment in the presence of:
 - Abdominal wall defects such as an open abdomen
 - The presence of “ostomy” sites or drain tubes
 - Abdominal surgical scars or prior major abdominal surgery
 - Known situs inversus
 - Known paraesophageal hernia

- Previous endoscopic attempt did not achieve adequate transillumination through the abdominal wall or compression and a suitable site for PEG placement could not be determined.
- ◆ Percutaneous Gastrostomy via Interventional Radiologist using CT guidance
 - A pre-operative CT Abdomen with or without contrast (CPT® 74150, 74160) may be appropriate for complicated cases in which a safe window cannot be determined via fluoroscopy. See above indications for CT prior to endoscopic gastrostomy tube placement for pre-operative indications.
- ◆ Suspected complication of an endoscopically or IR-placed gastrostomy or jejunostomy tube:
 - CT Abdomen with or without contrast (CPT® 74150, 74160) or CT Abdomen and Pelvis with or without contrast (CPT® 74176 or 74177)

Background and Supporting Information

- A percutaneous endoscopic gastrostomy utilizes endoscopic guidance in order to place the feeding tube.
- The optimal site for gastrostomy placement is determined by illuminating the abdominal wall from the stomach using the scope and simultaneously indenting the wall with the finger, and visualizing that indentation endoscopically.
 - ◆ Routine CT prior to this is generally not needed.
 - ◆ A recent study⁵ retrospectively compared complication rates between patients who underwent a pre-procedure CT vs. those that did not, and found no difference in the rate of bleeding events, need for operative intervention, and accidental tube dislodgement.
 - One patient in the non-CT group had an injury due to the tube being placed through the colon, but in that case there was failure of transillumination through the abdominal wall.
 - The authors concluded, “routine CT to evaluate for unfavorable anatomy such as overlying liver or transverse colon prior to PEG tube placement does not result in a reduced complication rate. Safe site selection utilizing the correct technique of transillumination of the abdominal wall and visualization of the indentation of the operator’s finger is essential for safe PEG tube placement.”

References

1. Gaetke-Udager K, Wasnik A, Kaza R, et al. A Guide To Imaging In Bariatric Surgery. *Emergency Radiology*, June 2014; 21(3):309-319. .
2. Levine MS and Carucci LR. Imaging of Bariatric Surgery: Normal Anatomy and Postoperative Complications. *Radiology*. 2014;270(2):327-341.
3. Varghese JC and Roy-Choudhury SH. Radiological imaging of the GI tract after bariatric surgery. *Gastrointestinal Endoscopy*. 2009;70(6):1176-1181.
4. Schneider R, Lazaridis I, Kraljević M, Beglinger C, Wölnerhanssen B, Peterli R. The impact of preoperative investigations on the management of bariatric patients; results of a cohort of more than 1200 cases. *Surgery for Obesity and Related Diseases*. 2018;14(5):693-699. doi:10.1016/j.soard.2018.01.009.
5. Miskimins RJ, Glenn JM, Kanya C, Paffett CL, Arshad S, Auyang ED. Routine CT Prior to PEG tube placement does not reduce complication rates. Poster presented at SAGES 2017 Annual Meeting.
6. Itkin M, DeLegge MH, Fang JC, et. al. Multidisciplinary practical guidelines for gastrointestinal access for enteral nutrition and decompression from the Society of Interventional Radiology and American Gastroenterological Association Institute, with endorsement by Canadian Interventional Radiological Association and Cardiovascular and Interventional Radiological Society of Europe. *AGA*. 2011;131:742-765. doi:10.1053/j.gastro.2011.06.001.
7. Jain R, Maple JT, Anderson MA, et. al. The role of endoscopy in enteral feeding. *Gastrointest Endosc*. 2011;74(1)7-12. doi:10.1016/j.gie.2010.10.021.
8. Arvanitakis M, Gkolfakis P, Despott EJ, et. al. Endoscopic management of enteral tubes in adult patients - part 1: definitions and indications. *Endoscopy*. 2021;53:81-92. doi:10.1055/a-1303-7449.
9. Arvanitakis M, Gkolfakis P, Despott EJ, et. al. Endoscopic management of enteral tubes in adult patients - part 2: peri- and post-procedural management. *Endoscopy*. 2021;53:178-195. doi:10.1055/a-1331-8080.

AB-10: Blunt Abdominal Trauma

AB-10.1: Blunt Abdominal Trauma

- Abdominal and/or Pelvic ultrasound (CPT® 76700 and/or CPT® 76856) can be approved for the evaluation of blunt abdominal trauma when requested.
- CT Abdomen and/or Pelvis with contrast (CPT® 74160, or CPT® 72193, or CPT® 74177):
 - ◆ High probability intra-abdominal injury
 - Abdominal pain or tenderness
 - Pelvic or femur fracture
 - Lower rib fracture
 - Costal margin tenderness or evidence of thoracic wall trauma
 - Diminished breath sounds
 - Vomiting
 - Pneumothorax
 - Hematocrit <30%
 - Hematuria
 - Elevated AST
 - Non-examinable individual (intoxicated, less than fully conscious, Glasgow Coma Scale Score <13, etc.)
 - Evidence of abdominal wall trauma or seat-belt sign
 - ◆ If ultrasound demonstrates any positive finding(s)

References

1. ACR Appropriateness Criteria® blunt abdominal trauma Clinical Practice Guidelines. Guideline Central.
2. Soto JA and Anderson SW. Multidetector CT of Blunt Abdominal Trauma. *Radiology*. 2012;265(3):678-693.
3. Nishijima DK, Simel DL, Wisner DH, et al. Does this adult patient have a blunt intra-abdominal injury? *JAMA* 2012; 307:1517.
4. Washington State Department of Health Office of Community Health Systems: Trauma Clinical Guideline. May 2017. <https://www.doh.wa.gov/Portals/1/Documents/Pubs/530168.pdf>.
5. Jansen JO, Yule SR, Loudon MA. Investigation of blunt abdominal trauma. *Bmj*. 2008;336(7650):938-942. doi:10.1136/bmj.39534.686192.80.
6. Diercks DB, Mehrotra A, Nazarian DJ, Promes SB, Decker WW, Fesmire FM. Clinical Policy: Critical Issues in the Evaluation of Adult Patients Presenting to the Emergency Department With Acute Blunt Abdominal Trauma. *Annals of Emergency Medicine*. 2011;57(4):387-404. doi:10.1016/j.annemergmed.2011.01.013.

AB-11: Gaucher Disease and Hemochromatosis

AB-11.1: Gaucher Disease	45
AB-11.2: Hereditary (Primary) Hemochromatosis (HH) and Other Iron Storage Diseases	45

AB-11.1: Gaucher Disease

- MRI Abdomen without contrast (CPT® 74181) and MRI Lower Extremity without contrast (CPT® 73718) should be used as follows:
 - ◆ Individuals not on enzyme therapy every 12 to 24 months¹
 - ◆ Individuals on enzyme therapy every 12 months:
 - For change in dose of medication, complication from medication specific for treatment of Gaucher disease or clinical complication, individuals with active bone disease may require more frequent monitoring than once a year.
- See: **PEDPN-4: Gaucher Disease** in the Pediatric Peripheral Nerve Disorders (PND) Imaging Guidelines

Background and Supporting Information

- Gaucher disease is a lysosomal storage disease characterized by glucosylceramide accumulation in the spleen, liver, kidneys, lung, brain, and bone marrow

AB-11.2: Hereditary (Primary) Hemochromatosis (HH) and Other Iron Storage Diseases

- MRI Abdomen without contrast (CPT® 74181) for iron quantification
 - ◆ If transferrin iron saturation (TS) ≥45% OR Elevated serum ferritin (males >300 ng/ml, females >200 ng/ml)
- AND
- ◆ Genetic studies for hemochromatosis have been performed and results are ANY of the following:
 - Negative for hemochromatosis
 - C282Y/H63D compound heterozygote
 - C282Y heterozygote
 - Non-C282Y homozygote
- ◆ Note:
 - For C282Y/C282Y homozygote, iron quantification generally not indicated. Workup is as follows:
 - If serum ferritin >1000 ug/L or elevated liver enzymes:
 - Liver biopsy for fibrosis staging and rule out concurrent liver disease
 - If serum ferritin <1000 ug/L and normal liver enzymes:
Therapeutic phlebotomy
(Note: Studies indicate that measurements of hepatic iron concentration by MRI may be more useful in ruling out than diagnosing clinically significant iron overload. MRI can distinguish between primary and secondary iron overload based on iron uptake in the reticuloendothelial system.)

- For the evaluation of suspected hepatic iron overload in chronic transfusional states (e.g., sickle cell disease, thalassemia, oncology patients, bone marrow failure, and stem cell transplant individuals):
 - ◆ MRI Abdomen without contrast (CPT® 74181) for iron quantification can be performed annually
- See: **PEDAB-18.2: Transfusion-Associated (Secondary) Hemochromatosis** in the Pediatric Abdomen Imaging Guidelines regarding transfusion-associated hepatic iron deposition.
- If clinical, biopsy, or radiological findings suggest advanced fibrosis or cirrhosis and HCC surveillance is requested, then follow HCC Screening Guidelines - See **AB-26.1: Chronic Liver Disease, Cirrhosis and Screening for HCC**.
- Role of MR Elastography (CPT® 76391):
 - ◆ The role of MR Elastography to assess the degree of fibrosis in the setting of hemochromatosis is not yet clearly defined and thus not currently approvable.
 - ◆ One of the main limitations of MR Elastography is that artifact from excess iron deposition degrades signal intensity in MRE sequences, leading to technical failure of elastography and a decrease in MRE's diagnostic reliability. The latest ACG Clinical Guideline (2019) indicates that MRI for the purpose of estimating hepatic iron concentration is appropriate in the circumstances described above. However, "if there is a concomitant need to stage hepatic fibrosis, then liver biopsy is the preferred method."¹⁴ The ACG diagnostic algorithm for the workup of hemochromatosis does not include MR Elastography at any stage, including the evaluation for the presence, absence, or degree of fibrosis.

Background and Supporting Information

- An elevated serum ferritin >1000 mcg/l is associated with an increased risk of cirrhosis and mortality in C282 homozygotes, while a serum ferritin <1000 mcg/l is associated with a very low likelihood of cirrhosis.
- The role of serial MRI for monitoring hepatic iron concentration in hemochromatosis has not been defined. Treatment is phlebotomy and results are monitored by serum ferritin.

References

1. Zoller H and Henninger B. Pathogenesis, Diagnosis, and Treatment of Hemochromatosis. *Digestive Diseases*. 2016;34:364-373.
2. Weinreb NJ, Aggio MC, Andersson HC, et al. Gaucher disease type 1: revised recommendations on evaluations and monitoring for adult patients. *Seminars in Hematology*, 2004, 41(4 Suppl 5), 15-22.
3. Taouli B, Ehman RL, Reeder SB. Advanced MRI Methods for Assessment of Chronic Liver Disease. *American Journal of Roentgenology*. 2009;193(1):14-27.
4. Penugonda N. Cardiac MRI in Infiltrative Disorders: A Concise Review. *Current Cardiology Reviews*, 2010, 6(2), 134-136.
5. Chavhan GB, Babyn PS, Thomas B, et al. Principles, Techniques, and Applications of T2*-based MR Imaging and Its Special Applications. *RadioGraphics*. 2009;29(5):1433-1449.
6. Bacon BR, Adams PC, Kowdley KV, et al. Diagnosis and management of hemochromatosis: 2011 Practice Guideline by the American Association for the Study of Liver Diseases. *Hepatology*. 2011;54(1):328-343.
7. Sarigianni M, Liakos A, Vlachaki E, et al. Exam 1: Accuracy of Magnetic Resonance Imaging in Diagnosis of Liver Iron Overload: A Systematic Review and Meta-analysis. *Clinical Gastroenterology and Hepatology*. 2015;13(1). Accessed October 19, 2017. [http://www.cghjournal.org/article/S1542-3565\(14\)00928-8/fulltext](http://www.cghjournal.org/article/S1542-3565(14)00928-8/fulltext).
8. Zoller H, and Henninger B. Pathogenesis, Diagnosis, and Treatment of Hemochromatosis: *Dig Dis* 2016;34:364-373.
9. Kanwar P, Kowdley KV. Diagnosis and treatment of hereditary hemochromatosis: an update. *Expert Review of Gastroenterology & Hepatology*. 2013;7(6):517-530. doi:10.1586/17474124.2013.816114.
10. EASL clinical practice guidelines for HFE hemochromatosis. *Journal of Hepatology*. 2010;53(1):3-22. doi:10.1016/j.jhep.2010.03.001.
11. Bacon BR, Adams PC, Kowdley KV, Powell LW, Tavill AS. Diagnosis and management of hemochromatosis: 2011 Practice Guideline by the American Association for the Study of Liver Diseases. *Hepatology*. 2011;54(1):328-343. doi:10.1002/hep.24330.
12. Initial TS% > 45% Hemochromatosis Diagnosis Algorithm. http://www.irondisorders.org/Websites/idi/files/Content/863362/HHC_Both_April_16_2017.pdf.
13. Kowdley KV, Brown KE, Ahn J, Sundaram V. ACG Clinical Guideline. Hereditary Hemochromatosis. *The American Journal of Gastroenterology*. 2019;1. doi:10.14309/ajg.0000000000000315.
14. Degnan AJ, Ho-Fung VM, Ahrens-Nicklas RC, et al. Imaging of non-neuronopathic Gaucher disease: recent advances in quantitative imaging and comprehensive assessment of disease involvement. *Insights into Imaging*. 2019;10(1). doi:10.1186/s13244-019-0743-5.
15. Wagner M, Corcuera-Solano I, Lo G, et al. Technical Failure of MR Elastography Examinations of the Liver: Experience from a Large Single-Center Study. *Radiology*. 2017;284(2):401-412. doi:10.1148/radiol.2016160863.
16. Ghos HM, Kröner PT, Stancampiano FF, et al. Hepatic iron overload identified by magnetic resonance imaging-based T2* is a predictor of non-diagnostic elastography. *Quantitative Imaging in Medicine and Surgery*. 2019;9(6):921-927. doi:10.21037/qims.2019.05.13.
17. Yin M, Glaser KJ, Talwalkar JA, Chen J, Manduca A, Ehman RL. Hepatic MR Elastography: Clinical Performance in a Series of 1377 Consecutive Examinations. *Radiology*. 2016;278(1):114-124. doi:10.1148/radiol.2015142141.
18. Fitzsimons EJ, Cullis JO, Thomas DW, Tsochatzis E, Griffiths WJH. Diagnosis and therapy of genetic haemochromatosis (review and 2017 update). *British Journal of Haematology*. 2018;181(3):293-303. doi:10.1111/bjh.15164.

AB-12: Hernias

AB-12.1: Inguinal or Femoral Hernia	49
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AB-12.1: Inguinal or Femoral Hernia

- Clinical examination alone is usually sufficient for confirming the diagnosis of an evident groin hernia
- Ultrasound, pelvic limited (CPT® 76857) or pelvic complete (CPT® 76856) is the initial imaging study if:
 - ◆ Vague groin swelling with diagnostic uncertainty
 - ◆ Poor localization of swelling (as might be seen with a small hernia and prominent overlying fat)
 - ◆ Intermittent swelling not present on examination
 - ◆ Other groin complaints without swelling
- CT Pelvis with contrast (CPT® 72193) or without contrast (CPT® 72192)
 - ◆ If ultrasound is indeterminate or non-diagnostic
 - ◆ For suspected incarceration or strangulation
- MRI Pelvis without contrast (CPT® 72195) or with and without contrast (CPT® 72197)
 - ◆ If ultrasound is indeterminate or non-diagnostic, and musculoskeletal ailments such as osteitis pubis, or athletic pubalgia are in the differential, see: **MS-23: Pelvis** in the Musculoskeletal Imaging Guidelines for applicability of MRI.
- For chronic post-surgical groin pain (after hernia repair):
 - ◆ Pelvic ultrasound (CPT® 76856 or CPT® 76857) or US-guided nerve block
 - ◆ CT Pelvis with contrast (CPT® 72193) or without contrast (CPT® 72192) or MRI Pelvis without contrast (CPT® 72195) or without and with contrast (CPT® 72197) can be approved if either ultrasound or ultrasound-guided nerve block is indeterminate or non-diagnostic, to assess for other, non-neuropathic causes.

AB-12.2: Spigelian, Ventral, Umbilical, or Incisional Hernia

- Known or suspected primary or recurrent Spigelian hernia (anterior abdominal wall hernia through the semilunar line), ventral hernia, umbilical, or incisional hernia:
 - ◆ CT Abdomen without or with contrast (if above the umbilicus) (CPT® 74150 or CPT® 74160) **or**
 - ◆ CT Pelvis without or with contrast (if below the umbilicus) (CPT® 72192 or CPT® 72193) **or**
 - ◆ CT Abdomen and Pelvis without or with contrast (if above and below the umbilicus) (CPT® 74176 or CPT® 74177)

AB-12.3: Hiatal Hernia

- CT Chest and/or Abdomen with contrast (CPT® 71260 and/or CPT® 74160) to evaluate ANY of the following:
 - ◆ GI specialist or surgeon or any provider in consultation with one of these specialists request for treatment/pre-operative planning.
 - ◆ Suspected complication of primary disease or surgery.

Background and Supporting Information

- Some complications might include suspicion of a gastric volvulus (torsion) within the chest cavity, vomiting, chest pain, and difficulty in swallowing

AB-12.4: Indeterminate Groin Pain

- See: **MS-23: Pelvis** in the Musculoskeletal Imaging Guidelines

References

1. Yaghamai V, Yee J, Cash B, Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® palpable abdominal mass. American College of Radiology. Published 2014.
2. LeBlanc KE, LeBlanc LL, LeBlanc KA. Inguinal hernias: Diagnosis and Management. Am Fam Physician, 2013;87(12):844-848.
3. Hartman S, Leyendecker JR, Friedman B, et al., Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® acute onset of scrotal pain -- without trauma, without antecedent mass. Reston (VA): American College of Radiology (ACR); Last review date, 2014.
4. International guidelines for groin hernia management. Hernia. 2018;22(1):1-165. doi:10.1007/s10029-017-1668-x.
5. Murphy KP, Oconnor OJ, Maher MM. Adult Abdominal Hernias. American Journal of Roentgenology. 2014;202(6). doi:10.2214/ajr.13.12071.
6. Peters JH. SAGES guidelines for the management of hiatal hernia. *Surgical Endoscopy*. 2013;27(12):4407-4408. doi:10.1007/s00464-013-3212-0.

AB-13: Abdominal Mass

AB-13.1: Abdominal Wall Mass	52
AB-13.2: Intra-Abdominal Mass	52
AB-13.3: Abnormal Findings on Endoscopy/Colonoscopy	52

AB-13.1: Abdominal Wall Mass

- Abdominal ultrasound and/or Pelvic ultrasound (CPT® 76700 or CPT® 76705 and/or CPT® 76856) is the initial imaging study to assess an abdominal wall or subcutaneous mass.
- MRI Abdomen without and with contrast (CPT® 74183) or CT Abdomen with contrast (CPT® 74160) to assess a suspected malignant or indeterminate mass detected on ultrasound (Pelvic imaging can be included depending on the location of the mass).

AB-13.2: Intra-Abdominal Mass

- Palpable abdominal mass on physical examination:
 - ◆ CT Abdomen with contrast (CPT® 74160) or if extending below the umbilicus or involving the pelvis, CT Abdomen and Pelvis with contrast (CPT® 74177) or CT Pelvis with contrast (CPT® 72193)
 - ◆ Abdominal ultrasound (CPT® 76700) and/or Pelvis ultrasound (CPT® 76856) may be approved if requested
 - ◆ MRI Abdomen without and with contrast (CPT® 74183) and/or MRI Pelvis without and with contrast (CPT® 72197) may be approved to evaluate indeterminate findings on a prior CT or ultrasound. (Pelvic imaging may be included if the mass extends below the umbilicus or involves the pelvis.)
 - ◆ For a pulsatile abdominal mass, suspected aortic aneurysm: See: **PVD-6.3: Abdominal Aortic Aneurysm (AAA)** in the Peripheral Vascular Disease (PVD) Imaging Guidelines
 - ◆ For females with a suspected adnexal mass or fibroid: See: **PV-5: Adnexal Mass/Ovarian Cysts** or **PV-12: Leiomyomata/Uterine Fibroids** in the Pelvis Imaging Guidelines.
- Pregnant individual:
 - ◆ Abdominal and/or Pelvic and/or Transvaginal ultrasound (CPT® 76700 and/or CPT® 76856 and/or CPT® 76830) is appropriate for initial imaging.
 - ◆ Follow-up Imaging if ultrasound findings are indeterminate: See: **AB-2.1: Red Flag Signs and Symptoms**

AB-13.3: Abnormal Findings on Endoscopy/Colonoscopy

- Submucosal colonic lesions above the rectum or unexplained colonic extrinsic compression above the rectum:
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177)
- Colonic Mucosal Mass or Polypoid Lesion above the rectum:
 - ◆ If pathology shows invasive cancer OR if colonoscopic findings describe a fungating, ulcerated, bleeding, irregular, circumferential (partial or complete) mass (i.e., findings that suggest a colonic malignancy based on the endoscopic appearance):

- CT Abdomen and Pelvis with contrast (CPT® 74177), and if requested, CT Chest with contrast (CPT® 71260) (See: **ONC-16.2: Colorectal Cancer – Initial Work-up/Staging** in the Oncology Imaging Guidelines)
- ◆ If the lesion is in the distal sigmoid:
 - MRI Pelvis without and with contrast (CPT® 72197) if requested can also be performed
- ◆ Pre-operative planning for the surgical (not endoscopic) removal of a polypoid lesion:
 - CT Abdomen and Pelvis with contrast (CPT® 74177)
- Submucosal gastric lesions:
 - ◆ CT Abdomen with contrast (CPT® 74160) or CT Abdomen and Pelvis with contrast (CPT® 74177)
 - If endoscopic ultrasound with or without fine-needle aspiration (which is the preferred initial imaging modality to further characterize a gastric submucosal lesion detected on endoscopy) cannot be performed, is indeterminate, or if the findings of the endoscopic ultrasound indicate a need for further imaging.
- Gastric extrinsic compression:
 - ◆ CT Abdomen with contrast (CPT® 74160) or CT Abdomen and Pelvis with contrast (CPT® 74177)
- Submucosal rectal lesions or unexplained extrinsic compression in the rectum:
 - ◆ MRI Pelvis without and with contrast (CPT® 72197), or, if requested, MRI Pelvis without contrast (CPT® 72195)
 - If rectal endoscopic ultrasound, which is the preferred initial imaging study, cannot be performed (e.g. anal stricture, or severe inflammatory process prohibiting passage of probe, etc.), is indeterminate, or, if based on endoscopic ultrasound findings, additional imaging is needed for further characterization
- Rectal Mucosal Mass or Polypoid Lesion:
 - ◆ If pathology shows invasive cancer OR if colonoscopic findings describe a fungating, ulcerated, bleeding, irregular, circumferential (partial or complete) mass (i.e., findings that suggest a colonic malignancy based on the endoscopic appearance):
 - CT Abdomen and Pelvis with contrast (CPT® 74177) and if requested, CT Chest with contrast (CPT® 74160)
 - MRI Pelvis without and with contrast (CPT® 72197) or without contrast (CPT® 72195) in addition to the above
 - ◆ Pre-operative planning for the surgical (not endoscopic) removal of a polypoid lesion:
 - CT Abdomen and Pelvis with contrast (CPT® 74177)

- For further imaging of a documented colonic or rectal malignancy: See **ONC-16.2: Initial Work-Up/Staging** in the Oncology Imaging Guidelines
- For further imaging of a suspected Gastrointestinal Stromal Tumor (GIST): See **ONC-12.5: Gastrointestinal Stromal Tumor (GIST)** in the Oncology Imaging Guidelines
- For further imaging of gastric cancer: See **ONC-14.9: Gastric Cancer - Initial Work-up/Staging** in the Oncology Imaging Guidelines

References

1. Lakkaraju A, Sinha R, Garikipati Ret al. Ultrasound for initial evaluation and triage of clinically suspicious soft-tissue masses. *ClinRadiol*, 2009; 64: 615-621.
2. Gaskin CM, Helms CA. Lipomas, Lipoma Variants, and Well-Differentiated Liposarcomas (Atypical Lipomas): Results of MRI Evaluations of 126 Consecutive Fatty Masses. *American Journal of Roentgenology*. 2004;182(3):733-739.
3. Einarsdottir H, Söderlund V, Larsson O, et al. 110 Subfascial Lipomatous Tumors. *Acta Radiologica*. 1999;40(6):603-609.
4. Zoga AC, Weissman BN, Kransdorf MJ, et al. ACR Appropriateness Criteria: Soft Tissue Masses. American College of Radiology, 2012.
5. ACR Appropriateness Criteria. Palpable Abdominal Mass-Suspected Neoplasm. Revised 2019.
6. Evans JA, Chandrasekhara V, Chathadi KV, et al. The role of endoscopy in the management of premalignant and malignant conditions of the stomach. *Gastrointestinal Endoscopy*. 2015;82(1):1-8. doi:10.1016/j.gie.2015.03.1967.
7. Faulx AL, Kothari S, Acosta RD, et al. The role of endoscopy in subepithelial lesions of the GI tract. *Gastrointestinal Endoscopy*. 2017;85(6):1117-1132. doi:10.1016/j.gie.2017.02.022.
8. Benson AB, Venook AP, Al-Hawary MM, et al. National Comprehensive Cancer Network (NCCN) Guidelines Version 2.2021, January 21, 2021. Colon cancer, available at: https://www.nccn.org/professionals/physician_gls/pdf/colon.pdf Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines™) for Colon cancer V2.2021, 1/21/2021. ©2021 National Comprehensive Cancer Network, Inc. All rights reserved. The NCCN Guidelines™ and illustrations herein may not be reproduced in any form for any purpose without the express written permission of the NCCN. To view the most recent and complete version of the NCCN Guidelines™, go online to [NCCN.org](https://www.nccn.org).
9. Benson AB, Venook AP, Al-Hawary MM, et al. National Comprehensive Cancer Network (NCCN) Guidelines Version 1.2021, December 22, 2020. Rectal cancer, available at: https://www.nccn.org/professionals/physician_gls/pdf/rectal.pdf Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines™) for Rectal cancer V1.2021, 12/22/2020. ©2020 National Comprehensive Cancer Network, Inc. All rights reserved. The NCCN Guidelines™ and illustrations herein may not be reproduced in any form for any purpose without the express written permission of the NCCN. To view the most recent and complete version of the NCCN Guidelines™, go online to [NCCN.org](https://www.nccn.org).
10. Rex DK, Hassan C, Bourke MJ. The colonoscopist's guide to the vocabulary of colorectal neoplasia: histology, morphology, and management. *Gastrointestinal Endoscopy*. 2017;86(2):253-263. doi:10.1016/j.gie.2017.03.1546
11. Emmanuel A, Gulati S, Ortenzi M, Burt M, Hayee B, Haji A. Radiological staging investigations before endoscopic resection of large colorectal lesions: significant burden with no benefit. *Gut*. 2018;67(Suppl 1). doi:10.1136/gutjnl-2018-bsgabstrs.94.

AB-14: Lower Extremity Edema

See the **Peripheral Vascular Disease Imaging Guidelines**.

AB-15: Zollinger-Ellison Syndrome (ZES-Gastrinoma)

AB-15.1: Zollinger-Ellison Syndrome (ZES-Gastrinoma)

- See: **ONC-15: Neuroendocrine Cancers and Adrenal Tumors** in the Oncology Imaging Guidelines

AB-16: Adrenal Cortical Lesions

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CPT® 74150	CT Abdomen without contrast
CPT® 74160	CT Abdomen with contrast
CPT® 74170	CT Abdomen without and with contrast
CPT® 74181	MRI Abdomen without contrast
CPT® 74183	MRI Abdomen without and with contrast
CPT® 78812	PET, Skull Base to Mid-Thigh
CPT® 78815	PET/CT, Skull Base to Mid-Thigh

AB-16.1: Adrenal Cortical Lesions

Imaging Decision Tree: Incidentally Discovered Adrenal Mass ^{1,2,3,4}		
Mass Details	Primary Study	Additional Studies
➤ Incidental adrenal lesion discovered on US, or any modality of chest or spine imaging Note: US is not a prerequisite study for advanced imaging in the evaluation of any adrenal abnormality		➤ CT Abdomen without contrast (CPT® 74150)
➤ Incidental adrenal mass <1 cm in short axis, on any CT or MRI Abdomen or Abdomen and Pelvis		➤ Need not be pursued with further imaging, as it is uncertain as to whether subcentimeter nodularity or adrenal thickening qualifies as an adrenal mass on radiology reports
➤ Asymptomatic** adrenal mass ≥1 cm ➤ No history of cancer	Incidentally detected on any CT or MRI Abdomen or Abdomen and Pelvis with definitive benign findings	➤ No further imaging, regardless of size, if imaging is diagnostic for benign findings, including ANY of the following: ◆ Myelolipoma (macroscopic fat) or ◆ Calcified mass or ◆ ≤10 HU on CT or decreased signal on Chemical Shift MRI (CS-MRI, CPT® 74181) consistent with benign adenoma, or ◆ If imaging was completed with and without contrast and no enhancement (defined as <10 HU change between unenhanced and enhanced/contrasted CT e.g. cyst, hemorrhage)*

➤ 1 cm to <4 cm ➤ No history of cancer ➤ Asymptomatic** ➤ No prior imaging for comparison	Incidentally detected and indeterminate on any initial CT or MRI Abdomen or Abdomen and Pelvis	➤ 1 cm to 2 cm: Very next study is 12 months from the initial indeterminate study, as follows: ◆ CT Abdomen without and with contrast (CPT® 74170 - adrenal protocol), or CS-MRI (chemical shift MRI, CPT® 74181) ■ If stable ≥1 year, no further imaging-likely benign ■ If enlarging (or new lesion present): ■ biochemical evaluation; ■ consider resection for possible primary adrenocortical carcinoma; ■ exclude pheochromocytoma prior to resection. ➤ >2 cm to <4 cm: Very next study after initial indeterminate finding is done immediately, as follows: ◆ CT Abdomen without and with contrast (CPT® 74170 - adrenal protocol), or CS-MRI (chemical shift MRI, CPT® 74181) ■ No further follow up imaging if: ■ Absolute Percentage Washout/Relative Percentage Washout (APW/RPW) ≥60/40%: Benign adenoma; ■ No enhancement (defined as change in pre- and post-contrast imaging of <10 HU Cyst or hemorrhage) ■ If APR/RPW <60/40%: ■ Consider 6-12 month follow up imaging, or ■ Resection for possible primary adrenocortical carcinoma, with biochemical evaluation to determine functional status and to exclude pheochromocytoma prior to resection ■ If not resected, follow-up CT Abdomen with and without contrast in 6 – 12 months or CS-MRI (chemical shift MRI, CPT® 74181) ➤ If enlarging on follow up imaging: Consider resection for possible primary adrenocortical carcinoma; biochemical evaluation to determine functional status and to exclude pheochromocytoma prior to resection.
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Imaging Decision Tree: Incidentally Discovered Adrenal Mass ^{1,2,3,4}		
Mass Details	Primary Study	Additional Studies
➤ ≥4 cm ➤ No history of cancer	Incidentally detected and indeterminate on any initial CT or MRI Abdomen or Abdomen and Pelvis	➤ Very next study is CT Abdomen without and with contrast (CPT® 74170) or chemical shift MRI (CPT® 74181) for clarification of findings. ➤ Consider resection for possible primary adrenocortical carcinoma ➤ If not a candidate for resection, imaging as requested by specialist in endocrinology, endocrine surgery, or urologist
➤ History of cancer with a likelihood or propensity to metastasize to the adrenal gland or abdomen	Incidentally detected and indeterminate on any initial CT or MRI Abdomen or Abdomen and Pelvis	➤ See: <u>ONC-31.4: Adrenal Gland Metastases</u> in the Oncology Imaging Guidelines

Suspected Condition	Initial Imaging	Additional Information
➤ Suspected Cushing's Syndrome, or virilizing adrenal tumors	CT Abdomen without contrast*	➤ Laboratory: dexamethasone suppression, serum ACTH level, virilizing hormone levels, and/or 24 hour urine for adrenal hormones confirm adrenal cortical endocrine syndrome
➤ Suspected Pheochromocytoma or ➤ Paraganglioma (PPGL)	CT Abdomen and Pelvis without and with contrast (preferred study) (CPT® 74178); or CT Abdomen and Pelvis with contrast (CPT® 74177); or MRI Abdomen (CPT® 74183) and Pelvis (CPT® 72197) without and with contrast (if CT is contraindicated***)	➤ CECT (contrast enhanced CT) is preferred over MRI due to superior spatial resolution in evaluation of PPGL. ➤ Imaging to locate PPGL is indicated once biochemical evidence of PPGL is supported by plasma free metanephrine or urinary fractionated metanephrine testing.

Suspected Condition	Initial Imaging	Additional Information
➤ Conn's Syndrome (hyperaldosteronism)	CT Abdomen without contrast	➤ If PAC (plasma aldosterone concentration) >20ng/dl plus undetectable PRA (plasma renin activity), plus spontaneously low potassium level (e.g. not diuretic-induced): proceed with advanced imaging. ➤ If PAC 15-19ng/dl plus low PRA plus PAC/PRA ratio >20: Confirmatory testing demonstrating lack of aldosterone suppression needed prior to advanced imaging (See: <u>Background and Supporting Information</u> for commonly used Confirmatory Aldosterone Suppression tests). ➤ If initial CT Abdomen without contrast is indeterminate, CT Abdomen with and without contrast (CPT® 74170) with adrenal protocol is indicated or MRI Abdomen (contrast as requested), if CT contrast is contraindicated. ➤ If adrenal vein sampling (AVS) is planned once primary aldosteronism is confirmed on biochemical and/or suppression testing: CT Abdomen with contrast is indicated after initial CT Abdomen without has been performed.

Symptomatic includes abdominal pain and/or elevated adrenal hormone levels. If the only symptom is abdominal pain and adrenal hormone hypersecretion is not suspected, adrenal hormone levels are not required prior to imaging. See: **AB-2 for specifics if the issue is not adrenal.

Background and Supporting Information

- Above imaging can be applied to patients with bilateral adrenal masses, with each lesion addressed separately.
- Benign calcified mass, such as an old hematoma or calcification from prior granulomatous infection needs no further imaging.
- Both benign and malignant adrenal masses may enlarge over time; there is not a known growth-rate threshold to differentiate benign from malignant adrenal masses.

- *If an adrenal mass does not demonstrate *enhancement* (defined as <10 HU change between unenhanced and enhanced/contrasted CT scan), mass represents a cyst or hemorrhage and no further imaging is needed. Conversely, when an adrenal mass shows avid enhancement (>110 – 120 HU), a pheochromocytoma should be considered and biochemical evaluation with serum catecholamines is recommended.
- The most commonly used Confirmatory Aldosterone Suppression tests include: Sodium loading testing (oral or IV), Fludrocortisone Suppression Test (FST) and Captopril Challenge Test.
- ***MRI is recommended in individuals with clips that cause artifacts when using CT, in individuals with an allergy to CT contrast, and in individuals in whom radiation exposure should be limited (children, pregnant women, individuals with known germline mutations, and those with recent excessive radiation exposure), and for detection of skull base and neck paragangliomas, as skull base and neck paragangliomas are often biochemically silent and imaging represents the principal means for diagnosis.
- For additional imaging regarding continued suspicion with negative/inconclusive CT scan or MRI and for metastatic tumors, see: **ONC-15.10: Adrenal Tumors - Initial Work-up/Staging** in the Oncology Imaging Guidelines
- The laboratory's reference range performing renin (PRA) and serum potassium levels should be used for determining abnormalities of these levels.

AB-16.2: Adrenal Insufficiency

- CT Abdomen without contrast (CPT® 74150) or MRI Abdomen without contrast (CPT® 74181) is supported to determine the cause of primary adrenal insufficiency. Imaging is necessary if testing has confirmed adrenal insufficiency or adrenomyeloneuropathy.^{6,7}

AB-16.3: Additional Adrenal Imaging

Note: The study for the evaluation of the adrenal gland is either with CT or MRI. Nuclear medicine imaging can assist in the evaluation of adrenal masses not adequately characterized by CT or MRI.

- Additional adrenal imaging considerations include the following:
 - ◆ Adrenal Nuclear Imaging of the cortex and/or medulla (CPT® 78075) is indicated for the following:
 - Distinguishing functional adrenal adenoma from adrenal hyperplasia with appropriate abnormal lab values.
 - Evaluation of suspected pheochromocytoma or paraganglioma.
 - MIBG preferred (ONE of the following codes: CPT® 78800, CPT® 78801, CPT® 78802, CPT® 78803, or CPT® 78804 or hybrid SPECT/CT CPT® 78830, or CPT® 78832).

- For known pheochromocytoma or paraganglioma: See **ONC-15: Neuroendocrine Cancers and Adrenal Tumors** in the Oncology Imaging Guidelines.
- Evaluation of suspected neuroblastoma, ganglioneuroblastoma, or ganglioneuroma.
 - MIBG preferred (One of the following codes: CPT® 78800, CPT® 78801, CPT® 78802, CPT® 78803, or CPT® 78804 or hybrid SPECT/CT CPT® 78830, CPT® 78831, or CPT® 78832) See **PEDONC-6: Neuroblastoma** in the Pediatric Oncology Imaging Guidelines.
- History of multiple endocrine neoplasia syndromes: See **PEDONC-2.8: Multiple Endocrine Neoplasias (MEN)** in the Pediatric Oncology Imaging Guidelines.
- History of neurofibromatosis: See **PEDONC-2.3: Neurofibromatosis 1 and 2 (NF1 and NF2)** in the Pediatric Oncology Imaging Guidelines.
- History of von Hippel-Lindau disease: See **PEDONC-2.10: Von Hippel-Lindau Syndrome (VHL)** in the Pediatric Oncology Imaging Guidelines.

Background and Supporting Information

- The majority of “incidentalomas” are benign adenomas. Primary Adrenal Carcinoma is a very rare disease and usually seen with adrenal masses greater than 5 cm in diameter. Metastases with history of malignancy are 25-75%. Routine screening for endocrine function is recommended since 5%-23% will be hormone secreting.
- Resection or biopsy is often considered for mass lesions larger than 4 cm or hormone-secreting tumors.*
- Biopsy is often considered if pheochromocytoma is excluded.
- Signs and symptoms of pheochromocytoma:
 - ◆ Flushing spells and/or poorly controlled hypertension.
 - ◆ Elevated plasma or urine metanephrines support the diagnosis of pheochromocytoma with sensitivity for diagnosis at 99.7%
 - ◆ 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 test, then no advanced imaging is indicated unless unexplained symptoms suggestive of pheochromocytoma persist.
 - ◆ Endocrine guidelines recommend biochemical evaluation in all incidental adrenal lesions with the exception of myelolipomas and cysts.

Adenoma imaging characteristics:

	Findings consistent with Adenoma	Indeterminate for Adenoma
CT Abdomen without contrast	≤10 Hounsfield Units	>10 Hounsfield Units
CT with contrast with washout (calculated)	≥60% absolute washout or ≥40% relative washout	<60% absolute washout <40% relative washout
Chemical Shift MRI	Signal drop out	Lack of signal drop out

*Size >4 cm or growth of a lesion are concerning for malignancy (though occasionally adenomas can demonstrate very slight growth on 6 to 12 month follow up imaging).

References

1. Hamrahian AH, Ioachimescu AG, Remer EM, et al. Clinical utility of noncontrast computed tomography attenuation value (Hounsfield Units) to differentiate adrenal adenomas/hyperplasias from nonadenomas: Cleveland Clinic Experience. *Journal of Clinical Endocrinology & Metabolism*, 2005 Feb;90(2):871-877.
2. Remer EM, Casalino DD, Bishoff JT, et al. Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® incidentally discovered adrenal mass. *American College of Radiology (ACR)*; 2012.
3. Song JH, Chaudry FS, Mayo-Smith WW. The incidental indeterminate adrenal mass on CT (> 10 H) in individuals without cancer: is further imaging necessary? Follow-up of 321 consecutive indeterminate adrenal masses. *Am J Roentgenol*. 2007;189:1119-1123.
4. Song JH, Chaudry FS, Mayo-Smith WW. The incidental adrenal mass on CT: prevalence of adrenal disease in 1,049 consecutive adrenal masses in individuals with no known malignancy. *American Journal of Roentgenology*, 2008 May;190:1163-1168.
5. Wallace I, Cunningham S, Lindsay J. The diagnosis and investigation of adrenalin sufficiency in adults. *AnnClinBiochem*. 2009 Sep;46(Pt 5):351-67.
6. Arlt W, Allolio B. Adrenal insufficiency. *Lancet*. 2003 May 31;361(9372):1881-93.
7. Raman, Siva P, Lessne, M, et al. Diagnostic Performance of Multidetector Computed Tomography in Distinguishing Unilateral From Bilateral Abnormalities in Primary Hyperaldosteronism: Comparison of Multidetector Computed Tomography with Adrenal Vein Sampling. *JCAT*, 2015, 39: 414-418.
8. Boland GW, Blake MA, Hahn PF, et al. Incidental Adrenal Lesions: Principles, Techniques, and Algorithms for Imaging Characterization. *RSNA*, 2008;49: 756-775.
9. Seo JM, Park BK, Park SY, et al. Characterization of Lipid-Poor Adrenal Adenoma: Chemical-Shift MRI and Washout CT. *AJR*, 2014, 202: 1043-1050.
10. Scheida N, Arrashad A, Flood TA. Comparison of Quantitative MRI and CT Washout Analysis for Differentiation of Adrenal Pheochromocytoma from Adrenal Adenoma. *Am J Roentgenol*. 2016 Jun; 206(6):1141-1148.
11. Johnson PT, Horton KM, Fishman, EK. Adrenal Imaging with Multidetector CT: Evidence-based Protocol Optimization and Interpretative Practice. *Radiographics*, 2009, 29: 1319-1330; 1333-1350.
12. Mayo-Smith WW, Song JH, Boland GL, et al. Management of incidental adrenal masses: a white paper of the ACR Incidental Findings Committee. *JACR J Am Coll Radiol*. 2017 Aug;14(8):1038-1044.
13. Funder JW, Carey RM, Mantero F, et al. The Management of Primary Aldosteronism: Case Detection, Diagnosis, and Treatment: An Endocrine Society Clinical Practice Guideline. *The Journal of Clinical Endocrinology & Metabolism*. 2016;101(5):1889-1916. doi:10.1210/je.2015-4061.
14. Zeiger M, Thompson G, Duh Q-Y, et al. American Association of Clinical Endocrinologists and American Association of Endocrine Surgeons Medical Guidelines for the Management of Adrenal Incidentalomas: Executive Summary of Recommendations. *Endocrine Practice*. 2009;15(5):450-453. doi:10.4158/ep.15.5.450
15. Lenders JWM, Duh Q-Y, Eisenhofer G, et al. Pheochromocytoma and Paraganglioma: An Endocrine Society Clinical Practice Guideline. *The Journal of Clinical Endocrinology & Metabolism*.
16. Shashank RC, Mukkamalla SKR, Karanchi H. Adrenal metastasis. [Updated 2020 Aug 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK441879/>

AB-17: Abdominal Aortic Aneurysm (AAA), Iliac Artery Aneurysm (IAA), and Visceral Artery Aneurysms Follow-Up of Known Aneurysms and Pre-Op Evaluation

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AB-17.1: Abdominal Aortic Aneurysm (AAA)

- See the **Peripheral Vascular Disease Imaging Guidelines**

AB-17.2: Iliac Artery Aneurysm (IAA)

- See the **Peripheral Vascular Disease Imaging Guidelines**

AB-17.3: Visceral Artery Aneurysm

- See the **Peripheral Vascular Disease Imaging Guidelines**

AB-18: Abdominal Aortic Aneurysm (AAA) and Iliac Artery Aneurysm (IAA)-Post Endovascular or Open Aortic Repair

AB-18.1: AAA, IAA, Post Endovascular or Open Aortic Repair

- See the Peripheral Vascular Disease Imaging Guidelines

AB-19: Aortic Dissection and Imaging for Other Aortic Conditions

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AB-19.1: Aortic Dissection and Other Aortic Conditions

- See the **Peripheral Vascular Disease Imaging Guidelines**

AB-19.2: Imaging for Other Aortic Conditions

- See the **Peripheral Vascular Disease Imaging Guidelines**

AB-20: Bowel Obstruction, Gastroparesis, and Bloating

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AB-20.1: Bowel Obstruction

- Suspected high-grade bowel obstruction:
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177)
 - ◆ Pediatric individuals:
 - MRI Abdomen and Pelvis without and with contrast (CPT® 74183 and CPT® 72197) can be approved if requested
 - ◆ Pregnant individuals:
 - MRI Abdomen and Pelvis without contrast (CPT® 74181 and CPT® 72195)
- Suspected intermittent or low-grade small bowel obstruction
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177)
 - ◆ Pediatric individuals:
 - MRI Abdomen and Pelvis without and with contrast (CPT® 74183 and CPT® 72197) can be approved if requested
 - ◆ Pregnant individuals:
 - MRI Abdomen and Pelvis without contrast (CPT® 74181 and CPT® 72195)
 - ◆ If the etiology or level of suspected intermittent or low-grade small bowel obstruction remains undetermined and additional imaging is needed after CT Abdomen and Pelvis:
 - CT Enteroclysis (CPT® 74176 or CPT® 74177) or
 - CT Enterography (CPT® 74177) or
 - MR Enteroclysis (CPT® 74183 and CPT® 72197) or
 - MR Enterography (CPT® 74183 and CPT® 72197)
- If there is a suspected small bowel tumor as a cause of the small bowel obstruction (including a history of no prior abdominal or pelvic surgery, no known hernia and/or concomitant obscure GI bleeding):
 - ◆ CT Enterography (CPT® 74177)
- Small bowel obstruction suspected to be secondary to Crohn's Disease:
 - ◆ See: **AB-23.1: IBD (Crohn's Disease or Ulcerative Colitis)** and **AB-23.2: Known IBD**
- Bariatric surgery patients, see: **AB-9.1: Bariatric Surgery**

Background and Supporting Information

- Complete or high-grade obstruction can be defined as no fluid or gas passing beyond the site of obstruction. In incomplete or partial obstruction (low-grade), some fluid or gas passes beyond the point of obstruction. However, a plain film is not required prior to advanced imaging for suspicion of either high- or low- grade obstruction.

AB-20.2: Gastroparesis and Dumping Syndrome

Gastroparesis

- Gastric Emptying Study (CPT® 78264): for suspicion of delayed gastric emptying and ONE of the following:
 - ◆ Nausea, or vomiting of old food ingested several hours earlier
 - ◆ Bloating
 - ◆ Early satiety, or postprandial fullness
 - ◆ Recurrent aspiration
 - ◆ Unexplained poor glucose control in diabetes
 - ◆ Gastroesophageal reflux refractory to medical management
 - ◆ Non-ulcer dyspepsia
 - ◆ Retained gastric contents on endoscopy
- Gastric emptying study with small bowel transit (CPT® 78265) can be used in the evaluation of suspected abnormalities in both total and regional times for gastrointestinal transit in small bowel.
- Gastric emptying study with small bowel and colon transit (CPT® 78266) can be used in the evaluation of suspected abnormalities in both total and regional time for gastrointestinal transit to the colon.

Dumping Syndrome

- Gastric Emptying Study (CPT® 78264) to evaluate signs or symptoms of dumping syndrome is not indicated
- Dumping syndrome is a common complication of gastric and bariatric surgery in which changes in anatomy and innervation promote a rapid emptying of gastric contents into the small bowel. This triggers a series of physiologic responses. “Early dumping”, occurring within the first hour after a meal is characterized by abdominal pain, bloating, gassiness, nausea, vomiting, and diarrhea as well as vasomotor symptoms such as flushing, sweateness, tachycardia, and hypotension). “Late dumping” symptoms occurring between 1 and 3 hours after meals are usually related to hypoglycemia (e.g., weakness, confusion, syncope).
- Dumping syndrome is usually a clinical diagnosis and the recommended diagnostic testing is an oral glucose tolerance test.
- Evidence-based guidelines have recently concluded that gastric emptying tests have low sensitivity and specificity for dumping syndrome, and that a gastric emptying test showing rapid emptying rate would not be used to confirm a diagnosis of dumping syndrome. Rapid emptying can occur in other conditions, and it has been demonstrated that the initial rapid emptying in dumping may produce symptoms such as nausea, which then delays gastric emptying, such that the results of a gastric emptying study are in the normal range. Because of these limitations, recent guidelines have concluded that “...gastric emptying testing seems to be of low utility in diagnosing dumping syndrome”.¹⁸

Note: The CPT® 78264 covers a gastric emptying study (GES) whether it is performed for solids, liquids, or both solids AND liquids. In most circumstances, it is not appropriate to request 2 separate CPT codes to cover both a solid and liquid phase GES, since the one CPT code covers this scenario. However, on occasion, a repeat GES with a liquid phase might be requested following a solid phase study which is negative or indeterminate. In this circumstance, where the result of the previous study is provided and an indication is provided in the notes as to why a liquid phase study is now needed, it may be appropriate to approve a second CPT code.

AB-20.3: Nausea and Vomiting as the Primary Symptom

- Nausea and vomiting as the Primary Symptom
 - ◆ An initial assessment should be performed prior to imaging requests. The initial assessment should include a history with a delineation of the duration, frequency, and severity of symptoms, including a description of their characteristics and any associated symptoms. The purpose of the initial assessment is to define whether the symptom complex suggests a central (neurologic), endocrine (e.g. pregnancy, thyroid disorder), iatrogenic (chemotherapy/medication-induced), obstructive (e.g., low-grade small bowel obstruction), or a mucosal (gastritis, peptic ulcer disease) etiology. Diagnostic testing for nausea and vomiting should be targeted at finding the etiology suggested by a thorough history and physical examination. In the absence of “red flags”, if the cause is not obvious or suggestive from the history and physical, laboratory data including a CBC, chemistry profile, and, in a reproductive-age female, pregnancy testing, should be performed prior to advanced radiographic imaging. Imaging is based on the findings of the initial evaluation as follows:
 - Symptoms suggesting an intracranial etiology (vertigo/nystagmus, associated headache, or neurogenic vomiting suggested by a positional nature and/or associated with other neurologic signs and symptoms):
 - See: **HD-11: Headache**, **HD-23: Dizziness, Vertigo and Syncope**, or other Head Imaging Guidelines depending on the predominant neurologic presentation
 - Nausea and vomiting associated with RUQ pain and suspicion of gallbladder disease, see: **AB-2.3: Right Upper Quadrant Pain including Suspected Gallbladder Disease**
 - Nausea and vomiting associated with dyspeptic symptoms, or epigastric pain, see: **AB-2.5: Epigastric Pain and Dyspepsia**
 - Symptoms suggesting an obstructive etiology (e.g. abdominal pain preceding vomiting, distension, feculent vomiting), for abdominal red flags, if the initial assessment does not suggest a specific cause, or if the evaluation proves unproductive:
 - CT Abdomen and Pelvis with contrast (CPT® 74177)
 - Symptoms suggesting mucosal disease (e.g. GERD, suspicion of ulcer disease):
 - EGD prior to advanced imaging

- If nausea and vomiting remains unexplained despite workup and CT Abdomen and Pelvis is negative:
 - Gastric emptying study (CPT® 78264)

AB-20.4: Superior Mesenteric Artery (SMA) Syndrome

- In individuals with the clinical suspicion of SMA syndrome with risk factors or radiographic/EGD findings as noted above, or other radiologic findings or history suggestive of duodenal obstruction:
 - ◆ CTA Abdomen (CPT® 74175) or MRA Abdomen (CPT® 74185)
- Note: CTA Abdomen (CPT® 74175) or MRA Abdomen (CPT® 74185) may also be appropriate if there is a failure to diagnose either persistent nausea and vomiting despite the workup as outlined in **AB-20.3: Nausea and Vomiting as the Primary Symptom**, or epigastric pain as indicated in **AB-2.5: Epigastric Pain and Dyspepsia**, and there is a clinical suspicion of SMA syndrome

Background and Supporting Information

- SMA syndrome is a rare cause of duodenal obstruction in which there is a decrease in the aortomesenteric angle with resulting compression of the duodenum by the SMA.
- Risk factors:
 - ◆ Recent significant weight loss which leads to a loss of retroperitoneal fat
 - ◆ Presence of a severe debilitating illness such as malignancy, malabsorption syndromes, AIDS, trauma, and burns.
 - ◆ History of corrective spine surgery for scoliosis
 - ◆ Anorexia Nervosa
 - ◆ Abdominal surgery
 - ◆ Congenital short ligament of Treitz
- The typical clinical scenario includes an episode of weight loss followed by chronic food intolerance with nausea and vomiting, further weight loss, and epigastric pain, and can be relieved by lying prone or in the left lateral decubitus position.
- The diagnosis can be suspected with barium studies demonstrating delayed passage of contrast beyond the duodenum, dilatation of the first and second portions of the duodenum, anti-peristaltic flow of barium proximal to the obstruction, and relief of obstruction when placed in the prone, knee-chest, or left lateral position, or with an upper endoscopy revealing pulsatile extrinsic compression of the duodenum, or plain films suggesting duodenal obstruction.

AB-20.5 Bloating, Gas, and Distention

- For bloating as the primary symptom, present for at least 3 months, see: **AB-21.4: Irritable Bowel Syndrome**
- For documented suspicion of bowel obstruction (e.g., patients with prior abdominal surgery, previous history of SBO, known adhesions, history of Crohn's Disease, etc.) see: **AB-20.2 Bowel Obstruction**.
- If associated with constipation, see: **AB-21.3: Constipation**
- If associated with dyspeptic symptoms, see: **AB-2.5 Epigastric Pain/Dyspepsia**
- If any red flag is present (see: **AB-2.1: Red Flag Signs and Symptoms** for red flag symptoms)
 - ◆ CT Abdomen and Pelvis with contrast (CPT® 74177)

Background and Supporting Information:

Bloating and distension are among the most common gastrointestinal complaints, and appears in 96% of patients with IBS, and 20-30% of the general population. Bloating is the subjective perception of increased abdominal pressure. Distension is the objective finding of increased abdominal girth.

References

1. Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® suspected small-bowel obstruction. *American College of Radiology (ACR)*; 2013
2. Donohoe KJ, Maurer AH, Ziessman HA. Society of Nuclear Medicine Procedure Guideline for Gastric Emptying and Motility, Version 2.0. Society of Nuclear Medicine and Molecular Imaging. Published June 6, 2004.
3. Parkman HP, Hasler WL, RS Fisher. American Gastroenterological Association Medical Position Statement: diagnosis and treatment of gastroparesis. *Gastroenterology*, 2004; 127:1589-1591
4. Abell TL, Camilleri M, Donohoe KJ, et al. Consensus recommendations for gastric emptying scintigraphy: A joint report of the American Neurogastroenterology and Motility Society and the Society of Nuclear Medicine, *Am J Gastroenterol*, 2008; 103:753-763.
5. Sarnelli G, Caenepeel P, Geypens B, et al. Symptoms associated with impaired gastric emptying of solids and liquids in Functional dyspepsia, *Am J Gastroenterol*, 2003; 98:783-788.
6. Parkman HP, Hasler WL, RS Fisher. American Gastroenterological Association technical review on the diagnosis and treatment of gastroparesis, *Gastroenterology*, 2004; 127:1592-1622.
7. Lawal A, Barboi A, Krasnow A, et al. Rapid gastric emptying is more common than gastroparesis in individuals with autonomic dysfunction, *Am J Gastroenterol*, 2007; 102:618-623.
8. Chial HJ, Camilleri M, Williams DE, et al. Rumination Syndrome in Children and Adolescents: Diagnosis, Treatment, and Prognosis, *Pediatrics*, 2003;111(1):158-62
9. Paulson EK, Thompson WM. Review of Small-Bowel Obstruction: The Diagnosis and When to Worry. *Radiology*. 2015;275(2):332-342. doi:10.1148/radiol.15131519.
10. Mullan CP, Siewert B, Eisenberg RL. Small Bowel Obstruction. *American Journal of Roentgenology*. 2012;198(2). doi:10.2214/ajr.10.4998.
11. American Gastroenterological Association medical position statement: Nausea and vomiting. *Gastroenterology*. 2001;120(1):261-262. doi:10.1053/gast.2001.20515.
12. Scorza K, Williams A, Phillips JD, Shaw J. Evaluation of Nausea and Vomiting, *American Family Physician*, 2007; 76(1):76-84.
13. Quigley EM, Hasler WL, Parkman HP. AGA technical review on nausea and vomiting. *Gastroenterology*. 2001;120(1):263-286. doi:10.1053/gast.2001.20516.
14. Sinagra E, Raimondo D, Albano D, et al. Superior Mesenteric Artery Syndrome: Clinical, Endoscopic, and Radiological Findings. *Gastroenterology Research and Practice*. 2018;2018:1-7. doi:10.1155/2018/1937416.
15. Zaraket V, Deeb L. Wilkies Syndrome or Superior Mesenteric Artery Syndrome: Fact or Fantasy. *Case Reports in Gastroenterology*. 2015;9(2):194-199. doi:10.1159/000431307.
16. Merrett ND, Wilson RB, Cosman P, Biankin AV. Superior Mesenteric Artery Syndrome: Diagnosis and Treatment Strategies. *Journal of Gastrointestinal Surgery*. 2008;13(2):287-292. doi:10.1007/s11605-008-0695-4.
17. Foley A, Burgell R, Barrett JS, Gibson PR. Management strategies for abdominal bloating and distension. *Gastroenterol Hepatol*. 2014;10(9):531-571.
18. Scarpellini E, Arts J, Karamanolis G, et. al. International consensus on the diagnosis and management of dumping syndrome. *Nat Rev Endocrinol*. 2020;16:448-466. doi:10.1038/s41574-020-0357-5.
19. Lacy BE, Cangemi D, Vazquez-Roque M. Management of chronic abdominal distension and bloating. *Clin Gastroenterol Hepatol*. 2021;19(2):219-231.e.1. doi:10.1016/j.cgh.2020.03.056.

AB-21: Diarrhea, Constipation, and Irritable Bowel

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AB-21.1: Acute and Persistent Diarrhea (up to 30 days)

- Routine advanced imaging is not supported for acute, or persistent (up to 30 days) uncomplicated, including infectious diarrhea.
- Travel and dysenteric (including bloody) diarrhea should undergo biological assessment and antimicrobial treatment.^{9,10,11} (See: **AB-2.1: Red Flag Signs and Symptoms**)
- CT Abdomen and Pelvis with contrast (CPT® 74177) can be used if:
 - ◆ Red Flags (See: **AB-2.1: Red Flag Signs and Symptoms**)
 - ◆ Suspected ischemia (See: **AB-6: Mesenteric/Colonic Ischemia**)
 - ◆ Older (>50) individuals with significant abdominal pain
 - ◆ Previous gastric bypass
 - ◆ Immunocompromised
 - ◆ Obstruction, toxic megacolon, or perforation suspected

AB-21.2: Chronic Diarrhea (more than 30 days)

- Basic lab work including routine CBC, chemistries, as well as stool tests for pathogens.
- CT Abdomen with contrast (CPT® 74160), CT Abdomen and Pelvis with contrast (CPT® 74177), CT Enterography (CPT® 74177), or MR Enterography (CPT® 74183 or CPT® 74183 and CPT® 72197), can be approved if all of the following have been performed:
 - ◆ Colonoscopy has been performed and is nondiagnostic or suggestive of inflammatory bowel disease
 - ◆ Fecal calprotectin or fecal lactoferrin
 - ◆ Testing for giardia antigen or PCR for giardia
 - ◆ Testing for celiac disease with serum IgA tissue transglutaminase (tTG)
- See: **AB-23.1: IBD (Crohn's Disease or Ulcerative Colitis)** for concerns regarding inflammatory bowel disease.

AB-21.3: Constipation

- CT Abdomen and Pelvis with contrast (CPT® 74177) if:
 - ◆ Red flags (See: **AB-2.1: Red Flag Signs and Symptoms**)
 - ◆ Concern for obstruction
- MRI Defecography (MRI Pelvis without contrast CPT® 72195) can be approved if the following conditions are met:
 - ◆ Individual has undergone ano-rectal manometry **and** a balloon-expulsion test, and the results confirm a defecatory disorder or are inconclusive, **and** the individual has failed a trial of biofeedback or other conservative therapy.
or
 - ◆ Balloon expulsion test is normal and there is a need to identify structural lesions
or
 - ◆ To guide planned surgical therapy for rectoceles, cystoceles, or uterine prolapse.

(Please note: Certain insurers may have specific policies with regards to MR Defecography, and their policy will supersede eviCore guidelines.)

Background and Supporting Information

- The work-up and treatment of constipation usually proceeds with a history and physical followed by empiric medication or dietary trials.
 - ◆ In general, a colonoscopy is performed prior to advanced imaging in an individual presenting with chronic constipation if the alarm symptoms of blood in the stool, anemia, or weight loss are present.
- Defecography can be used in the evaluation of constipation to obtain information regarding the structural causes of outlet dysfunction (e.g. rectal prolapse, rectocele, or enterocele).
- Defecography can be performed either as a barium study with fluoroscopy (conventional defecography or CD), or with MRI (D-MRI). In a comparative study, D-MRI was found to be less diagnostic than CD for diagnosing rectocele and enterocele, but superior in identifying intussusception. Arnold Wald, the lead author of the American College of Gastroenterology's clinical guidelines for the management of ano-rectal disorders concludes (UpToDate, last update May 12, 2016) that while pelvic MR or dynamic MRI can evaluate "global pelvic floor anatomy and sphincter morphology and assess dynamic motion", thus providing "more valuable information without radiation", he concludes that MR and dynamic MR defecography "have uncertain added value compared to standard defecography".

AB-21.4: Irritable Bowel Syndrome

- Advanced imaging in the absence of alarm symptoms has a very low yield, but can be considered in the following circumstances:
 - ◆ CT Abdomen (CPT® 74160) or CT Abdomen and Pelvis (CPT® 74177) can be considered in the following circumstances:
 - Presence of any of the following alarm symptoms:
 - Weight loss
 - Frequent nocturnal awakenings due to gastrointestinal symptoms
 - Fever
 - Blood in the stool or iron deficiency anemia (See: **AB-22: GI Bleeding** for appropriateness of imaging in this circumstance)
 - New onset and progressive symptoms
 - Onset of symptoms after age 50
 - Family history of colon cancer or inflammatory bowel disease
 - Findings of an abdominal mass
 - Presence of lymphadenopathy
 - For any "Red Flag"
 - See: **AB-2.1: Red Flag Signs and Symptoms**

- Fecal calprotectin $\geq 50\text{ug/g}$ or fecal lactoferrin $\geq 4.0\text{ug/g}$ or CRP >0.5 in individuals with diarrhea-predominance
- Celiac testing should also be performed in individuals with diarrhea-predominance IBS, and if positive see: **AB-24.1: Celiac Disease** for imaging guidance. (See background and supporting information in **AB-23.1: IBD (Crohn's Disease or Ulcerative Colitis)**)

Background and Supporting Information

- Irritable bowel syndrome is characterized by abdominal pain associated with altered bowel habits, abdominal distention, and bloating. It is important to understand that IBS is a positive diagnosis, not a diagnosis of exclusion. ACG guidelines (2021) strongly suggest that IBS be assessed with a “positive diagnostic strategy as compared to a diagnostic strategy of exclusion”. Subtypes include IBS-C (constipation-predominant), IBS-D (diarrhea-predominant), IBS-M (mixed), and unclassified IBS. Rome IV Criteria for the diagnosis of irritable bowel syndrome are:
 - ◆ Recurrent abdominal pain, on average ≥ 1 d/wk in the past 3 months, related to ≥ 2 of the following:
 - Defecation
 - Change in stool frequency
 - Change in stool appearance (form)

References

1. O'Connor OJ, McSweeney SE, McWilliams S, et al. Role of radiologic imaging in irritable bowel syndrome: Evidence-based review. *Radiology*. 2012;262(2):485-494.
2. Riddle MS, Dupont HL, Connor BA. ACG Clinical Guideline: Diagnosis, Treatment, and Prevention of Acute Diarrheal Infections in Adults. *The American Journal of Gastroenterology*. 2016;111(5):602-622.
3. Bharucha A. Exam 3: American Gastroenterological Association Technical Review on Constipation. *Gastroenterology*. 2013;144(1).
4. van Iersel JJ, Jonkers F, Verheijen PM et al. (2017), Comparison of dynamic magnetic resonance defaecography with rectal contrast and conventional defaecography for posterior pelvic floor compartment prolapse. *Colorectal Dis*. 19: O46–O53.
5. Wald A, Bharucha AE, Cosman BC, et.al. Clinical Guideline: Management of Benign Anorectal Disorders. *Am. J. Gastroenterol*. 2014.
6. Menees SB, Powell C, Kurlander J, Goel A, Chey WD. A meta-analysis of the utility of c-reactive protein, erythrocyte sedimentation rate, fecal calprotectin and fecal lactoferrin to exclude inflammatory bowel disease in adults with IBS. *The American Journal of Gastroenterology*. 2015;110(3):444-454. doi:10.1038/ajg.2015.
7. Sultan S, Malhotra A. Irritable Bowel Syndrome. *Annals of Internal Medicine*. 2017;166(11). doi:10.7326/aitc201706060.
8. An Evidence-Based Position Statement on the Management of Irritable Bowel Syndrome. *The American Journal of Gastroenterology*. 2008;104(S1). doi:10.1038/ajg.2008.122.
9. O'Connor OJ, Mcsweeney SE, McWilliams S, et al. Role of radiologic imaging in Irritable Bowel Syndrome: evidence-based review. *Radiology*. 2012;262(2):485-494. doi:10.1148/radiol.11110423.
10. Ford AC, Moayyedi P, Lacy BE, et al. American College of Gastroenterology monograph on the management of Irritable Bowel Syndrome and chronic idiopathic constipation. *The American Journal of Gastroenterology*. 2014;109(S1). doi:10.1038/ajg.2014.187.
11. Foley A, Burgell R, Barrett JS, Gibson PR. Management strategies for abdominal bloating and distension. *Gastroenterol Hepatol (NY)*. 2014;10(9):561-571.
12. Smalley W, Falck-Ytter C, Carrasco-Labra A, Wani S, Lytvyn L, Falck-Ytter Y. AGA clinical practice guidelines on the laboratory evaluation of functional diarrhea and diarrhea-predominant Irritable Bowel Syndrome in adults (IBS-D). *Gastroenterology*. 2019;157(3):851-854. doi:10.1053/j.gastro.2019.07.004.
13. Lacy BE, Pimentel M, Brenner DM, et. al. ACG clinical guideline: management of Irritable Bowel Syndrome. *Am J Gastroenterol*. 2021;116(1):17-44. doi:10.14309/ajg.0000000000001036.
14. Bharucha AD, Dorn SD, Lembo A, Pressman A. American Gastroenterological Association medical position statement on constipation. *Gastroenterology*. 2013;144:211-217. doi:10.1053/j.gastro.2012.10.029.

AB-22: GI Bleeding

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AB-22.1: GI Bleeding

- Endoscopy for upper GI bleeding as initial evaluation
- Colonoscopy for lower GI bleeding as initial evaluation
- CTA Abdomen (CPT® 74175) or CTA Abdomen and Pelvis (CPT® 74174) or CT Abdomen and Pelvis with contrast (CPT® 74177):
 - ◆ Active bleeding and if endoscopy is negative
 - ◆ If conventional angiography is being considered
 - ◆ If surgery is being considered
 - ◆ If colonoscopy cannot be performed in an individual with GI bleeding
 - ◆ GI bleeding and severe abdominal pain
 - ◆ GI bleeding and hemodynamic instability (shock)
 - ◆ If there is concern for an aorto-enteric fistula (known or suspected aortic aneurysm, history of any type of aortic aneurysm repair).
- Meckel's scan (CPT® 78290) can be approved if bleeding is suspected from a Meckel's diverticulum.
- Gastrointestinal Bleeding Scintigraphy (CPT® 78278) can be considered if there is brisk active bleeding with negative endoscopy
- For TIPS placement, see: **AB-26.3: Portal Hypertension**

AB-22.2: Small Bowel Bleeding Suspected

- If small bowel bleeding is suspected as the source of bleeding, and if upper and lower endoscopies are negative:
 - ◆ Video capsule endoscopy (VCE) is performed prior to advanced imaging.
 - VCE is not required prior to advanced imaging if small bowel obstruction or stricture of the gastrointestinal tract is suspected, or if there is dysphagia. In addition there are theoretical concerns in individuals with implantable devices such as pacemakers or defibrillators.
 - ◆ CT Enterography (CPT® 74177) if upper and lower endoscopy are negative and if VCE is negative. If there is a contraindication to CT Enterography, MR Enterography (CPT® 74183 or CPT® 74183 and CPT® 72197) may be performed.
 - ◆ Note: Providers occasionally request a CT or MR Enterography prior to the administration of a VCE, in order to assess whether there is pathology that might impede passage of the capsule and cause retention. This is not supported as a routine procedure prior to VCE. It should be noted that a patency capsule is available, and that this may identify patients at higher risk of retention. However, guidance from the consensus group of the American College of Gastroenterology recommends that in individuals with obstructive symptomatology, imaging (MR Enterography or CT Enterography) should be performed prior to VCE. This group would also include high risk individuals with a known history of Crohn's Disease, known history of strictures or other obstruction, history of previous pelvic or abdominal radiation, or suspected tumor.

➤ Iron Deficiency Anemia

- ◆ If the bleeding is determined to be non-gastrointestinal (e.g. hematuria or vaginal bleeding), refer to the appropriate guideline for these conditions.
- ◆ If the source is determined to be gastrointestinal:
 - Upper endoscopy and colonoscopy should be performed, unless contraindicated.
 - Small bowel video capsule endoscopy is next, if endoscopies are negative (unless contraindicated).
 - CT Abdomen and Pelvis with contrast (CPT® 74177), CT Enterography (CPT® 74177), or MR Enterography (CPT® 74183 or CPT® 74183 and CPT® 72197) (if CT Enterography is contraindicated) can be performed, if small bowel video capsule endoscopy is negative, or for further evaluation of abnormal video capsule findings. CT Enterography should be considered the test of choice given the lack of motion artifact and its superior spatial resolution.

References

1. ACR Appropriateness Criteria®. Radiologic Management of Upper Gastrointestinal Bleeding, 2016.
2. Laing CJ, Tobias T, Rosenblum DI, Banker WL, et al. Acute gastrointestinal bleeding: emerging role of multidetector CT angiography and review of current imaging Techniques. *Radiographics*, 2007;27:1055-1070.
3. American Gastroenterological Association Medical Position Statement: Evaluation And Management Of Occult And Obscure Gastrointestinal Bleeding. *Gastroenterology*, 2000; 118(1):197-200.
4. Barkun AN, Bardou M, Kuipers EJ, et al. International Consensus Upper Gastrointestinal Bleeding Conference Group. International Consensus Recommendations on the Management of Individuals with Nonvariceal Upper Gastrointestinal Bleeding. *Ann Intern Med*. 2010 Jan 19;152(2):101-13.
5. Wilkins T, Khan N, Nabh A, et al. Diagnosis and Management of Upper Gastrointestinal Bleeding. *Am Fam Physician*. 2012 Mar 1;85(5):469-76.
6. Strate LL, Gralnek IM. ACG Clinical Guideline. Management of Individuals with Acute Lower Gastrointestinal Bleeding. *Amer. J. Gastroenterol*. Advance Online Publication 1 March 2016.
7. Gerson L, et al. ACG Clinical Guideline: Diagnosis and Management of Small Bowel Bleeding. *Amer J Gastroenterol*, 2015;110:1265-1287.
8. Laine L, Jensen D. Management of Individuals with Ulcer Bleeding. *Am J. Gastroenterol* 2012; 107:345-360.
9. Garcia-Tsao G, et al. Prevention and Management of Gastroesophageal Varices and Variceal Hemorrhage in Cirrhosis. *Amer J Gastroenterol*, 2007;102:2086-2102.
10. Short M and Domagalski J, Iron deficiency Anemia: Evaluation and Management. *Am. Fam. Physician*, 2013 Jan 15;87 (2): 98-104.
11. Garcia-Lopez S, Bermejo F. A guide to diagnosis of iron deficiency and iron deficiency anemia in Digestive Diseases. *World Journal of Gastroenterology*, 2009 Oct 7; 15 (37): 4638-4643.
12. Ghosh S. Investigating Iron Deficiency Anemia without Clinical Evidence of Gastrointestinal Blood Loss. *Canadian Journal of Gastroenterology*. 2012;26(10):686-686.
13. American Gastroenterological Association Medical Position Statement: Evaluation and management of occult and obscure gastrointestinal bleeding. *Gastroenterology*, 2000; 118:197-200.
14. Raju GS, Gerson L, Das A, et al. American Gastroenterological Association (AGA) Institute medical position statement on obscure gastrointestinal bleeding. *Gastroenterology*, 2007; 133:1694-1696.
15. Zuckerman GR, Prakash C, Askin MP, et al. AGA Technical review on the evaluation and management of occult and obscure gastrointestinal bleeding. *Gastroenterology*, 2000; 118:201-221.
16. Enns RA, Hookey L, Armstrong D, et al. Clinical Practice Guidelines for the Use of Video Capsule Endoscopy. *Gastroenterology*. 2017;152(3):497-514. doi:10.1053/j.gastro.2016.12.032.
17. Flemming J, Cameron S. Small bowel capsule endoscopy. *Medicine*. 2018;97(14). doi:10.1097/md.00000000000010148.
18. Technology status evaluation report on wireless capsule endoscopy. *Gastrointestinal Endoscopy*. 2014;79(5):805-815.

AB-23: Inflammatory Bowel Disease

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AB-23.1: IBD (Crohn's Disease or Ulcerative Colitis)

- Suspected Crohn's Disease or Ulcerative Colitis
 - ◆ Chronic diarrhea without "Red Flags" (See: **AB-2.1: Red Flag Signs and Symptoms** and **AB-21: Diarrhea, Constipation, and Irritable Bowel**)
 - ◆ Any "Red Flag" (See: **AB-2.1: Red Flag Signs and Symptoms**) can undergo:
 - CT Abdomen and Pelvis with contrast (CPT® 74177) or CT Enterography (CPT® 74177) or MR Enterography (CPT® 74183 or CPT® 74183 and CPT® 72197).
 - ◆ CT Enterography (CPT® 74177) or MR Enterography (CPT® 74183 or CPT® 74183 and CPT® 72197) can be approved if no red flag is present and request is for the evaluation of chronic abdominal pain associated with diarrhea due to a concern for inflammatory bowel disease if:
 - There is a positive family history of inflammatory bowel disease, **OR**
 - There are endoscopy or colonoscopy findings suggestive of inflammatory bowel disease, **OR**
 - Elevated inflammatory markers (fecal lactoferrin ≥ 4.0 ug/g, CRP >0.5 mg/dL, or fecal calprotectin ≥ 50 ug/g), **OR**
 - Diagnosis is still in doubt after colonoscopy and evaluation of inflammatory markers, and Crohn's disease is suspected
- NOTE: Serologic markers

Serologic and genetic markers are currently under investigation with regards to their value in diagnosing inflammatory bowel disease, and are sometimes used as a screening test for IBD in which other examinations are negative. At the current time they are not considered suitable as a screening test for inflammatory bowel disease in patients with GI symptoms, and the routine use of serologic or genetic markers for the diagnosis of IBD is not indicated. Thus, an isolated positive marker result in a patient without any other findings to suggest IBD, especially in the presence of negative inflammatory markers and endoscopic examinations, is not, in and of itself, an indication for advanced imaging.

- Note: Serologic markers include anti-glycan antibodies, such as ASCA, ACCA, ALCA, AMCA, Anti-L, Anti-C), Anti-OmpC, Anti-Is, Anti-Cbir, pANCA, PAB, GAB

Background and Supporting Information

Studies have demonstrated the negative predictive value of a low fecal calprotectin and CRP with regards to inflammatory bowel disease. Chey, et al. in a meta-analysis demonstrated that a fecal calprotectin <40 mcg/g or a CRP ≤ 0.5 mg/dl effectively excludes inflammatory bowel disease in patients with IBS. Katsinelos, et al. reviewed wireless capsule endoscopy results in patients with abdominal pain and diarrhea. The diagnostic yield of capsule endoscopy in patients with abdominal pain and diarrhea with positive inflammatory markers was 90.1%, and 0% in patients with abdominal pain and diarrhea with negative inflammatory markers.

This led the Canadian Association of Gastroenterology to recommend against the use of capsule endoscopy in persons with chronic abdominal pain or diarrhea as their only symptoms and no evidence of biomarkers associated with Crohn's Disease, stating "CE (capsule endoscopy) is not warranted in most patients who present with chronic abdominal pain in the absence of positive tests for inflammatory markers or abnormal findings on endoscopy or imaging".

AB-23.2: Known IBD

- Known Crohn's Disease or Ulcerative Colitis with suspected complications including abscess, perforation, fistula or obstruction, or monitoring response to therapy:
 - ◆ CT Abdomen and Pelvis (CPT® 74177), CT Enterography (CPT® 74177), or MR Enterography (CPT® 74183 or CPT® 74183 and CPT® 72197)
 - ◆ MR Enterography is the test of choice for the follow up of young patients with IBD given the lack of ionizing radiation and the need for lifetime follow up in many patients.

AB-23.3: Perirectal/Perianal Disease

This section is applicable to individuals with or without Crohn's disease. See also: **PV-21.1** and **PV-21.2**

- Perirectal/Perianal Fistula:
 - ◆ MRI Pelvis without and with contrast (CPT® 72197)
 - ◆ Endoscopic ultrasound is preferential to CT in this setting
 - ◆ CT Pelvis with contrast (CPT® 72193) is an inferior study in this setting, and should be used when MRI or Endoscopic ultrasound cannot be performed.
- Perirectal/Perianal Abscess:
 - ◆ MRI Pelvis without and with contrast (CPT® 72197)
 - ◆ CT Pelvis with contrast (CPT® 72193) is inferior but can be approved as an alternative if desired.

AB-23.4: Primary Sclerosing Cholangitis (PSC)

- Primary Sclerosing Cholangitis:
 - ◆ MRCP can be considered to assess for PSC in those:
 - With IBD and any elevated liver study (including alkaline phosphatase, GGTP, bilirubin, AST, or ALT).
 - Without IBD, but with persistent cholestatic liver tests. (See: **AB-30: Abnormal Liver Chemistries**)
 - ◆ Ultrasound or MRI/MRCP can be done as surveillance for cholangiocarcinoma in individuals with PSC every 6 months.

Background and Supporting Information

Primary sclerosing cholangitis (PSC) is a chronic liver and biliary tract disease that can result in stricturing and fibrosis of the intra- and extra- hepatic biliary ducts, as well as end-stage liver disease. It is most often associated with inflammatory bowel disease. Biliary obstruction can occur anywhere along the biliary tree, resulting in cholangitis, and there is a high risk of the development of cholangiocarcinoma, which must be strongly considered in individuals with PSC and a dominant stricture, as well as an increased risk of gallbladder polyps and other malignancies. As such, imaging plays an important role in the diagnosis and follow-up of PSC.^{6,7,8}

See **AB-26.1: Chronic Liver Disease, Cirrhosis and Screening for HCC** Background and Supporting Information PSC (Primary Sclerosing Cholangitis) vs PBC (Primary Biliary Cholangitis)

AB-23.5: Special Considerations

- CT Abdomen and Pelvis with or without contrast (CPT® 74177 or CPT® 74176) can be performed prior to endoscopy if requested by or in consultation with the physician who will be performing the endoscopy, if there is suspected inflammatory bowel disease.

References

1. Lichtenstein GR, Loftus EV, Isaacs KL, Regueiro MD, Gerson LB, Sands BE. ACG Clinical Guideline: Management of Crohn's Disease in Adults. *American Journal of Gastroenterology*. 2018;113(4):481-517. doi:10.1038/ajg.2018.27.
2. Hara AK, Leighton JA, Heigh RI, et al. Crohn Disease of the Small Bowel: Preliminary Comparison among CT Enterography, Capsule Endoscopy, Small-Bowel Follow-through, and Ileoscopy | *Radiology*.
3. Lin MF and Narra V. Developing role of magnetic resonance imaging in Crohn's disease. *Current Opinion in Gastroenterology*. 2008, 24(2):135-140.
4. Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® Crohn disease. American College of Radiology (ACR); Reviewed 2014.
5. Linder KD et al. ACG Clinical Guideline: Primary Sclerosing Cholangitis. *Amer J Gastroenterol*. 2015;110:646-659.
6. Razumilava, N. et al. Cancer Surveillance in individuals with primary sclerosing cholangitis. *Hepatology*, 2011; 54: 1842-1852.
7. Chapman R, Fevery J, Kalloo A, et al. Diagnosis and Management of Primary Sclerosing Cholangitis. *Hepatology*, 2010;51(2).
8. Katsinelos P, Fasoulas K, Beltsis A, et al. Diagnostic yield and clinical impact of wireless capsule endoscopy in patients with chronic abdominal pain with or without diarrhea: A Greek multicenter study. *European Journal of Internal Medicine*. 2011;22(5). doi:10.1016/j.ejim.2011.06.012.
9. Enns RA, Hookey L, Armstrong D, et al. Clinical Practice Guidelines for the Use of Video Capsule Endoscopy. *Gastroenterology*. 2017;152(3):497-514. doi:10.1053/j.gastro.2016.12.032.
10. Menees SB, Powell C, Kurlander J, Goel A, Chey WD. A Meta-Analysis of the Utility of C-Reactive Protein, Erythrocyte Sedimentation Rate, Fecal Calprotectin and Fecal Lactoferrin to Exclude Inflammatory Bowel Disease in Adults With IBS. *The American Journal of Gastroenterology*. 2015;110(3):444-454. doi:10.1038/ajg.2015.6.
11. Ziech M, Felt-Bersma R, Stoker J. Imaging of Perianal Fistulas. *Clinical Gastroenterology and Hepatology*. 2009;7(10):1037-1045. doi:10.1016/j.cgh.2009.06.030.
12. Berman L. Utility of magnetic resonance imaging in anorectal disease. *World Journal of Gastroenterology*. 2007;13(23):3153. doi:10.3748/wjg.v13.i23.3153.
13. Vogel JD, Johnson EK, Morris AM, et al. Clinical Practice Guideline for the Management of Anorectal Abscess, Fistula-in-Ano, and Rectovaginal Fistula. *Diseases of the Colon & Rectum*. 2016;59(12):1117-1133. doi:10.1097/dcr.0000000000000733.
14. Long MD, Sands BE. What Is the Role of the Inflammatory Bowel Disease Panel in Diagnosis and Treatment? *Clinical Gastroenterology and Hepatology*. 2018;16(5):618-620. doi:10.1016/j.cgh.2018.02.010
15. Magro F, Gionchetti P, Eliakim R, et al. Third European Evidence-based Consensus on Diagnosis and Management of Ulcerative Colitis. Part 1: Definitions, Diagnosis, Extra-intestinal Manifestations, Pregnancy, Cancer Surveillance, Surgery, and Ileal-anal Pouch Disorders. *Journal of Crohn's and Colitis*. 2017;11(6):649-670. doi:10.1093/ecco-jcc/jjx008.
16. Rubin DT, Ananthakrishnan AN, Siegel CA, Sauer BG, Long MD. ACG Clinical Guideline. Ulcerative Colitis in Adults. *The American Journal of Gastroenterology*. 2019;114(3):384-413. doi:10.14309/ajg.0000000000000152.
17. Smalley W, Falck-Ytter C, Carrasco-Labra A, Wani S, Lytvyn L, Falck-Ytter Y. AGA clinical practice guidelines on the laboratory evaluation of functional diarrhea and diarrhea-predominant Irritable Bowel Syndrome in adults (IBS-D). *Gastroenterology*. 2019;157(3):851-854. doi:10.1053/j.gastro.2019.07.004.

AB-24: Celiac Disease (Sprue)

AB-24.1: Celiac Disease

- Endoscopy and biopsy of the small bowel is performed to confirm the diagnosis if the anti-tTG and/or EMA tests are positive.
- CT Abdomen and Pelvis with contrast (CPT® 74177), CT Enteroclysis (CPT® 74176 or CPT® 74177), or CT Enterography (CPT® 74177) is appropriate for:
 - ◆ One time study after initial, confirmed diagnosis of Celiac Disease.
 - ◆ Confirmed Celiac disease and despite adherence to a gluten free diet the individual is experiencing new or continued weight loss, diarrhea, abdominal distention, anemia, or other symptoms suggesting complications of celiac disease.

Background and Supporting Information

- Celiac is an autoimmune disease in which the villi of the small intestine are damaged from eating gluten (found in wheat, barley, and rye).
- Complications of celiac disease include ulcerative jejunitis, lymphoma, and small intestinal adenocarcinoma.
- Diagnosis is made by blood testing¹:
 - ◆ Anti-tissue transglutaminase antibody [anti-tTG], anti-endomysium antibody (EMA), total IgA count, CBC to detect anemia, ESR, C-reactive protein, complete metabolic panel, vitamin D, E, B12 levels.

References

1. Rubio-Tapia A, Hill ID, Kelly CP, Calderwood AH, Murray JA. ACG Clinical Guidelines: Diagnosis and Management of Celiac Disease. The American Journal of Gastroenterology. 2013;108(5):656-676.
2. Weyenberg SJV, Mulder CJ, Waesberghe JHTV. Small Bowel Imaging in Celiac Disease. Digestive Diseases. 2015;33(2):252-259. doi:10.1159/000369516.
3. Radmard AR, Taheri APH, Nik ES, et al. MR enterography in nonresponsive adult celiac disease: Correlation with endoscopic, pathologic, serologic, and genetic features. Journal of Magnetic Resonance Imaging. 2017;46(4):1096-1106. doi:10.1002/jmri.25646.
4. Elsayes KM, Al-Hawary MM, Jagdish J, Ganesh HS, Platt JF. CT Enterography: Principles, Trends, and Interpretation of Findings. RadioGraphics. 2010;30(7):1955-1970. doi:10.1148/rg.307105052.

AB-25: CT Colonography (CTC)

AB-25.1: CTC

Certain payers (e.g. Medicare) consider CTC for screening investigational and their coverage policies will take precedence over eviCore guidelines.

Note: A screening CTC (CPT® 74263) can ONLY be used for an individual who is a candidate for average risk screening as defined below. It cannot be used for any other indication. If the request for a CTC is for any other reason than average risk screening, please refer to diagnostic CTC indications. A diagnostic CTC would be the appropriate code, if approvable, for any other reason than average risk screening. This would include surveillance for a history of colon polyps, the evaluation of a change in bowel habits, abdominal pain, bleeding, etc. Please refer to the definition below of an average-risk individual, as well as the circumstances for which a diagnostic CTC is appropriate.

- Screening CTC (CPT® 74263) for colorectal cancer is NOT indicated if:
 - ◆ FIT-DNA (multi-targeted stool DNA test) within the last 3 years, OR
 - ◆ Colonoscopy within the last 10 years
- Screening CTC (CPT® 74263) can be approved every 5 years for colorectal cancer^{1,2,3} for:
 - (This coverage may vary according to health plan/payer policies.)
 - ◆ Average-risk individuals ages 45 to 75
 - Average risk is defined as no previously diagnosed colorectal cancer, colonic adenomas, or inflammatory bowel disease involving the colon
 - ◆ Individuals between 76 to 85 if there is no history of a previously negative colonoscopy or CTC, or, if in the opinion of the provider, the benefits of screening outweigh the risks.
 - ◆ Individuals with a SINGLE first-degree relative diagnosed at age >60 years with colorectal cancer or an advanced adenoma can be screened with CTC beginning at age 40.
 - If there are 2 or more first degree relatives at any age with CRC or an advanced adenoma, or a first degree relative <60, the individual should be screened via colonoscopy, not CTC.
- Diagnostic CTC without contrast (CPT® 74261) can be approved for:
 - ◆ Failed conventional colonoscopy (e.g. due to a known colonic lesion, structural abnormality, or technical difficulty), and/or
 - ◆ Conventional colonoscopy is medically contraindicated. Contraindications may include:⁴
 - Coagulopathy
 - Intolerance to sedation
 - Elderly ≥80 years of age
 - Recent (within the last 60 days) myocardial infarction (MI)

- Diagnostic CTC with contrast (CPT® 74262) can be approved if:
 - ◆ There is a known obstructing colorectal malignancy so that staging prior to surgery can be performed, if desired.
 - ◆ There is a clearly stated indication for IV contrast to evaluate extra-colonic organs. When performed in this setting, a CTC with contrast will substitute for a CT Abdomen and Pelvis such that an additional CT Abdomen and Pelvis would generally not be needed.
- MRI Colonography: Currently, no published society-endorsed guideline with respect to colorectal cancer screening lists MRI Colonography as an alternative screening study. As such, requests for MRI Colonography would be considered investigational at this time. There is no specific CPT assigned for this procedure. It is sometimes requested as an MRI Abdomen and MRI Pelvis.

Background and Supporting Information

CT Colonography is routinely performed without contrast, and IV contrast is not needed in most cases

References

1. Lin JS, Piper MA, Perdue LA, et al. Screening for Colorectal Cancer. *JAMA*, 2016;315(23):2576. doi:10.1001/jama.2016.3332.
2. Yee J, Kim DH, Rosen MP, et al. ACR Appropriateness Criteria® Colorectal cancer screening. Last review date: 2018.
3. Rex DK, Boland CR, Dominitz JA, et al. Colorectal Cancer Screening: Recommendations for Physicians and Patients From the U.S. Multi-Society Task Force on Colorectal Cancer. *Gastroenterology*. 2017;153(1):307-323. doi:10.1053/j.gastro.2017.05.013.
4. Yau TY, Alkandari L, Haaland B, Low W, Tan CH. Is intravenous contrast necessary for detection of clinically significant extracolonic findings in patients undergoing CT colonography? *The British Journal of Radiology*. 2014;87(1036):20130667. doi:10.1259/bjr.20130667.
5. Spada C, Stoker J, Alarcon O, et al. Clinical indications for computed tomographic colonography: European Society of Gastrointestinal Endoscopy (ESGE) and European Society of Gastrointestinal and Abdominal Radiology (ESGAR) Guideline. *Endoscopy*. 2014;46(10):897-915. doi:10.1055/s-0034-1378092.
6. ACR-SAR-SCBT-MR: Practice Parameter for the Performance of Computed Tomography (CT) Colonography in Adults. 2014.
7. Scalise P, Mantarro A, Pancrazi F, Neri E. Computed tomography colonography for the practicing radiologist: A review of current recommendations on methodology and clinical indications. *World Journal of Radiology*. 2016;8(5):472. doi:10.4329/wjr.v8.i5.472.
8. U.S. Preventative Services Task Force. Colorectal cancer: screening. Draft recommendation statement. October 27, 2020. <https://uspreventiveservicestaskforce.org/uspstf/draft-recommendation/colorectal-cancer-screening3#fullrecommendationstart>
9. Wolf AMD, Fontham ETH, Church TR, et. al. Colorectal cancer screening for average-risk adults: 2018 guideline update from the American Cancer Society. *CA*. 2018;68(4):250-281. doi:10.3322/caac.21457.
10. Shaukat A, Kahi CJ, Burke CA, Rabeneck L, Sauer BG, Rex, D. ACG clinical guidelines: colorectal cancer screening 2021. *Am J Gastroenterol*. 2021;116(3):458-479. doi:10.14309/ajg.0000000000001122.

AB-26: Cirrhosis and Liver Screening for Hepatocellular Carcinoma (HCC); Ascites and Portal Hypertension

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AB-26.1: Chronic Liver Disease, Cirrhosis and Screening for HCC

- Note: for HCC surveillance in Budd-Chiari Syndrome/Hepatic Vein Thrombosis, see: **AB-43.1: Hepatic Arteries and Veins**.
- Screening for HCC in individuals with chronic liver disease or cirrhosis:
 - ◆ Ultrasound (CPT® 76700 or CPT® 76705) every 6 months in the presence of chronic liver disease, regardless of etiology (See exception for **AB-26.4: Monitoring After Fontan Procedure**).
 - If liver nodule is identified:
 - Less than 1cm
 - Repeat US in 3 months, then every 3 to 6 months.
 - If stable for 2 years, then return to US every 6 months
 - Greater than or equal to 1cm
 - Multiphase CT Liver (either CPT® 74160 or CPT® 74170) or MRI Abdomen (CPT® 74183) should be performed.
 - If negative, return to routine surveillance via US in 6 months.
 - If Li-RADS NC (non-categorizable): repeat the same study or an alternative diagnostic imaging ≤3 months. (Note: non-categorizable refers to a technical problem with the study, such as image omission or severe degradation)
 - If Li-RADS 1 (definitely benign): Return to routine surveillance via US in 6 months.
 - If Li-RADS 2 (probably benign): CT or MRI in 6 months can be approved (US requests are approvable if desired). If unchanged, return to routine surveillance via US.
 - If Li-RADS 3 (intermediate): CT or MRI in 3-6 months, and can be repeated every 6 months 2 more times, for a total of 18 months from the initial finding. If no change by 18 months, return to US surveillance every 6 months.
 - If Li-RADS 4 (probable HCC): Repeat or alternative imaging in ≤3 months. If HCC confirmed: See: **ONC-14: Upper GI Cancers** in the Oncology Imaging Guidelines.
 - If Li-RADS 5 (HCC confirmed): See: **ONC-14: Upper GI Cancers** in the Oncology Imaging Guidelines.
 - If Li-RADS M (Malignant, not definitely HCC): Repeat or alternative imaging in ≤3 months, and follow appropriate Oncology guidelines upon diagnosis.
 - ◆ Exceptions to the above algorithms:
 - Advanced imaging for surveillance may be substituted for US in the following circumstances:
 - Obesity (BMI >35)
 - Marked parenchymal heterogeneity noted on US.
 - Other specifically noted technical limitations of US such as obscuration by intestinal gas, chest wall deformity, etc.

- For individuals on the Liver Transplant list: See: **AB-42.1: Liver Transplant, Pre-Transplant**
- ◆ Alpha-fetoprotein ≥ 20 ng/mL: Multiphasic CT or MRI Abdomen:
 - Further imaging should follow the above algorithm, depending on the findings of the CT or MRI.
 - If the initial CT or MRI does not reveal a lesion, but the AFP increases on subsequent testing, additional advanced imaging by CT or MRI may be approved.
- ◆ Contrast-Enhanced Ultrasound (CEUS)
 - Further studies are needed to assess the value of CEUS in this setting, and it should be considered investigational and experimental at this time.

Background and Supporting Information

When performed for liver lesion evaluation, a multiphase CT protocol may include non-contrast imaging as well as arterial, portal venous, and delayed-phase post-contrast imaging. However, these protocols do not always require non-contrast imaging which may not provide additional information in many scenarios. Therefore, a multiphase CT for liver lesion evaluation can be requested as CPT® 74160 (CT Abdomen with contrast) or CPT® 74170 (CT Abdomen without and with contrast).

The American Association for the Study of Liver Diseases (AASLD) revised its guidelines with respect to surveillance for HCC in patients with cirrhosis in 2018. The recommended algorithm now includes either US alone or US with serum AFP every 6 months. It should be noted that “modification of this surveillance strategy based on the etiology of liver diseases or risk stratification models cannot be recommended at this time.”¹

In addition, the AASLD also issued a subsequent Practice Guidance in 2018 and this document forms the basis of eviCore’s guidelines. The AASLD has adopted the Li-RADS classification of liver lesions with respect to HCC surveillance imaging for patients with advanced liver disease, and follow-up imaging protocols are based on this system. In view of this, the Li-RADS classification now informs imaging protocols used by eviCore.

Note: PSC (Primary Sclerosing Cholangitis) vs. PBC (Primary Biliary Cholangitis)

These 2 entities sound similar, and both are cholestatic, but they are different diseases, and as such have different monitoring requirements.

PSC is an idiopathic cholestatic disease characterized by chronic inflammation, progressive fibrosis, and stricturing of the *medium and large-sized* extra-hepatic or intra-hepatic bile ducts. Segmental bile duct dilation proximal to areas of stricturing creates the characteristic beaded appearance on a cholangiogram, such as MRCP. This may progress and eventually lead to cirrhosis as well. It is most commonly associated with inflammatory bowel disease. From a surveillance standpoint, PSC may be complicated by disease-associated malignancies, including cholangiocarcinoma, hepatocellular carcinoma, and pancreatic cancer. Thus, follow-up imaging in this setting is generally via MRCP +/- MRI Abdomen (CPT® 74181 or CPT® 74183) – See: **AB-23.4: Primary Sclerosing Cholangitis (PSC)**.

PBC is a complex, chronic, and slowly progressive autoimmune liver disease that predominately affects women, and is characterized by cholestatic liver biochemistries as well as the presence of AMA (Anti-Mitochondrial Antibodies), and results in T-lymphocyte-mediated destruction of *small* intrahepatic bile ducts. This may ultimately lead to cirrhosis, and thus an increased risk of hepatocellular carcinoma. Because of this, surveillance via US screening protocols for HCC are followed in PBC.

It may be necessary, when the diagnosis of PBC is uncertain, for an MRCP to be performed in order to distinguish between PBC and PSC. However, MRI or MRCP is not used for serial monitoring for PBC, once the diagnosis is established. This is in contradistinction to PSC, in which MRCP is used to surveil for cholangiocarcinoma, as discussed above.

AB-26.2: Ascites

- Abdominal ultrasound (CPT® 76700 or CPT® 76705) with diagnostic paracentesis required for all initial evaluations to determine the need for advanced imaging.
- Peritoneal-venous shunt patency study (CPT® 78291) is considered for evaluation of shunt patency and function in an individual with ascites

AB-26.3: Portal Hypertension

- For noninvasive abdominal imaging:
 - ◆ Abdominal US (CPT® 76700 or CPT® 76705) (including Duplex Doppler US [CPT® 93975] of the liver and upper abdomen) is required for all initial evaluations to assist in determining the cause (pre-hepatic [e.g. portal vein thrombosis, extrinsic compression from a tumor], intrahepatic [e.g. cirrhosis], and post-hepatic [e.g. hepatic vein thrombosis]). US is very accurate for detecting portal vein or hepatic vein thrombosis.
- For additional imaging indications, see: **AB-43.1: Hepatic Arteries and Veins**
- TIPS (transjugular intrahepatic portosystemic shunt)
 - ◆ See: **AB-43.1: Hepatic Arteries and Veins**
- Certain requests are made for advanced imaging to evaluate an individual with cirrhosis for the presence of esophageal varices. In general, and in the absence of a contraindication, endoscopy should be performed in individuals to assess for the presence of varices.

Background and Supporting Information:

- Most cases of portal hypertension are caused by cirrhosis, and the most feared complication is that of esophageal variceal hemorrhage. Causes of portal hypertension can be divided into prehepatic (e.g. portal vein thrombosis, extrinsic compression from a tumor), intrahepatic (e.g. cirrhosis) and post-hepatic (e.g. hepatic vein thrombosis) causes. The differentiation of some of these causes may require work-up which includes measurement of the hepatic venous pressure gradient (HVPG) which is considered the gold standard for the evaluation of portal hypertension.

- The gold standard for the assessment of portal hypertension is the Hepatic Venous Pressure Gradient (HPVG [pressure gradient between portal vein and the inferior vena cava]), which is an invasive test.

AB-26.4: Monitoring After Fontan Procedure

- Abdominal ultrasound and Doppler yearly
- Transient Elastography yearly (CPT® 91200) (Note: eviCore does not currently review for this procedure code and providers should contact the insurer directly for any pre-authorization requirements.)
- If any sized lesions are detected on ultrasound:
 - ◆ MRI Abdomen without or without and with contrast (CPT® 74181 or CPT® 74183) and then follow **AB-26.1: Chronic Liver Disease, Cirrhosis and Screening for HCC** timeframes for follow-up based on Li-RADS classification, with the exception that all future follow-up imaging can be with MRI Abdomen without or without and with contrast (CPT® 74181 or CPT® 74183) if requested
- If advanced fibrosis or cirrhosis is detected:
 - ◆ HCC monitoring every 6 months with MRI Abdomen without or without and with contrast (CPT® 74181 or CPT® 74183) is indicated

Background and Supporting Information

- Individuals with single-ventricle physiology who have undergone the Fontan Procedure which redirects venous blood flow to the pulmonary circulation invariably develop liver complications, which can include the development of nodules and cirrhosis secondary to the altered vascular anatomy, and thus are at risk for hepatocellular carcinoma. In addition, the congestive hepatopathy associated with the Fontan procedure makes differentiation of focal liver lesions from congestive changes more challenging than other cirrhotic conditions. Thus most institutions use MRI rather than US for monitoring in the setting of cirrhosis. There are no current society-endorsed guidelines and institutions may vary in the monitoring of chronic liver disease in this individual population. The above algorithm represents an accepted approach and is consistent with the consensus from the Fontan-Associated Liver Disease proceedings from the American College of Cardiology Shareholders Meeting (2015) as well as an institutional algorithm.¹⁰

References

1. Heimbach JK, Kulik LM, Finn RS, et al. AASLD guidelines for the treatment of hepatocellular carcinoma. *Hepatology*. 2017;67(1):358-380. doi:10.1002/hep.29086.
2. Benson AB, D'Angelica MI, Abbot D et al. National Comprehensive Cancer Network (NCCN) Guidelines Version 2.2018 – June 7, 2018. Hepatobiliary cancers, available at: https://www.nccn.org/professionals/physician_gls/pdf/hepatobiliary.pdf. Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines™) for Hepatobiliary cancers, V 2.2018 – June 7, 2018. ©2018 National Comprehensive Cancer Network, Inc. All rights reserved. The NCCN Guidelines™ and illustrations herein may not be reproduced in any form for any purpose without the express written permission of the NCCN. To view the most recent and complete version of the NCCN Guidelines™, go online to NCCN.org.
3. Ascites SR, Katz J. Portal Hypertension Imaging: Practice Essentials, Radiography, Computed Tomography. Published June 9, 2017.
4. Khanna R, Sarin SK. Non-cirrhotic portal hypertension – Diagnosis and management. *Journal of Hepatology*. 2014;60(2):421-441.
5. Marrero JA, Kulik LM, Sirlin CB, et al. Diagnosis, Staging, and Management of Hepatocellular Carcinoma: 2018 Practice Guidance by the American Association for the Study of Liver Diseases. *Hepatology*. 2018;68(2):723-750. doi:10.1002/hep.29913.
6. Diamond T, Ovchinsky N. Fontan-associated liver disease: Monitoring progression of liver fibrosis. *Clinical Liver Disease*. 2018;11(1):1-5. doi:10.1002/cld.681.
7. Daniels CJ, Bradley EA, Landzberg MJ, et al. Fontan-Associated Liver Disease. *Journal of the American College of Cardiology*. 2017;70(25):3173-3194. doi:10.1016/j.jacc.2017.10.045.
8. Munsterman ID, Duijnhouwer AL, Kendall TJ, et al. The clinical spectrum of Fontan-associated liver disease: results from a prospective multimodality screening cohort. *European Heart Journal*. 2018;40(13):1057-1068. doi:10.1093/eurheartj/ehy620.
9. Lindor KD, Bowlus CL, Boyer J, Levy C, Mayo M. Primary Biliary Cholangitis: 2018 Practice Guidance from the American Association for the Study of Liver Diseases. *Hepatology*. June 2018. doi:10.1002/hep.30145.
10. Primary Biliary Cirrhosis and Primary Sclerosing Cholangitis: a Review Featuring a Womens Health Perspective. *Journal of Clinical and Translational Hepatology*. 2014;2(4). doi:10.14218/jcth.2014.00024.
11. European Association for the Study of the Liver. EASL clinical practice guidelines on the management of ascites, spontaneous bacterial peritonitis, and hepatorenal syndrome in cirrhosis. *J Hepatol*. 2010;53(3):397-417. doi:10.1016/j.jhep.2010.05.004.
12. Aithal GP, Palaniyappan N, China L, et. al. Guidelines on the management of ascites in cirrhosis. *Gut*. 2020;Epub ahead of print;1-21. doi:10.1136/gutjnl-2020-321790.
13. Oey RC, van Buuren HR, de Man RA. The diagnostic work-up in patients with ascites: current guidelines and future prospects. *Neth J Med*. 2016;74(8):330-335.

AB-27: MR Cholangiopancreatography (MRCP)

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AB-27.1: MRCP	99

AB-27

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AB-27.1: MRCP

- MRCP (Magnetic Resonance Cholangio Pancreatography) is a non-invasive imaging procedure which is used to visualize the biliary and pancreatic ductal system. It is used most often in the following circumstances:
 - ◆ Suspected gallstone pancreatitis (See: **AB-33: Pancreatitis**)
 - ◆ Suspected biliary pain (See: **AB-2.3: Right Upper Quadrant Pain** including Suspected Gallbladder Disease and **AB-2.5: Epigastric Pain and Dyspepsia**)
 - ◆ Pancreatic cyst and pseudocyst evaluation (See: **AB-31: Pancreatic Lesion**, and **AB-33: Pancreatitis**)
 - ◆ Evaluation of abnormal liver chemistries (See: **AB-30.1: Abnormal Liver Chemistries**)
 - ◆ Evaluation of the pancreas secondary to abdominal trauma with suspected duct injury or pseudocyst
 - ◆ Recurrent pancreatitis of unknown etiology (See: **AB-33: Pancreatitis**)
 - ◆ Evaluation and follow-up of Primary Sclerosing Cholangitis (See: **AB-23.4: Primary Sclerosing Cholangitis (PSC)**)
 - ◆ Evaluation of jaundice (See: **AB-30.1: Abnormal Liver Chemistries**)
 - ◆ Evaluation of congenital anomalies of the cystic and hepatic ducts
 - ◆ Post-surgical biliary anatomy and complications (See: **AB-42.3: Liver Transplant, Post-Transplant Imaging**)
 - ◆ For the further evaluation of abnormal ultrasound or CT findings of dilated pancreatic duct, enlargement, or fullness of the pancreas.
- Code assignment for MRCP
 - ◆ In general, there is no specific CPT code to describe MRCP. To report an MRCP, one of the MRI Abdomen codes should be selected, depending on contrast needs (CPT® 74181, CPT® 74182, or CPT® 74183).
 - ◆ There is a Level II HCPCS code for MRCP, S8037, used by some insurers. However this code (and any other code beginning with the letter “S”) is not payable by Medicare.
 - ◆ Reporting or billing a *second* MRI code to represent the “MRCP portion” of the study is not supported. When this occurs, it is usually seen as 2 simultaneous MRI requests, an MRI Abdomen without and with contrast (CPT® 74183) AND an additional MRI Abdomen without contrast (CPT® 74181). This second MRI code, as noted, is not supported. Both the primary MRI Abdomen AND the MRCP portion of the study are covered by the single MRI Abdomen code (CPT® 74183).
 - ◆ Requests for 3D rendering (either CPT® 76376 or CPT® 76377) are approvable, if requested, in addition to the primary MRI Abdomen code (CPT® 74181, CPT® 74182, or CPT® 74183).

References

1. Faerber EN, Benator RM, Browne LP, et al. American College of Radiology. ACR practice guideline for the performance of magnetic resonance imaging (MRI) of the abdomen. Reston (VA): American College of Radiology (ACR); 2010 (revised 2015).
2. Kaltenthaler EC, Walters SJ, Chilcott J, et al. MRCP compared to diagnostic ERCP for diagnosis when biliary obstruction is suspected: a systematic review. BMC Medical Imaging. 2006;6(1).
3. Griffin N, Charles-Edwards G, Grant LA. Magnetic resonance cholangiopancreatography: the ABC of MRCP. Insights into Imaging. 2011;3(1):11-21. doi:10.1007/s13244-011-0129-9.

AB-28: Gallbladder Polyps

AB-28.1: Gallbladder Polyps

- Individuals at increased risk for gallbladder malignancy (if surgery not chosen):
 - ◆ Age >50
 - ◆ Primary Sclerosing Cholangitis
 - ◆ Indian ethnicity
 - ◆ Sessile polyp or gallbladder wall thickening >4 mm
- Increased risk for gallbladder malignancy:
 - ◆ Polyp <6 mm
 - Ultrasound at 6 months, then yearly for 5 years
 - ◆ Polyp 6-9 mm (If cholecystectomy is not chosen)
 - Ultrasound at 6 months, then yearly for 5 years
- No increased risk for gallbladder malignancy:
 - ◆ Polyp <6 mm
 - Ultrasound at 1, 3, and 5 years
 - ◆ Polyp 6-9 mm
 - Ultrasound at 6 months, and then yearly for 5 years
- Gallbladder polyp ≥10 mm:
 - ◆ Surgery recommended. If surgery not performed, follow guidelines for increased risk of gallbladder malignancy as noted above.
- Alternative Imaging:
 - ◆ Endoscopic ultrasound (EUS) may provide additional information in the diagnosis of gallbladder polyps. There is insufficient data that advanced imaging (CT or MRI) should be used ahead of conventional ultrasound in the investigation of gallbladder polyps.¹
- Findings on ultrasound or EUS suspicious for malignancy:
 - ◆ CT Abdomen with or without and with contrast (CPT® 74160 or CPT® 74170)
- For confirmed gallbladder malignancy:
 - ◆ See: **ONC-14.6: Gallbladder and Biliary Tumors – Initial Work-up/Staging** in the Oncology Imaging Guidelines

References

1. Wiles R, Thoeni RF, Barbu ST, et al. Management and follow-up of gallbladder polyps. *European Radiology*. 2017;27(9):3856-3866. doi:10.1007/s00330-017-4742-y.
2. Andrén-Sandberg Å. Diagnosis and Management of Gallbladder Polyps. *North American Journal of Medical Sciences*. 2012;4(5):203. doi:10.4103/1947-2714.95897.
3. McCain RS, Diamond A, Jones C, Coleman HG. Current practices and future prospects for the management of gallbladder polyps: A topical review. *World Journal of Gastroenterology*. 2018;24(26):2844-2852. doi:10.3748/wjg.v24.i26.2844.
4. Anderson MA, Appalaneni V, Ben-Menachem T, et al. The role of endoscopy in the evaluation and treatment of patients with biliary neoplasia. *Gastrointestinal Endoscopy*. 2013;77(2):167-174. doi:10.1016/j.gie.2012.09.029.

AB-29: Liver Lesion Characterization

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AB-29.1: Liver Lesion Characterization

Note: Advanced imaging approvals in this section refers to MRI Abdomen without and with contrast (CPT® 74183), CT Abdomen with contrast (CPT® 74160), CT Abdomen without and with contrast (CPT® 74170) and Contrast-Enhanced Ultrasound (CPT® 76978-initial lesion, CPT® 76979-additional lesions). In the following section, if only CT Abdomen with contrast (CPT® 74160) is noted as the appropriate study, it is because the American College of Radiology has determined that a prior without contrast study does not provide any added benefit. It should also be noted that a standard “triple-phase CT” liver does not involve a prior without contrast study (See: **AB-1.2: CT Imaging**)

- **Low-risk** individuals defined as:
 - ◆ No known primary malignancy
 - ◆ No hepatic dysfunction (abnormal liver tests)
 - ◆ No known underlying chronic liver disease
 - ◆ No history of alcoholism, sclerosing cholangitis, choledochal cysts, hemochromatosis, or anabolic steroid use²
- High-risk individual would have one or more of the above conditions.
- Liver Lesion discovered on US:
 - ◆ Indeterminate Liver Lesion ≥1cm on initial imaging
 - No suspicion or evidence of extrahepatic malignancy or underlying liver disease
 - MRI Abdomen without and with contrast (CPT® 74183) or CT Abdomen with contrast (CPT® 74160) or Contrast-Enhanced US (CEUS, CPT® 76978, CPT® 76979)
 - Known history of an extrahepatic malignancy:
 - MRI Abdomen without and with contrast (CPT® 74183) or CT Abdomen with contrast or without and with contrast (CPT® 74160 or CPT® 74170)
 - Known history of chronic liver disease:
 - See **AB-26.1: Chronic Liver Disease, Cirrhosis, and Screening for HCC**
 - ◆ Indeterminate Liver Lesion <1cm on initial imaging
 - Known underlying chronic liver disease
 - See **AB-26.1: Chronic Liver Disease, Cirrhosis, and Screening for HCC**
 - Known history of an extrahepatic malignancy:
 - MRI Abdomen without and with contrast (CPT® 74183) is the preferred study
 - Contrast-Enhanced US (CPT® 76978, CPT® 76979) is appropriate
 - CT Abdomen is generally not the appropriate study in this scenario. In most circumstances, the resolution of CT does not allow for definitive characterization of lesions <1cm.

- Liver Lesion discovered on CT (non-contrast or single-contrast) or non-contrast MRI
 - ◆ Indeterminate, $\geq 1\text{cm}$ on initial imaging:
 - No suspicion or evidence of extrahepatic malignancy or underlying liver disease
 - Multiphase CT Abdomen with contrast (CPT® 74160), MRI Abdomen without and with contrast (CPT® 74183), or CEUS (CPT® 76978 and/or CPT® 76979)
 - Known history of an extrahepatic malignancy:
 - MRI Abdomen without and with contrast (CPT® 74183), CT Abdomen with contrast or without and with contrast (CPT® 74160 or CPT® 74170), or CEUS (CPT® 76978 or CPT® 76979)
 - Known chronic liver disease:
 - See: **AB-26.1: Chronic Liver Disease, Cirrhosis, and Screening for HCC**
 - ◆ Indeterminate liver lesion $< 1\text{cm}$ on initial imaging:
 - Known history of an extrahepatic malignancy:
 - MRI Abdomen without and with contrast (CPT® 74183), Multiphase CT Abdomen (CPT® 74160), or CEUS (CPT® 76978 and/or CPT® 76979)
 - Known chronic liver disease:
 - See: **AB-26.1: Chronic Liver Disease, Cirrhosis, and Screening for HCC**
- Additional scenarios and follow-up imaging for an Indeterminate lesion²:
 - ◆ Indeterminate lesion $< 1\text{cm}$ on US, CT, or MRI, **low-risk** individual (See above “Low-Risk individuals”) and no suspicious imaging features noted on the study
 - No further imaging
 - ◆ Indeterminate lesion $< 1\text{cm}$ in **high-risk** individuals on US, CT, or unenhanced MRI (See above “High Risk”) not specifically dealt with in the above guidelines:
 - MRI Abdomen without and with contrast (CPT® 74183)
 - If, after MRI, the lesion remains indeterminate or not fully characterized
 - See: **ONC-31.2: Liver Metastases** or malignancy-specific guidelines in the Oncology Imaging Guidelines
 - If **biopsy cannot be performed**, follow-up MRI can be obtained in 3-6 months. Additional imaging in this setting can be considered on an individual basis. This timeframe would also apply if the lesion is indeterminate and an MRI with Eovist is requested for further evaluation in this setting.
 - ◆ Most lesions $\geq 1\text{cm}$ can be categorized by MRI or histology. For lesions which have been categorized, regardless of size, see below.
- For the imaging of specific focal liver lesions:
 - ◆ Suspected hepatic adenoma:³
 - MRI is considered the best technique for characterization. Follow-up imaging can be CT Abdomen (CPT® 74160 or CPT® 74170) or MRI Abdomen (CPT® 74183) every 6 months for 2 years, and then annually, to establish any growth patterns and assess for malignant transformation.

- ◆ Hepatic Hemangioma (if not completely characterized on initial CT without a liver protocol):³
 - Multiphase CT Abdomen (CPT® 74160 or CPT® 74170) or MRI Abdomen (CPT® 74183)
 - Additional follow-up imaging is not required if the advanced imaging study demonstrates classic features of hemangioma with the following exception:
 - Giant hemangiomas (>4cm) can be followed by limited abdominal US in 6-12 months. If no change in size, no further follow-up is indicated, unless it becomes symptomatic.
 - See below for pre-operative considerations
- ◆ Focal Nodular Hyperplasia (FNH):³
 - MRI Abdomen (CPT® 74183) or CT Abdomen (CPT® 74160 or CPT® 74170) to confirm a diagnosis of FNH. The use of Eovist contrast is often diagnostic in differentiating FNH from other lesions seen on MRI or CT.
 - Additional follow-up is annual US for 2 to 3 years in women diagnosed with FNH who are continuing to use oral contraceptives. Follow-up with CT or MRI can be done if the lesion is not adequately visualized on US.
- ◆ Hepatic cysts:³
 - Asymptomatic, simple cysts do not require additional follow-up.
 - For complicated cysts (US shows internal septations, fenestrations, calcifications, irregular walls, as well as the presence of daughter cysts):
 - CT Abdomen (CPT® 74160 or CPT® 74170) or MRI Abdomen (CPT® 74183) can be performed
- Additional indications for advanced imaging (MRI Abdomen or CT Abdomen):
 - ◆ If documented that a percutaneous liver biopsy is to be considered if imaging is atypical or inconclusive.¹
 - ◆ Fatty liver on US with a focal liver lesion.
 - ◆ **If there is a technical limitation to US (e.g. marked heterogeneity, or other specifically noted technical limitations of US such as obscuration by intestinal gas, chest wall deformity, etc.)⁵
 - ◆ For suspected liver metastases, see: **ONC-31.2: Liver Metastases** in the Oncology Imaging Guidelines
- Preoperative studies for individuals with large hemangiomas or adenomas considered for resection:
 - ◆ MRA Abdomen (CPT® 74185) or CTA Abdomen (CPT® 74175) can be considered
- For Indeterminate Lesions ≥1cm in categories for which defined guidelines do not exist (i.e., underlying chronic liver disease, **AB-26.1: Chronic Liver Disease, Cirrhosis and Screening for HCC**, underlying malignancy, **ONC-31.2: Liver Metastases** or the specific malignancy in the Oncology Imaging Guidelines, hepatic adenoma, etc.) a biopsy should be considered when the findings from advanced imaging are inconclusive. In clinical situations when a biopsy cannot be performed (such as a medical contraindication or a liver transplant candidate due to the risk of needle-tract seeding), or is inconclusive, a short-term surveillance MRI can be performed in 3-4 months to monitor lesion stability.

- This can be repeated every 6 months, as necessary in this scenario.¹ This timeframe would also apply if an MRI with Eovist is requested for short-term follow-up of an indeterminate lesion imaged on MRI Abdomen without and with contrast performed with other contrast, such as gadolinium. An exception would be if the differential is between FNH vs. hepatic adenoma or other benign lesions. FNH follow-up is yearly, and hepatic adenoma would require a 6 month follow-up study; if the differential of the lesion is between FNH and hepatic adenoma, then the follow-up study should be 6 months.

AB-29.2: Fatty Liver (Non-Alcoholic Fatty Liver Disease – NAFLD)

- Non-Alcoholic Fatty Liver Disease
 - ◆ Fatty liver incidentally discovered on imaging (US/CT/MRI) or suspected:
 - Magnetic Resonance Elastography (MRE) (CPT® 76391)
 - See: **AB-45: Liver Elastography** for MRE indications
 - Magnetic Resonance-Protein Density Fat Fraction (MRI-PDFF, usually requested as CPT® 74181 or 74183), MR Spectroscopy (MR-S, CPT® 76390), and the multiparametric MRI referred to as Liver Multiscan (LMS, Category III CPT® code 0648T or 0649T) for evaluation of fatty liver disease:
 - With regards to the above procedures, their main current utility is in assessing response to therapy in clinical trials. Their role in clinical practice, or with what frequency one would image, has not been defined. In view of this, they are considered investigational at this time.
 - HCC Screening for Fatty Liver with cirrhosis or advanced fibrosis:
 - See: **AB-26.1: Chronic Liver Disease, Cirrhosis, and Screening for HCC**
 - MRI or CT for the further evaluation of incidentally discovered fatty liver on US, in the absence of a specific finding needing further characterization such as a nodule, is generally not indicated. See: **AB-29.1 Liver Lesion Characterization and Additional Indications for Advanced Imaging**. In addition, the finding of fatty liver alone on CT with contrast does not require MRI for confirmation.
 - ◆ Requests for imaging studies to screen individuals at high-risk for NALFD (e.g., diabetes or obesity) or for screening family members of individuals with NALFD is not approvable at this time.⁴

AB-29.3: Polycystic Liver Disease

- Polycystic Liver Disease
 - ◆ Defined as >20 cysts, or the presence of cysts occupying $\frac{1}{2}$ the volume of the hepatic parenchyma
 - ◆ Most commonly seen as an extra-renal manifestation of Autosomal Dominant Polycystic Kidney Disease, though may occur as Autosomal Dominant Polycystic Liver Disease.
 - ◆ Imaging:
 - For prognostication purposes MRI Abdomen (CPT® 74183) or CT Abdomen (CPT® 74160 or CPT® 74170) can be performed initially to assess liver volume.
 - At this time, there is no evidence that the asymptomatic patient requires surveillance imaging or monitoring.
 - Suspected complications such as cyst rupture or hemorrhage (manifested by acute pain in the upper abdomen):
 - MRI Abdomen (CPT® 74183) or CT Abdomen (CPT® 74160 or CPT® 74170)
- Nuclear Medicine imaging of the Liver (CPT® 78201, CPT® 78202, CPT® 78803, CPT® 78215, CPT® 78216, or CPT® 78830) are rarely performed, but can be considered when US, CT, and MRI are unavailable or contraindicated for:
 - ◆ Evaluation of liver mass, trauma, or suspected focal nodular hyperplasia (FNH).
 - ◆ Differentiation of hepatic hemangioma from FNH.
 - ◆ Diffuse hepatic disease or elevated liver function tests.

Background and Supporting Information

As noted by the AASLD "...imaging tests, such as ultrasound, computed tomography (CT), and MR, do not reliably reflect the spectrum of liver histology in patients with NAFLD." In addition, "MR imaging, either by spectroscopy or by proton density fat fraction is an excellent noninvasive modality for quantifying hepatic fat and is being widely used in NAFLD clinical trials.....However, the utility of noninvasively quantifying HS (hepatic steatosis) in patients with NAFLD in routine clinical care is limited".⁴

- Hints for liver lesion imaging:
 - ◆ Imaging accuracy:
 - A non-contrast CT is less sensitive than ultrasound
 - A non-contrast MRI is better than a non-contrast CT, but inadequate to define the etiology of a lesion
 - Triple-phase scanning is essential in characterizing a liver lesion
- How to interpret the radiologist's descriptors:
 - ◆ Hemangioma:
 - Hyperechoic
 - Peripheral nodular enhancement
 - Fills in from the periphery (nodular centripetal fill-in on venous and delayed phases)

- ◆ Focal nodular hyperplasia:
 - Homogenous enhancement
 - Washout. No delayed rim enhancement
 - Central scar (with fibrous-appearing septae radiating from the scar)
 - MRI specifics:
 - Homogenous on T1
 - Scar hyperintense on T2
 - Uniformly hyperintense with contrast
- ◆ Hepatic adenoma:
 - Irregular enhancement
 - Fat-containing
 - Washout
 - Central hemorrhage
 - No rim enhancement
 - No central scar
 - MRI specifics: Hyperintense signal on T1 and T2-weighted imaging with intra-lesional lipid
- ◆ Hepatocellular carcinoma:
 - HCC's are hypervascular and receive 100% of their blood supply from the hepatic artery, whereas the liver parenchyma receives 30% from the hepatic artery and 70% from the portal vein, and this discrepancy can be exploited during imaging.
 - Dynamic imaging via MRI and CT follows tumor density with time after IV contrast bolus.
 - During the early arterial phase: HCC appears brighter than surrounding liver (hyperintense) due to hepatic arterial supply.
 - May have a necrotic central region
 - Washes out rapidly
 - Delayed post-contrast phase: rim enhancement (a "tumor capsule")
- ◆ Focal fat (pseudo-mass)
 - Area with sharply demarcated borders
 - Absence of mass effect of surrounding architecture
 - Vessels can course through the region
 - No rim enhancement
 - No central scar

References

1. Lalani T, Rosen MP, Blake MA, Baker ME, et al. Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® liver lesion -- initial characterization. *American College of Radiology (ACR)*, 2014.
2. Gore RM, Pickhardt PJ, Mortele KJ, et al. Management of Incidental Liver Lesions on CT: A White Paper of the ACR Incidental Findings Committee. *Journal of the American College of Radiology*. 2017;14(11):1429-1437. doi:10.1016/j.jacr.2017.07.018.
3. Marrero JA, Ahn J, Reddy KR. ACG Clinical Guideline: The Diagnosis and Management of Focal Liver Lesions. *The American Journal of Gastroenterology*. 2014;109(9):1328-1347. doi:10.1038/ajg.2014.213.
4. Chalasani N, Younossi Z, Lavine JE, et al. The diagnosis and management of nonalcoholic fatty liver disease: Practice guidance from the American Association for the Study of Liver Diseases. *Hepatology*. 2017;67(1):328-357. doi:10.1002/hep.29367.
5. Heimbach JK, Kulik LM, Finn RS, et al. AASLD guidelines for the treatment of hepatocellular carcinoma. *Hepatology*. 2017;67(1):358-380. doi:10.1002/hep.29086.
6. Albrecht T. Dynamic Vascular Pattern of Focal Liver Lesions with Contrast-Enhanced Ultrasound: Latest Results with SonoVue. *Contrast-Enhanced Ultrasound in Clinical Practice*:1-22. doi:10.1007/88-470-0357-1_1.
7. Nolsøe CP, Lorentzen T. International guidelines for contrast-enhanced ultrasonography: ultrasound imaging in the new millennium. *Ultrasonography*. 2016;35(2):89-103. doi:10.14366/usg.15057.
8. Greenbaum LD. Foreword to Guidelines and Good Clinical Practice Recommendations for Contrast Enhanced Ultrasound (CEUS) in the Liver – Update 2012. *Ultrasound in Medicine & Biology*. 2013;39(2):186. doi:10.1016/j.ultrasmedbio.2012.09.021.
9. Chalasani N, Younossi Z, Lavine JE, et al. The Diagnosis and Management of Non-alcoholic Fatty Liver Disease: Practice Guideline by the American Gastroenterological Association, American Association for the Study of Liver Diseases, and American College of Gastroenterology. *Gastroenterology*. 2012;142(7):1592-1609. doi:10.1053/j.gastro.2012.04.001.
10. Chandok N. Polycystic liver disease: a clinical review. *Annals of Hepatology*. 2012;11(6):819-826. doi:10.1016/s1665-2681(19)31406-1.
11. Cnossen WR, Drenth JP. Polycystic liver disease: an overview of pathogenesis, clinical manifestations and management. *Orphanet Journal of Rare Diseases*. 2014;9(1):69. doi:10.1186/1750-1172-9-69.
12. Aerts RMV, Laarschot LFVD, Banales JM, Drenth JP. Clinical management of polycystic liver disease. *Journal of Hepatology*. 2018;68(4):827-837. doi:10.1016/j.jhep.2017.11.024.
13. Schiffman, Mitchell. Director, Liver Institute of Virginia. Assessment of Liver Masses. Presentation at 2019 American College of Gastroenterology Hepatology School and Eastern Regional Postgraduate Course. Washington, DC, June 7-9, 2019.
14. Aytaman, Ayse. Hepatocellular Carcinoma. Presentation at 2019 American College of Gastroenterology Hepatology School and Eastern Regional Postgraduate Course. Washington, DC, June 7-9, 2019.
15. Singal, Amit. Approach to Liver Lesions: Abnormal Sonogram, Please Evaluate. Medical Director, Liver Tumor Program, UT Southwestern Medical College. Presentation at 2019 American College of Gastroenterology Hepatology School and Eastern Regional Postgraduate Course. Washington, DC, June 7-9, 2019.
16. Bell, Daniel. Et. al. Hepatocellular Carcinoma Radiopedia
17. Marrero JA, Kulik LM, Sirlin CB, et al. Diagnosis, Staging, and Management of Hepatocellular Carcinoma: 2018 Practice Guidance by the American Association for the Study of Liver Diseases. *Hepatology*. 2018;68(2):723-750. doi:10.1002/hep.29913.
18. Castera L, Friedrich-Rust M, Loomba R. Noninvasive Assessment of Liver Disease in Patients With Nonalcoholic Fatty Liver Disease. *Gastroenterology*. 2019;156(5). doi:10.1053/j.gastro.2018.12.036
19. Chartampilas E. Imaging of nonalcoholic fatty liver disease and its clinical utility. *Hormones*. 2018;17(1):69-81. doi:10.1007/s42000-018-0012-x
20. EASL–EASD–EASO Clinical Practice Guidelines for the management of non-alcoholic fatty liver disease. *Journal of Hepatology*. 2016;64(6):1388-1402. doi:10.1016/j.jhep.2015.11.004
21. Caussy C, Reeder SB, Sirlin CB, Loomba R. Noninvasive, Quantitative Assessment of Liver Fat by MRI-PDFF as an Endpoint in NASH Trials. *Hepatology*. 2018;68(2):763-772. doi:10.1002/hep.29797
22. American College of Radiology ACR Appropriateness Criteria® Liver Lesion-Initial Characterization Revised 2020. <https://acsearch.acr.org/docs/69472/Narrative/>.
23. National Institute for Health and Care Excellence (NICE-UK). Liver Multiscan for Liver Diagnosis. Medtech Innovation Briefing 26April2019.

AB-30: Abnormal Liver Chemistries

AB-30.1: Abnormal Liver Chemistries

- The major patterns of elevation which affect work-up are:
 - ◆ Hepatocellular (AST and ALT disproportionately elevated to ALKP)
 - ◆ Cholestatic (ALKP elevated disproportionately to AST and ALT)
 - ◆ Mixed pattern (ALKP, AST, and ALT all elevated)
 - ◆ Isolated hyperbilirubinemia (elevated bilirubin and normal ALKP, ALT and AST)
 - ◆ “R” Ratio
 - “R” Ratio: The so-called “R” ratio can be used to determine whether a pattern of multiple elevated liver chemistries is predominately cholestatic or hepatocellular in origin
 - $R = (ALT / \text{Upper limit of normal (ULN)}) / (ALKP / \text{ULN ALKP})$
 - If the “R” ratio:
 - >5 = hepatocellular
 - <2 = cholestatic
 - $2-5$ = mixed pattern
 - For hepatocellular, use AST or ALT elevation guidelines
 - For cholestatic, use ALKP elevation guidelines
 - Use ULN for ALT as noted below, and ULN for alkphos based on the individual lab report
- For elevated AST and/or ALT (>33 IU/l for males, >25 IU/l for females) and other LFTs are normal:
 - ◆ $<2X$ normal:
 - Repeat lab after 3 weeks and discontinuation of medications associated with elevated LFTs (such as statins, niacin, sulfa, rifampin, tetracycline, estrogen) if applicable.
 - If LFTs remain elevated: Abdominal US (CPT® 76700 or CPT® 76705)
 - ◆ 2 to 15X normal:
 - Abdominal US (CPT® 76700 or CPT® 76705)
 - ◆ $>15X$ normal:
 - Abdominal US with Doppler (CPT® 76700 or CPT® 76705 and CPT® 93975)
- CT Abdomen with contrast (CPT® 74160) may be approved if the above studies do not explain the cause of the elevated transaminases AND the following labs have been performed and are inconclusive:
 - ◆ HAV IgG, HBsAg, HBcAb, HBsAb, HCV Ab, iron panel (may include ferritin, serum iron, iron-binding capacity, or transferrin saturation).
 - Additional labs which may be useful, but not required are: serum ceruloplasmin, anti-nuclear antibody (ANA), anti-smooth muscle antibody (ASMA), lipid profile, prothrombin time, creatine kinase (CK)

- If the findings suggest chronic liver disease, see: **AB-26.1**
- If the findings suggest hemochromatosis, see: **AB-11.2**
- Elevated alkaline phosphatase level (or GGT), and other LFTs are normal
 - ◆ Etiology of elevated ALKP should be determined prior to imaging.
 - If isolated ALKP elevation, GGT should be obtained for confirmation of hepatic etiology, prior to imaging. If ALKP is elevated with other LFTs, no confirmatory test is necessary.
 - For confirmed hepatic etiology of elevated ALKP, Abdominal or RUQ ultrasound (CPT® 76700 or CPT® 76705)
 - If dilated biliary ducts on US: MRCP
 - If no dilated biliary ducts: anti-mitochondrial antibody (AMA) should be checked prior to advanced imaging.
 - If AMA is negative, and ALKP >2X ULN: MRCP
 - If AMA is negative, and ALKP 1 to 2X ULN: observe for 6 months, if ALKP remains elevated: MRCP
 - CT Abdomen with contrast (CPT® 74160) if the above studies are unrevealing or individual cannot undergo MRCP.
- Isolated elevated bilirubin (no other LFTs elevated).
 - ◆ An isolated elevated bilirubin should be fractionated into direct (conjugated) and indirect (unconjugated) levels.
 - No advanced imaging if elevation is unconjugated, and no other LFT elevations
 - RUQ ultrasound if elevation is conjugated
 - MRCP if biliary ducts dilated
 - Check AMA prior to advanced imaging if biliary ducts not dilated
 - MRCP or liver biopsy can be considered if negative and elevation persists or is unexplained
 - CT Abdomen with contrast (CPT® 74160) if the above studies are unremarkable or the individual cannot undergo MRCP.
- For individuals with elevated LFTs and suspicion of sclerosing cholangitis, such as those with IBD, see: **AB-23.4: Primary Sclerosing Cholangitis (PSC)**.
- For individuals with elevated LFTs and history of underlying malignancy, please refer to the specific oncology guidelines, when appropriate.
- Requests for additional advanced imaging (CT, MRI, etc.) are based on the US or MRCP results, as appropriate to the finding (for example, if a lesion is identified that needs further characterization, refer to liver lesion imaging as per **AB-29.1: Liver Lesion Characterization**).
- Clinical jaundice, no known predisposing condition
 - ◆ Abdominal ultrasound (CPT® 76700 or CPT® 76705)
 - ◆ For further imaging, follow guideline for elevated bilirubin

- Clinical jaundice, suspected mechanical obstruction based on clinical condition or laboratory values (e.g., known choledocholithiasis, acute and chronic pancreatitis, suspected stricture from a recent invasive procedure, previous biliary surgery, suspected tumor), or US findings suggesting mechanical biliary obstruction, non-diagnostic or technically limited US (e.g., large amounts of intestinal gas, obesity with BMI >35):
 - ◆ CT Abdomen with contrast (CPT® 74160) or
 - ◆ MRI and/or MRCP (CPT® 74183 or CPT® 74181)

Background and Supporting Information

- The standard laboratory tests commonly referred to as “LFTs” include bilirubin, alkaline phosphatase (alkphos or ALKP), aspartate transaminase (AST), alanine transaminase (ALT), and gamma-glutamyl transferase (GGT).

References

1. Kwo, Paul, et al. ACG Clinical Guideline: Evaluation of Abnormal Liver Chemistries. *Am J Gastroenterol* 2017; 112:18-35.
2. O'Shea RS, Dasarthy S, McCullough AJ. ACG practice guidelines: alcoholic liver disease. *American Journal of Gastroenterology*. 2010, 105: 14-32.
3. American College of Radiology ACR Appropriateness Criteria® Jaundice, Revised 2018.
4. EASL Clinical Practice Guidelines: Management of cholestatic liver diseases. *Journal of Hepatology*. 2009;51(2):237-267. doi:10.1016/j.jhep.2009.04.009.
5. Fargo, MV, et al, Evaluation of Jaundice in Adults. *Am Fam Physician*, 2017;95(3):164-68.
6. Aronsohn A, Gondal B. A Systematic Approach to Patients with Jaundice. *Seminars in Interventional Radiology*. 2016;33(04):253-258. doi:10.1055/s-0036-1592331.

AB-31: Pancreatic Lesion

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AB-31.1: Pancreatic Cystic Lesions

Screening studies for pancreatic cancer can be considered in those who are considered high risk in the following guideline: **ONC-13: Pancreatic Cancer** in the Oncology Imaging Guidelines.

- Note:
 - ◆ Individuals who are not medically fit for surgery should not undergo further surveillance of incidentally found pancreatic cysts, irrespective of size.
 - ◆ Surveillance should be discontinued if an individual is no longer a surgical candidate. However, follow-up imaging can be performed if requested for a symptomatic cyst (such as the development of jaundice secondary to cyst), in which palliative treatment might be available.
- This guideline applies to the following pancreatic cystic lesions:
 - ◆ Intraductal papillary mucinous neoplasms (IPMN)
 - ◆ Mucinous cystic neoplasms (MCN)
 - ◆ Serous Cystadenomas (SCA)
 - ◆ Solid-pseudopapillary neoplasms (SPN)
- Pancreatic Cyst seen on Imaging-Initial Management:
 - ◆ MRI Abdomen (CPT® 74183) and/or MRCP are the tests of choice for initial evaluation.
 - ◆ CT Pancreatic protocol (CPT® 74160) or EUS are alternatives in patients who are unable to undergo MRI.
 - ◆ Indeterminate cysts may benefit from a second imaging modality or EUS prior to proceeding with surveillance. MRI/MRCP can be approved to better characterize the lesion, without reference to the timeframe for follow-up imaging, if a previous US or CT Abdomen has been performed.
 - ◆ Radiographic diagnosis of a non-neoplastic cyst or classic features of a serous cystadenoma
 - No further imaging
 - ◆ If any of the following are present the individual should proceed to EUS + FNA and depending on findings, surgical consultation:
 - Main duct >5mm
 - Cyst ≥3cm
 - Change in main duct caliber with upstream atrophy
 - If EUS does not reveal findings of main duct involvement, patulous ampulla, cytology with high-grade dysplasia or pancreatic malignancy, or a mural nodule, then follow up MRI should be performed in 6 months.
- Pancreatic Cyst Follow up Imaging
 - ◆ If high risk features (See below High Risk Considerations and Features) are not present, then the next follow-up imaging proceeds as follows:
 - Cyst <1cm: MRI in 2 years
 - Cyst 1-<2cm: MRI in 1 year
 - Cyst 2-3cm: if cyst is not clearly an IPMN or MCN then proceed with EUS. If it is an IPMN or MCN, then MRI at 6-12 months.

- If the cyst is determined to be a serous cystadenoma, then no further evaluation unless symptomatic.
- Additional Surveillance for a presumed IPMN or MCN (imaging from time of presentation):
- (Note: MRCP or MRI/MRCP is the preferred modality for surveillance due to non-invasiveness, lack of radiation, and improved delineation of the main pancreatic duct. In addition, since the timeframes for surveillance imaging are based on the size of the cyst as well as characteristics such as the presence or absence of high-risk features, it is necessary to have an adequate description of these findings from the previous imaging study, either by inclusion of the previous imaging report, or an adequate description of the findings. Finally, the date of the previous study is needed so that the appropriate timing for the next study can be determined.)
 - ◆ Cyst <1cm
 - MRI every 2 years for 4 years.
 - If stable after 4 years consider lengthening of interval imaging.
 - If increase in cyst size, then MRI or EUS in 6 months.
 - If stable, repeat again in 1 year and if stable return to MRI every 2 years.
 - ◆ Cyst 1-<2cm
 - MRI yearly for 3 years
 - If stable for 3 years, then change to MRI every 2 years for 4 years
 - If stable after the additional 4 years, consider lengthening of interval for surveillance.
 - If increase in cyst size, repeat MRI in 6 months. If stable, repeat MRI in 1 year and if remains stable, resume original surveillance schedule.
 - ◆ Cyst 2-<3cm
 - MRI every 6-12 months for 3 years
 - If stable after 3 years, change to MRI every year for 4 years
 - If remains stable, consider lengthening of surveillance interval
 - ◆ Cyst ≥3cm
 - MRI alternating with EUS every 6 months for 3 years
 - If stable for 3 years, increase interval to MRI alternating with EUS yearly for 4 years.
 - If remains stable, consider lengthening of surveillance interval.
 - If increase in cyst size, EUS + FNA
 - ◆ Additional considerations
 - Individuals with asymptomatic cysts that are diagnosed as pseudocysts on initial imaging and clinical history, or are determined to be serous cystadenomas, do not require further evaluation.
 - High-Risk Considerations and Features
 - Individuals with IPMNs or MCNs with new onset or worsening diabetes
 - Rapid increase in cyst size (>3mm/year) during surveillance may have an increased risk of malignancy and should undergo a short-interval MRI or EUS.

- Additional high-risk features which may prompt early evaluation are:
 - Jaundice secondary to the cyst
 - Acute pancreatitis secondary to the cyst
 - Significantly elevated CA 19-9
 - Presence of a mural nodule or solid component either within the cyst or in the pancreatic parenchyma
 - Dilation of the main pancreatic duct >5mm
 - Focal dilation of the pancreatic duct concerning for main duct IPMN or an obstructing lesion
 - IPMNs or MCNs measuring ≥3cm in diameter
 - Presence of high-grade dysplasia or pancreatic cancer on cytology. In this circumstance, imaging should be at the discretion of the provider.
- Post-op surveillance
 - ◆ Surgically resected serous cystadenomas, pseudocyst, or other benign cyst:
 - No additional imaging after resection
 - ◆ Surgically resected mucinous cystic neoplasms (MCNs) without an associated pancreatic malignancy (can have low, intermediate, or high-grade dysplasia):
 - No additional post-op surveillance
 - ◆ Surgically resected MCNs with invasive cancer:
 - Standard surveillance-based pancreatic cancer guidelines (See **ONC-13.5: Surveillance/Follow-up** in the Oncology Imaging Guidelines) for 5 years. No surveillance required after 5 years.
 - ◆ Surgically resected IPMNs
 - IPMN with cancer
 - Pancreatic cancer surveillance guidelines (See: **ONC-13.5: Surveillance/Follow-up** in the Oncology Imaging Guidelines)
 - IPMN with high-grade dysplasia
 - MRI Abdomen (CPT® 74183) or EUS every 6 months
 - IPMN with low- or intermediate-grade dysplasia
 - MRI Abdomen (CPT® 74183) every 2 years
 - ◆ Surgically resected solid-pseudopapillary neoplasm with negative margins:
 - MRI Abdomen (CPT® 74183) yearly for 5 years.
- See: **AB-27: MR Cholangiopancreatography (MRCP)** for coding guidelines for MRCP.

AB-31.2: Incidental Pancreatic Mass or Suspected Metastatic Disease to Pancreas

- CT Abdomen with contrast with dual phase imaging (CPT® 74160), or MRI Abdomen without and with contrast (CPT® 74183).
- Note: A pancreatic protocol CT involves scan acquisition during a parenchymal and portal venous phase, each of which are post-contrast administration.

References

1. Vege SS, Ziring B, Jain R, et al. and the Clinical Guidelines Committee Guideline American Gastroenterological Association Institute guideline on the diagnosis and management of asymptomatic neoplastic pancreatic cysts. *Gastroenterol.* 2015 Apr;148(4):819-822.
2. Elta GH, Enestvedt BK, Sauer BG, Lennon AM. ACG Clinical Guideline: Diagnosis and Management of Pancreatic Cysts. *The American Journal of Gastroenterology.* 2018;113(4):464-479. doi:10.1038/ajg.2018.14.
3. Tempero MA, Malafa MP, Al-Hawary M, et al. National Comprehensive Cancer Network (NCCN) Guidelines Version 1.2020 – November 26, 2019. Pancreatic adenocarcinoma, available at: https://www.nccn.org/professionals/physician_gls/pdf/pancreatic.pdf Referenced with permission from the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines™) for Pancreatic adenocarcinoma V 1.2020 – November 26, 2019. ©2019 National Comprehensive Cancer Network, Inc. All rights reserved. The NCCN Guidelines™ and illustrations herein may not be reproduced in any form for any purpose without the express written permission of the NCCN. To view the most recent and complete version of the NCCN Guidelines™, go online to NCCN.org.
4. American College of Radiology ACR Appropriateness Criteria® Staging of Pancreatic Ductal Adenocarcinoma. New 2017. <https://acsearch.acr.org/docs/3099847/Narrative/>.

AB-32: Pancreatic Pseudocysts

AB-32.1: Pancreatic Pseudocysts

See: AB-33.1: Acute Pancreatitis

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AB-33.1: Acute Pancreatitis

- Knowledge base:
 - ◆ Acute pancreatitis (2 of 3 of the following criteria):
 - Characteristic abdominal pain (typically epigastric or left upper quadrant pain with radiation to the back, chest, or flank)
 - Amylase or lipase >3 times the upper limit of normal
 - Radiographic evidence of pancreatitis on cross-sectional imaging
 - ◆ Early Phase takes place in the first week
 - Goals of imaging:¹
 - Establish the correct diagnosis or provide an alternative diagnosis
 - Establish the etiology
 - Stage the morphologic severity
 - Assess for complications in patients who deteriorate or fail to improve
 - ◆ Late phase can last weeks to months thereafter
 - Goals of imaging:¹
 - Monitor established pancreatic collections
 - Delineate the presence of symptomatic and asymptomatic complications
 - Guide interventional procedures
 - ◆ Etiologies of pancreatitis:
 - Gallstones and alcohol account for 75-80% of all causes¹
 - Hypercalcemia, hypertriglyceridemia, medications, a benign or malignant obstruction, pancreatic mass, genetic causes (hereditary pancreatitis), autoimmune pancreatitis (IgG4), infectious etiologies, ischemia secondary to vascular disease, anatomic abnormalities (e.g., pancreas divisum), physiologic abnormalities (Sphincter of Oddi dysfunction), idiopathic causes.
 - ◆ Complications:
 - Early Phase:²
 - Generally manifests as a systemic inflammatory response
 - In the first week, imaging findings correlate poorly with clinical severity¹
 - Advanced imaging is most useful when performed 5-7 days after admission, when local complications have developed and pancreatic necrosis can be clearly defined.
 - IEP = acute interstitial edematous pancreatitis
 - Necrotizing Pancreatitis
 - Late Phase:²
 - APFC (Acute peripancreatic fluid collection) occurs during the first 4 weeks. If it does not resolve within 4 weeks, it can become organized and develop into a pseudocyst, which contains only fluid with no nonliquefied components
 - Walled-off necrosis (sequelae of necrotizing pancreatitis): inhomogenous nonliquefied components, encapsulated with a wall

- Note: Most cases of pancreatitis are mild. More severe cases are usually hospitalized and imaging performed in that setting is generally not managed by eviCore. The majority of imaging requests are for the initial evaluation of suspected pancreatitis in individuals with epigastric pain, and then the follow-up imaging of discharged individuals with respect to complications experienced during the hospitalization, to further elucidate the etiology of the pancreatitis if this was not previously established, or to evaluate continued post-discharge symptoms.
- Imaging:
 - ◆ Initial imaging for suspicion of pancreatitis (typical symptoms, <48 to 72 hours, first-time presentation)³
 - Abdominal ultrasound (CPT® 76700 or CPT® 76705)
 - Purpose is to establish the presence/absence of gallstones and biliary ductal dilation.
 - Doppler ultrasound (CPT® 93975) can be approved to assess vasculature, if requested
 - If ultrasound performed and is nondiagnostic due to technical limitation (obesity, overlying gas, etc.):
 - MRI/MRCP (CPT® 74183 or CPT® 74181)
 - CT Abdomen and Pelvis with contrast (CPT® 74177) or CT Abdomen with contrast (CPT® 74160) if ultrasound is nondiagnostic and MRI/MRCP cannot be performed.
 - In suspected acute biliary pancreatitis and/or cholangitis (dilated ducts or choledocholithiasis on ultrasound, elevated liver chemistries with a negative ultrasound, suspicion of cholangitis (classic triad is RUQ pain, fever, and jaundice))⁴
 - MRI/MRCP (CPT® 74183 or CPT® 74181)
 - ◆ Initial imaging with atypical signs and symptoms when diagnoses other than pancreatitis are being considered (e.g., bowel perforation, bowel ischemia):
 - ◆ (Note: This would apply generally if RED FLAGS are present see: **AB-2.1: Red Flag Signs and Symptoms**)
 - CT Abdomen and Pelvis with contrast (CPT® 74177) or CT Abdomen with contrast (CPT® 74160)
 - NOTE: While MRI/MRCP will give better evaluation of the pancreatic parenchyma as well as biliary and pancreatic ducts, it does NOT provide coverage and adequate evaluation of the bowel to assess alternative diagnoses such as bowel ischemia or perforation.
 - MRI/MRCP (CPT® 74181 or CPT® 74183) can be considered for pregnant patients (non-contrast), or those with renal insufficiency (without or without and with depending on request)

- ◆ Follow-up imaging (late phase and thereafter):
 - Continued or worsening symptoms:
 - CT Abdomen and Pelvis with contrast (CPT® 74177), CT Abdomen with contrast (CPT® 74160) or MRI and/or MRCP (CPT® 74183 or CPT® 74181)
 - Follow-up of known pancreatic or peri-pancreatic fluid collections (including pseudocysts), to follow-up symptomatic collections, or for interventional planning:
 - MRI/MRCP (CPT® 74183 or CPT® 74181) or CT Abdomen and Pelvis (CPT® 74177)
 - Note: If requested, CT Abdomen with contrast (CPT® 74160) or Abdominal ultrasound (CPT® 76705 or CPT® 76700) can be approved

(Note: Frequency or intervals for additional follow-up is not defined and depends on clinical circumstances, response to therapy, etc.)

- If, despite initial imaging, the etiology of the pancreatitis is still in doubt:
 - MRI/MRCP (CPT® 74183 or CPT® 74181) or CT Abdomen and Pelvis with (CPT® 74177)
 - Note: If requested, CT Abdomen with contrast (CPT® 74160) can be approved.
- ◆ Acute recurrent pancreatitis
 - Abdominal ultrasound (CPT® 76705 or CPT® 76700)
 - MRI/MRCP (CPT® 74183 or CPT® 74181)
 - CT Abdomen and Pelvis with contrast (CPT® 74177)
 - See: **AB-33.2: Chronic Pancreatitis**.

AB-33.2: Chronic Pancreatitis

- If chronic pancreatitis is suspected:
 - ◆ Initial imaging:
 - CT Abdomen with contrast or without and with contrast (CPT® 74160 or CPT® 74170) or MRI Abdomen without and with contrast (CPT® 74183)
 - If diagnostic criteria are met (pancreatic calcification in combination with pancreatic atrophy and/or dilated pancreatic duct):
 - No further imaging indicated (See below regarding worsening symptoms)
 - If initial CT is inconclusive or nondiagnostic of chronic pancreatitis:
 - MRI/MRCP with secretin enhancement (CPT® 74183 or CPT® 74181)
 - If MRI/MRCP are inconclusive or nondiagnostic of chronic pancreatitis:
 - Endoscopic ultrasound (EUS) is the appropriate next imaging study
 - If EUS is inconclusive, pancreatic function testing and/or ERCP can be performed
 - Note: If abdominal ultrasound is requested at any stage for evaluation of chronic pancreatitis, this can be approved in lieu of advanced imaging

- ◆ If initial imaging fails to confirm chronic pancreatitis, but the clinical suspicion remains, the above testing can be repeated in 6 months.
- Known chronic pancreatitis with worsening symptoms or pain
 - ◆ CT Abdomen with or without and with contrast (CPT® 74160 or CPT® 74170), MRI/MRCP (CPT® 74183 or CPT® 74181) or Abdominal ultrasound (CPT® 76700 or CPT® 76705) can be approved
 - ◆ Note: Possible etiologies of worsening pain include:
 - Peptic ulcer disease
 - GI cancers
 - Pseudocysts
 - Duodenal or common bile duct obstruction
 - Pancreatic duct stone or strictures
 - Inflammatory masses at the head of the pancreas
- For pre-surgical planning or post-surgical evaluation for treatment of complications of chronic pancreatitis
 - ◆ CT Abdomen with or without and with contrast (CPT® 74160 or CPT® 74170), or MRI/MRCP (CPT® 74183 or CPT® 74181) or Abdominal ultrasound (CPT® 76700 or CPT® 76705)
- Routine screening for pancreatic cancer in chronic pancreatitis
 - ◆ As noted in the American College of Gastroenterology Clinical Guideline for Chronic Pancreatitis (2020)¹⁴ “There is a lack of evidence to suggest that performing screening examinations on patients with CP (chronic pancreatitis) to detect malignancy is beneficial.....Although the overall prevalence of pancreatic malignancy is increased in patients with CP, there are no RCTs (randomized controlled trials), systematic reviews, or meta-analyses to support screening this patient population for pancreatic malignancy.” As such, the ACG Guideline concludes “At this time there is no definitive benefit to screen patients with CP for pancreatic ductal adenocarcinoma. This is based on the invasive and costly nature of testing, the inherent difficulty in screening given the structural changes of CP, and the inability to alter in many cases the natural history of the disease even if malignancy is detected at an early stage.”
 - Therefore, routine surveillance to monitor for the occurrence of pancreatic cancer in individuals with chronic pancreatitis is not supported at this time. For other indications for imaging in chronic pancreatitis, see the above. For pancreatic cancer screening guidelines in inherited syndromes, including hereditary pancreatitis, see: **ONC-13.1: Screening Studies for Pancreatic Cancer** in the Oncology Imaging Guidelines

Background and Supporting Information

- Clinical signs of chronic pancreatitis include history of alcohol use, abdominal pain, weight loss, steatorrhea, malabsorption, recurrent pancreatitis, fatty food intolerance, low fecal elastase.

AB-33.3: Exocrine Pancreatic Insufficiency

- Pancreatic Insufficiency
 - ◆ The initial evaluation for pancreatic insufficiency should include one of the following laboratory results:
 - Elevation in fecal fat
 - Fecal elastase <200 mcg/g
 - Serum trypsinogen <20ng/mL
 - ◆ CT Abdomen with (CPT® 74160) or without and with contrast (CPT® 74170) or MRI/MRCP (CPT® 74183 or 74181) for the evaluation of suspected pancreatic insufficiency:
 - For suspected pancreatic insufficiency with any one of the above laboratory findings
 - Any “red flags” present (See: **AB-2.1: Red Flag Signs and Symptoms**)
 - ◆ For suspected pancreatic insufficiency due to known chronic pancreatitis, see: **AB-33.2: Chronic Pancreatitis**
 - ◆ For suspected pancreatic insufficiency due to known cystic fibrosis, see: **PEDAB-16** and **PEDCH-5.1**
 - ◆ For suspected pancreatic cancer, see: **ONC-13.2**

Background and Supporting Information

- Exocrine pancreatic insufficiency (EPI) reflects reduced pancreatic enzymes with resulting maldigestion/malabsorption. When intraduodenal levels of lipase fall below 5-10% of normal output, individuals may manifest with abdominal pain, bloating/cramping, flatulence, and progressive steatorrhea.

AB-33.4: Asymptomatic Elevation of Pancreatic Enzymes

- If there is the incidental elevation of amylase or lipase:
 - ◆ If isolated amylase elevation, prior to imaging, the source of the elevation should be confirmed as pancreatic by the performance of amylase isoenzymes demonstrating that the source is not salivary, or the absence of macroamylase should be ascertained by blood test.
 - ◆ If the lipase is elevated alone or in combination with an elevated amylase, or If the amylase is confirmed as pancreatic in origin:
 - Abdominal Ultrasound can be performed initially
 - If US is inconclusive, nondiagnostic, or the elevated pancreatic enzymes persist:
 - MRI/MRCP can be performed (CPT® 74183). Note: It is best performed as a secretin-stimulation test in this setting.
 - Note: CT abdomen can be performed if there is a contraindication to MRI.
 - ◆ If the pancreatic enzyme elevation persists at one year, either of the above studies can be repeated

References

1. Imaging Assessment of Etiology and Severity of Acute Pancreatitis. The Pancreapedia: Exocrine Pancreas Knowledge Base. doi:10.3998/panc.2016.31.
2. Foster BR, Jensen KK, Bakis G, Shaaban AM, Coakley FV. Revised Atlanta Classification for Acute Pancreatitis: A Pictorial Essay—Erratum. *RadioGraphics*. 2019;39(3):912-912. doi:10.1148/rg.2019194003.
3. ACR Appropriateness Criteria: Acute Pancreatitis. Rev. 2019.
4. Greenberg JA, Hsu J, Bawazeer M, et al. Clinical practice guideline: management of acute pancreatitis. *Canadian Journal of Surgery*. 2016;59(2):128-140. doi:10.1503/cjs.015015.
5. Testoni PA. Acute recurrent pancreatitis: Etiopathogenesis, diagnosis and treatment. *World Journal of Gastroenterology*. 2014;20(45):16891. doi:10.3748/wjg.v20.i45.16891.
6. Pan G, Wan MH, Xie K-L, et al. Classification and Management of Pancreatic Pseudocysts. *Medicine*. 2015;94(24). doi:10.1097/md.0000000000000960.
7. O'Connor OJ, Buckley JM, Maher MM. Imaging of the Complications of Acute Pancreatitis. *American Journal of Roentgenology*. 2011;197(3). doi:10.2214/ajr.10.4339.
8. Conwell DL, Lee LS, Yadav D, et al. American Pancreatic Association Practice Guidelines in Chronic Pancreatitis. *Pancreas*. 2014;43(8):1143-1162. doi:10.1097/mpa.0000000000000237.
9. Lohr JM, Dominguez-Munoz E, Rosendahl J, et al. United European Gastroenterology evidence-based guidelines for the diagnosis and therapy of chronic pancreatitis (HaPanEU). *United European Gastroenterology Journal*. 2017;5(2):153-199. doi:10.1177/2050640616684695.
10. Forsmark CE. Management of Chronic Pancreatitis. *Gastroenterology*. 2013;144(6). doi:10.1053/j.gastro.2013.02.008.
11. Duggan SN, Chonchubhair HMN, Lawal O, O'Connor DB, Conlon KC. Chronic pancreatitis: A diagnostic dilemma. *World Journal of Gastroenterology*. 2016;22(7):2304-2313. doi:10.3748/wjg.v22.i7.2304.
12. Conwell DL, Wu BU. Chronic Pancreatitis: Making the Diagnosis. *Clinical Gastroenterology and Hepatology*. 2012;10(10):1088-1095. doi:10.1016/j.cgh.2012.05.015.
13. Gardner TB, Adler DG, Forsmark CE, Sauer BG, Taylor JR, Whitcomb DC. ACG Clinical Guideline: Chronic Pancreatitis. *The American Journal of Gastroenterology*. 2020;115(3):322-339. doi:10.14309/ajg.0000000000000535.
14. Capurso G, Traini M, Piciocchi M, Signoretti M, Arcidiacono PG. Exocrine pancreatic insufficiency: prevalence, diagnosis, and management. *Clin Exp Gastroenterol*. 2019;12:129-39. doi:10.2147/CEG.S168266.
15. Forsmark CE. Diagnosis and management of exocrine pancreatic insufficiency. *Curr Treat Options Gastroenterol*. 2018;16(3):306-315. doi:10.1007/s11938-018-0186-y.
16. Singh VK, Yadav D, Garg PK. Diagnosis and management of chronic pancreatitis: a review. *JAMA*. 2019;322(4):2422-34. doi:10.1001/jama.2019.19411.
17. Durie P, Baillargeon J-D, Bouchard S, Donnellan F, Zepeda-Gomez S, Teshima C. Diagnosis and management of pancreatic exocrine insufficiency (PEI) in primary care: consensus guidance of a Canadian expert panel. *Curr Med Res Opin*. 2018;34(1):25-33. doi:10.1080/03007995.2017.1389704.
18. Lohr J, Oliver M, Frulloni L. Synopsis of recent guidelines on pancreatic exocrine insufficiency. *United European Gastroenterol J*. 2013;1(2):79-83. doi:10.1177/2050640613476500.
19. Gonoi W, Hayashi TY, Hayashi N, Abe O. Association between chronic asymptomatic pancreatic hyperenzymemia and pancreatic ductal anomalies: a magnetic resonance cholangiopancreatography study. *Abdom Radiol (NY)*. 2019;44(2):2494-2500. doi:10.1007/s00261-019-02004-4.
20. Mariani A. Chronic asymptomatic pancreatic hyperenzymemia: is it a benign anomaly or a disease? *JOP: Journal of the Pancreas*. 2010;11(2):95-8. doi:10.6092/1590-8577/3840.

AB-34: Spleen

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AB-34.1: Spleen

- Incidental splenic findings on US:
 - ◆ CT Abdomen (CPT® 74170) or MRI Abdomen (CPT® 74183) can be obtained.
- Incidental splenic findings on CT or MRI:
 - ◆ Imaging is diagnostic of a benign lesion (simple cyst, hemangioma) or characteristics are benign-appearing (homogeneous, low attenuation, no enhancement, smooth margins):
 - No follow-up imaging.
 - ◆ Imaging characteristics are not diagnostic:
 - Prior imaging available:
 - One year stability: no follow up imaging
 - Lack of stability: consider MRI if not done, biopsy, or PET/CT (CPT® 78815).
 - No prior imaging:
 - No known malignancy:
 - Suspicious imaging features: (suggesting possible malignancy)
 - MRI Abdomen (CPT® 74183) if not already done or biopsy
 - If MRI still inconclusive and biopsy is not feasible then PET/CT (CPT® 78815) can be considered
 - Indeterminate imaging features: (equivocal but not suspicious for malignancy)
 - Follow up MRI Abdomen (CPT® 74183) in 6 and 12 months.
 - Known malignancy:
 - <1 cm: follow up MRI Abdomen (CPT® 74183) in 6 and 12 months.
 - ≥1 cm: consider MRI Abdomen (CPT® 74183) if not done, biopsy
 - If MRI still inconclusive and biopsy is not feasible then PET/CT (CPT® 78815) can be considered
 - (See diagnosis-specific in the Oncology Imaging Guidelines).
 - Clinically detected splenomegaly
 - ◆ Abdominal US (CPT® 76700 or CPT® 76705) should be the first imaging study to evaluate splenic size.
 - ◆ If splenomegaly is confirmed, the following evaluation is indicated prior to advanced imaging:
 - CBC, evaluation of the peripheral blood smear, LFTs, UA, chest x-ray, HIV testing.
 - CT Abdomen without and with contrast or with (CPT® 74170 or CPT® 74160) can be performed if the etiology of the splenomegaly remains unexplained.
 - MRI Abdomen (CPT® 74183) can be considered for pregnant patients, or individuals with iodinated contrast allergy.
 - ◆ Nuclear medicine imaging of the liver/spleen (CPT® 78201, CPT® 78202, CPT® 78803, CPT® 78215, CPT® 78216, or CPT® 78830) is rarely performed, but can be considered if CT and MRI are contraindicated, as well as for evaluation of an accessory spleen.

Background and Supporting Information

Our current guidelines are consistent with ACR recommendations for the follow-up of incidental splenic masses. It is noteworthy, however, that a recent study from Beth Israel Deaconess Medical Center in which the authors retrospectively reviewed 379 patients who were found to have an incidental splenic mass on CT found that in patients without a history of malignancy, constitutional symptoms of fever or weight loss, or left upper quadrant or epigastric pain (205/379) there were 2 incidences of malignancy. However, in both of these cases the splenic masses were neither isolated nor indeterminate findings as the CTs demonstrated disease in other locations. An isolated splenic malignancy (which can occur but is very rare) was found only in 2 patients and both of these had constitutional symptoms. Thus, the authors claim that “the isolated and incidentally found splenic mass is of unlikely clinical significance, regardless of its appearance”. They concluded that “in patients with an incidental splenic mass identified at imaging and with the absence of a history of malignancy, fever, weight loss, or pain in the left upper quadrant or epigastrium, such masses are highly likely to be benign regardless of their appearance. Additional imaging or follow-up is not warranted, even if the mass does not show the appearance of simple cyst. Further work-up is only needed if the splenic mass is seen in conjunction with other findings worrisome for malignancy”. These authors challenge the use of the ACR guidelines.

AB-34.2: Trauma – Spleen

- Ultrasound Abdomen (CPT® 76700 or CPT® 76705) and Pelvis (CPT® 76856 or CPT® 76857) or CT^{3,4,5} Abdomen and Pelvis without and with contrast (CPT® 74178) or with contrast (CPT® 74177) are indicated in individuals with blunt abdominal trauma with suspected splenic rupture or in individuals with penetrating trauma to the left upper quadrant. See: **AB-10: Blunt Abdominal Trauma**

Background and Supporting Information

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 are often performed prior to considering advanced imaging. There is no evidence-based data to support performing serial CT or MRI to follow individuals with incidental splenic lesions.

References

1. Heller M et. al. Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 3. Journal of the American College of Radiology, Vol. 10, Issue 11, Pages 833-839, Nov. 2013.
2. Thut D et. al. A diagnostic approach to splenic lesions. Appl. Radiology 2017; 46 (2): 7-22(B)
3. Saboo SS, Krajewski KM, O'Regan KN, et al. Spleen in haematological malignancies: spectrum of imaging findings. *British Journal of Radiology* , 2012; 85: 81-92 2012.
4. Benter T, Klühs L, Teichgräber U. Sonography of the spleen. *J Ultrasound Med.*, 2011; 30:1281-93.
5. Killeen KL, Shanmuganathan K, Boyd-Kranis R, et al. CT findings after embolization for blunt splenic trauma. *J VascIntervRadiol.* Feb 2001;12(2):209-14.
6. Naulet P, Wassel J, Gervaise A, et al. Evaluation of the value of abdominopelvic acquisition without contrast injection when performing a whole body CT scan in a patient who may have multiple trauma. *DiagnInterv Imaging.* Apr 2013;94(4):410-7.
7. Boscak AR, Shanmuganathan K, Mirvis SE, et al. Optimizing trauma multidetector CT protocol for blunt splenic injury: need for arterial and portal venous phase scans. *Radiology.* Jul 2013;268(1):79-88.
8. Royal HD, Brown ML, Drum DE. Society of Nuclear Medicine Procedure guideline for hepatic and splenic imaging 3.0, version 3.0, approved July 20, 2003.
9. Siewert B, Millo NZ, Sahi K, et al. The Incidental Splenic Mass at CT: Does It Need Further Work-up? An Observational Study. *Radiology.* 2018;287(1):156-166. doi:10.1148/radiol.2017170293.

AB-35: Indeterminate Renal Lesion

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AB-35: Indeterminate Renal Lesion – General Information

For acute flank pain, rule out renal stone, see: **AB-4: Flank Pain, Rule Out or Known Renal/Ureteral Stone**

AB-35.1: Indeterminate Renal Lesion

- Incidental Renal Mass on Ultrasound
 - ◆ If categorized as simple cyst or Bosniak I or II, no further imaging
 - ◆ Otherwise, CT Abdomen without and with contrast (CPT® 74170), MRI Abdomen without and with contrast (CPT® 74183), or Contrast-Enhanced Ultrasound (CPT® 76978 for one lesion, and CPT® 76979 if there are additional lesions).
- CT Abdomen without and with contrast (CPT® 74170) or MRI Abdomen without and with contrast (CPT® 74183) can be approved for further characterization if the original study reveals incomplete visualization of a renal lesion (for example, if only partially visualized on a CT Chest).
- Incidental Renal Mass on Non-Contrast CT
 - ◆ If characterized as heterogeneous (thick or irregular wall, mural nodule, septa or calcification):
 - Considered indeterminate. MRI Abdomen without and with contrast (CPT® 74183) or CT Abdomen without and with contrast (CPT® 74170)
 - ◆ If characterized as homogeneous (thin or imperceptible wall, NO mural nodule, septa or calcification):
 - 10 to 20 HU (Hounsfield units)
 - Likely benign, not fully characterized: no further work-up
 - 21 to 69 HU
 - Indeterminate: MRI or CT Abdomen without and with contrast (CPT® 74183 or CPT® 74170)
 - ≥70 HU
 - Hemorrhagic or proteinaceous cyst, unlikely to be neoplastic: no further work-up
 - ◆ If characterized as TSTC (too small to characterize) and homogeneous:
 - If labelled likely benign cyst, not fully characterized:
 - No further work-up
 - If labelled inconclusive based on subjective evaluation:
 - Considered indeterminate. MRI Abdomen without and with contrast (CPT® 74183) (preferred) or CT Abdomen without and with contrast (CPT® 74170) within 6-12 months
- Incidental Renal Mass on Contrast-Enhanced CT
 - ◆ If characterized as heterogeneous: thick or irregular wall, mural nodule, septa or calcification:
 - Considered indeterminate. MRI Abdomen without and with contrast (CPT® 74183) or CT Abdomen without and with contrast (CPT® 74170)

- ◆ If characterized as homogeneous: thin or imperceptible wall, NO mural nodule, septa or calcification:
 - 10 to 20 HU
 - No further work-up
 - >20 HU (solid or complicated cystic mass)
 - Considered indeterminate. MRI Abdomen without and with contrast (CPT® 74183) or CT Abdomen without and with contrast (CPT® 74170)
- ◆ If characterized as TSTC, homogeneous:
 - If labelled likely benign cyst, not fully characterized:
 - No further work-up
 - If labelled inconclusive based on subjective evaluation:
 - Considered indeterminate. MRI Abdomen without and with contrast (CPT® 74183) (preferred), or CT Abdomen without and with contrast (CPT® 74170) within 6-12 months
- Incidental cystic renal mass on CT or MRI without and with contrast (completely characterized, and does NOT contain fat)
 - ◆ Bosniak I (benign simple) or II (minimally complicated)
 - No further work-up
 - ◆ Bosniak IIF
 - CT Abdomen without and with contrast (CPT® 74170) or MRI Abdomen without and with contrast (CPT® 74183) at 6 and 12 months, then yearly for 5 years
 - If no changes for 5 years, cyst is considered benign and of no clinical significance
 - ◆ Bosniak III or IV should be referred for additional management or if chosen, active surveillance see: **ONC-17.4: Surveillance** in the Oncology Imaging Guidelines
- Incidental solid renal mass or incidental mass too small to characterize evaluated on CT or MRI without and with contrast and does NOT contain fat
 - ◆ TSTC
 - If labelled likely benign cyst:
 - No further work-up
 - If labelled inconclusive based on subjective evaluation:
 - MRI Abdomen without and with contrast (CPT® 74183) (preferred), or CT Abdomen without and with contrast (CPT® 74170) within 6 months
 - ◆ If solid mass <1.0cm
 - MRI Abdomen without and with contrast (CPT® 74183) (preferred), or CT Abdomen without and with contrast (CPT® 74170) beginning at 6-12 months, then yearly for 5 years
 - If stable at 5 years (average growth ≤3mm per year): No further work-up
 - If mass shows growth (≥4mm per year) or morphologic change: refer for management, consider renal biopsy. If biopsy is technically challenging or relatively contraindicated, a T2 weighted image MRI Abdomen without and with contrast (CPT® 74183) can be performed

- ◆ Solid mass 1.0-4.0cm:
 - Considered a small renal neoplasm: refer for management, consider biopsy. If biopsy is technically challenging or relatively contraindicated, a T2 weighted imaging MRI Abdomen without and with contrast (CPT® 74183) can be performed. If active surveillance chosen due to limited life expectancy or co-morbidities, see: **ONC-17.4: Surveillance** in the Oncology Imaging Guidelines
- ◆ Solid renal mass >4.0cm
 - Considered a renal neoplasm: refer for management, or biopsy. If biopsy is technically challenging or relatively contraindicated, a T2 weighted image MRI Abdomen without and with contrast (CPT® 74183) can be performed. If active surveillance chosen due to limited life expectancy or co-morbidities, see: **ONC-17.4: Surveillance** in the Oncology Imaging Guidelines
- Incidental renal mass containing fat (contains a region of interest measuring <-10 HU)
 - ◆ No calcification angiomyolipoma (AML)
 - Solitary and without documentation of growth:
 - <4cm: no further work-up
 - If no prior imaging study for comparison, one follow-up MRI Abdomen (CPT® 74183) or CT Abdomen (CPT® 74170) can be repeated in 6-12 months to assess for any growth.
 - ≥4cm, and considered an AML with potential for clinical symptoms: refer for management.
 - Multiple lesions or growth documented based on old studies:
 - Refer for management. If active surveillance chosen due to limited life expectancy or co-morbidities, see: **ONC-17.4: Surveillance** in the Oncology Imaging Guidelines.
 - ◆ With calcification (suspected renal cell carcinoma):
 - CT Abdomen without and with contrast (CPT® 74170) or MRI Abdomen without and with contrast (CPT® 74183) if only a non-contrast CT has been performed. If active surveillance chosen due to limited life expectancy or co-morbidities, see: **ONC-17.4: Surveillance** in the Oncology Imaging Guidelines.
- Active Surveillance: For all Active Surveillance indications, see: **ONC-17.4: Surveillance** in the Oncology Imaging Guidelines

NOTE: PET/CT or PET/MRI are not recommended because their role evaluating the incidental renal mass is limited.¹

Bosniak Classification:

I- Benign simple cyst with a hairline thin wall without septa, calcification, or solid component. Homogeneous near-water attenuation density (10 to 20 HU) without enhancement.

II- Benign minimally complicated cyst that may contain a few hairline thin septa that may have “perceived” but not measurable enhancement. Fine calcification or a segment of slightly thickened calcification may be present in the wall or septa. Also, a well-margined nonenhancing homogeneous mass <3cm with density above simple fluid attenuation (hyperdense cyst).

IIF- Usually benign complicated renal cyst with multiple hairline thin septa or minimal smooth thickening of the wall or septa. Wall or septa may contain thick and nodular calcification and may have “perceived” but not measurable enhancement. Also, a well-margined intrarenal nonenhancing mass >3cm with density above simple fluid.

III -Indeterminate complicated cystic renal mass with thickened irregular walls or septa that have measurable enhancement.

IV-Malignant cystic renal mass with enhancing soft tissue components (cystic renal cell carcinoma).

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AB-35.2: Pre-operative Assessment

- Pre-operative assessment for robotic kidney surgery
 - ◆ If not previously performed:
 - CT Abdomen without and with contrast (CPT® 74170) OR
 - MRI Abdomen without and with contrast (CPT® 74183)
 - ◆ CTA Abdomen (CPT® 74175) or CTA Abdomen and Pelvis (CPT® 74174) OR
 - ◆ MRA Abdomen (CPT® 74185), or MRA Abdomen and Pelvis (CPT® 74185 and CPT® 72198)

References

1. Herts BR, Silverman SG, Hindman NM, et al. Management of the Incidental Renal Mass on CT: A White Paper of the ACR Incidental Findings Committee. *Journal of the American College of Radiology*. 2018;15(2):264-273. doi:10.1016/j.jacr.2017.04.028.
2. Finelli A, Ismaila N, Russo P. Management of Small Renal Masses: American Society of Clinical Oncology Clinical Practice Guideline Summary. *Journal of Oncology Practice*. 2017;13(4):276-278. doi:10.1200/jop.2016.019620.
3. Campbell S, Uzzo RG, Allaf ME, et al. Renal Mass and Localized Renal Cancer: AUA Guideline. *The Journal of Urology*. 2017;198(3):520-529. doi:10.1016/j.juro.2017.04.100.
4. Zhao PT, Richstone L, Kavoussi LR. Laparoscopic partial nephrectomy. *International Journal of Surgery*. 2016;36:548-553. doi:10.1016/j.ijsu.2016.04.028.
5. Lane BR, Campbell SC, Gill IS. 10-Year Oncologic Outcomes After Laparoscopic and Open Partial Nephrectomy. *Journal of Urology*. 2013;190(1):44-49. doi:10.1016/j.juro.2012.12.102.
6. Barr RG, Peterson C, Hindi A. Evaluation of Indeterminate Renal Masses with Contrast-enhanced US: A Diagnostic Performance Study. *Radiology*. 2014;271(1):133-142. doi:10.1148/radiol.13130161.
7. Nicolau C, Buñesch L, Paño B, et al. Prospective evaluation of CT indeterminate renal masses using US and contrast-enhanced ultrasound. *Abdominal Imaging*. 2014;40(3):542-551. doi:10.1007/s00261-014-0237-3.
8. Zarzour JG, Lockhart ME, West J, et al. Contrast-Enhanced Ultrasound Classification of Previously Indeterminate Renal Lesions. *Journal of Ultrasound in Medicine*. 2017;36(9):1819-1827. doi:10.1002/jum.14208.

AB-36: Renal Failure

AB-36.1: Renal Failure

- Ultrasound kidney and bladder (CPT® 76770 or CPT® 76775), preferably with Doppler (CPT® 93975 or CPT® 93976), is the preferred imaging study for the evaluation of acute or chronic renal failure¹.
- MRA Abdomen (CPT® 74185) can be utilized when there is suspected¹:
 - ◆ Renal vein/caval thrombosis
 - ◆ Renal artery stenosis as cause of renal failure
 - ◆ MRA with contrast may be contraindicated in severe renal failure or patients on dialysis due to the risk of gadolinium agents in causing nephrogenic systemic sclerosis.
- CT Abdomen without contrast (CPT® 74150) is not needed except to rule out ureteral obstruction or retroperitoneal mass.¹
- Nuclear renal imaging (CPT® 78701, CPT® 78707, CPT® 78708, CPT® 78709) can be considered for ANY of the following:^{3,4}
 - ◆ Renal transplant follow-up
 - ◆ Kidney salvage vs. nephrectomy surgical decisions
 - ◆ Acute renal failure with no evidence of obstruction on recent ultrasound.
 - ◆ Chronic renal failure to estimate prognosis for recovery.
- Nuclear medicine studies of the kidney (CPT® 78700 or CPT® 78701) can be considered for evaluation of the following anatomic renal anomalies:³
 - ◆ Suspected horseshoe kidney
 - ◆ Suspected solitary or ectopic kidney

References

1. Papnicolaou N, Francis IR, Casalino DD, Arellano RS, et al. Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® renal failure. American College of Radiology (ACR); 2008.
2. National Kidney Foundation. KDOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. 2012. Am J Kidney Disease, 2002;39(2 Supp 1):S1-S266.
3. Kim C, Becker M, Grant F, et al., ACR–SPR Practice Guideline for the Performance of Renal Scintigraphy. Revised 2017. The American College of Radiology.
4. Expert Panel on Urologic Imaging. American College of Radiology Appropriateness Criteria – Renal Failure.

AB-37: Renovascular Hypertension

AB-37.1: Renovascular Hypertension

- See: **PVD-6.6: Renovascular Hypertension/Renal Artery Stenosis** in the Peripheral Vascular Disease Imaging Guidelines

AB-38: Polycystic Kidney Disease

AB-38.1: Polycystic Kidney Disease

- Retroperitoneal ultrasound¹ (CPT® 76770 or CPT® 76775) can be performed for:
 - ◆ Suspected polycystic kidney disease
 - ◆ Screening individuals at risk for autosomal dominant polycystic disease (ADPKD)
 - In the absence of any clinical change, follow-up screening is not indicated if a screening ultrasound was performed at age 40 or later and was negative for any cysts (The negative predictive value of an ultrasound in this age group is 100% for both PKD1 and PKD2, if no cysts are identified.).
 - If an initial ultrasound is negative for any cysts, a follow-up ultrasound can be performed at the discretion of the ordering provider for individuals <40 years of age.
- MRI Abdomen without contrast (CPT® 74181) can be performed:
 - ◆ If a cystic renal lesion is detected in an individual at-risk of PKD, for prognostic purposes
 - ◆ For volume averaging (Total Kidney Volume – TKV) prior to treatment for PKD (Jynarque, tolvaptan)
 - Optimal follow-up imaging intervals in this setting have not yet been established. Requests for follow-up imaging can be considered on a case-by-case basis.

Background and Supporting Information

- Ultrasound is very effective in establishing a diagnosis of ADPKD, though may miss early small cysts. However, the negative predictive value in the various age groups of a negative ultrasound is as follows:
 - ◆ ≥40: 100% for PKD1 and PKD2
 - ◆ 30-39: 100% for PKD1 and 96.8% for PKD2
 - ◆ 5-29: 99.1% for PKD1 and 83.5% for PKD2
- In addition, the preferable advanced imaging study is MRI Abdomen without contrast (CPT® 74181). This is because of the increased risk of gadolinium-induced nephrogenic fibrosis in individuals with PKD.

References

1. Chapman AB, Devuyst O, Eckardt K-U, et al. Autosomal-dominant polycystic kidney disease (ADPKD): executive summary from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. *Kidney International*. 2015;88(1):17-27. doi:10.1038/ki.2015.59.
2. Belibi FA, Edelstein CL. Unified Ultrasonographic Diagnostic Criteria for Polycystic Kidney Disease. *Journal of the American Society of Nephrology*. 2008;20(1):6-8. doi:10.1681/asn.2008111164.
3. Chebib FT, Torres VE. Autosomal Dominant Polycystic Kidney Disease: Core Curriculum 2016. *American Journal of Kidney Diseases*. 2016;67(5):792-810. doi:10.1053/j.ajkd.2015.07.037.
4. Gastel MDAV, Messchendorp AL, Kappert P, et al. T1 vs. T2 weighted magnetic resonance imaging to assess total kidney volume in patients with autosomal dominant polycystic kidney disease. *Abdominal Radiology*. 2017;43(5):1215-1222. doi:10.1007/s00261-017-1285-2.
5. Alam A, Dahl NK, Lipschutz JH, et al. Total Kidney Volume in Autosomal Dominant Polycystic Kidney Disease: A Biomarker of Disease Progression and Therapeutic Efficacy. *American Journal of Kidney Diseases*. 2015;66(4):564-576. doi:10.1053/j.ajkd.2015.01.030.

AB-39: Hematuria and Hydronephrosis

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AB-39.1: Hematuria with Urinary Tract Infection (UTI)

- Individuals suspected to have a UTI as the etiology of microscopic hematuria should be treated for the UTI and should then undergo repeat urinalysis to confirm resolution of the hematuria. If the hematuria persists following treatment, proceed with the risk-based evaluation as per **AB-39.2**.
- Also see: **AB-40: Urinary Tract Infection (UTI)** for additional imaging considerations

Background and Supporting Information

- Signs and symptoms of UTI: urinary frequency, burning on urination, urgency, dysuria, positive urine leukocyte esterase, presence of WBCs in the urine, fever, elevated WBC as per the testing laboratory's range

AB-39.2: Asymptomatic Hematuria

- Microscopic hematuria is defined as ≥ 3 red blood cells per high power field. Hematuria is NOT defined as a positive dipstick. A positive dipstick should prompt a microscopic examination. A positive dipstick is not considered as defining microhematuria.
- Prior to imaging, individuals should be stratified into low, intermediate, or high risk, based on the following criteria⁷
 - ◆ Low risk (individual meets ALL criteria listed)
 - Women <50 years of age or Men <40 years of age
 - Never smoker or <10 pack years
 - 3-10 RBC/HPF on a single urinalysis
 - No additional risk factors for urothelial cancer:
 - Irritative lower urinary tract symptoms
 - Prior pelvic radiation therapy
 - Prior cyclophosphamide/ifosfamide chemotherapy
 - Family history of urothelial cancer or Lynch Syndrome
 - Occupational exposures to benzene chemicals or aromatic amines (e.g. rubber, petrochemicals, dyes)
 - Chronic indwelling foreign body in the urinary tract
 - ◆ Intermediate risk (individual meets any one of these criteria)
 - Women age 50-59 years, Men age 40-59 years
 - 10-30 pack years of smoking
 - 11-25 RBC/HPF on a single urinalysis
 - Low-risk individual with no prior evaluation and 3-10 RBC/HPF on repeat urinalysis
 - Any one of the Additional risk factors for urothelial cancer (see above)

- ◆ High-risk (individual meets any one of these criteria)
 - Women or Men ≥60 years
 - >30 pack-years of smoking
 - >25 RBC/HPF on a single urinalysis
 - History of gross hematuria
- Low- or intermediate-risk individuals:
 - ◆ Renal ultrasound (combined with cystoscopy)
 - Note: Low-risk individuals may opt for observation with repeat urinalysis within 6 months. If no imaging was performed initially, and follow-up urinalysis reveals persistent hematuria with 3-10 RBC/HPF the individual may be imaged according to Intermediate-Risk criteria. If >10 RBC/HPF, they should be imaged according to High-risk guidelines.
- High-risk individuals
 - ◆ CT Urogram (CPT® 74178) (3D imaging is appropriate if requested)
 - If CT is contraindicated, MR Urography may be performed (CPT® 74183 and 72197)
 - If both CT and MR are contraindicated due to contrast, non-contrast CT urography or renal ultrasound should be performed. See also: **AB-1.12** for pregnancy considerations.
- Persistent microscopic hematuria if previously evaluated by renal ultrasound
 - ◆ Imaging as per High-risk individuals above
- Hematuria in individuals with inherited risk factors for renal cortical tumors
 - ◆ Renal ultrasound or
 - ◆ CT Abdomen without and with contrast (CPT® 74170) or
 - ◆ MRI Abdomen without and with contrast (CPT® 74183)
 - ◆ Note: Inherited risk factors include:
 - Von-Hippel-Lindau
 - Birt-Hogg-Dube
 - Hereditary Papillary RCC
 - Hereditary Leiomyomatosis Renal Cell Cancer
 - Tuberous Sclerosis
- Follow-up
 - ◆ Individuals with a negative hematuria evaluation who undergo repeat urinalysis
 - If repeat urinalysis is negative:
 - No further workup
 - If repeat urinalysis demonstrates persistent hematuria
 - Repeat imaging as requested (Renal Ultrasound or CT urography)
- NOTE: 3-D Reconstruction enhances a CT Urogram. Requests for 3-D reconstruction (CPT® 76377 or 76376) for a CT Urogram can be approved.

AB-39.3: Hematuria and Flank Pain (suspicion for renal/ureteral stones)

- CT Abdomen and Pelvis without contrast (CPT® 74176) or CT Urogram (CPT® 74178)
- NOTE:
 - ◆ 3-D Reconstruction enhances a CT Urogram. Requests for 3-D reconstruction (CPT® 76377 or CPT® 76376) for a CT Urogram can be approved.
 - ◆ US abdomen or retroperitoneum can be performed in lieu of a CT for any of the above indications

AB-39.4: Hydronephrosis of unexplained or indeterminate cause^{3, 4}

- CT Urogram (CPT® 74178)
- NOTE:
 - ◆ 3-D Reconstruction enhances a CT Urogram. Requests for 3-D reconstruction (CPT® 76377 or CPT® 76376) for a CT Urogram can be approved.
 - ◆ US abdomen or retroperitoneum can be performed in lieu of a CT for any of the above indications
- Patients with known uncomplicated hydronephrosis, neurogenic bladder, myelomeningocele (open spinal dysraphism), or spina bifida can have follow-up/surveillance imaging with Retroperitoneal Ultrasound (CPT® 76770) every 6 to 12 months

References

1. Ramchandani P, Kisler T, Francis IR, Casalino DD, et al. Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® hematuria. *American College of Radiology (ACR)*; 2014.
2. Cohen RA, Brown RS. Microscopic hematuria. *New England Journal of Medicine*. 2003; 348:2330-2338.
3. Kolbeck K, Ray C Jr, Lorenz J, et al. Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® radiologic management of urinary tract obstruction. *American College of Radiology (ACR)*; 2013.
4. Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® acute onset flank pain - suspicion of stone disease (urolithiasis). *American College of Radiology (ACR)*, 2015:11.
5. Raman SP, Horton KM, Fishman EK. MDCT Evaluation of Ureteral Tumors: Advantages of 3D Reconstruction and Volume Visualization. *American Journal of Roentgenology*. 2013;201(6):1239-1247. doi:10.2214/ajr.13.10880.
6. Coplen D. Diagnosis, Evaluation and Follow-Up of Asymptomatic Microhematuria (AMH) in Adults: AUA Guideline. *Yearbook of Urology*. 2013;2013:1-2. Reviewed and Validity Confirmed 2016 doi:10.1016/j.yuro.2013.07.019.
7. Georgieva MV, Wheeler SB, Erim D, et al. Comparison of the Harms, Advantages, and Costs Associated With Alternative Guidelines for the Evaluation of Hematuria. *JAMA Internal Medicine*. 2019;179(10):1352. doi:10.1001/jamainternmed.2019.2280.
8. Barocas D, Boorjian S, Alvarez R, et. al. Microhematuria: AUA/SUFU guideline. *J Urol*. 2020;204:778.

AB-40: Urinary Tract Infection (UTI)

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AB-40: Urinary Tract Infection

These guidelines refer to UTI without Hematuria.

For UTI with Hematuria, see: **AB-39: Hematuria and Hydronephrosis**

AB-40.1: Upper (Pyelonephritis)

- CT Abdomen and Pelvis without and with contrast (CPT® 74178) or CT Abdomen and Pelvis with contrast (CPT® 74177) if¹:
 - ◆ Suspected complicated: diabetes, immune-compromised, history of stones, prior renal surgery, or fever ≥ 101 F (≥ 38.5 C).
 - ◆ Not responding to therapy after 3 days.
 - ◆ Recurrent pyelonephritis (at least 1 prior pyelonephritis).
 - ◆ Males with first time UTI, or recurrent UTI without etiology.
- MRI Abdomen without or with and without contrast (CPT® 74181 or CPT® 74183)
 - ◆ Elevated Creatinine
- Pregnant women should be evaluated initially by renal ultrasound² (CPT® 76770 or CPT® 76775) and if further imaging is necessary, MRI Abdomen and Pelvis³ without contrast (CPT® 74181 and CPT® 72195).

AB-40.2: Lower

- CT Abdomen and Pelvis without and with contrast (CPT® 74178) if³:
 - ◆ Suspected complicated: diabetes or immunocompromised or history of stones or prior renal surgery, or fever ≥ 101 F (≥ 38.5 C).
 - ◆ Not responding to therapy after 3 days.
 - ◆ Males with first time UTI or recurrent UTI without etiology.
 - ◆ Recurrent UTI ≥ 3 per year.
 - ◆ Recommendation by or in consultation with a urologist or specialist.
- MRI Abdomen and MRI Pelvis without or with and without contrast (CPT® 74181 and CPT® 72195 or CPT® 74183 and CPT® 72197) can be approved if requested when ALL of the following apply:
 - ◆ Criteria (as above) for CT Abdomen and Pelvis without and with contrast are met and
 - ◆ Elevated Creatinine
- See: **PV-13: Periurethral Cysts and Urethral Diverticula** in the Pelvis Imaging Guidelines.

References

1. Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® acute pyelonephritis. American College of Radiology (ACR); 2012.
2. Delzell JE, Lefevre ML. Urinary tract infections during pregnancy. *American Family Physician*. 2000;61(3):713-720.
3. Lazarus E, Casalino DD, Remer EM, Arellano RS, et al. Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® recurrent lower urinary tract infection in women. American College of Radiology (ACR); 2014.
4. Davis R, Jones JS, Barocas DA, et al. Diagnosis, Evaluation and Follow-Up of Asymptomatic Microhematuria (AMH) in Adults: AUA Guideline. *Journal of Urology*. 2012;188(6s):2473-2481. doi:10.1016/j.juro.2012.09.078.
5. Silverman SG, Leyendecker JR, Amis ES. What Is the Current Role of CT Urography and MR Urography in the Evaluation of the Urinary Tract? *Radiology*. 2009;250(2):309-323. doi:10.1148/radiol.2502080534.
6. Hooton TM. Uncomplicated Urinary Tract Infection. *New England Journal of Medicine*. 2012;366(11):1028-1037. doi:10.1056/nejmcp1104429.
7. Suskind AM, Saigal CS, Hanley JM, Lai J, Setodji CM, Clemens JQ. Incidence and Management of Uncomplicated Recurrent Urinary Tract Infections in a National Sample of Women in the United States. *Urology*. 2016;90:50-55. doi:10.1016/j.urology.2015.11.051.
8. Gupta K, Hooton TM, Naber KG, et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. *Clinical Infectious Diseases*. 2011;52(5). doi:10.1093/cid/ciq257.
9. Anger J, Lee U, Ackerman AL, et al. Recurrent Uncomplicated Urinary Tract Infections in Women: AUA/CUA/SUFU Guideline. *Journal of Urology*. 2019;202(2):282-289. doi:10.1097/ju.0000000000000296

AB-41: Patent Urachus

AB-41.1: Patent Urachus

- See: **PV-23.1: Patent Urachus** in the Pelvis Imaging Guidelines

AB-42: Transplant

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AB-42.1: Liver Transplant, Pre-Transplant

- Cardiac studies specific to liver transplantation:
 - ◆ Stress echocardiogram which should be pharmacologic, or MPI, initially and can be repeated annually prior to transplant. Requests for cardiac catheterization for an abnormal stress study should be reviewed by cardiologist.
 - ◆ Echocardiography or Echocardiography with bubble studies to exclude portopulmonary hypertension (POPH) and/or Hepatopulmonary Syndrome (HPS). Request for right heart catheterization if there is evidence of POPH should be reviewed by cardiologist. (Note: AASLD guidelines suggest right heart catheterization for POPH with RSVP ≥ 45).
 - ◆ See: **CD-1.6: Transplant Individuals** in the Cardiac Imaging Guidelines
- Individuals on transplant list without Hepatocellular Carcinoma (HCC):
 - ◆ CT Chest with or without contrast (CPT® 71260 or CPT® 71250) for placement on the transplant list, with repeat studies based on clinical indications per Chest Imaging Guidelines.
 - ◆ CT or MRI Abdomen (CPT® 74160 or CPT® 74170 or CPT® 74183) for placement on the transplant list (i.e., initial placement or part of a transplant evaluation) and can be repeated annually.
 - ◆ Abdominal US (CPT® 76700 or CPT® 76705) and Doppler (CPT® 93975) every 6 months
 - ◆ MRI Bone Marrow Blood Supply (CPT® 77084) or bone-scan one time.
 - ◆ Vascular evaluation in anticipation of transplant:
 - CTA or MRA Abdomen (CPT® 74175 or CPT® 74185)
 - ◆ Immediately prior to transplant:
 - ANY of the above studies can be repeated immediately prior to transplant, if requested.
 - In addition, CT Abdomen and Pelvis (CPT® 74177) or CT Pelvis (CPT® 72193) if requested, can be performed
- Individual on transplant list with known HCC:
 - ◆ CT or MRI Abdomen (CPT® 74170 or CPT® 74160, or CPT® 74183) every 3 months.
 - ◆ CT Chest (CPT® 71260) every 6 months.
 - ◆ Bone scan every 6 months.
 - ◆ If under active locoregional therapy to control tumor growth in waitlisted individuals (i.e., tumor ablation), CT or MRI Abdomen (CPT® 74160, or CPT® 74170, or CPT® 74183) and CT Chest (CPT® 71260) can be approved as requested according to the transplant center's protocol.
 - ◆ Abdominal US (CPT® 76700 or CPT® 76705) with Doppler (CPT® 93975) every 6 months
 - ◆ MRI Bone Marrow Blood Supply (CPT® 77084), CTA or MRA Abdomen (CPT® 74175 or CPT® 74185) and imaging immediately prior to transplant, as per the guideline note above in individuals without HCC.

- Individual on transplant list with known cholangiocarcinoma
 - ◆ As per guidelines for individuals without HCC except that CT or MRI Abdomen (CPT® 74160, or CPT® 74170, or CPT® 74183) and CT Chest (CPT® 71260) can be repeated according to the transplant institution's protocol.
- Individual on the transplant list with known Primary Sclerosing Cholangitis (PSC):
 - ◆ In addition to the standard studies for an individual on the transplant list without HCC:
 - MRCP (See: **AB-27.1: MRCP** for acceptable CPT Codes) can be requested as per the transplant institution's protocol.

AB-42.2: Liver Transplant, Living Donor Pre-Transplant Imaging (Donor Imaging)

- CT Abdomen or MRI Abdomen (CPT® 74160, or CPT® 74170, or CPT® 74183) to assess liver anatomy and volumetrics.
- MRCP to assess biliary anatomy (See: **AB-27.1: MRCP** for proper coding)
- CTA or MRA Abdomen (CPT® 74175 or CPT® 74185) to assess vascular anatomy

AB-42.3: Liver Transplant, Post-Transplant Imaging

- Cardiac Imaging:
 - ◆ See: **CD-1.6: Transplant Patients** in the Cardiac Imaging Guidelines
- Suspected post-operative complications:
 - ◆ Vascular thrombosis (suspected hepatic artery thrombosis)
 - Doppler ultrasound (CPT® 93975)
 - CTA or MRA Abdomen (CPT® 74175 or CPT® 74185)
 - ◆ Suspicion of biliary anastomotic strictures:
 - MRCP (See: **AB-27.1: MRCP** for appropriate CPT codes)
 - Vascular imaging as above for vascular thrombosis may also be requested and approved for this indication
 - ◆ Other suspected post-operative complications (e.g., infection, etc.)
 - Imaging as requested by the transplant institution or team
- Transplant individuals without prior HCC or cholangiocarcinoma:
 - ◆ Routine post-transplant imaging is not indicated.
 - ◆ If cirrhosis develops post-transplant:
 - See: **AB-26: Cirrhosis and Liver Screening for Hepatocellular Carcinoma (HCC); Ascites and Portal Hypertension** for HCC screening guidelines.
 - ◆ Fibrosis assessment post-liver transplant:
 - Transient elastography (CPT® 91200), which is the most studied modality in this setting.

- Surveillance after transplant for HCC:
 - ◆ Based on RETREAT score
 - 0 points: No additional screening needed
 - 1-3 points: CT or MRI Abdomen (CPT® 74160, or CPT® 74170, or CPT® 74183) and CT Chest (CPT® 71260 or CPT® 71250) every 6 months for 2 years.
 - 4 points: CT or MRI Abdomen (CPT® 74160, or CPT® 74170, or CPT® 74183) and CT Chest (CPT® 71260 or CPT® 71250) every 6 months for 5 years
 - ≥5 points: CT or MRI Abdomen (CPT® 74160, or CPT® 74170, or CPT® 74183) and CT Chest (CPT® 71260 or CPT® 71250) every 3 months for 2 years, then every 6 months between the 2nd and 5th years.
- If there is a suspicion of recurrent tumor based on clinical findings and/or sequentially increasing AFP:
 - ◆ CT Abdomen (CPT® 74160 or CPT® 74170) or MRI Abdomen (CPT® 74183)
- Imaging after transplant for primary sclerosing cholangitis (PSC):
 - ◆ Suspected recurrence of PSC;
 - MRCP (See: **AB-27.1: MRCP** for proper coding)
- Imaging after transplant for cholangiocarcinoma:
 - ◆ Liver ultrasound (CPT® 76705 or CPT® 76700) or MRI Abdomen and MRCP (CPT® 74183) every 6 months for 5 years post-transplantation.
 - ◆ CT Chest (CPT® 71250 or CPT® 71260) every 6 months for 5 years post-transplantation

Background and Supporting Information

Consensus guidelines regarding post-transplant surveillance imaging have not yet been established. There have been recent attempts to establish evidence-based guidelines, including the development of the RETREAT score, validated recently in a study conducted at University of California, San Francisco, Mayo Clinic-Rochester, and Mayo Clinic-Jacksonville. This scoring system has been adopted for use by UCSF and guides post-transplant imaging for individuals who have undergone transplant for HCC.

The RETREAT score is a protocol used to estimate the risk of tumor recurrence after liver transplantation in patients who have been transplanted for the treatment of hepatocellular carcinoma. It is comprised of 3 factors which are assessed before and after transplant. Points are assigned based on criteria which include the alpha-fetoprotein level before liver transplantation, the presence or absence of microvascular invasion, and the sum of the diameter of the largest viable tumor and the number of viable nodules on pathologic examination of the explant liver. The RETREAT score is calculated as follows:

Risk Factor	Score
Alpha-fetoprotein level before LT	
0-20	0
21-99	1
100-999	2
≥1000	3
Microvascular invasion present	2
Sum of the diameter of the largest viable tumor and the number of viable nodules	
0	0
1.1-4.9	1
5.0-9.9	2
≥10	3

AB-42.4: Post-Transplant Lymphoproliferative Disorder (PTLD)

- CT Chest/Abdomen/Pelvis with contrast (CPT® 71260 and CPT® 74177) for known or suspected PTLD.
- Additional evaluation of suspected PTLD is the same as the evaluation of lymphoma. See: **ONC-27.2: Diffuse Large B Cell Lymphoma (DLBCL)** in the Oncology Imaging Guidelines for further recommendations
- There is insufficient evidence to support the routine use of imaging to screen for PTLD.

Background and Supporting Information

- Post-transplant lymphoproliferative disease (PTLD) is a major complication of solid organ transplantation and the spectrum ranges from benign hyperplasia to malignant lymphoma. It has an incidence of 1-20%, and is usually related to Epstein-Barr virus infection in the setting of immunosuppression.

AB-42.5: Kidney Transplant, Pre-Transplant Imaging Studies

See: **CD-1.6: Transplant Patients** in the Cardiac Imaging Guidelines for guidelines on cardiac stress testing.

- Individuals on the kidney transplant waiting list can undergo advanced imaging per that institution's protocol as long as the studies do not exceed the following:
 - ◆ Diagnostic left heart catheterization if stress test is positive for reversible ischemia, or if duration of diabetes is >25 years and individual has additional cardiac risk factors.
 - ◆ Carotid duplex study (CPT® 93880 bilateral study or CPT® 93882 unilateral study) if there is history of stroke, TIA, or if carotid bruit is present on exam.
 - ◆ CT Abdomen and Pelvis (CPT® 74176 or CPT® 74177) or CTA Abdomen (CPT® 74175) one time.

- Donor Transplant Imaging Studies
 - ◆ CTA Abdomen (CPT® 74175) is the study of choice prior to transplant to evaluate donors
 - ◆ MRI Abdomen without and with contrast (CPT® 74183) can be substituted for a CTA in individuals with contrast allergy

AB-42.6: Kidney Transplant, Post-Transplant

- Ultrasound of transplanted kidney:
 - ◆ Current ultrasound imaging protocols of the transplanted kidney commonly include a Doppler study and are coded as CPT® 76776.
 - Do **not** report non-invasive vascular codes CPT® 93975 and CPT® 93976 in conjunction with CPT® 76776.
 - ◆ Ultrasound of the transplanted kidney performed without duplex Doppler should be reported as a limited retroperitoneal ultrasound (CPT® 76775).

AB-42.7: Heart Transplant

See: **CD-1.6: Transplant Patients** in the Cardiac Imaging Guidelines

References

1. Carruso S, Miraglia R, et al. Imaging in liver transplantation. *World Journal of Gastroenterology*. 2009;15(6):675-683.
2. Pomfret E, Washburn K, Wald C, et al. Report of a national conference on liver allocation in patients with hepatocellular carcinoma in the United States. *Liver Transplant*. 2010;16(3):262-78.
3. Sahani D, Mehta A, Blake M, et al. Preoperative hepatic vascular evaluation with CT and MR angiography: implications for surgery. *RadioGraphics*. 2004;24:1367-1380. 2017.
4. Cincinnati Children's Hospital Medical Center. Evidence based clinical practice guideline for management of EBV-associated post-transplant lymphoproliferative disease (PTLD) in solid organ transplant.
5. Liu, D. et al. Evidence-Based Surveillance Imaging Schedule After Liver Transplantation for Hepatocellular Carcinoma Recurrence. *Transplantation* 2017. Jan;101(1): 107-111
6. Lucey, Michael, et al. Long-Term Management of the Successful Adult Liver Transplant: 2012 Practice Guideline by AASLD and the American Society of Transplantation.
7. Mehta N, Heimbach J, Harnois DM, et al. Validation of a Risk Estimation of Tumor Recurrence After Transplant (RETREAT) Score for Hepatocellular Carcinoma Recurrence After Liver Transplant. *JAMA Oncology*. 2017;3(4):493. doi:10.1001/jamaoncol.2016.5116.
8. Filgueira NA. Hepatocellular carcinoma recurrence after liver transplantation: Risk factors, screening and clinical presentation. *World Journal of Hepatology*. 2019;11(3):261-272. doi:10.4254/wjh.v11.i3.261.
9. Xu M, Doyle MM, Banan B, et al. Neoadjuvant Locoregional Therapy and Recurrent Hepatocellular Carcinoma after Liver Transplantation. *Journal of the American College of Surgeons*. 2017;225(1):28-40. doi:10.1016/j.jamcollsurg.2017.03.015.
10. Cai L, Yeh BM, Westphalen AC, Roberts JP, Wang ZJ. Adult living donor liver imaging. *Diagnostic and Interventional Radiology*. 2016;22(3):207-214. doi:10.5152/dir.2016.15323.
11. Liu D, Chan ACY, Fong DYT, Lo C-M, Khong P-L. Evidence-Based Surveillance Imaging Schedule After Liver Transplantation for Hepatocellular Carcinoma Recurrence. *Transplantation*. 2017;101(1):107-111. doi:10.1097/tp.0000000000001513.
12. Bajaj L, Slavev A, Macinga P, et al. Risk of recurrence of primary sclerosing cholangitis after liver transplantation is associated with de novo inflammatory bowel disease. *World Journal of Gastroenterology*. 2018;24(43):4939-4949. doi:10.3748/wjg.v24.i43.4939.
13. Ligeti K, Müller LP, Müller-Tidow C, Weber T. Risk factors, diagnosis, and management of posttransplant lymphoproliferative disorder: improving patient outcomes with a multidisciplinary treatment approach. *Transplant Research and Risk Management*. 2017;Volume 9:1-14. doi:10.2147/trrm.s84744.
14. Aghayev A, Gupta S, Dabiri BE, Steigner ML. Vascular imaging in renal donors. *Cardiovascular Diagnosis and Therapy*. 2019;9(S1). doi:10.21037/cdt.2018.11.02.
15. Sawinski D, Locke JE. Evaluation of Kidney Donors: Core Curriculum 2018. *American Journal of Kidney Diseases*. 2018;71(5):737-747. doi:10.1053/j.ajkd.2017.10.018.

AB-43: Hepatic and Abdominal Arteries

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AB-43.1: Hepatic Arteries and Veins

- Portal Vein Thrombosis (PVT):
 - ◆ Doppler US (CPT® 93975) is the initial noninvasive modality for the diagnosis of Portal Vein Thrombosis
 - ◆ CT Abdomen with contrast (CPT® 74160 or 74170 – 4 phase CT), MRI Abdomen without and with contrast (CPT® 74183) or CTA Abdomen (CPT® 74175)
 - To assess the extension of thrombus into the mesenteric veins when Doppler US (or other imaging, such as abdominal US) is positive for PVT
 - To exclude tumor thrombus among individuals with cirrhosis who develop new portal and/or mesenteric vein thrombosis
 - For continued concern for PVT (for example in an individual with a hypercoagulable state or abdominal malignancy) if Doppler US is negative or inconclusive
 - ◆ To assess for development of intestinal ischemia among individuals with known portal and/or mesenteric vein thrombosis (MVT) (e.g., development of fever, rebound, leukocytosis, elevated serum lactate levels, or other red flag symptoms):
 - In lieu of the above imaging modalities, if requested: CT Abdomen and Pelvis with contrast (CPT® 74177)
 - ◆ For suspicion of portal hypertensive or portal cavernoma cholangiopathy in individuals with known PVT or MVT (cholestatic liver chemistry profile (See **AB-30.1: Abnormal Liver Chemistries**), known portal cavernoma, extrahepatic biliary abnormalities on imaging):
 - MRCP (CPT® 74183 or CPT® 74181)

(Note: Portosystemic collaterals in the region surrounding the common bile duct in individuals with chronic PVT can be associated with common bile duct obstruction.)

- For routine follow-up of PVT:
 - ◆ US/Doppler every 6 months. If these are reported as not providing adequate visualization, CT Abdomen (CPT® 74160), MRI Abdomen (CPT® 74183), or CTA Abdomen (CPT® 74175), can be performed.
- For follow-up of PVT being treated with anticoagulation:
 - ◆ US/Doppler, CT Abdomen (CPT® 74160), MRI Abdomen (CPT® 74183), or CTA Abdomen (CPT® 74175) in 3-6 months.
 - ◆ Further follow-up every 6 months with US/Doppler unless these are reported as not providing adequate visualization, in which case any of the above studies can be approved.
- TIPS (transjugular intrahepatic portosystemic shunt)
 - ◆ Pre-procedure evaluation:
 - Abdominal US, including Doppler (CPT® 76700 and/or CPT® 93975), Multiphase CT Abdomen (CPT® 74160 or CPT® 74170), Multiphase CTA Abdomen (CPT® 74175), Multiphase MRA Abdomen (CPT® 74185), or MRI Abdomen liver protocol (CPT® 74183)

- ◆ For routine follow-up to monitor stent patency:
 - US with Doppler (CPT® 93975) 7-14 days after shunt creation, and then at 3 months, 6 months, and then every 6 months thereafter.
 - Note: If requested earlier than the above intervals because of a clinical deterioration or suspicion of stent occlusion, the Doppler can be approved.
- ◆ If Doppler imaging is indeterminate or if there is a negative Doppler with clinical signs of worsening portal hypertension:
 - Multiphase CT Abdomen (CPT® 74160 or CPT® 74170), Multiphase CTA Abdomen (CPT® 74175), Multiphase MRA Abdomen (CPT® 74185), or MRI Abdomen liver protocol (CPT® 74183)
- Budd-Chiari Syndrome
 - ◆ Primary Budd-Chiari Syndrome (BCS) is due to thrombotic obstruction of the hepatic venous outflow tract, and Secondary BCS is caused by malignant tumors or extrinsic compression of the hepatic vein. Guidelines refer to Primary BCS.
 - LI-RADS assessment should not be applied to individuals <18 years old or those with cirrhosis from congenital hepatic fibrosis or secondary to vascular disorders (e.g., Budd-Chiari syndrome, chronic portal vein occlusion, cardiac congestion, hereditary hemorrhagic telangiectasia).
 - ◆ Doppler US (CPT® 93975) is the initial diagnostic test for the evaluation of BCS.
 - ◆ CT Abdomen with contrast (CPT® 74160), or MRI Abdomen without and with contrast (CPT® 74183) or CTA Abdomen (CPT® 74175)
 - To assess thrombus extension
 - Rule out tumor thrombus
 - Assess response to anticoagulation therapy
 - If there is high suspicion of BCS despite a negative or inconclusive Doppler US
 - To additionally assess indeterminate hepatic nodules detected on the prior US (any of the above studies or CT Abdomen without and with contrast CPT® 74170)
 - ◆ For pre-operative evaluation of anticipated interventional vascular therapies or TIPS:
 - Abdominal US, including Doppler (CPT® 76700 and/or CPT® 93975), Multiphase CT Abdomen (CPT® 74160 or CPT® 74170), Multiphase CTA Abdomen (CPT® 74175), Multiphase MRA Abdomen (CPT® 74185), or MRI Abdomen liver protocol (CPT® 74183)
 - ◆ For HCC Surveillance in patients with chronic BCS:
 - Abdominal US and serum alpha-fetoprotein every 6 months
 - Triphasic CT Abdomen (CPT® 74160 or CPT® 74170), or MRI Abdomen (CPT® 74183) for the evaluation of hepatic nodules seen on US or AFP ≥15 ng/ml.
 - The LiRADS reporting system does not apply to HCC surveillance in this population, due to the vascular origin of many of the hepatic imaging abnormalities.

- Hereditary Hemorrhagic Telangiectasia (HHT)
 - ◆ Note: The liver may be involved in individuals with HHT, and artery-to-vein or vein-to-vein shunting may occur resulting in liver vascular malformations (LVMs).
 - ◆ Screening the liver for LVMs is not indicated. As per recent ACG Guidelines⁶ “There is no evidence to suggest that making a diagnosis in an asymptomatic patient has clinical benefits or prevents death”.
 - ◆ For symptoms suggestive of LVMs (including an audible bruit or palpable thrill over the hepatic region on physical examination, abnormal liver tests) or for the development of signs or symptoms of heart failure, biliary ischemia, hepatic encephalopathy, mesenteric ischemia, or portal hypertension:
 - CT Abdomen (CPT® 74160), CTA Abdomen (CPT® 74175), MRI Abdomen with and without (CPT® 74183), MRCP (CPT® 74183), or MRA Abdomen (CPT® 74185)
- CTA Abdomen and Pelvis (CPT® 74174), or CTA Abdomen (CPT® 74175) or MRA Abdomen (CPT® 74185) additional indications:
 - ◆ Evaluation of portal and hepatic veins prior to or following surgical intervention for the treatment of portal hypertension (See: **AB-26.3: Portal Hypertension**)
 - ◆ Evaluation of hepatic vasculature prior to and following embolization procedure (See: **ONC-14.4 and ONC-14.5: Hepatocellular Carcinoma** and **ONC-31.2: Liver Metastases** in the Oncology Imaging Guideline)
 - ◆ Evaluation of hepatic vasculature prior to planned hepatectomy (See: **AB-42.1: Liver Transplant, Pre-Transplant**)
 - ◆ Evaluation of liver donor (See: **AB-42.2: Liver Transplant, Living Donor Pre-Transplant Imaging (Donor Imaging)** for specific guidance)
- Hepatic arterial aneurysms:
 - ◆ See: **PVD-6: Aortic Disorders, Renal Vascular Disorders and Visceral Artery Aneurysms** in the Peripheral Vascular Disease Imaging Guidelines

Background and Supporting Information

- Primary Budd-Chiari Syndrome is due to thrombotic occlusion of the hepatic venous outflow tract. Most individuals have an underlying prothrombotic condition such as a myeloproliferative disease, an inherited thrombophilia (e.g. Factor V Leiden), a systemic disease such as vasculitis, or hormonal factors, such as recent oral contraceptive use. Secondary Budd-Chiari Syndrome is caused by malignant tumors or extrinsic compression of the hepatic veins.

AB-43.2: Abdominal Veins other than Hepatic and Portal Veins

- CTA Abdomen and Pelvis (CPT® 74174), or CTA Abdomen (CPT® 74175) or MRA Abdomen (CPT® 74185) if ONE of the following:
 - ◆ Nephrotic syndrome
 - ◆ Suspicion of iliac vein thrombus
 - ◆ Suspicion of inferior vena cava thrombus
 - ◆ Renal vein thrombosis
 - ◆ Mesenteric vein thrombosis

AB-43.3: Renal Vein Thrombosis

- MRA Abdomen (CPT® 74185) if ONE of the following:
 - ◆ Nephrotic syndrome
 - ◆ Proteinuria – 3 grams or more in 24 hours
 - ◆ Lupus nephritis
 - ◆ Hypercoagulable state, ONE of the following:
 - Antiphospholipid antibodies
 - Behçet's syndrome
 - Protein C deficiency
 - Protein S deficiency

References

1. American College of Radiology (ACR), North American Society for Cardiovascular Imaging (NASCI), Society for Pediatric Radiology (SPR). ACR-NASCI-SPR practice guideline for the performance of pediatric and adult body magnetic resonance angiography (MRA). *Am Coll Radiol*. Revised 2015.
2. Nghiem HV, Winter TC III, Mountford MC, et al. Evaluation of the portal venous system before liver transplantation: value of phase-contrast MR angiography. *AJR*. 1995;164:871-878.
3. American Association for the Study of Liver Disease (AASLD). AASLD practice guidelines: the role of transjugular intrahepatic portosystemic shunt (TIPS) in the management of portal hypertension. *Hepatology*, 2010;51:1-16.
4. Lee SS, Kim TK, Byun JH, et al. Hepatic arteries in potential donors for living related liver transplantation: evaluation with multi-detector row CT angiography. *Radiology*. 2003; 227:391-399.
5. Simonetto DA, Singal AK, Garcia-Tsao G, Caldwell SH, Ahn J, Kamath PS. ACG Clinical Guideline. The American Journal of Gastroenterology. 2020;115(1):18-40. doi:10.14309/ajg.0000000000000486.
6. Boyer TD, Haskal ZJ. The role of transjugular intrahepatic portosystemic shunt (TIPS) in the management of portal hypertension: Update 2009. *Hepatology*. 2009;51(1):306-306. doi:10.1002/hep.23383.
7. Kapoor B, Sands M, Copelan A. Transjugular Intrahepatic Portosystemic Shunt: Indications, Contraindications, and Patient Work-Up. *Seminars in Interventional Radiology*. 2014;31(03):235-242. doi:10.1055/s-0034-1382790.
8. Dariushnia SR, Haskal ZJ, Midia M, et al. Quality Improvement Guidelines for Transjugular Intrahepatic Portosystemic Shunts. *Journal of Vascular and Interventional Radiology*. 2016;27(1):1-7. doi:10.1016/j.jvir.2015.09.018.
9. Margini C, Berzigotti A. Portal vein thrombosis: the role of imaging in the clinical setting. *Dig Liver Dis*. 2017;49(2):113-120. doi:10.1016/j.dld.2016.11.013.
10. Northup PG, Garcia-Pagan JC, Garcia-Tsao G, et. al. Vascular liver disorders, portal vein thrombosis, and procedural bleeding in patients with liver disease: 2020 practice guidance by the American Association for the Study of Liver Diseases. *Hepatology*. 2020;73(1):366-413. doi:10.1002/hep.31646.

AB-44: Suspected Neuroendocrine Tumors of the Abdomen

- For the evaluation of a suspected neuroendocrine tumor of the abdomen: See **ONC-15.2: Gastrointestinal/Pancreatic Neuroendocrine Cancers - Suspected/Diagnosis** in the Oncology Imaging Guidelines.

AB-45: Liver Elastography

- Vibration-Controlled Transient Elastography (VCTE) (e.g. Fibroscan, CPT® 91200) may be considered appropriate to assess for advanced fibrosis and cirrhosis in the following conditions: (Note: eviCore does not currently review for this procedure code and providers should contact the insurer directly for any pre-authorization requirements.)
 - ◆ Hepatitis C
 - ◆ Hepatitis B
 - ◆ Chronic alcoholic liver disease
 - ◆ All other chronic liver diseases
- Special consideration for Magnetic Resonance Elastography (MRE, CPT® 76391):
 - ◆ Suspected NAFLD (Non-alcoholic fatty liver disease) or other chronic liver diseases (For MRE requests in the setting of hemochromatosis, see: **AB-11.2: Hereditary (Primary) Hemochromatosis (HH) and Other Iron Storage Diseases**):
 - Transient Elastography (CPT® 91200) is the initial imaging modality to stage fibrosis
 - ◆ MRE (CPT® 76391) can be approved for either of the following:
 - If Transient Elastography failure despite use of an XL-probe, OR BMI ≥ 35
 - Conflict between clinical picture and transient elastography results (e.g., patient with portal hypertension but VCTE suggests no fibrosis)
 - ◆ Note: The correct CPT code for MR Elastography is CPT® 76391. It is a stand-alone code and it does not require an additional CPT code such as MRI Abdomen (CPT® 74183). An additional MRI Abdomen code should only be approved if there is another appropriate indication for it, other than the Elastography study (for example, MRE for fibrosis scoring in NAFLD due to a BMI ≥ 35 , AND further evaluation of an indeterminate hepatic lesion).
- The use of other ultrasound elastographic techniques (CPT® 76981, CPT® 76982, and CPT® 76983), including but not limited to acoustic radiation force impulse imaging or real-time tissue elastography for any indication is considered experimental or investigational at this time.
 - ◆ Note: Transient Elastography (VCTE) is the most studied elastography technique and informs multiple evidence-based guidelines with respect to fibrosis scoring. No national evidence-based guideline recommends the use of either ARFI or real-time tissue elastography (RTTE) over the use of VCTE for any clinical protocol, nor is there direct evidence that ARFI or RTTE improves health outcomes over and above VCTE.

Background and Supporting Information

For the assessment of cirrhosis in individuals with hepatitis C, the AGA noted that MRE has little to no increase in identifying cirrhosis, but had poorer specificity and thus higher false-positive rates than VCTE. In view of this, the AGA concluded that MRE has a poorer diagnostic performance in this setting, compared to VCTE. In their recommendations for the assessment of fibrosis in chronic liver disease,

VCTE was recommended over MRE with the exception of NAFLD in high risk populations, in which MRE resulted in a lower rate of false positives compared to VCTE. This was considered a conditional recommendation with a low quality of evidence. The role of MRE was reviewed again in 2019 (Castera, et. al.) in Gastroenterology⁸ and the pathway recommendations form the basis of our current guideline with respect to the role of MRE in fatty liver disease.

References

1. American Gastroenterologic Association Institute guideline on the role of elastography in the evaluation of liver fibrosis. *Gastroenterology*. 2017;152:1536-1543.
2. Conti CB, Cavalcoli F, Fraquelli M, Conte D, Massironi S. Ultrasound elastographic techniques in focal liver lesions. *World Journal of Gastroenterology*. 2016;22(9):2647. doi:10.3748/wjg.v22.i9.2647.
3. The diagnosis and management of nonalcoholic fatty liver disease: Practice guidance from the American Association for the Study of Liver Diseases. *Clinical Liver Disease*. 2018;11(4):81-81. doi:10.1002/cld.722.
4. Li Q, Dhyani M, Grajo JR, Sirlin C, Samir AE. Current status of imaging in nonalcoholic fatty liver disease. *World Journal of Hepatology*. 2018;10(8):530-542. doi:10.4254/wjh.v10.i8.530.
5. Imajo K, Kessoku T, Honda Y, et al. Magnetic Resonance Imaging More Accurately Classifies Steatosis and Fibrosis in Patients With Nonalcoholic Fatty Liver Disease Than Transient Elastography. *Gastroenterology*. 2016;150(3). doi:10.1053/j.gastro.2015.11.048.
6. Chalasani N, Younossi Z, Lavine JE, et al. The diagnosis and management of nonalcoholic fatty liver disease: Practice guidance from the American Association for the Study of Liver Diseases. *Hepatology*. 2017;67(1):328-357. doi:10.1002/hep.29367.
7. Vuppalanchi R, Siddiqui MS, Natta MLV, et al. Performance characteristics of vibration-controlled transient elastography for evaluation of nonalcoholic fatty liver disease. *Hepatology*. 2017;67(1):134-144. doi:10.1002/hep.29489.
8. Castera L, Friedrich-Rust M, Loomba R. Noninvasive assessment of liver disease in patients with nonalcoholic fatty liver disease. *Gastroenterology*. 2019;156(5). doi:10.1053/j.gastro.2018.12.036.

AB-46: Hiccups

- Note: Hiccups may be associated with cerebrovascular disease, brain tumors, and intracranial injury, though it would be very rare for hiccups to be the only presenting symptom of serious neurologic disease. If concern is expressed for one of these issues (e.g. stroke, etc.), please see the appropriate guideline in HD imaging (e.g., **HD 21.1: Stroke/TIA**)
- Hiccups <48 hours without any localizing or specific symptoms:
 - ◆ No advanced imaging
- Hiccups ≥48 hours:
 - ◆ History and physical examination, laboratory and CMP and baseline chest x-ray
 - ◆ Abnormal or negative chest x-ray with symptoms referable to the chest:
 - CT Chest with contrast (CPT® 71260)
 - ◆ Lab or history/physical findings suggest a gastrointestinal etiology:
 - CT Abdomen with contrast (CPT® 74160)

References

1. British Journal of General Practice. Hiccups. A Common Problem with Some Unusual Causes and Cures: 2016;66(652):584-586.
2. Steger M, Schneemann M, Fox M. Systemic review: the pathogenesis and pharmacological treatment of hiccups. Alimentary Pharmacology & Therapeutics. 2015;42(9):1037-1050. doi:10.1111/apt.13374.

AB-47: Retroperitoneal Fibrosis

- Individuals diagnosed with retroperitoneal fibrosis:
 - ◆ ONE of the following every 3 months until stability demonstrated:
 - CT Abdomen and Pelvis with contrast (CPT® 74177)
 - MRI Abdomen and Pelvis without contrast (CPT® 74181 and CPT® 72195)
 - MRI Abdomen and Pelvis with and without contrast (CPT® 74183 and CPT® 72197)
 - Retroperitoneal or Abdominal ultrasound (CPT® 76770 or CPT® 76700) can be approved if requested.
 - ◆ After stability established repeat imaging can be approved every 6 months.
 - ◆ Requests for non-contrasted studies in individuals with renal insufficiency is appropriate. Gadolinium may induce nephrogenic systemic fibrosis in individuals with moderate or severe renal insufficiency, especially if the GFR is <30 ml/min.
 - ◆ Additional imaging:
 - CT Chest (CPT® 71260) can also be performed upon initial diagnosis if requested, to further evaluate for the possibility of malignancy as an underlying etiology.
- PET/CT (CPT® 78815)
 - ◆ Can be considered initially, after diagnosis, to establish avidity patterns to assess for the likelihood of malignancy and for stratification for the likelihood of response to steroids.
 - ◆ Follow-up can be considered if there is documentation of an anticipated therapeutic change based on the results (such as a change in immunosuppression therapy or stent removal).
- Methysergide-induced retroperitoneal fibrosis:
 - ◆ Methysergide for migraine treatment is generally no longer available but is rarely being used at some centers. It has a known complication of retroperitoneal fibrosis.
 - ◆ Individuals can be screened at baseline and then every 6 months with ONE of the following:
 - CT Abdomen and Pelvis with contrast (CPT® 74177)
 - CT Abdomen and Pelvis without contrast (CPT® 74176)
 - MRI Abdomen and Pelvis without and with contrast (CPT® 74183 and CPT® 72197)
 - MRI Abdomen and Pelvis without contrast (CPT® 74181 and CPT® 72195)
 - Retroperitoneal ultrasound (CPT® 76770 or CPT® 76775)

Background and Supporting Information

Retroperitoneal fibrosis is a rare disease, and may be idiopathic (IgG4 or non-IgG-4 related) or secondary. Secondary causes include malignancy, infections, previous radiation therapy, previous abdominal surgery, drugs such as methysergide, and biologic agents.

References

1. Retroperitoneal Fibrosis Clinical Presentation: History and Physical Examination. Retroperitoneal Fibrosis Clinical Presentation: History and Physical Examination. <https://emedicine.medscape.com/article/458501-clinical>. Published May 30, 2019.
2. Vaglio A, Maritati F. Idiopathic Retroperitoneal Fibrosis. *Journal of the American Society of Nephrology*. 2016;27(7):1880-1889. doi:10.1681/asn.2015101110.
3. Runowska M, Majewski D, Puszczewicz M. Retroperitoneal fibrosis – the state-of-the-art. *Reumatologia/Rheumatology*. 2016;5:256-263. doi:10.5114/reum.2016.63667.
4. Urban M, Palmisano A, Nicastro M, Corradi D, Buzio C, Vaglio A. Idiopathic and secondary forms of retroperitoneal fibrosis: A diagnostic approach. *La Revue de Médecine Interne*. 2015;36(1):15-21. doi:10.1016/j.revmed.2014.10.008.
5. EMA restricts methysergide use, concern over fibrosis. *Reactions Weekly*. 2014;1491(1):2-2. doi:10.1007/s40278-014-9172-x.
6. Fendler WP, Eiber M, Stief CG, Herrmann K. A PET for All Seasons: 18 F-Fluorodeoxyglucose to Characterize Inflammation and Malignancy in Retroperitoneal Fibrosis? *European Urology*. 2017;71(6):934-935. doi:10.1016/j.eururo.2017.01.019.
7. Gu L, Wang Y, Zhang X. Re: Archie Fernando, James Pattison, Catherine Horsfield, David D'Cruz, Gary Cook, Tim O'Brien. [18F]-Fluorodeoxyglucose Positron Emission Tomography in the Diagnosis, Treatment Stratification, and Monitoring of Patients with Retroperitoneal Fibrosis: A Prospective Clinical Study. *Eur Urol* 2017;71:926–33. *European Urology*. 2017;72(2). doi:10.1016/j.eururo.2017.02.029.