INTRODUCTION:

CT provides direct visualization of anatomic structures in the abdomen and pelvis and is a 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. It has an ability to demonstrate abnormal 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 after equivocal ultrasound has been validated for diagnosis. Clinician should exercise increased caution with CT imaging in children, pregnant women and young adults. Screening for pregnancy as part of a work-up is suggested to minimize the number of unexpected radiation exposures for women of childbearing age.

INDICATIONS FOR ABDOMEN/PELVIS CT:

For evaluation of hematuria:
- Hematuria

For evaluation of known or suspected kidney or ureteral stones:
- Delineation of known or suspected renal calculi or ureteral calculi.

Evaluation of suspicious 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.
- 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 change was found on last follow-up CT, new/changing sign/symptoms or abnormal lab values.

Evaluation of known cancer for further evaluation of indeterminate or questionable findings, identified by physical examination or imaging exams such as Ultrasound (US):
- Initial staging of known cancer
  - All cancers, excluding the following:
    - Excluding Basal Cell Carcinoma of the skin,
    - Excluding Melanoma without symptoms or signs of metastasis.
    - Excluding Prostate cancer unless Gleason score seven plus (7+) or PSA over twenty (20)
- Three (3) month follow-up of known abdomen/pelvic cancer undergoing active treatment within the past year.
- Six (6) month follow-up of known abdomen/pelvic cancer undergoing active treatment within the past year.
- 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.
- Cancer surveillance: Once per year (last test must be over ten (10) months ago before new approval) for surveillance of known cancer.

**For evaluation of an organ enlargement:**
- For the evaluation of an organ enlargement such as splenomegaly, hepatomegaly, uterus or ovaries as evidenced by physical examination or confirmed on any previous imaging study.

**For evaluation of suspected infection or inflammatory disease:**
- Suspected acute appendicitis (or severe acute diverticulitis) if abdominal pain and tenderness to palpation is present, with at LEAST one of the following:
  - WBC elevated
  - Fever
  - Anorexia or
  - Nausea and vomiting.
- Suspected peritonitis (from any cause) if abdominal pain and tenderness to palpation is present, and at LEAST one of the following:
  - Rebound, rigid abdomen, or
  - Severe tenderness to palpation present over entire abdomen.
- Suspected pancreatitis with abnormal elevation of amylase or lipase results.
- Suspected complications of diverticulitis (known to be limited to the abdomen/pelvis by prior imaging) with abdominal/pelvic pain or severe tenderness, not responding to antibiotics treatment.
- Suspected inflammatory bowel disease (Crohn’s or ulcerative colitis) with abdominal pain, and persistent diarrhea, or bloody diarrhea.
- Suspected cholecystitis or retained gallstones with recent equivocal ultrasound.
- Suspected infection in abdomen/pelvis.

**For evaluation of known infection or inflammatory disease follow up:**
- Complications of diverticulitis with severe abdominal/pelvic pain or severe tenderness, not responding to antibiotic treatment, (prior imaging study is not required for diverticulitis diagnosis).
- Pancreatitis by history, (including pancreatic pseudocyst) with abdominal pain suspicious for worsening, or re-exacerbation.
- Known inflammatory bowel disease, (Crohn’s or Ulcerative colitis) with recurrence or worsening signs/symptoms requiring re-evaluation.
- Any known infection that is clinically suspected to have created an abscess in the abdomen or pelvis.
- Any history of fistula that requires re-evaluation, or is suspected to have recurred in the abdomen or pelvis.
Abnormal fluid collection seen on prior imaging that needs follow-up evaluation.
Follow up for peritonitis (from any cause) if abdominal/pelvic pain and tenderness to palpation is present, and at LEAST one of the following: rebound, rigid abdomen, or severe tenderness to palpation present over entire abdomen.
Known infection in the abdomen/pelvis region.

For evaluation of known or suspected vascular disease (e.g., aneurysms, hematomas):
- Evidence of vascular abnormality seen on imaging studies.
- Evaluation of suspected or known aortic aneurysm:
  - Suspected or known aneurysm < four (4) cm AND equivocal or indeterminate ultrasound results OR
  - Prior imaging demonstrated aneurysm ≥ four (4) cm in diameter OR
  - Suspected complications of known aneurysm as evidenced clinical findings such as new onset of abdominal or pelvic pain
- Scheduled follow-up evaluation of aorto/iliac endograft. (Abd/Pelvis CTA is preferred)
  - Asymptomatic at six (6) month intervals, for two (2) years
  - Symptomatic/complications related to stent graft – more frequent imaging may be needed.
- Suspected retroperitoneal hematoma or hemorrhage

For evaluation of trauma:
- For evaluation of trauma with lab or physical findings of intra-abdominal/pelvic bleeding.
- Suspected retroperitoneal hematoma or hemorrhage.

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, OR ongoing tumor/cancer surveillance 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.

Other indications for Abdomen/Pelvic CT Combo:
- Suspected adrenal mass or pheochromocytoma based on diagnostic testing/imaging results, and/or a suspicious clinical presentation.
- Persistent abdomen/pelvic pain not explained by previous imaging/procedure
- 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.
• Unexplained weight loss of 5% of body weight in six months confirmed by documentation to include the following
  o Related History and Abdominal exam.
  o Chest x-ray
  o Abdominal Ultrasound
  o Lab tests, must include TSH
  o Colonoscopy if patient fifty plus (50+) years old
• Unexplained abdominal pain in patients seventy-five (75) years or older.
• Suspected Spigelian hernia (ventral hernia) or incisional hernia (evidence by a surgical abdominal scar) when ordered as a pre-operative study by a surgeon OR when surgery scheduled within thirty (30) days.
• Hernia with suspected complications.
• Ischemic bowel.

ADDITIONAL INFORMATION RELATED TO ABDOMEN/PELVIS CT:

Ultrasound should precede any request for Abdomen or Pelvis CT for the following evaluations:
  o Possible gallstones or abnormal liver function tests with gall bladder present.
  o Evaluation of cholecystitis.
  o Repeat CT studies of renal or adrenal mass.
  o Repeat CT Hepatic mass follow-up.
  o Repeat CT for aortic aneurysm ordered by non-surgeon.

CT for organ enlargement - An abd/pelvis combo is most appropriate because it will demonstrate the kidneys and the ureters. Other organs may require an Abdomen CT or Pelvis CT only.

CT for suspected renal stones - An initial CT study is done to identify the size of the stone and rule out obstruction. *(7 mm is the key size - less than that size the expectation is that it will pass)* After the initial CT study for kidney stone is done, the stone can be followed by x-ray or US (not CT). If a second exacerbation occurs/a new stone is suspected another CT would be indicated to access the size of stone and rule out obstruction.

CT Imaging for Renal Colic and Hematuria – Multidetector computed tomography (CT) is the modality of choice for the evaluation of the urinary tract. It is fast and it has good spatial resolution. It is superior to plain-film for imaging the renal parenchyma. 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 is an effective imaging examination for diagnosing hematuria caused by urinary tract calculi, renal tumors and urothelia tumors.

CT Imaging for Abdominal Aortic Aneurysms – Abdominal aortic aneurysms are usually asymptomatic and most are discovered during imaging studies ordered for other indications or on physical examination as a pulsatile abdominal mass. If a pulsatile abdominal mass is found, abdominal ultrasonography is an inexpensive and noninvasive technique for
examination. 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.

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

**REDUcing RADIATION EXPOSURE:**

**CT urography** - Utilization of appropriate imaging techniques can reduce radiation exposure in performance of CT urography. Some protocols may result in 15-35 mSv of exposure. In the article by Chow, et al. a technique involving administration of IV contrast in two boluses separated by a suitable time delay, allows nephrographic and excretory phases to be acquired in a single imaging pass. This allows for full non-contrast and contrast imaging to be obtained with two imaging passes.

**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 patient (<5%). Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 74.2%, 97%, 88%, 93%, and 92%, respectively and comparable to CT. 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.

**Consider the role of barium contrast studies** - Effective doses for fluoroscopic SBFT (small bowel follow through) imaging ranged between 1.37-3.83 mSv for the right lower quadrant, central abdomen and pelvis, respectively. The findings by Jaffe, et al suggest a modified examination for Crohn’s disease indications would have lower effective doses than these. For MDCT the effective dose was 16.1 mSv. This indicates a 5 fold increase in the use of MDCT over SBFT.

For patients with Crohn’s disease, efforts should be made to minimize the number of CT examinations, decrease the CT dose or consider MR Enterography. Limitations of SBFT include partial evaluation of extramucosal and extraluminal disease, impaired evaluation of small-bowel loops, especially those inaccessible in the deep pelvis.

**Consider the role of capsule endoscopy** - Retrospective comparison of capsule endoscopy (CE) to CT in patients with no evidence of a small-bowel stricture at barium examination was the focus of the article by Hara, et al. Studies were done for bleeding of unknown origin after colonoscopy and/or Gastroenterologist, inflammatory bowel disease or chronic abdominal pain.
CE was found to be more sensitive than CT examination in the 19 patients that underwent both. CE provides a complimentary and sensitive approach to the evaluation of the small bowel without radiation exposure. A negative examination does not completely rule out pathology.

**Work up for distant metastasis in the initial evaluation of melanoma** - Multiple studies, including the two authored by Miranda and Yancovitz below indicate that imaging studies, including Chest x-ray, Chest CT, Abdomen/Pelvis CT, Brain CT or Brain MRI in the absence of symptoms or findings of metastatic disease have extremely low yields (< 1%) in the survey evaluation of newly diagnosed melanoma, even in the presence of a positive sentinel node biopsy. The further work-up of the more common benign incidental finding (5-7%) on these studies lead to many more diagnostic tests, including surgery, which are seldom warranted.

**Initial evaluation of abdominal aortic aneurysm (AAA)** - Initial evaluation of AAA is accurately made by ultrasound. 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. >7% the risk of rupture goes to 7% per year.

Chronic contained ruptures should meet the following criteria- known abdominal aortic aneurysm, previous pain symptoms that may have resolved; stable hemodynamic status with a normal HCT, CT scans showing retroperitoneal hemorrhage, and pathologic confirmation of organized hematoma.

**Initial evaluation of adnexal masses** - MRI is a sensitive and specific modality for evaluation of adnexal masses in comparison to CT. While improved diagnostic accuracy of MRI was not shown to be statistically significant in the study- there was a trend to more accurate results with MRI over multi-detector (16-row) CT.

**Evaluation for recurrence of ovarian cancer metastases** - MRI was noted to be superior to PET/CT (with non-contrast CT) in the detection of recurrence of ovarian cancer in a small study (36 patients).

**Pre-operative evaluation of primary rectal cancer** - Abdomen CT may detect hepatic and extra-hepatic disease relevant to decision making and prognosis in rectal cancer. But complete imaging through the pelvis does not add useful information. The area of the pelvis in pre-operative evaluation of rectal cancer is better defined by Pelvis MRI.
REFERENCES


