National Imaging Associates, Inc.*	
Clinical guideline ABDOMEN/PELVIS CT COMBO	Original Date: September 1997
CPT Codes: 74176, 74177, 74178	Last Revised Date: April 2021
Guideline Number: NIA_CG_068	Implementation Date: January 2022

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

Note: CT Abdomen/Pelvis Combo (CPT Codes: 74176, 74177, 74178) is the better 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) that includes the specific organ, area of known disease/abnormality or the area of concern.

INDICATIONS FOR ABDOMEN/PELVIS COMPUTED TOMOGRAPHY (CT)

~~This includes CTU (CT urography) and CTE (CT enterography).~~

Evaluation of Abdominal and Pelvis 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)
    - A~~(needs to include a~~mylase/lipase if suspected pancreatitis
    - Liver function tests if suspicion of hepatic disease

~~and liver function tests if suspicion of hepatic disease)~~

- For acute abdominal pain in a patient over the age of 65 (ACR, 2018; Lehtimaki, 2017)

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

- Initial evaluation of suspicious masses/tumors found by physical exam or imaging study, such as ultrasound (US), and both the abdomen and pelvis are likely affected (ACR, 2013, 2014).
- New evidence of an unknown primary (Greco, 2012)
- 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.
- For abnormal incidental abdominopelvic lymph nodes when follow-up is recommended based on prior imaging (initial 3-month FU) (Smereka, 2017)
- For follow-up of mesenteric panniculitis (Kaya, 2018; Mclaughlin, 2013; van Putte-Katiiser, 2014; Kaya, 2018) or lymphadenitis (Helbling, 2017) when another diagnosis is suspected after initial imaging or there is a failure of symptom resolution

Evaluation of known cancer (Bourgioti, 2016; NCCN, 2019b) (see exception for prostate cancer*)

- Initial staging of known cancer
  - Follow-up of known cancer of patient undergoing active treatment within the past year
  - Known cancer with suspected abdominal/pelvic 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)

*Prostate Cancer imaging is indicated for the following scenarios (Pelvis CT +/- Abdomen)

- Initial Staging:
  - High Risk and above (T3a or higher, PSA >20‡*, Gleason 8-10)
  - Intermediate Risk (T2b-T2c or PSA 10-20‡* or Gleason 7) when Nomogram predicts >10% probability of lymph node involvement (MSKCC/Kattan is the nomogram recommended by NCCN 2021)

‡*In patients who have been on a 5-alpha reductase inhibitor (such as Proscar) in the past 12 months, an "adjusted PSA" should be used. To adjust, multiply PSA by a factor of 2 (e.g., PSA 6 on finasteride adjusts to a PSA of 12) (initial imaging with CT is not needed for low risk or very low risk prostate cancer (NCCN 2021))

- Workup of recurrence and/or response to treatment:
  - Initial treatment by radical prostatectomy with failure of PSA to fall to undetectable levels or PSA detectable and rising on at least 2 subsequent determinations.

- **Initial treatment radiation therapy with post-RT rising PSA or positive digital exam and is candidate for local therapy.**

For evaluation of suspected infection or inflammatory disease
(ACR, 2013; Cartwright, 2015)

- Suspected diverticulitis or acute appendicitis for initial imaging ~~along~~ with **at least ONE** of the following (Linzay, 2018):
  - WBC Elevated
  - Fever
  - Anorexia
  - Nausea and vomiting
- Suspected appendicitis in a child (< age 18) (AAP**, 2019**;~~/ACS;~~ ACR, 2018; **ACS, 2013**; Baker, 2020; Sanchez, 2016) when ultrasound is inconclusive or cannot be completed due to body habitus or inability to cooperate
- Use ultrasound or MRI in pregnant women with suspected appendicitis (ACR, 2018)
- For acute non-localized abdominal pain and fever, no recent surgery (ACR, 2018)
- For suspected retroperitoneal fibrosis after labs and inconclusive ultrasound (Runowska, 2016)

For follow-~~-~~up evaluation of known infection or inflammatory disease involving the abdomen and pelvis
(ACR, 2019; Cartwright, 2015)

- Complications of diverticulitis with severe abdominal/pelvic pain or severe tenderness or mass not responding to antibiotic treatment (prior imaging study is not required for diverticulitis diagnosis) (ACR, 2018; Cartwright, 2015)
- Pancreatitis by history (including pancreatic pseudocyst) with continued abdominal pain, early satiety, nausea, vomiting, or signs of infection greater than 4 weeks from initial presentation (ACR, 2019) **when there is reason to suspect extensive disease extending into the pelvis (otherwise CT abdomen)**
- Known inflammatory bowel disease, (Crohn's or u~~U~~lcerative colitis) with recurrence or worsening signs/symptoms requiring re-evaluation or for monitoring therapy (ACR, 2019)
- Any known infection that is clinically suspected to have created an abscess in the abdomen and pelvis
- Any history of fistula that requires re-evaluation or is suspected to have recurred in the abdomen and pelvis
- Abnormal fluid collection seen on prior imaging that needs follow-up evaluation
- Follow-~~-~~up for **known** peritonitis (from any cause) if abdominal/pelvic pain and tenderness to palpation is present, and **at LEAST ONE** of the following:
  - Rebound, guarding, or rigid abdomen; **OR**
  - Severe tenderness to palpation present over entire abdomen
- For known retroperitoneal fibrosis to determine extent of disease

Suspected peritonitis (from any cause) if abdominal pain and tenderness to palpation is present, and at LEAST ONE of the following:

- **Rebound, guarding (not voluntary) or rigid abdomen, OR**
- **Severe tenderness to palpation present over entire abdomen**

- ~~For evaluation of hematuria (includes CT urography (CTU))~~

~~(ACR, 2019; Davis, 2012; Sharp, 2013)~~

- ~~For hematuria (should be documented by greater than 3 red blood cells (RBC) per high-power field on urinalysis and not based on a dipstick test) (Davis, 2012)~~
- ~~For non-infectious macroscopic or gross hematuria~~

Suspected or known acute pancreatitis (ACR, 2019) **when have reason to suspect extension beyond abdomen, into pelvis**

- For **suspected acute pancreatitis** ~~first time presentation~~ with pain and abnormal amylase and lipase and < 48-72 hours, when ultrasound is inconclusive. **(ACR, 2019; Vagvala, 2018)**
-
- Suspected acute pancreatitis with atypical signs and symptoms, and when a diagnosis other than pancreatitis may be possible.
- **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 evaluation of a suspected or known hernia**~~

- ~~Abdominal/pelvic pain suspected to be due to an occult, umbilical, Spigelian, incisional, hernia when physical exam or prior imaging is non-diagnostic or equivocal or if requested as a preoperative study.~~
- ~~Hernia with suspected complications (e.g. bowel obstruction or strangulation) (Lassandro, 2011; Miller, 2014; Robinson, 2013)~~
- ~~Complex ventral hernia that is ≥ 10 cm for pre-operative planning (Halligan, 2018)~~

Suspected inflammatory bowel disease (includes CT enterography)

- **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)**

- ~~Suspected Crohn's disease) (consider MRE for patients under 35) with abdominal pain, chronic diarrhea, or bloody diarrhea, fatigue, or when there is a high clinical suspicion after complete work up including physical exam, labs, endoscopy with biopsy (ACR, 2019; Lichtenstein, 2018)~~
- ~~For ulcerative colitis that is suspected clinically, however abdominal symptoms are not explained by endoscopy (Rubin, 2019)~~

For CT enterography (CTE) if a CT scan is inconclusive

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For evaluation of hematuria when stone is NOT suspected (includes CT urography (CTU)) (ACR, 2019; Davis, 2012; Sharp, 2013)

- **For painless, microscopic hematuria (should be documented by greater than 3 red blood cells (RBC) per high-power field on urinalysis and not based on a dipstick test) (Davis, 2012)**
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- **For non-infectious macroscopic or gross hematuria (UA must be negative for infection, however, UA can be negative for blood, if hematuria is witnessed by patient or provider)**

NOTE: If a previous "routine" CT abdomen/pelvis has been done (with or with/without contrast), and a CTU is later requested, the previous CT must show a clear reason that additional delayed post-contrast images of the collecting system are needed.

For evaluation of known or suspected kidney or ureteral stone in a patient with ~~es~~acute flank pain~~:~~

- ~~**CT is indicated if one or more of the following is present:**~~**CT is indicated if one or more of the following is present:**
  - **Atypical presentation (i.e. fever or WBC >15,000)**
  - **Inadequate analgesia**
  - **Abnormal or indeterminate ultrasound (with findings needing further evaluation with CT)**
- **Ultrasound should be performed PRIOR to CT in the following situations (CT is needed only if US is inconclusive or has findings that need further imaging):**
  - **Pediatric and pregnant patients (MRU preferred if further imaging indicated)**
  - **Typical presentation without signs/symptoms of infection in a patient < 65.**
- **CT is allowed for acute abdominal pain, in general, for patients >65**

Preoperative planning~~:~~

- CT is indicated when no imaging has been done in the last 30 days, or if passage or movement of stones will change management (Assimos, 2016).

Postoperative stone follow-up CT ~~is indicated for:~~

- ~~—~~Symptomatic patients following:
  - Ureteroscopic extraction of an intact stone (Fulgham, 2012)
  - ~~—~~Symptomatic patients following U~~u~~reteroscopy with lithotripsy/fragmentation of a radiolucent ~~—~~stone (Fulgham 2012)
- ~~—~~Further evaluation of hydronephrosis seen on post-operative ultrasound (following ureteroscopy or ESWL) (Fulgham, 2012)

~~(Choosing Wisely, 2018; Fontanelle, 2019; Moore, 2019)~~

- ~~For patients <35 with a typical presentation and adequate pain relief, no imaging necessary.~~
- ~~For acute renal colic in patients <55 and inadequate analgesia OR with an atypical presentation, OR with an abnormal or indeterminate ultrasound~~
- ~~In patients with acute flank pain age > 75~~
- ~~In patients >55 with a prior history of stones and a typical presentation, no imaging (or ultrasound first).~~
- ~~In middle aged patients (≥55) with no history of stones OR an atypical presentation, OR if ultrasound is inconclusive, non-diagnostic or shows an abnormality needing further evaluation, i.e., hydronephrosis or alternate diagnosis being considered.~~
- ~~Pregnant and pediatric patients should have ultrasound as the initial imaging study if indicated (MRU preferred if further imaging indicated).~~
- ~~For pre-operative planning related to percutaneous nephrolithotomy (PCNL), extracorporeal shock wave lithotripsy (SWL) or ureteroscopic procedure and no imaging has been done in the last 30 days, or if passage or movement of stones will change management (Assimos, 2016).~~
- ~~For post-operative stone follow-up related to SWL or ureteroscopic procedures:~~
  - ~~Symptomatic patients with known radiolucent stones~~
  - ~~Symptomatic patients with radiopaque calculi, following a non-diagnostic KUB or ultrasound~~
- ~~Asymptomatic patients with abnormal findings on another study (e.g., hydronephrosis) (Fulgham, 2012)~~

For evaluation of pyelonephritis in the following situations

- When other imaging such as ultrasound is abnormal
- For a patient who remains febrile after 72 hours of treatment (Bonkat, 2017) or symptoms resolve and then recur within 2 weeks (Grabe, 2015)
- For a complicated patient with history of diabetes, stone disease, ~~or~~ prior urinary tract surgery, or who is immunocompromised and is not responding to treatment (ACR, 2018).

For evaluation of ~~Recurrent~~ Complicated U~~u~~rinary tract Infection~~s~~: (see above section for pyelonephritis)

- Women: UTI is considered complicated (and therefore imaging (ultrasound and/or CT) is warranted) in any of the following situations,
  - Immunocompromised host
  - Persistence of bacteria or symptoms after culture specific treatment,
  - Rapid recurrence with same bacteria after treatment,
  - Multidrug resistant bacteria
  - When there is suspicion of renal calculi or obstruction (Anger 2019; Bonkat 2017)
- Men: Any UTI is considered complicated due to high likelihood of anatomic abnormalities (Schaeffer, 2016), therefore imaging (ultrasound and/or CT) is warranted

~~in women (defined as at least 3 episodes of uncomplicated infection in the past twelve months)~~ ~~(Tononlini, 2016; Seminerio, 2011)~~

- ~~When there is suspicion of renal calculi or outflow obstruction (Anger 2019; Bonkat 2017)~~
- ~~Suspect an anatomic abnormality based on prior imaging (i.e., Cystocele, diverticulum, congenital anomaly) (Dason, 2011)~~
- ~~For recurrent lower urinary tract infections in a female who are non-responders to conventional therapy or have known underlying risk factors (ACR, 2020)~~
- ~~For evaluation of a non-diagnostic ultrasound with hydronephrosis~~
- ~~Men with UTI symptoms~~
  - ~~≥ age 60, initial infection (Schaeffer, 2016)~~
  - ~~< age 60 with two or more infections~~

Suspected small bowel obstruction when there is a strong clinical suspicion

- Crampy pain, vomiting, distention, high pitched or absent bowel sounds, prior history of abdominal surgery, or based on initial radiograph (ACR, 2019; Paulson, 2015)

~~**Suspected peritonitis (from any cause) if abdominal pain and tenderness to palpation is present, and at LEAST ONE of the following**~~

- ~~Rebound, guarding (not voluntary) or rigid abdomen, **OR**~~
- ~~Severe tenderness to palpation present over entire abdomen~~

~~**Evaluation of suspicious or known mass/tumors**~~

- ~~Initial evaluation of suspicious masses/tumors found by physical exam or imaging study such as ultrasound (US), and both the abdomen and pelvis are likely affected (ACR, 2013, 2014).~~

- ~~New evidence of an unknown primary (Greco, 2012)~~
- ~~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.~~
- ~~For abnormal incidental abdominopelvic lymph nodes when follow up is recommended based on prior imaging (initial 3-month FU) (Smereka, 2017)~~
- ~~For follow up of mesenteric panniculitis (Mclaughlin, 2013; Putte-Kaiser, 2014; Kaya, 2018) or lymphadenitis (Helbling, 2017) when another diagnosis is suspected after initial imaging or there is a failure of symptom resolution~~
- ~~Prostate cancer when intermediate risk or greater, PSA levels ≥10 ng/mL, or biopsy Gleason Score ≥7 (Grade Group ≥2), or clinically advanced disease (T2b, T2c, T3, or T4) **AND** nomogram (e.g., Partin, Cancer of Prostate Risk Assessment CAPRA) indicating probability of lymph node involvement >10%) (NCCN, 2019; Reese, 2012; Tosian, 2017).~~
- ~~**Follow-up of known cancer** (Bourgioti, 2016; NCCN, 2019b)~~
  - ~~Follow-up of known cancer of patient undergoing active treatment within the past year~~
  - ~~Known cancer with suspected abdominal/pelvic metastasis based on a sign, symptom, or an abnormal lab value~~

Suspected colonic or mesenteric ischemia (Dhatt, 2015) CTA also appropriate (ACR, 2018)

For suspected small bowel bleeding when endoscopy and capsule endoscopy are inconclusive or negative (Pasha, 2017)

~~**For evaluation of known or suspected aortic aneurysm - CTA or MRA are the gold standards and preferred after ultrasound** (ACR, 2018; Kumar, 2017) **has been completed, however CT also approvable** (Chaikof, 2018)~~**For known or suspected abdominal aneurysm~~:~~**
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.

- Known or suspected aneurysm > 2.5 cm **AND** equivocal or indeterminate ultrasound results
- Suspected complications of known aneurysm as evidenced by signs/symptoms such as new onset of abdominal or pelvic pain
- Scheduled follow-up evaluation of aorto/iliac endograft or stent (Abd/Pelvic CTA preferred)
- Evaluation of endovascular/interventional abdominal vascular procedures for luminal patency versus restenosis due to conditions such as atherosclerosis, thromboembolism, and intimal hyperplasia~~.~~
- Evaluation of post-operative complications, e.g.~~,~~ pseudoaneurysms, related to surgical bypass grafts, vascular stents, and stent-grafts in the peritoneal cavity~~.~~
- Follow-up for post-endovascular repair (EVAR) or open repair of abdominal aortic aneurysm (AAA) or abdominal extent of iliac artery aneurysms. Routine, baseline study (post-op/intervention) is warranted within 1-3 months (Chaikof, 2018; Uberoi, 2011).
  - Asymptomatic at six (6~~)~~)~~-~~month intervals, for one (1) year, then annually~~.~~

- Symptomatic/complications related to stent graft – more frequent imaging may be needed.
- Follow-up study may be needed 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 for the type and area(s) requested.

For evaluation of trauma

(ACR, 2012)

- Suspected retroperitoneal hematoma or hemorrhage based on lab or physical findings
- Blunt injury with suspicion of multisystem trauma and hematuria
- Penetrating abdominal injury with suspicion of multisystem trauma with or without hematuria (ACR, 2012)

For evaluation of a suspected or known hernia

- **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**
- ~~•~~ **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).**
- ~~Suspected with suspected complication (such as incarceration, strangulation or bowel obstruction) based on physical exam 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)**

~~**Pre-operative evaluation**~~

- ~~For abdominal/pelvic surgery or procedure~~

~~**Post-operative/procedural evaluation**~~

- ~~Follow-up of known or suspected post-operative complication~~
- ~~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.~~

Other Indications for Abdomen/Pelvic CT Combo

- ~~Persistent abdomen/pelvic pain not explained by previous imaging/procedure~~
- To locate a pheochromocytoma once there is clear biochemical evidence
- For B symptoms of fevers to more than 101° F, drenching night sweats, and unexplained weight loss of more than 10% of body weight over 6 months, if CXR, labs and an ultrasound of the abdomen and pelvis have been completed (can also approve chest CT) (Cheson, 2014).
- Unexplained weight loss of 10% of body weight in two months (patient history is acceptable); with a second MD visit documenting some further decline in weight (Gaddey, 2014).
- Unexplained weight loss of 5% of body weight in six months confirmed by documentation to include the following (Bosch, 2017; Wong, 2014):
    - Related history and abdominal exam

- Chest x-ray
- Abdominal ultrasound
- Lab tests, must include TSH
- Colonoscopy if patient fifty plus (50+) years old

- ~~Acute abdominal pain in patients sixty-five (65) years or older (ACR, 2018; Lehtimaki, 2016)~~
- In the work-up of a paraneoplastic syndrome after ultrasound, mammography, and appropriate lab tests are completed.
- To screen all adult patients with dermatomyositis to rule out occult malignancy (Chen, 2010; Dalakis, 2015; Titulauer, 2011)
- For diffuse, unexplained lower extremity edema with negative or inconclusive ultrasound (Hoshino, 2016)
- For elevation of carcinoembryonic antigen (CEA) in a patient with no cancer history after complete clinical work-up (including organ-specific investigations, such as colonoscopy, gastroscopy, mammography, cystoscopy, ultrasound) that fails to demonstrate a reason and CEA is >10 ng/ml, or fails to drop below 5 ng/ml after 3-6 months intervals (see ~~comment~~ Background section).
- For fever of unknown origin (temperature of ≥101 degrees for a minimum of 3 weeks) after standard diagnostic tests are negative (see ~~comment~~ Background section) (Brown, 2019)
- For evaluation of suspected May-Thurner syndrome (CTV/MRV preferred) (Ibrahim, 2012; Wuan~~-Ling~~, 2012)
- For further evaluation of an isolated right varicocele with additional signs and symptoms that suggest malignancy or suspicious prior imaging (Gleason, 2019)

Pre-operative evaluation

• For abdominal/pelvic surgery or procedure

Post-operative/procedural evaluation

• Follow-up of known or suspected post-operative complication

• 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**

BACKGROUND

CT provides direct visualization of anatomic structures in the abdomen and pelvis and is a ~~fast~~ **fast-** imaging tool used to detect and characterize disease ~~involving the abdomen and pelvis~~. Abdomen/pelvis imaging begins at the diaphragmatic dome through pubic symphysis. CT uses x-rays

and multiple detectors to create 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.** ~~, followed by MRI in appropriate situations.~~ Clinicians should exercise increased caution with CT imaging in children, pregnant 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.

OVERVIEW

CT Imaging for renal colic and hematuria: ~~There are over~~**More than** 2 million ~~annual~~ emergency visits **in the US are** for suspected renal colic, ~~in the US~~ and CT is performed in over 90% of patients diagnosed with kidney stones (Moore, 2019). Evidence now supports ultrasound or no further imaging in specific clinical scenarios as renal colic is often self-limited. CT can guide therapy in a subset of patients who require intervention or who have other conditions that mimic renal colic (i.e., appendicitis). CT protocols include: "stone protocol" for detecting urinary tract calculi, "renal mass protocol" for characterizing known renal masses, and CT urography for evaluating hematuria. Non-contrast CT can be used for detecting most ureteral and renal stones but sometimes an intravenous contrast agent is needed to determine the relationship of the calculus to the opacified ureter.

CT imaging for recurrent urinary tract infections: Imaging in patients without risk factors and less than two infections a year on average and who respond promptly to therapy, is of low yield. Risk factors include but **are** not limited to: Infection with urea-splitting organism, previous pyelonephritis, history of calculi or obstruction, obstructive symptoms, elevated creatinine, severe diabetes, childhood UTI, neurogenic bladder dysfunction, history of GU surgery, suspected bladder diverticula or urethral, urinary incontinence, pelvic floor dysfunction, post void residual (ACR, 2020).

CT Imaging for abdominal aortic aneurysms:

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**~~).~~

If a pulsatile abdominal mass is found in an asymptomatic patient, **abdominal ultrasonography** is an inexpensive and noninvasive technique for **initial evaluation**. For further examination, CT may be performed to better define the shape and extent of the aneurysm and the local anatomic relationships of the visceral and renal vessels. CT has high level of accuracy in sizing aneurysms; **however,** ~~-~~CTA and MRA are the gold standards for imaging. The majority of evidence regarding AAA surveillance using CT is based on CTA data and is primarily related to contrast bolus timing. Contrast-enhanced CT is well established in the literature and is capable of identifying aortic aneurysms, with many papers discussing incidental AAA identification (ACR 2018). Risk of rupture in 6 years for an AAA < 4 cm is 1%. For a 4-5 cm AAA, the risk of rupture increases to 1-3% per year and becomes 6-11% per year for AAA 5-7 cm in cross sectional diameter. For **any AAA** >7 cm, the risk of rupture goes to 7% per year.

****Abdominal aneurysms and general guidelines for follow-up:**
The normal diameter of the suprarenal abdominal aorta is 3.0 cm and that of the infrarenal is 2.0 cm. Aneurysmal dilatation of the infrarenal aorta is defined as diameter ≥ 3.0 cm or dilatation of the aorta ≥ 1.5x the normal diameter. Initial evaluation of AAA is accurately made by ultrasound. Ultrasound can detect and size AAA, with the advantage of being relatively inexpensive, noninvasive and not require iodinate contrast. The limitations are that overlying bowel gas can obscure findings and the technique is operator dependent.

Recommended intervals for initial follow-up imaging (any modality) of ectatic aortas and abdominal aortas (follow-up intervals may vary depending on comorbidities and the growth rate of the aneurysm)
2.5-2.9 cm: ……5 yr
3.0-3.4 cm: …… 3 yr
3.5-3.9 cm: ……2 yr
4.0-4.4 cm: ……1 yr
4.5-4.9 cm: ……6 mo
5.0-5.5 cm: ……3-6 mo

The Society of Vascular Surgery has different ~~follow~~ **follow**-up intervals for AAA (~~SVS~~**Chaikof**, 2018):
>2.5 cm - <3 cm……..10 yr
3.0 - 3.9 cm……..3 yr
4.0 - 4.9 cm……12 mo
5.0 - 5.4 cm……..6 mo~~.~~

The Society of Vascular Surgery recommends elective repair of AAA ≥ 5.5 cm in patients at low or acceptable surgical risk (Chaikof, 2018).

CT for Mesenteric Ischemia
CT of the abdomen and pelvis with intravenous (IV) contrast performed during the venous phase has been less well-studied compared with CTA in diagnosing mesenteric ischemia. CT with IV contrast can assess nonvascular findings, major arterial lesions, and mesenteric veins; however, the lack of arterial phase may lead to suboptimal evaluation of the mesenteric arteries compared to CTA (ACR, ~~AUC~~ 2018).

CT for elevation of CEA with no history of a previous CEA-producing tumor
CEA is not normally elevated after birth, but ~~when~~ elevated **CEA levels** increases the chance of finding colon cancer from 1.3% to 4.6%. It is also a predictor of other diseases, including other cancers (e.g., **m**~~M~~ucinous adenocarcinomas of the endocervix and ovary, as well as keratinising squamous cell carcinoma of the cervix), diabetes, chronic lung, and liver disease.

Evaluation should begin with a thorough history**, including smoking history**, and clinical exam~~, and smoking history~~. Investigation would include repeat CEA, full blood count,~~ and~~ iron, liver function and renal function tests, CA 125 levels, and calcitoinin. If CEA <10ng/ml and clinical review is negative, repeat the clinical evaluation in 3 months and CEA for changes. If level falls, repeat at 6-month

intervals until normal or 2 consecutive decreases. If CEA level remains above 5 ng/ml after 3-6-month intervals or exceeds 10ng/ml at any stage, consider CT imaging (Hall, 2019).

CT and Fever of Unknown Origin
Initial work up prior to CT would include a comprehensive history, repeated physical exam, complete blood count with differential, three sets of blood cultures, chest x-ray, complete metabolic panel, urinalysis, ESR, ANA, RA, CMV IgM antibodies, v~~V~~irus detection in blood, heterophile antibody test, tuberculin test, and HIV antibody test (Brown, 2019).

CT and screening for occult malignancy - In patients with a dermatomyositis, an initial screen with CT chest and abdomen is recommended because large population-based cohort studies report a frequency of 20-25% of malignancy~~)~~. For the first incidence of unprovoked DVT, there is no indication for screening for occult malignancy (history, blood testing including blood count, calcium, UA, liver function tests~~)~~, CXR, and age- and gender--specific screening indicated) (Carrier, 2015). In the case of recurrent DVT, recently a risk score including age >70, chronic lung disease, anemia, elevated platelet count, prior venous thrombosis and recent surgery was designed but still needs external validation before clinical use (Fernandes, 2019; Jara-Palomares, 2017~~; Fernandes, 2019~~). Paraneoplastic neurologic syndromes fall into this category. They are rare, often sub--acutely manifesting conditions associated with malignant neoplasms, and they are hypothesized to be ~~immune~~ immune-mediated. When classic clinical symptoms are present and a high concentration of characteristic ~~anti~~ anti-neuronal antibodies, there is associated a high probability of malignancy. Small cell lung cancer, thymoma, breast cancer, ovarian cancer and ~~and~~ teratoma, and testicular tumors are most common. In paraneoplastic syndrome, screen first for breast cancer with mammography then MRI breast, ovarian teratoma and ovarian cancer with pelvic ultrasound (also CA-125), and for a testicular tumor with ultrasound (also B-HCG and AFP), and if inconclusive follow by CT. Note that tumors may manifest as late as 5 years after the onset of PNS symptoms and further follow--up imaging may be warranted (Sundermann, 2017).

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

Evaluation for appendicitis following clinical and laboratory evaluation -
Sonography of the right upper quadrant and pelvis followed by graded compression and color Doppler sonography of the right lower quadrant was used by Gaitini and colleagues as the initial imaging study in 420 consecutive patients referred for emergency evaluation of acute appendicitis. This method correctly diagnosed acute appendicitis in 66 of 75 patients (88%) and excluded it correctly in 312 of 326 patients (96%). It was inconclusive in 19 patients (<5%). Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 74.2%, 97%, 88%, 93%, and 92%, respectively and comparable to CT **(Gaitini,2008).**

Appropriate and timely diagnosis of acute appendicitis is needed. Negative laparotomy rates can range from 16% to 47% when based on clinical and laboratory data alone, while perforation rate can reach 35% when surgery is delayed. Appropriate initial imaging can lower the negative laparotomy rate to 6-

10%. Ultrasound has a higher non-diagnostic rate (4%) vs. 0.8% for MDCT. In a prospective study operator experience and patient BMI did not affect diagnostic accuracy (Gaitini, 2008; Keyzer, 2005).

Consider alternatives to CT imaging in patients with Crohn disease - In facilities where the technical and clinical expertise exists, MR enterography is emerging as the study of choice (replacing CT) for patients requiring frequent follow-up examinations to determine disease extent or progression. The technique also allows evaluation of extramucosal and extraluminal disease.

Consider the role of capsule endoscopy - Small bowel capsule endoscopy allows for direct visualization of the mucosa of the small intestine and has been found to be superior to barium studies, CTE and ileocolonscopy. However, the specificity has been questioned. There is a high negative predictive value of 96%. Also, it may identify a site for selected biopsy to establish a diagnosis.

Lab tests used in diagnosing IBD - Anti-glycan antibodies are more prevalent in CD than UC, but this test hasve a low sensitivity. Fecal calprotectin is a helpful test which that can help differentiate IBD from irritable bowel syndrome, as well as in assessment of disease activity, monitoring disease including response to therapy. Data supports the use of fecal calprotectin to predict relapse in CD. Those who relapsed in one year had significantly higher levels at baseline.
Fecal lactoferrin and fecal PMN-elastase are also used for monitoring disease activity in Crohn's. (Cappello, 2016).

Initial evaluation of abdominal aortic aneurysm (AAA) - Initial evaluation of AAA is accurately made by ultrasound.

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	• Updated prostate cancer imaging section to reflect current NCCN 2021 changes and adjusted PSA • Revised and clarified hematuria when stone is not suspected • Updated known or suspected stone with acute flank pain section to more clearly reflect criteria for when CT imaging is needed

	• Renamed “recurrent UTI” as “Complicated UTI” and specified definitions and criteria for when imaging is needed for women and when for men
May 2020	• Added indication for imaging of new evidence of an unknown primary • FU for abnormal lymph nodes at 3 months • FU mesenteric panniculitis if symptoms fail to improve • Renal colic added no imaging if under 35 and adequate pain relief; if <55 and inadequate relief or abnormal US can image, >55 if no hx of stones or abnormal ultrasound • Pre op for renal surgery or procedure • Post op for symptomatic patients or asymptomatic and abnormal ultrasound • Added imaging for pyelonephritis with complex med hx such as diabetes or prior urinary tract surgery or immunocompromised • Added GL for men with UTI based on age <or>60 • Improved criteria for WU of IBD, added CTE information and imaging for monitoring therapy • Other indications added—for diffuse LE edema with neg or inconclusinve US; elevated CEA with no cancer hx, FUO; May-Thurner; isolated right varicocele; Paraneoplastic syndrome; dermatomyositis; acute pain in patient over 65 • Added to comment section on renal colic, recurrent UTI, CEA; Occult malignancy
May 2019	• For hematuria, clarified that testing should not be done by dipstick; for infectious hematuria, removed restriction of 6 week completion of antibiotic therapy • Modified indication for prostate cancer imaging when PSA levels ≥10 ng/mL per NCCN update • Removed indication for evaluation of organ enlargement; suspected cholecystitis or retained gallstones; hepatitis screening; adrenal mass; ischemic bowel; suspected partial small bowel obstruction • Added indications for known necrotizing pancreatitis; acute flank pain with or without hematuria; pregnant women with suspected appendicitis consider US or MRI; blunt injury or penetrating abdominal injury; evaluation of endovascular/interventional abdominal vascular procedures; follow up for post endovascular repair or open repair of abdominal aortic aneurysm; symptoms of fevers, night sweats, unexplained weight loss over 6 months if CXR, labs, and US have been performed

	• Added time frame to Pancreatitis history to include >4 weeks of symptoms

~~May 2019~~

- ~~For hematuria, clarified that testing should not be done by dipstick; for infectious hematuria, removed restriction of 6 week completion of antibiotic therapy~~
- ~~Modified indication for prostate cancer imaging when PSA levels ≥10 ng/mL per NCCN update~~
- ~~Removed indication for evaluation of organ enlargement; suspected cholecystitis or retained gallstones; hepatitis screening; adrenal mass; ischemic bowel; suspected partial small bowel obstruction~~
- ~~Added indications for known necrotizing pancreatitis; acute flank pain with or without hematuria; pregnant women with suspected appendicitis consider US or MRI; blunt injury or penetrating abdominal injury; evaluation of endovascular/interventional abdominal vascular procedures; follow up for post endovascular repair or open repair of abdominal aortic aneurysm; symptoms of fevers, night sweats, unexplained weight loss over 6 months if CXR, labs, and US have been performed~~
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- ~~Added indication for imaging of new evidence of an unknown primary~~
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- ~~Renal colic added no imaging if under 35 and adequate pain relief; if <55 and inadequate relief or abnormal US can image, >55 if no hx of stones or abnormal ultrasound~~
- ~~Pre op for renal surgery or procedure~~
- ~~Post op for symptomatic patients or asymptomatic and abnormal ultrasound~~
- ~~Added imaging for pyelonephritis with complex med hx such as diabetes or prior urinary tract surgery or immunocompromised~~
- ~~Added GL for men with UTI based on age <or>60~~
- ~~Improved criteria for WU of IBD, added CTE information and imaging for monitoring therapy~~
- ~~Other indications added—for diffuse LE edema with neg or inconclusinve US; elevated CEA with no cancer hx, FUO; May-Thurner; isolated right varicocele; Paraneoplastic syndrome; dermatomyositis; acute pain in patient over 65~~
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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.