AmeriHealth Caritas Louisiana

National Imaging Associates, Inc. *	
Clinical guidelines **ABDOMEN CT**	**Original Date: September 1997**
CPT Codes: 74150, 74160, 74170	**Last Revised Date: April 2021**
Guideline Number: NIA_CG_030	**Implementation Date: January 2022**

Note: For syndromes for which imaging starts in the pediatric age group, MRI preferred

NOTE: ABDOMEN CT ALONE SHOULD ONLY BE APPROVED WHEN DISEASE PROCESS IS SUSPECTED TO BE LIMITED TO THE ABDOMEN. CT Abdomen/Pelvis Combo (CPT Codes: 74176, 74177, 74178) is the correct study when the indication(s) include both the abdomen AND pelvis, such as CTU (CT Urography), CTE (CT Enterography), acute abdominal pain, widespread inflammatory disease or neoplasm. Otherwise, the exam should be limited to the appropriate area. (i.e., Abdomen OR Pelvis) which includes the specific organ, area of known disease/abnormality, or the area of concern.

INDICATIONS FOR ABDOMEN CT

~~Note: For syndromes for which imaging starts in the pediatric age group, MRI preferred~~

Abdominal Pain for Unknown Etiology

- CT allowed after initial workup **is** inconclusive **and must include results of the following:**
  - Initial imaging, such as, **ultrasound (although ultrasound does have limitations, it is a common misconception ~~is~~ that ultrasound is not a good tool in ALL obese patients, such that it is often useful even in obese patients and quite reasonable to attempt as a first-line imaging modality particularly given the benefit of no radiation)**, scope study, or x-ray **AND**
  - Appropriate laboratory testing (chemistry profile, complete blood count, and urinalysis)
    - Amylase/ lipase if suspected pancreatitis
    - Liver function tests if suspicion of hepatic disease
- For acute abdominal pain in a patient over the age of 65 (ACR, 2018; Lehtimaki, 2017)

Evaluation of suspicious known mass/tumors (unconfirmed diagnosis of cancer) for further evaluation of indeterminate or questionable findings

* National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.

- **Initial evaluation of suspicious masses/tumors found by physical exam or imaging study, such as ultrasound (US), and only the abdomen is affected (ACR, 2013, 2014).** ~~Initial evaluation of a palpable abdominal or abdominal wall mass/tumor found by physical exam or imaging study, such as ultrasound (US) (ACR, 2019).~~
- ~~Follow-up of known cancer (Bourgioti, 2016; NCCN, 2019):~~
- ~~Follow-up of known cancer of patient undergoing active treatment within the past year.~~
- ~~Known cancer with suspected abdominal metastasis based on a sign, symptom or an abnormal lab value.~~
-
- **Surveillance: One follow-up exam to ensure no suspicious change has occurred in a tumor in the abdomen and pelvis. No further surveillance CT unless tumor(s) are specified as highly suspicious or a change was found on the last follow-up CT, new/changing sign/symptoms, or abnormal lab values**
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- **For abnormal incidental abdominal lymph nodes when follow-up is recommended based on prior imaging (initial 3-month ~~FU~~follow-up) (Smereka, 2017)**
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Follow-up of known cancer
(Bourgioti, 2016; NCCN, 2019~~b~~)

- **~~O~~ Follow-up of known cancer of patient undergoing active treatment within the past year**
-
- **~~o~~ Known cancer with suspected abdominal metastasis based on a sign, symptom (e.g., anorexia, early satiety, intestinal obstruction, night sweats, pelvic pain, weight loss, vaginal bleeding) or an abnormal lab value (alpha-fetoprotein, CEA, CA 19-9, p53 mutation)**

For evaluation of suspected infection or inflammatory disease based on exam or discovered on previous imaging
(ACR, 2018; Cartwright, 2015; Sartelli, 2015)

- Right upper quadrant pain for suspected biliary disease with negative or equivocal ultrasound.
- For epigastric or left upper quadrant pain if labs or other imaging are inconclusive (Ecanow, 2015)
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For evaluation of suspected infection or for follow-up known infection limited to the abdomen

- **Any known infection that is clinically suspected to have created an abscess limited to the abdomen. (If location unclear or ~~/~~unknown, CT Abdomen/Pelvis)**
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- **Any history of fistula limited to the abdomen that requires re-evaluation or is suspected to have recurred.**
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- **Abnormal fluid collection limited to the abdomen seen on prior imaging that needs follow-up evaluation.**

For evaluation of inflammatory disease or follow-up limited to the abdomen

- ~~•~~ **For suspected inflammatory bowel disease (Crohn's disease or ulcerative colitis) with abdominal pain AND one of the following (ACR, 2019; Arif-Tiwari, 2019; Lichtenstein, 2018):**
  - **Chronic diarrhea**
  - **Bloody diarrhea**

  Note: For patients under 35 years old, consider MRE
- ~~•~~ **High clinical suspicion after complete work up including physical exam, labs, endoscopy with biopsy (ACR, 2019; Arif-Tiwari, 2019; Lichtenstein, 2018; Rubin, 2019)**~~For suspected of inflammatory bowel disease (Crohn's or ulcerative colitis) with abdominal pain, and persistent diarrhea, or bloody diarrhea (Arif-Tiwari, 2019; Kilcoyne, 2016).~~
- •
- ~~•~~ **Known inflammatory bowel disease, (Crohn's or ulcerative colitis) with recurrence or worsening signs/symptoms requiring re-evaluation**

For evaluation of an organ or abnormality seen on previous imaging~~:~~

ADRENAL

- To locate a pheochromocytoma once there is clear biochemical evidence (may require abdomen and pelvis imaging)
- Suspected adrenal secreting tumor after full clinical and biochemical work-up (Fassanacht, 2018, **Meek, 2013)**~~; Meek, 2013)~~
- Suspected adrenal mass ≥ 1 cm incidentally discovered with no history of malignancy (one follow-up in 6-12 months to document stability)~~.~~
- If adrenal mass ≥ 4 cm and no diagnosis of cancer, can approve for preoperative planning (surgery to rule out adrenal cortical carcinoma)
- For adrenal mass < 4 cm with history of malignancy (if ≥ 4 cm consider biopsy or PET/CT unless pheochromocytoma is suspected)
- Yearly surveillance for patients with Multiple Endocrine Neoplasia type 1 (MEN1) beginning at age 10 (Kamilaris, 2019).
- For patients with Von Hippel Lindau, surveillance at least every other year starting at age 16 if MRI contraindicated (Abdominal US starting at age 8) (Varshney, 2017)

LIVER

- Indeterminate liver lesion > 1 cm seen on ultrasound ****** (ACR, 2020)
- Indeterminate liver lesion < 1cm on initial imaging with known chronic liver disease or a history of extrahepatic malignancy~~.~~
- Hepatitis/hepatoma screening after ultrasound is abnormal, equivocal, or non-diagnostic (may be limited in patients who are obese, those with underlying hepatic steatosis, as well as nodular livers (Bruix, 2011; Lee, 2014; Marquardt, 2016; Mayo-Smith, 2017)). (No literature supports the use of AFP alone in the screening of HCC).
- For jaundice or abnormal liver function tests after equivocal or abnormal ultrasound (Vagvala, 2018).

- For surveillance of HCC in patients who have received liver-directed therapy, surgical resection, medical treatment or transplant (MRI or CT) at one-month post treatment and then every 3 months for up to two years** (Horowitz, 2017; Vagvala, 2018)
- For ~~follow~~ follow-up of suspected adenoma every 6-12 months
- To confirm diagnosis of focal nodular hyperplasia seen on other imaging~~.~~
- For ~~follow~~ follow-up of focal nodular hyperplasia (FNH) annually if US is inconclusive (Marrero, 2014)
- Pre-procedure for transjugular intrahepatic portosystemic shunt (TIPS) (~~Gaba, 2011;~~ Farsad, 2014; Gaba, 2011)
- In patients with Beckwith-Wiedemann syndrome and abnormal ultrasound or rising AFP and MRI is contraindicated (Kalish, 2017)~~.~~

PANCREAS

- Pancreatic cystic lesion found on initial imaging
- Intraductal papillary mucinous neoplasm (IPMN) and mucinous cystic neoplasm (MCN) require surveillance imaging as follows (if MRI/MRCP is contraindicated) if indeterminate on initial imaging and duct communication is present and there are no high-risk characteristics (see ~~B~~background section) (Elta, 2018):
    - For incidental and asymptomatic cysts <5 mm, one follow-up at three years (Pandey, 2019)
    - For cysts 5 mm-1 cm image every 2 years for 4 years, and if stable can lengthen intervals
    - For cysts 1-2 cm image every year for 2 years and if stable every 2 years for 4 years, and if stable can lengthen intervals~~.~~
    - Cysts that are 2-3 cm every 6-12 months for 3 years and if stable then yearly for 4 years and if stable can lengthen intervals (can also use EUS)
    - For lesions > 3 cm MRI/CT or EUS every 6 months for 3 years, then imaging alternating with EUS every year for 4 years and if stable can lengthen intervals
- ~~Yearly~~ Annual surveillance for individuals determined to have an increased lifetime risk of developing pancreatic cancer (if MRI/MRCP and EUS contraindicated), based on genetic predisposition or family history
    - S~~s~~tarting at age 50~~,~~ or 10 years younger than the earliest age of cancer affected ~~first~~ first-degree relative (except with Peutz-Jeghers start at age 30-35)~~;~~
    - Von Hippel Lindau starting at age 16 at least every other year (abdominal US starting at age 8)
    - ~~, and~~ Hereditary Pancreatitis starting at age 40 or 20 years after first attack)*** (Hu, 2018; NCCN, 2019; Syngal, 2015~~; NCCN, 2019~~)~~.~~
- For patients with MEN 1, yearly surveillance for primary neuroectodermal tumors (pNET) starting at age 10 (EUS also considered)~~.~~
- For suspected acute pancreatitis with pain and abnormal amylase and lipase and <48-72 hours if ultrasound is inconclusive (ACR, 2019; Vagvala, 2018)~~.~~
- Suspected acute pancreatitis with ~~Presentation with~~ atypical signs and symptoms including equivocal amylase and lipase (Mathur, 2015)
- Severe acute pancreatitis, 72-96 hours after onset of symptoms (Leppaniemi, 2019)
- ~~Known necrotizing pancreatitis requiring follow up.~~

- Pancreatitis by history, (including pancreatic pseudocyst) with abdominal pain suspicious for worsening, or re-exacerbation
- **Known necrotizing pancreatitis requiring follow- up.**
- For localization of an insulinoma once diagnosis is confirmed (Vinik, 2017).

RENAL

- For an indeterminate renal mass on other imaging (ACR, 2014)
- Active surveillance for indeterminate cystic renal mass, not a simple renal cyst (Richard, 2017) (see **Bosniak criteria** in **the** ~~comment~~ **Overview** section)
- Active surveillance for patients with tuberous sclerosis and known angiomyolipoma (AML) if MRI is contraindicated (Vos, 2018)
- For surveillance of patients with Von Hippel Lindau at least every other year to assess for clear cell renal cell carcinoma to begin at age 16 (screening with ultrasound starting at around age 8) (Varshney, 2017).
- ~~Follow~~ **Follow-**up for solid renal masses under 1 cm at 6 and 12 months, then annually (Herts, 2018)
- Active surveillance for renal cell carcinoma in patients with Birt-Hogg syndrome every 36 months (Gupta, 2017)

SPLEEN

- Incidental findings of the spleen that are indeterminate on other imaging

For evaluation of a suspected or known hernia

- ~~Other Indications for an Abdominal CT~~
- **Abdominal/pelvic pain suspected to be due to an occult, umbilical, Spigelian, or incisional, hernia when physical exam and prior imaging is non-diagnostic or equivocal or if requested as a preoperative study and limited to the abdomen.**
- **Hernia with suspected complications (e.g., bowel obstruction or strangulation, or non-reducible) based on symptoms (e.g., diarrhea, hematochezia, vomiting, severe pain, or guarding), physical exam (guarding, rebound)- or prior imaging (Halligan, 2018).**
- **For confirming the diagnosis of a recurrent hernia when ultrasound is negative or non-diagnostic.**
- **Complex ventral hernia that is ≥ 10 cm for pre-operative planning (Halligan, 2018)**

~~Abdominal pain suspected to be due to an occult, spigelian, incisional or epigastric hernia when physical exam and initial laboratory/urine testing (to exclude other etiologies) and prior imaging is non-diagnostic or equivocal (Abdelmohsen, 2017; Lassandro, 2011; Miller, 2014; Robinson, 2013) and limited to the abdomen.~~

~~Ssymptoms (e.g. diarrhea, hematochezia, vomiting, severe pain), (guarding, rebound)uspected incarceration or strangulation based on physical exam or prior imaging (Halligan, 2018).)~~

For evaluation of known or suspected vascular disease (e.g., aneurysms, hematomas) (Khosa, 2013~~1~~; Uberoi, 2011)
NOTE: CT/MRI should not be approvable without a contraindication to CTAngiography /MRAngiography (such as severe renal dysfunction, contrast allergy, or another specific reason CT/MRI (rather than CTA/MRA) is preferred.

- ~~•~~ **Evidence of vascular abnormality identified on imaging studies and limited to the abdomen.**

~~**For evaluation of suspected infection or for follow-up known infection**~~

- ~~Any known infection that is clinically suspected to have created an abscess in the abdomen.~~
- ~~Any history of fistula limited to the abdomen that requires re-evaluation or is suspected to have recurred.~~
- ~~Abnormal fluid collection limited to the abdomen seen on prior imaging that needs follow-up evaluation.~~
- ~~Suspected peritonitis (from any cause) if abdominal pain and tenderness to palpation is present, and **at LEAST one** of the following:~~
    - ~~Rebound, guarding or rigid abdomen; **OR**~~
    - ~~Severe tenderness to palpation over the entire abdomen~~

~~**For evaluation of suspected inflammatory disease or follow-up (also approve CT pelvis)**~~

- ~~For suspected of inflammatory bowel disease (Crohn's or ulcerative colitis) with abdominal pain, and persistent diarrhea, or bloody diarrhea (Arif-Tiwari, 2019; Kilcoyne, 2016).~~
- ~~Known inflammatory bowel disease, (Crohn's or ulcerative colitis) with recurrence or worsening signs/symptoms requiring re-evaluation~~

Pre-operative evaluation

- For abdominal surgery or procedure~~.~~

Post-operative/procedural evaluation~~:~~

- Follow-up of known or suspected post-operative complication involving only the abdomen~~.~~
- A follow-up study to help evaluate a patient's progress after treatment, procedure, intervention, or surgery. Documentation requires a medical reason that clearly indicates why additional imaging is needed~~.~~

Indication for combination studies for the initial pre-therapy staging of cancer, evaluation before starting treatment OR active monitoring for recurrence as clinically indicated OR evaluation of suspected metastases

- ≤ 5 concurrent studies to include CT or MRI of any of the following areas as appropriate depending on the cancer: Neck, Abdomen, Pelvis, Chest, Brain, Cervical Spine, Thoracic Spine or Lumbar Spine, **and MUGA**.

~~**Combination studies with Abdomen CT**~~

- ~~**Abdomen CT/Pelvis CT/Chest CT/Neck MRI/Neck CT with MUGA –** known tumor/cancer for initial staging or evaluation before starting chemotherapy or radiation treatment.~~

~~**If an Abdomen/Pelvis CT combo is indicated and the Abdomen CT has already been approved, then the Pelvis CT may be approved.**~~

BACKGROUND

CT provides direct visualization of anatomic structures in the abdomen and pelvis and is a fast-imaging tool used to detect and characterize diseases ~~involving the abdomen and pelvis~~. Abdominal imaging begins at the diaphragm and extends to the umbilicus or iliac crests.
CT uses x-rays and multiple detectors to create ~~cross~~ **cross-**sectional images of the normal anatomy, as well as demonstrate abnormal soft tissue densities, calcifications or fluid/gas patterns in the viscera or peritoneal space.

In general, ionizing radiation from CT should be avoided during pregnancy. Ultrasound is clearly a safer imaging option and is the first imaging test of choice; ~~,~~ although, CT or MRI after equivocal ultrasound has been validated for diagnosis. Clinicians should exercise increased caution with CT imaging in children, **pregnant** ~~women~~**women**, and young adults due to the risks of exposure to ionizing radiation. Screening for pregnancy as part of a work-up is suggested to minimize the number of unexpected radiation exposures for women of childbearing age.

Cross-sectional imaging (liver ultrasound with Doppler, CT or MRI) should be completed no more than a month prior to the Transjugular Intrahepatic Portosystemic Shunt (TIPS) to assess for vascular patency and look for hepatic masses or other problems that could complicate the procedure. Post procedure, an ultrasound of the liver **is performed** a day after to assess shunt patency. Hepatic encephalopathy (HE) is the most common complication and usually occurs 2-3 weeks after insertion of TIPS. Unique complications may include intravascular hemolysis and infection of the shunt. Other complications can include capsule puncture, intraperitoneal bleed, hepatic infarction, fistula, hematobilia, thrombosis of stent, occlusion or stent migration and may require ~~cross~~ **cross-**sectional imaging.

Follow up and maintenance imaging if complications suspected include Doppler ultrasound to assess shunt velocity. If asymptomatic sonogram performed at 4 weeks post placement, then every 6 months to a year. The gold standard for shunt patency is portal venography, usually reserved if concern for shunt occlusion.

OVERVIEW

Ultrasound should be considered prior to a request for Abdomen CT for the following evaluations:

- Possible gallstones or abnormal liver function tests~~.~~
- Evaluation of cholecystitis~~.~~
- Follow up for aortic aneurysm~~.~~

  Note: For known or suspected abdominal aneurysm, CT/MRI should not be approvable without a contraindication to CTAngiography /MRAngiography, ~~(~~such as severe renal dysfunction, contrast allergy, or another specific reason CT/MRI (rather than CTA/MRA) is preferred~~)~~.

Screening for Hepatocellular carcinoma (HCC): AASLD (American Association for the Study of Liver Diseases) recommends screening for HCC with ultrasound every 6 months for patients with hepatitis C and B (Bruix, 2011). The literature differs on the role of AFP (alpha fetoprotein) in the screening of HCC. Some authors argue against its use altogether due to its lack of sensitivity and specificity in detecting HCC (Bruix, 2011; Marquardt, 2016) and instead recommend ultrasound alone for screening. According to Marquardt, the AASLD and EASLD (European Association for the Study of the Liver) "do not endorse its [AFP] use in clinical routine, neither alone nor in combination with ultrasound". This approach is supported by reports of patients with chronic viral hepatitis and elevated AFP but normal livers on imaging. AFP elevation in these cases is due to hepatic inflammation and viral replication (Patil, 2013), not neoplasm. Others advocate for combined ultrasound and AFP for screening (Tan, 2011; Tzartzeva, 2018), citing increased sensitivity compared to ultrasound alone in detecting early-stage HCC particularly in cirrhotic patients. In a meta-analysis by Tzartzeva, et al of thirty-two studies (13,367 patients with cirrhosis), ultrasound with AFP had a 63% sensitivity of detecting early-stage HCC, compared to 45% for ultrasound alone. In the final analysis, no literature supports the use of AFP alone in the screening of HCC.

Although most international groups recommend US screening and surveillance for HCC, the evidence to support this practice is weak. The recommendation for screening with US every 6 months by the AASLD is based on a prospective Chinese study of hepatitis B patients that showed that patients who had an US survived longer. However, there is no good evidence to show that these results apply to the population in the United States, which has a much higher percentage of obese patients, fewer patients with chronic hepatitis B, and many more patients with alcoholic cirrhosis, often with hepatitis C and NAFLD (and the role of surveillance in NAFLD without cirrhosis is unclear). US is insensitive for detection of HCC in patients with hepatic steatosis, as well as nodular cirrhotic livers who are undergoing surveillance. The regenerative nodules in cirrhotic livers alter the background hepatic echotexture, making HCC difficult to detect. Another inherent limitation of US is its operator dependence (~~ACR~~**Gore**, 2017).

- Incidental liver lesions – "Incidental hepatic lesions that are ≥1 cm and have distinctly benign imaging features do not require follow-up. Such features include sharp margin, homogeneous low attenuation (≤20 HU) on noncontrast or portal venous–phase imaging, or characteristic features of hemangiomas, FNH, or perfusional changes (including focal fatty sparing or deposition)~~.~~... Incidental hepatic lesions that are ≥1 cm and have suspicious imaging features require further workup with prompt MRI or biopsy, depending on the lesion's size and features and the patient's risk level. Suspicious imaging features include ill-defined margins,

heterogeneous density, mural thickening or nodularity, thick septa, and intermediate to high attenuation on portal venous–phase imaging (>20 HU, in the absence of pseudoenhancement) (Gore, 2017)."

A diagnosis of HCC can be made with CT or MRI if the typical characteristics are present: a solid FLL with enhancement in the arterial phase with washout in the delayed venous phase should be considered to have HCC until otherwise proven (strong recommendation, moderate quality of evidence. If the characteristic features are not seen on imaging, a biopsy may be indicated.
"A study by Serst et al, performed CT, MRI, and biopsy for a series of 74 patients with nodules identified by surveillance ultrasound. The authors concluded that sensitivity and specificity of the combination of the two diagnostic tests was 98% and 81%, respectively, and that biopsy could be reserved for those without definitive findings on either CT or MRI" (Heimbach, 2018).

A CT or MRI should be performed in cirrhotics with an ultrasound showing a lesion of > 1 cm, an elevated or rising α -fetoprotein in the absence of a liver lesion on US, or when there is a clinical suspicion for the presence of HCC. The choice of MRI versus CT is controversial at this time.

**Surveillance for HCC is required for patients who have received liver-directed therapy, surgical resection, medical treatment, or a transplant for HCC. However, because of the higher risk of tumor recurrence, US is not typically used for surveillance for HCC in the first 2 years after treatment. The European Association for the Study of the Liver recommends multiphase CT or MRI to assess response 1 month after resection or locoregional or systemic therapies, followed by one imaging technique every 3 months to complete at least 2 years, and then regular US every 6 months. This schedule is more frequent than some of the other society recommendations and the most common practice among interventional radiologists (every 3 months).

"The AASLD (American Association for the Study of Liver Diseases) recommends screening for the following high-risk groups: Asian male hepatitis B carriers over age 40, Asian female hepatitis B carriers over age 50, hepatitis B carriers with a family history of HCC, Africans and African Americans with hepatitis B, cirrhotic hepatitis B carriers, individuals with hepatitis C cirrhosis, individuals with stage 4 primary biliary cholangitis, individuals with genetic hemochromatosis and cirrhosis, individuals with alpha 1-antitypsin deficiency and cirrhosis, individuals with cirrhosis from other etiologies.
We scan patients with cirrhosis from any etiology every 6 months with ultrasound. Ultrasonography remains the primary imaging modality of choice for HCC surveillance. It is more cost-effective than CT and MRI, and more widely available. A meta-analysis reported a sensitivity of 94% in detecting lesions and a specificity of >90%, although the figures were less favourable for lesions measuring less than 2 cm. The sensitivity for early HCC is 63%. Although our liver clinic routinely uses alpha-fetoprotein as an adjunct to imaging screening, it is acknowledged that it is neither sensitive nor specific for early diagnosis of HCC (Willatt, 2017~~8~~)."

CT for incidental adrenal mass: In general, masses found < 1 cm do not need to be pursued. If an adrenal mass has diagnostic features of a benign mass, such as a myelolipoma (presence of macroscopic fat), cyst, or hemorrhage (masses without enhancement, defined as change in pre- and postcontrast imaging of <10 HU), no additional workup or follow-up imaging is needed. If the mass has

a density of 10 HU on unenhanced CT or signal loss compared with the spleen between in- and opposed-phase images of a chemical-shift MRI (CS-MRI) examination,
these features are almost always diagnostic of a lipid-rich adenoma, regardless of size. If no benign imaging features but stable for a year or longer, **it is** very likely benign and needs no further imaging. The role of adrenal mass biopsy is reserved predominantly to confirm a suspected adrenal metastasis; this procedure has been shown to be safe with a low morbidity. If
there are signs or symptoms of pheochromocytoma, plasma-fractionated metanephrine and normetanephrine levels should be obtained prior to biopsy. Otherwise, endocrine workup of an incidental adrenal mass is controversial. Current guidelines from the American Association of Clinical Endocrinologists and the American Association of Endocrine Surgeons recommend an initial biochemical evaluation of all adrenal incidentalomas to exclude pheochromocytoma, subclinical Cushing's syndrome, and hyperaldosteronism.

Genetic syndromes and adrenal tumors: Adrenal cortical carcinoma (ACC) diagnosed during childhood is known to be commonly associated with hereditary syndromes including Beckwith-Wiedemann (BWS) and Li-Fraumeni syndrome (LFS). In adults, ACC may be associated with Multiple Endocrine Neoplasia 1 (MEN1), familial adenomatous polyposis coli and neurofibromatosis type 1 (NF1); however, there are currently no surveillance imaging recommendations (Tobias, 2012).

CT of the kidney - Recommendations for follow up of a complex cystic renal mass are made using Bosniak criteria (Muglia, 2014):

- Bosniak I (water density 0-20 HU); no further ~~follow~~ **follow**-up
- Bosniak II (one or a few thin septations, small or fine calcifications, hyperdense cysts up to 3 cm); no further ~~follow~~ **follow**-up
- Bosniak IIF felt to be benign but too complex to be diagnosed with certainty; image at 6 and 12 months, then annually for 5 years if no progression
- Bosniak III thick-walled cystic lesions with wall or septal enhancement; resection favored vs conservative management and RFA in select cases (Richard, 2017)
- Bosniak IV malignant cystic renal mass with enhancing soft tissue components; resection favored, malignant until proven otherwise

Screening for pancreatic cancer

*** Pancreatic cancer is thought to have a familial or hereditary component in approximately 10% of cases. Surveillance of individuals with genetic predisposition for pancreatic adenocarcinoma should include known mutation carriers from hereditary syndromes such as Peutz-Jeghers (10-30% lifetime risk), hereditary pancreatitis (which is associated with genes *PRSS1* and *SPINK1*), familial atypical multiple melanoma and mole syndrome (10-30% risk) or for members of familial pancreatic cancer with a ~~first~~ **first**-degree family member with pancreatic cancer. In patients who are mutation carriers in *BRCA2* (5-10% lifetime risk), *PALB2* (5-10% lifetime risk), and Lynch syndrome (5-10%) families. Surveillance for patients with *BRCA1* (2% lifetime risk) and *ATM* serine/threonine kinase (1-5% lifetime risk) is limited to those with first- or second-degree relatives with pancreatic cancer. NCCN also recommends screening for individuals with a known pathogenic/likely pathogenic germline variant in a pancreatic susceptibility gene, including *CDKN2A, MLH1, MLH2, MSH6, PMS2, EPCAM* (mismatch repair genes associated with Lynch syndrome), *ATM, PALB2, STK11, TP-53* and a family history (first- or ~~second~~ **second**-degree

relative) from the same side of the family; or a family history of exocrine pancreatic cancer in ≥2 ~~first~~ **first-**degree relatives from the same side of the family or ≥3 first- and ~~second~~ **second-**degree relatives from the same side of the family (and at least one is a ~~first~~ **first-**degree relative) (**Daly, 2020**~~NCCN, 2019~~; Goggins, 2020; **NCCN, 2019**~~Daly, 2020~~). Patients with a family history of pancreatic cancer affecting two first-degree relatives meet criteria for familial pancreatic cancer and are candidates for genetic testing. It should be noted that 90% of families meeting criteria for familial pancreatic cancer~~,~~ will not have a pathogenic mutation (Sto~~e~~ffel, 2019).

Insulinomas are rare pancreatic tumors. Localization of the tumor by ultrasound and CT are the preferred initial options once a diagnosis has been made, followed by endoscopic ultrasound or arterial stimulation with hepatic venous sampling. Whipples triad includes symptoms of hypoglycemia, low blood glucose relieved by ingestion of glucose, and benign 90%. ~~Work~~ **Work-**up prior to imaging should include: a ~~72~~ **72-**hour fast with serial glucose and insulin levels over this period until the patient becomes symptomatic. An insulin/glucose ration of greater than 0.3 has been found in virtually all patients with insulinoma or other islet cell disease (Vinik, 2017).

Surveillance of Pancreatic Cysts: Some pancreatic cysts have the potential for malignant transformation to invasive ductal adenocarcinoma**;** ~~,~~ hence the need for intervention vs surveillance**.** ~~,~~ **T**~~however t~~he data**,** **however,** is unclear as to the risk of cancer. Cyst surveillance can be offered to patients with asymptomatic cysts presumed to be IPMN**'**~~'~~s or MCN**'**~~'~~s. Pancreatic cystic Neoplasms (PCN) make up about 2-45% of the general population.

High risk characteristics for mucinous pancreatic cysts include all of the following: Symptoms, Jaundice secondary to the cyst, acute pancreatitis secondary to the cyst, elevated serum CA 19-9 and no benign cause present, an enhancing mural nodule or solid component within the cyst or pancreas, main pancreatic duct of > 5mm, change in duct calib**er**~~re~~ with upstream atrophy, size over 3 cm, high grade dysplasia or cancer on cytology. These patients should undergo EUS + -FNA or be referred to a multidisciplinary group for further recommendations (Elta, 2018~~,~~).

CT and elevated Liver Function Tests: For elevated bilirubin, or serum transaminases with or without bilirubin elevation, US is the initial recommended test to assess for duct dil**a**~~i~~tation which might lead to ERCP or MRCP, vs other causes which might necessitate further lab testing or liver biopsy (Kwo, 2017).

Combination request of Abdomen CT/Chest CT - A c~~C~~hest CT will produce images to the level of L3. Documentation for combo is required.

Imaging of hernias - Most hernias are diagnosed clinically with imaging recommended for the diagnosis of occult hernias or in the evaluation of hernia complications, such as bowel obstruction or strangulation. To detect occult hernias, ultrasound is a first--line study with a sensitivity of 86% and specificity of 77%, compared to 80% sensitivity and 65% specificity for CT (Robinson, 2013). According to Miller, et al "Magnetic resonance imaging is generally not considered a first- or even second-line evaluation modality for hernias…" (Miller, 2014). Based on this analysis, MRI is recommended only when ultrasound and CT have been performed and fail to make a diagnosis.

POLICY HISTORY

Date	Summary
April 2021	Added Notes: • For syndromes for which imaging starts in the pediatric age group, MRI preferred • ABDOMEN or Pelvis CT ALONE SHOULD ONLY BE APPROVED WHEN DISEASE PROCESS IS SUSPECTED TO BE LIMITED TO THE ABDOMEN or Pelvis. CT Abdomen/Pelvis Combo (CPT Codes: 74176, 74177, 74178) is the correct study when the indication(s) include both the abdomen AND pelvis, such as CTU (CT Urography), CTE (CT Enterography), acute abdominal pain, widespread inflammatory disease or neoplasm. Otherwise, the exam should be limited to the appropriate area. (i.e., Abdomen OR Pelvis) which includes the specific organ, area of known disease/abnormality or the area of concern.
May 2020	• Added at top of guideline- For syndromes with imaging started in pediatric age group, MRI preferred • Removed Surveillance of cancer. Deleted active monitoring for recurrence as clinically indicated. • Removed suspected cholecystitis or retained gallstones as an indication for CT. Would require an MRCP or ERCP. • Added indication for suspected adrenal secreting tumor • Added surveillance for MEN 1 and Von Hippel Lindau; also Beckwith-Wiedemann syndrome (if abnormal US or rising AFP); Added multiple indications for surveillance for patients with increased lifetime risk of pancreatic cancer; also for surveillance for renal cell cancer in Birt-Hogg syndrome • Added pre procedural imaging prior to transjugular intrahepatic portosystemic shunt (TIPS) • Added imaging for indeterminate liver lesion < 1 cm with known chronic liver disease or a history of extrahepatic malignancy (ACR, 2020) • Added follow up for pancreatic cystic masses under 5mm (possible IPMN) • Added for localization of an insulinoma • Expanded section on hernia imaging • Removed diverticulitis and appendicitis since need CT of the abdomen and pelvis • Expanded background section to include: Genetic syndromes associated with adrenal tumors, improved on Bosniak criteria; Improved indications for screening for pancreatic cancer; Added section on work up for insulinoma; Added section on CT and elevated liver function tests; Removed reduction radiation exposure, consider barium

	studies for inflammatory bowel disease; work up for distant mets in melanoma, and pre-operative evaluation of primary rectal cancer.
May 2019	• For evaluation of suspected infection or inflammatory disease, Added: ○ Right upper quadrant pain for suspected biliary disease with negative or equivocal US or HIDA scan ○ For epigastric or left upper quadrant pain if labs or other imaging are inconclusive • For evaluation of an organ or abnormality seen on previous imaging ○ Removed: For the evaluation of an organ enlargement such as splenomegaly or hepatomegaly as evidenced by physical exam or confirmed on any previous imaging study" ○ Added: To locate a pheochromocytoma once there is clear biochemical evidence ○ Changed adrenal indications from mass >4 cm to ≥1 cm with no hx of malignancy; AND adrenal mass ≥4 cm and no diagnosis of cancer, can approve for preoperative planning; AND adrenal mass <4 cm with history of malignancy • Added indications for: liver lesions, adenoma, hyperplasia; modified hepatitis/hepatoma screening; pancreatic cystic lesions, pancreatitis, pancreatic cancer risk; renal mass; spleen • Modified hernia indications from suspected spigelian hernia or hernia with suspected complications to occult hernia when physical exam or prior imaging is non diagnostic or equivocal • Removed follow-up for peritonitis; evaluation of trauma; unexplained weight loss; removed age restrictions for abdominal pain • Added Background information and updated references

~~May 2019~~

- ~~For evaluation of suspected infection or inflammatory disease, Added:~~
  - ~~Right upper quadrant pain for suspected biliary disease with negative or equivocal US or HIDA scan~~
  - ~~For epigastric or left upper quadrant pain if labs or other imaging are inconclusive~~
- ~~For evaluation of an organ or abnormality seen on previous imaging~~
  - ~~Removed: For the evaluation of an organ enlargement such as splenomegaly or hepatomegaly as evidenced by physical exam or confirmed on any previous imaging study"~~
  - ~~Added: To locate a pheochromocytoma once there is clear biochemical evidence~~
  - ~~Changed adrenal indications from mass >4 cm to ≥1 cm with no hx of malignancy; AND adrenal mass ≥4 cm and no diagnosis of cancer, can approve for preoperative planning; AND adrenal mass <4 cm with history of malignancy~~

- ~~Added indications for: liver lesions, adenoma, hyperplasia; modified hepatitis/hepatoma screening; pancreatic cystic lesions, pancreatitis, pancreatic cancer risk; renal mass; spleen~~
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- ~~Added Background information and updated references~~

~~May 2020~~

- ~~Added at top of guideline- For syndromes with imaging started in pediatric age group, MRI preferred~~
- ~~Removed Surveillance of cancer. Deleted active monitoring for recurrence as clinically indicated.~~
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GENERAL INFORMATION

It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.

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