CLINICAL GUIDELINES

Pediatric Abdomen Imaging Guidelines

Version 1.0

Effective February 1, 2021

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

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Procedure Codes Associated with Abdomen Imaging

MRI	CPT®
MRI Abdomen without contrast	74181
MRI Abdomen with contrast (rarely used)	74182
MRI Abdomen without and with contrast	74183
Unlisted MRI procedure (for radiation planning or surgical software)	76498
MRA	**CPT®**
MRA Abdomen	74185
CT	**CPT®**
CT Abdomen without contrast	74150
CT Abdomen with contrast	74160
CT Abdomen without and with contrast	74170
CT Abdomen and Pelvis without contrast	74176
CT Abdomen and Pelvis with contrast	74177
CT Abdomen and Pelvis without and with contrast	74178
CT Guidance for Needle Placement (Biopsy, Aspiration, Injection, etc.)	77012
CT Guidance for and monitoring of Visceral Tissue Ablation	77013
CT Guidance for Placement of Radiation Therapy Fields	77014
Unlisted CT procedure (for radiation planning or surgical software)	76497
CTA	**CPT®**
CTA Abdomen	74175
CTA Abdomen and Pelvis	74174
Nuclear Medicine	**CPT®**
PET Imaging; limited area (this code not used in pediatrics)	78811
PET Imaging: skull base to mid-thigh (this code not used in pediatrics)	78812
PET Imaging: whole body (this code not used in pediatrics)	78813
PET with concurrently acquired CT; limited area (this code rarely used in pediatrics)	78814
PET with concurrently acquired CT; skull base to mid-thigh	78815
PET with concurrently acquired CT; whole body	78816
Adrenal Nuclear Imaging Cortex and/or Medulla	78075
Spleen Imaging Only with or without Vascular Flow	78185
Liver Imaging Static	78201
Liver Imaging with Vascular Flow	78202
Liver and Spleen Imaging Static	78215
Liver and Spleen Imaging with Vascular Flow	78216
Hepatobiliary System Imaging, Including Gallbladder When Present	78226
Hepatobiliary System Imaging, Including Gallbladder When Present; with Pharmacologic Intervention, Including Quantitative Measurement(s) When Performed	78227
Gastric Mucosa Imaging	78261

Gastroesophageal Reflux Study	78262
Gastric Emptying Study	78264
GI Bleeding Scintigraphy	78278
Gastrointestinal Protein Loss	78282
Intestinal Imaging	78290
Peritoneal-Venous Shunt Patency	78291
Kidney Imaging (Nuclear) Static	78700
Kidney Imaging (Nuclear) with Vascular Flow	78701
Kidney Flow and Function, Single Study without Pharmacologic Intervention	78707
Kidney Imaging with Vascular Flow and Function with Pharmacological Intervention, Single	78708
Kidney Imaging with Vascular Flow and Function with and without Pharmacological Intervention, Multiple	78709
Nuclear Non-imaging Renal Function	78725
Ureteral Reflux Study (Radiopharmaceutical Voiding Cystogram)	78740
Radiopharmaceutical Localization Imaging Limited area	78800
Radiopharmaceutical Localization Imaging Whole Body	78802
Radiopharmaceutical Localization Imaging SPECT	78803
Ultrasound	**CPT®**
Ultrasound, abdomen; complete	76700
Ultrasound, abdomen; limited	76705
Ultrasound, abdominal wall	76705
Ultrasound, retroperitoneal; complete	76770
Ultrasound, retroperitoneal; limited	76775
Ultrasound, transplanted kidney (with duplex Doppler)	76776
Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; complete study	93975
Duplex scan of arterial inflow and venous outflow of abdominal, pelvic, scrotal contents and/or retroperitoneal organs; limited study	93976
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; complete	93978
Duplex scan of aorta, inferior vena cava, iliac vasculature, or bypass grafts; limited	93979

PEDAB-1: General Guidelines

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PEDAB-1.0: General Guidelines

- A recent (within 60 days) face to face evaluation including a detailed history, physical examination, appropriate laboratory studies, and basic imaging such as plain radiography or ultrasound should be performed prior to considering advanced imaging (CT, MRI, Nuclear Medicine), unless the patient is undergoing guideline-supported follow-up imaging evaluation.
- These guidelines are based upon using advanced imaging to answer specific clinical questions that will affect patient management. Imaging is not indicated if the results will not affect patient management decisions. Standard medical practice would dictate continuing conservative therapy prior to advanced imaging in patients who are improving on current treatment programs.
- Unless otherwise stated in a specific guideline section, the use of advanced imaging to screen asymptomatic patients for disorders involving the abdomen is not supported. Advanced imaging should only be approved in patients who have documented active clinical signs or symptoms of disease.
- Unless otherwise stated in a specific guideline section, repeat imaging studies of the same body area are not necessary unless there is evidence for progression of disease, new onset of disease, and/or documentation of how repeat imaging will affect patient management or treatment decisions.
- Ultrasound
  - Ultrasound should be the initial imaging study of choice in most children with abdominal conditions and should be done prior to advanced imaging.
  - For those patients who do require advanced imaging after ultrasound, ultrasound can be very beneficial in selecting the proper modality, body area, image sequences, and contrast level that will provide the most definitive information for the patient.
  - CPT® codes vary by body area and presence or absence of Doppler imaging and are included in the table at the beginning of this guideline.

PEDAB-1.1: Pediatric Abdominal Imaging Age Considerations

- Many conditions affecting the abdomen in the pediatric population are different diagnoses than those occurring in the adult population. For those diseases which occur in both pediatric and adult populations, differences may exist in management due to patient age, comorbidities, and differences in disease natural history between children and adults.
- Patients age <18 years old should be imaged according to the Pediatric Abdomen Imaging Guidelines if discussed. Any conditions not specifically discussed in the Pediatric Abdomen Imaging Guidelines should be imaged according to the General Abdomen Imaging Guidelines. Patients age ≥18 years should be imaged according to the General Abdomen Imaging Guidelines, except where directed otherwise by a specific guideline section.

PEDAB-1.2: Pediatric Abdomen Imaging Appropriate Clinical Evaluation and Conservative Treatment

- See **PEDAB-1.0: General Guidelines**

PEDAB-1.3: Pediatric Abdomen Imaging Modality General Considerations

- Ultrasound
  - See **PEDAB-1.0: General Guidelines**
- MRI
  - MRI Abdomen is generally performed without and with contrast (CPT® 74183) unless the patient has a documented contraindication to gadolinium or otherwise stated in a specific guideline section.
  - Due to the length of time required for MRI acquisition and the need to minimize patient movement, anesthesia is usually required for almost all infants (except neonates) and young children (age <7 years) as well as older children with delays in development or maturity. This anesthesia may be administered via oral or intravenous routes. In this patient population, MRI sessions should be planned with a goal of minimizing anesthesia exposure by adhering to the following considerations:
    - MRI procedures can be performed without and/or with contrast use as supported by these condition-based guidelines. If intravenous access will already be present for anesthesia administration and there is no contraindication for using contrast, imaging without and with contrast may be appropriate if requested. By doing so, the requesting provider may avoid repetitive anesthesia administration to perform an MRI with contrast if the initial study without contrast is inconclusive.
      - Recent evidence based literature demonstrates the potential for gadolinium deposition in various organs including the brain, after the use of MRI contrast.
      - The U.S. Food and Drug Administration (FDA) has noted that there is currently no evidence to suggest that gadolinium retention in the brain is harmful and restricting gadolinium-based contrast agents (GBCAs) use is not warranted at this time. It has been recommended that GBCA use should be limited to circumstances in which additional information provided by the contrast agent is necessary and the necessity of repetitive MRIs with GBCAs should be assessed.
    - If multiple body areas are supported by eviCore's guidelines for the clinical condition being evaluated, MRI of all necessary body areas should be obtained concurrently in the same session.
  - The presence of surgical hardware or implanted devices may preclude MRI.
  - The selection of best examination may require coordination between the provider and the imaging service. CT may be the procedure of choice in these cases.

- CT
  - CT Abdomen typically extends from the dome of the diaphragm to the upper margin of the sacroiliac joints, and CT Abdomen and Pelvis extends from the dome of the diaphragm through the ischial tuberosities.
    - In general, CT Abdomen is appropriate when evaluating solid abdominal organs.
    - In general, CT Abdomen and Pelvis is appropriate when evaluating inflammatory or infectious processes, hematuria, or conditions which appear to involve both the abdomen and the pelvis.
    - In some cases, especially in follow-up of a known finding, it may be appropriate to limit the exam to the region of concern to reduce radiation exposure.
  - The contrast level in pediatric CT imaging is specific to the clinical indication, as listed in the specific guideline sections.
  - CT Abdomen or Abdomen and Pelvis may be indicated for further evaluation of abnormalities suggested on prior US or MRI studies.
  - CT may be indicated without prior MRI or US, as indicated in specific sections of these guidelines.
  - CT should not be used to replace MRI in an attempt to avoid sedation unless listed as a recommended study in a specific guideline section.
  - The selection of the best examination may require coordination between the provider and the imaging service.
- Nuclear Medicine
  - Nuclear medicine studies are commonly used in evaluation of the pediatric kidney and gallbladder. Other less common indications exist as well:
    - Esophageal motility study (CPT® 78258) and/or Gastroesophageal reflux study (CPT® 78262) is indicated in the evaluation of gastroesophageal reflux.
  - Nuclear intestinal imaging (Preferred code for Meckel's Scan, CPT® 78290) or Gastric mucosa imaging (Alternate code Meckel's scan, CPT® 78261) is indicated for the following:
    - Suspected Meckel's diverticulum.
    - Gastric mucosa imaging (CPT® 78261) is also indicated for:
      - Barrett's esophagus.
      - Thoracic masses suspected of containing gastric mucosa.
  - Gastric emptying study (CPT® 78264) is indicated for evaluation of either suspected delayed or rapid gastric emptying.
  - Gastric emptying study with small bowel transit (CPT® 78265) is indicated for evaluation of suspected abnormalities in both total and regional times for gastrointestinal transit in the small bowel.
  - Gastric emptying study with small bowel and colon transit (CPT® 78266) is indicated for evaluation of suspected abnormalities in both total and regional times for gastrointestinal transit to the colon.
  - Gastrointestinal bleeding scintigraphy (CPT® 78278) is indicated for evaluation of brisk active GI bleeding with indeterminate endoscopy.
  - Gastrointestinal protein loss study (CPT® 78282) is indicated for decreased serum albumin or globulins and no evidence of GI bleeding.

- Peritoneal-venous shunt patency study (CPT® 78291) is indicated for evaluation of shunt patency and function in a patient with ascites.
- Nuclear renal imaging (CPT® 78701, CPT® 78707, CPT® 78708, or CPT® 78709) is indicated for evaluation of the following:
  - Renal transplant follow-up.
  - Kidney salvage vs. nephrectomy surgical decisions.
  - Acute renal failure with no evidence of obstruction on recent ultrasound.
  - Chronic renal failure to estimate prognosis for recovery.

- 3D Rendering
  - 3D Rendering indications in pediatric abdomen imaging are identical to those in the general imaging guidelines. See **Preface-4.1: 3D Rendering** in the Preface Imaging Guidelines.

The guidelines listed in this section for certain specific indications are not intended to be all-inclusive; clinical judgment remains paramount and variance from these guidelines may be appropriate and warranted for specific clinical situations.

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PEDAB-2: Generalized Abdominal Pain

- Children with generalized abdominal pain, no red flags signs or symptoms, and normal physical examination and laboratory studies, including stool for blood (and stool culture if diarrhea), should initially be evaluated by ultrasound (CPT® 76700 or CPT® 76705) and treated conservatively.
  - Gastroenterology (GI) specialist evaluation is helpful in determining the need for advanced imaging.
- Children with abdominal pain that can be localized to a particular area of the abdomen should be imaged according to the relevant guideline section:
  - **PEDAB-3: Right Lower Quadrant Pain**
  - **PEDAB-4: Flank Pain, Renal Stone**
  - **PEDAB-8: Right Upper Quadrant Pain**
  - **PEDAB-25: Left Upper Quadrant Pain**
  - **PEDAB-29: Left Lower Quadrant Pain**
- Children with generalized abdominal pain AND ANY of the following red flag signs or symptoms require additional investigation (which may include advanced imaging). CT Abdomen (CPT® 74160) or Abdomen and Pelvis (CPT® 74177) with contrast is indicated unless otherwise specified in a specific guideline section:
  - Pain that wakes the child from sleep.
  - Unexplained fever (T >100.4°F).
  - Dysphagia.
  - GI bleeding.
  - Significant vomiting.
  - Guarding, rebound tenderness, or other peritoneal signs.
  - Severe chronic diarrhea or nocturnal diarrhea in a toilet-trained child.
  - Failure to thrive, involuntary weight loss, or delay in linear growth or pubertal development.
  - Family history of inflammatory bowel disease, familial polyposis syndrome, celiac disease, or peptic ulcer disease.
  - Abdominal mass, hepatomegaly, and/or splenomegaly on exam.
  - Jaundice.
  - Arthritis.
  - Costovertebral angle tenderness.
  - Perianal disease.
  - Spinal tenderness.

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PEDAB-3: Right Lower Quadrant Pain

- For patients age ≤14 years:
  - Ultrasound (CPT® 76700 or CPT® 76705) is indicated as the initial examination. If positive or negative, no further diagnostic imaging is necessary.
    - If the appendix is not visualized on ultrasound and the white blood cell count is not elevated, no further imaging is necessary in nearly all cases, although the referring physician should make the final determination of the need for advanced imaging.
  - If insufficient local ultrasound expertise exists or the ultrasound findings are inconclusive, any of the following studies are indicated for evaluation of right lower quadrant pain:
    - CT Abdomen and Pelvis with contrast (CPT® 74177).
    - CT Abdomen and Pelvis without contrast (CPT® 74176).
    - MRI Pelvis without contrast (CPT® 72195).
    - MRI Pelvis without and with contrast (CPT® 72197).
- For patients age ≥15 years:
  - Any of the following studies are indicated:
    - CT Abdomen and Pelvis with contrast (CPT® 74177).
    - CT Abdomen and Pelvis without contrast (CPT® 74176).
    - MRI Pelvis without contrast (CPT® 72195).
    - MRI Pelvis without and with contrast (CPT® 72197).
- If the appendix is absent, follow guidelines in: **PEDAB-2: Generalized Abdominal Pain**

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of MR Imaging versus CT for Acute Appendicitis. Radiology. 2018;288(2):467-475. doi:10.1148/radiol.2018171838.

PEDAB-4: Flank Pain, Renal Stone

- Flank Pain imaging indications in pediatric patients are very similar to those for adult patients. See **AB-4: Flank Pain, Rule Out or Known Renal/Ureteral Stone** in the Abdomen Imaging Guidelines.
- Pediatric-specific imaging considerations include the following:
  - In children, ultrasound (CPT® 76770 or CPT® 76775) is the preferred initial study
  - If ultrasound is inconclusive, CT Abdomen and Pelvis without contrast (CPT® 74176) is indicated.
  - If CT is inconclusive or there is significant concern for radiation exposure from frequent CT use for a particular patient, MRI Abdomen (CPT® 74183) and Pelvis (CPT® 72197) without and with contrast is indicated.
  - If hematuria is present, See **PEDAB-7: Hematuria** for imaging guidelines.
- Nuclear kidney imaging (CPT® 78707, CPT® 78708, CPT® 78709, or CPT® 78803) is indicated for evaluation of recurrent flank pain when CT and ultrasound are non-diagnostic, or for suspected obstructive uropathy.

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PEDAB-5: Urinary Tract Infection (UTI)

PEDAB-5.1: Upper Urinary Tract	**16**
PEDAB-5.2: Lower Urinary Tract	**17**

PEDAB-5.1: Upper Urinary Tract

- All children with first time UTI should undergo ultrasound evaluation (CPT® 76770 or CPT® 76775), as the initial imaging modality to diagnose hydronephrosis, pyelonephritis, or congenital renal anomaly.
  - If hydronephrosis is present, this should be further evaluated with voiding cystourethrography (VCUG), to evaluate for vesicoureteral reflux. In boys, this is generally accomplished using fluroroscopic imaging and iodinated contrast to exclude urethral abnormalities. In girls, Ureteral Reflux Study (Radiopharmaceutical Voiding Cystogram) (CPT® 78740) is commonly used as urethral abnormalities are rare and this technique results in lower radiation exposure.
- Diuretic renography using Tc-99m MAG 3 (CPT® 78707, CPT® 78708, or CPT® 78709) is the study of choice for the following indications:
  - Differentiating a dilated non-obstructed urinary system from a true stenosis (e.g., UPJ obstruction; ureteral-vesical junction [UVJ] obstruction).
  - Quantifying renal parenchymal function.
  - Ultrasound findings that are compatible with a multicystic dysplastic kidney to evaluate function of the affected kidney or a ureteral-pelvic junction (UPJ) obstruction of the contralateral kidney.
  - Diagnostic evaluation of upper tract dilatation when VCUG is negative.
  - Renal function evaluation in patients with hydronephrosis.
- Post-contrast CT Abdomen (CPT® 74160) is sensitive in diagnosing pyelonephritis has a role in evaluation of renal abscess or unusual complications such as xanthogranulomatous pyelonephritis but has no role in the routine evaluation of UTI
- Magnetic resonance urography (MRU) (CPT® 74183 and CPT® 72197), is not a first line test for the routine evaluation of a UTI, but may be appropriate (where available) for investigation of a dilated upper urinary tract.
  - NOTE: MRU requires sedation in young children.
  - MRU can also quantitate renal function.
- Technetium-99m-dimercaptosuccinic acid (Tc-99m DMSA) scintigraphy (CPT® 78700, CPT® 78701, or CPT® 78803), is sensitive for the diagnosis of UTI but there is little benefit in using this after the first episode of a UTI:
  - DSMA is recommended for Detection of post-pyelonephritic renal scarring at least 6 months after the documented upper tract UTI in high risk patients with recurrent UTIs.
- Radiopharmaceutical nuclear medicine imaging (CPT® 78800, CPT® 78801, CPT® 78802, CPT® 78803, CPT® 78830, CPT® 78831, or CPT® 78832) is indicated for evaluation of suspected pyelonephritis or diffuse interstitial nephritis.
- Nuclear non-imaging renal function study (CPT® 78725) is a quantitative study that can be used to evaluate renal function.
- Children with atypical (poor response to antibiotics within 48 hours, sepsis, poor urine stream, raised creatinine, or non–E coli UTI) or recurrent febrile UTI may be

imaged with US kidneys and bladder (CPT® 76770 or CPT® 76775) (preferred) and/or Voiding cystourethrography (CPT® 78740)

PEDAB-5.2: Lower Urinary Tract

- All children with first time UTI should undergo ultrasound evaluation (CPT® 76770 or CPT® 76775), as the initial imaging modality to diagnose hydronephrosis, pyelonephritis, or congenital renal anomaly
  - Fluoroscopic Voiding cystourethrography (VCUG) is indicated for detection of possible vesico-ureteral reflux (VUR) in neonates or young children when hydronephrosis is seen on ultrasound.
- The American Academy of Pediatrics clinical practice guidelines no longer recommend routine VCUG for infants and young children from 2 to 24 months of age after the first febrile UTI.
  - The current recommendation is to postpone the VCUG until the second febrile UTI UNLESS there are:
    - Atypical or complex clinical circumstances.
    - Renal/bladder ultrasound reveals hydronephrosis, scarring, or obstructive uropathy.
- Vesicoureteral Reflux (VUR)
  - Fluoroscopic VCUG is typically performed for diagnosis and grading of VUR, and should be the first modality used for diagnosis.
  - Ureteral Reflux Study (Radiopharmaceutical Voiding Cystogram) (CPT® 78740), because of its lower radiation exposure and higher sensitivity for reflux > Grade I, is recommended for follow-up imaging of VUR, and investigation of VUR in siblings of affected patients.
- Male patients with first UTI should be evaluated with fluoroscopic VCUG studies rather than radionuclide cystography, to visualize the male urethra for possible abnormalities such as posterior urethral valves, strictures, or diverticula.
- For female patients, radionuclide cystography (CPT® 78740) may replace fluoroscopic VCUG as the initial study, since urethral anatomy is rarely abnormal except in complex malformations.
- MR urography is indicated for evaluation of ectopic distal ureteral insertion, or other complex lower urinary tract anatomy.
- Siblings of patients with known vesicoureteral reflux can undergo Ureteral Reflux Study (Radiopharmaceutical Voiding Cystogram) (CPT® 78740) if they have renal scarring on ultrasound or history of UTI and no prior evaluation for VUR.

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PEDAB-6: Pediatric Acute Gastroenteritis

- Imaging is not indicated in pediatric acute gastroenteritis unless there is a concern for diagnosis other than acute gastroenteritis.
- When necessary, imaging in children with suspected gastroenteritis should begin with plain x-rays of the abdomen, including supine and left lateral decubitus views. The left lateral decubitus view is useful for the detection of air-fluid levels and for detection of gas in the rectum and to exclude obstruction or bowel perforation.
- Ultrasound (CPT® 76700 or CPT® 76705) should be performed if there is organomegaly, palpable mass, or suspicion for complications in the form of intussusception. See **PEDAB-27: Intussusception**
  - While ultrasound (CPT® 76700 or CPT® 76705) may detect findings of gastroenteritis, imaging is not necessary to make the diagnosis of uncomplicated gastroenteritis.
- CT Abdomen and Pelvis with contrast (CPT® 74177) is indicated if abdominal red flag symptoms are present as listed in **PEDAB-2: Generalized Abdominal Pain**.

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PEDAB-7: Hematuria

Hematuria is a relatively common complaint in pediatric patients, and the imaging considerations are different than those occurring in adult patients.

- For patients with asymptomatic gross hematuria or microscopic hematuria with proteinuria present, ultrasound kidneys (CPT® 76770 or CPT® 76775) and bladder (CPT® 76856 or CPT® 76857) are indicated.
- No imaging is appropriate for asymptomatic microscopic hematuria without proteinuria.
- For patients with painful hematuria and no recent trauma, ANY of the following studies can be approved:
  - CT Abdomen and Pelvis without contrast (CPT® 74176)
  - Ultrasound kidneys (CPT® 76770 or CPT® 76775)
  - Ultrasound bladder (CPT® 76856 or CPT® 76857)
- For patients with hematuria and recent trauma, the following studies are indicated:
  - CT Abdomen and Pelvis with contrast (CPT® 74177)

CT Cystography (CT Pelvis with bladder contrast – CPT® 72193), if gross hematuria is present and pelvic fracture or traumatic bladder injury is suspected.

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PEDAB-8: Right Upper Quadrant Pain

- Right upper quadrant pain imaging indications in pediatric patients are very similar to those for adult patients. See **AB-2: Abdominal Pain** in the Abdomen Imaging Guidelines.
- Pediatric-specific imaging considerations include the following:
  - In patients with complaints of RUQ pain with fever, elevated white blood cell count, positive Murphy sign with suspicion of acute cholecystitis or suspicion of acalculous cholecystitis, the diagnosis should be confirmed or excluded using US abdomen (CPT® 76700) and/or Nuclear medicine imaging of the hepatobiliary system (HIDA scan, CPT® 78226 or CPT® 78227).
    - MRI Abdomen with and without contrast (CPT® 74183) or CT Abdomen with contrast (CPT® 74160) when either US or NM is equivocal.
  - In patients with complaints of RUQ pain with no fever and normal white blood cell count where a diagnosis of stones and bile duct obstruction are suspected, the diagnosis should be confirmed with US abdomen (CPT® 76700) and/or Nuclear medicine imaging of the hepatobiliary system (HIDA scan, CPT® 78226 or CPT® 78227).
    - MRI Abdomen with and without contrast (CPT® 74183) when US or NM is equivocal.
    - CT Abdomen with contrast (CPT® 74160) when US or NM is equivocal.
  - In patients with complaints of RUQ pain with no fever and an ultrasound shows only gallstones, MRI Abdomen without contrast (CPT® 74181), MRI Abdomen without and with contrast (CPT® 74183) or Nuclear medicine imaging of the hepatobiliary system (HIDA scan, CPT® 78226) is indicated to exclude other sources of pain.

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PEDAB-9: Inflammatory Bowel Disease, Crohn Disease, or Ulcerative Colitis

Enterography is the most appropriate advanced imaging study for patients with inflammatory bowel disease (IBD).

- For children with suspected IBD, MR enterography (CPT® 74183 and CPT® 72197) is preferred to avoid radiation exposure.
  - CT enterography (CPT® 74177) is indicated if MR enterography is inconclusive or unavailable.
- For children with established IBD, MR enterography (CPT® 74183 and CPT® 72197) is indicated for the following:
  - Monitoring response to disease-modifying treatment on an annual basis or when treatment change is being considered.
  - Patients with new or worsening symptoms or suspected complications including abscess, perforation, fistula, or obstruction.
  - CT enterography (CPT® 74177) can be approved if MR enterography is inconclusive or unavailable.

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PEDAB-10: Abdominal Sepsis (Suspected Abdominal Abscess)

- Abdominal sepsis imaging indications in pediatric patients are identical to those for adult patients. See **AB-3: Abdominal Sepsis (Suspected Abdominal Abscess)** in the Abdomen Imaging Guidelines.

PEDAB-11: Postoperative Pain within 60 Days Following Abdominal Surgery

- CT Abdomen and Pelvis with contrast (CPT® 74177) is indicated in patients with suspected postoperative complications (e.g. bowel obstruction, abscess, anastomotic leak, etc.).
  - Children can also be evaluated with ultrasound (CPT® 76700 or CPT® 76705) initially (especially in small children or in thin older children) or MRI Abdomen and Pelvis without and with contrast (CPT® 74183 and CPT® 72197).
  - Because MRI may not be practical for the timely evaluation of post-operative abscesses, MRI should only replace CT when the study can be completed in a similar time frame as CT.
- Radiopharmaceutical nuclear medicine imaging (CPT® 78800, CPT® 78801, CPT® 78802, CPT® 78803, CPT® 78830, CPT® 78831, or CPT® 78832) is indicated for evaluation of any of the following:
  - Peritonitis.
  - Postoperative fever without localizing signs or symptoms.
- Beyond 60 days postoperatively, See **PEDAB-2: Generalized Abdominal Pain**.

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PEDAB-12: Constipation, Diarrhea, and Irritable Bowel Syndrome

- Constipation and diarrhea are extremely common complaints in children. The overwhelming majority of patients do not require advanced imaging for evaluation of constipation or diarrhea.
- Irritable bowel is rare in young children, but more common in adolescents. The overwhelming majority of patients do not require advanced imaging for evaluation of irritable bowel syndrome.
  - In most cases, causes of constipation can be excluded on the basis of a careful history and physical examination. Advanced Imaging should be performed if warning signs of other diseases are present.
- Constipation associated with red flag signs or symptoms may require advanced imaging:
  - Red flag symptoms for abdominal pain: See **PEDAB-2: Generalized Abdominal Pain**.
  - Clinical suspicion of tethered cord based on abnormal physical findings over the spine or failure of maximal laxative therapy: See **PEDSP-5: Tethered Cord** in the Pediatric Spine Imaging Guidelines.
- Diarrhea that is associated with additional red flag signs or symptoms may require advanced imaging: See **PEDAB-2: Generalized Abdominal Pain**.
- Irritable bowel syndrome that is associated with additional red flag signs or symptoms may require advanced imaging: See **PEDAB-2: Generalized Abdominal Pain**.
- A barium enema and rectal biopsy are indicated for diagnosis of Hirschsprung disease in children with features suggestive of this disorder. MRI Pelvis without and with contrast (CPT® 72197) may be indicated in post-operative patients who have signs of complications related to treatment to assess the position of the pulled-through bowel, the sphincter muscles, and the area of the posterior urethra.

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PEDAB-13: Abdominal Mass

PEDAB-13.1: Abdominal Wall Mass	**27**
PEDAB-13.2: Intra-Abdominal Mass	**27**

PEDAB-13.1: Abdominal Wall Mass

- For initial imaging of a newly discovered abdominal wall mass, ANY of the following studies are indicated:
  - Ultrasound (CPT® 76700 or CPT® 76705).
  - MRI Abdomen without contrast (CPT® 74181) or without and with contrast (CPT® 74183).
  - If below the umbilicus, MRI Pelvis without contrast (CPT® 72195) or without and with contrast (CPT® 72197) may be added to MRI Abdomen.
- If ultrasound and/or MRI are inconclusive or insufficient for preoperative planning, ANY of the following studies are indicated:
  - CT Abdomen with contrast (CPT® 74160) or without contrast (CPT® 74150).
  - If below the umbilicus, CT Abdomen and Pelvis with contrast (CPT® 74177) or without contrast (CPT® 74176).

PEDAB-13.2: Intra-Abdominal Mass

- Ultrasound (CPT® 76700) should be the initial imaging study for children with an intra-abdominal mass.
- Additional imaging studies will be determined by the results of the ultrasound, and will depend on the location and organ involvement associated with the mass as well as history, physical exam, and laboratory findings. See the following sections for additional imaging guidelines:
  - **PEDONC-1: General Guidelines** in the Pediatric Oncology Imaging Guidelines.
  - **PEDONC-5: Pediatric Lymphomas** in the Pediatric Oncology Imaging Guidelines.
  - **PEDONC-6: Neuroblastoma** in the Pediatric Oncology Imaging Guidelines.
  - **PEDONC-7: Pediatric Renal Tumors** in the Pediatric Oncology Imaging Guidelines.
  - **PEDONC-10: Pediatric Germ Cell Tumors** in the Pediatric Oncology Imaging Guidelines.
  - **PEDONC-11: Pediatric Liver Tumors** in the Pediatric Oncology Imaging Guidelines.
  - **PEDONC-14: Pediatric Adrenocortical Carcinoma** in the Pediatric Oncology Imaging Guidelines.
  - **PEDAB-15: Liver Lesion Characterization**.
  - **PEDAB-17: Adrenal Lesions**.
  - **PEDAB-19: Indeterminate Renal Lesion**.
  - **PEDAB-26: Spleen**.

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PEDAB-14: Renovascular Hypertension and Other Secondary Causes of Hypertension

- Clinical evaluation for suspected hypertension should include repeated blood pressure measurements (generally ≥3 measurements). If these measurements are at or above the age-dependent systolic or diastolic blood pressures requiring further evaluation, as listed in the following table, further evaluation is warranted. Blood pressure may be obtained in-clinic, at home, or by using a wearable ambulatory blood pressure measurement (ABPM) device which records blood pressure at frequent intervals during normal activities and is downloaded later for computer analysis.

Age-Dependent Systolic or Diastolic Blood Pressures Requiring Further Evaluation[16]				
	Boys	Boys	Girls	Girls
Age	Systolic	Diastolic	Systolic	Diastolic
1	98	52	98	54
2	100	55	101	58
3	101	58	102	60
4	102	60	103	62
5	103	63	104	64
6	105	66	105	67
7	106	68	106	68
8	107	69	107	69
9	107	70	108	71
10	108	72	109	72
11	110	74	111	74
12	113	75	114	75
≥13	120	80	120	80

- ANY of the following studies are indicated for initial evaluation of a pediatric patient with suspected secondary hypertension.
  - Doppler or Duplex Ultrasound (CPT® 93975 or CPT® 93976).
  - Complete retroperitoneal ultrasound (CPT® 76770).
  - Captopril renography (CPT® 78709) has largely been abandoned in clinical practice, replaced by CTA and MRA Abdomen, but may be supported for unusual circumstances. All such requests should be forwarded to Medical Directors Review.
- All follow-up requests for pediatric hypertension will go to Medical Directors Review.

Other considerations for imaging evaluation:

- MRA (CPT® 74185) or CTA (CPT® 74175) Abdomen may be indicated for pediatric patients with hypertension to exclude fibromuscular dysplasia or other blood-flow restricting lesions of the renal arteries.
- Echocardiography (CPT® 93306) is indicated at initial evaluation to screen for cardiac abnormalities, coarctation of the aorta, and end-organ damage such as left ventricular hypertrophy.
- Nuclear renal imaging (CPT® 78707, CPT® 78708, or CPT® 78709) is indicated for evaluation of the following:
  - Severe hypertension with progressive renal insufficiency or failure to respond to 3 drug therapy.
  - Malignant or accelerated hypertension.
  - Acute worsening of previously stable hypertension.
  - Diastolic BP >100 in patient <35 years old.
  - New onset severe hypertension.
  - Hypertension in presence of asymmetric kidneys.
  - Hypertension in presence of acute elevation in creatinine either unexplained or after treatment with ACE inhibitor.
  - Abdominal bruit.
  - Recurrent acute pulmonary edema and hypertension.
  - Hypokalemia with normal or elevated plasma renin level in absence of diuretic therapy.
  - Hypertension with known neurofibromatosis.

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PEDAB-15: Liver Lesion Characterization

- Liver lesion characterization imaging indications in pediatric patients are very similar to those for adult patients. See **AB-29: Liver Lesion Characterization** in the Abdomen Imaging Guidelines.
- Nuclear medicine liver imaging (ONE of CPT® codes: CPT® 78201, CPT® 78202, CPT® 78803, CPT® 78215, or CPT® 78216) is rarely performed, but can be approved for the following when ultrasound, CT, and MRI are unavailable or contraindicated:
  - Evaluation of liver mass, trauma, or suspected focal nodular hyperplasia (FNH).
  - Differentiation of hepatic hemangioma from FNH.
  - Diffuse hepatic disease or elevated liver function tests.
  - Suspected accessory spleen (CPT® 78215 or CPT® 78216 only).
- Pediatric-specific imaging considerations includes:
  - US abdomen (CPT® 76700 or CPT® 76705) is the initial study of choice in children. MRI is preferred over CT when possible to reduce radiation exposure.

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PEDAB-16: Pediatric Liver Failure and Cirrhosis

- Elevated liver function testing imaging indications in pediatric patients are very similar to those for adult patients. See **AB-30: Abnormal Liver Chemistries** in the Abdomen Imaging Guidelines.
- Causes of liver failure or cirrhosis in pediatric patients are different from adults, and are frequently idiopathic, but commonly due to ONE of the following:
  - Biliary dysfunction (biliary atresia, cystic fibrosis, etc.).
  - Metabolic disease.
  - Post-infectious.
- Liver ultrasound (CPT® 76700) with duplex Doppler (CPT® 93975) is indicated as an initial study for patients prior to approving CT or MRI for pediatric patients.
  - MRI Abdomen without and with contrast (CPT® 74183) is indicated for evaluation of ultrasound findings that are inconclusive or technically limited, and is preferred over CT when possible to reduce radiation exposure.
- Repeat liver ultrasound (CPT® 76705) with duplex Doppler (CPT® 93975) is indicated in pediatric patients in the following circumstances:
  - Known chronic liver dysfunction or cirrhosis of any cause may be reimaged on an annual basis in the absence of new or worsening findings.
  - New or worsening findings on history, physical exam, or laboratory results that suggest progression of liver disease.
  - Doppler ultrasound liver (CPT® 93975 or CPT® 93976) is indicated when portal venous congestion or portal hypertension is suspected.
- Nuclear medicine liver imaging (ONE of CPT® codes: CPT® 78201, CPT® 78202, CPT® 78803, CPT® 78215, or CPT® 78216) is rarely performed, but can be approved for the following when ultrasound, CT, and MRI are unavailable or contraindicated:
  - Diffuse hepatic disease or elevated liver function tests.

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PEDAB-17: Adrenal Lesions

- Adrenal masses in infants and young children usually present as palpable abdominal masses or are detected on in utero US. In the neonates, the common masses are adrenal hemorrhage and neuroblastoma. Abdominal US is the initial imaging study of choice.
  - If an adrenal mass is detected, it can often be adequately evaluated with short interval follow-up retroperitoneal ultrasound (CPT® 76770) in 7 to 10 days.
    - If repeat ultrasound is concerning for neuroblastoma or there is high clinical concern for neuroblastoma, MRI Abdomen without and with contrast (CPT® 74183) or CT Abdomen without and with contrast (CPT® 74170) are indicated to confirm the diagnosis. MRI is preferred over CT when possible to reduce radiation exposure. If these studies, confirm neuroblastoma ^{123}I-Metaiodobenzylguanidine (MIBG) scintigraphy is indicated for staging.
  - Neuroblastoma is the most common primary adrenal tumor in pediatric patients between day 1 and 5 years of age. See **PEDONC-6: Neuroblastoma** in the Pediatric Oncology Imaging Guidelines.
- Additional adrenal imaging considerations include the following:
  - Adrenal Nuclear Imaging of the cortex and/or medulla (CPT® 78075) is indicated for the following:
    - Distinguishing adrenal adenoma from adrenal hyperplasia.
    - Evaluation of suspected pheochromocytoma or paraganglioma.
      - MIBG preferred (ONE of CPT® codes: CPT® 78800, CPT® 78801, CPT® 78802, CPT® 78803, or CPT® 78804).
      - For known pheochromocytoma or paraganglioma, See **ONC-15: Neuroendocrine Cancers and Adrenal Tumors** in the Oncology Imaging Guidelines.
    - Evaluation of suspected neuroblastoma, ganglioneuroblastoma, or ganglioneuroma.
      - MIBG preferred (ONE of CPT® codes: CPT® 78800, CPT® 78801, CPT® 78802, CPT® 78803, or CPT® 78804 or hybrid SPECT/CT CPT® 78830, CPT® 78831, or CPT® 78832), See **PEDONC-6: Neuroblastoma** in the Pediatric Oncology Imaging Guidelines.
    - History of multiple endocrine neoplasia syndromes: See **PEDONC-2.8: Multiple Endocrine Neoplasias (MEN)** in the Pediatric Oncology Imaging Guidelines.
    - History of neurofibromatosis: See **PEDONC-2.3: Neurofibromatosis 1 and 2 (NF1 and NF2)** in the Pediatric Oncology Imaging Guidelines
    - History of von Hippel-Lindau disease: See **PEDONC-2.10: Von Hippel-Lindau Syndrome (VHL)** in the Pediatric Oncology Imaging Guidelines

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PEDAB-18: Hemochromatosis

PEDAB-18.1: Hereditary (Primary) Hemochromatosis	**37**
PEDAB-18.2: Transfusion-Associated (Secondary) Hemochromatosis	**37**

PEDAB-18.1: Hereditary (Primary) Hemochromatosis

- Hereditary hemochromatosis imaging indications in pediatric patients are identical to those for adult patients. See **AB-11.2: Hereditary (Primary) Hemochromatosis (HH) and Other Iron Storage Diseases** in the Abdomen Imaging Guidelines.

PEDAB-18.2: Transfusion-Associated (Secondary) Hemochromatosis

- Transfusion-associated hemochromatosis is a common complication of exposure to repeated red blood cell transfusions. This can occur in any patient with exposure to >20 transfusion episodes, but is most common among sickle cell disease, thalassemia, bone marrow failure (aplastic anemia, Fanconi anemia, etc.), oncology patients, and hematopoietic stem cell transplant patients.
- T2* MRI has been well established in the determination of organ iron burden in transfusion-associated hemochromatosis. Contrast use is not necessary for evaluation of iron burden. The following studies are indicated for evaluation of transfusion-associated hemochromatosis:
  - MRI Abdomen without contrast (CPT® 74181) for liver iron evaluation.
  - MRI Cardiac without contrast (CPT® 75557) for cardiac iron evaluation.
  - MRI Chest without contrast (CPT® 71550) can be approved as a single study to evaluate both heart and liver iron burden.
  - CPT® 74181 and CPT® 75557 can be approved alone, or together.
  - If requested, CPT® 71550 will evaluate both heart and liver and should not be approved with any other codes.
- Screening MRI is indicated every 12 months for chronically transfused patients at risk of hemochromatosis.
- Imaging is indicated every 3 months for treatment response in patients receiving active treatment (chelation and/or phlebotomy).

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PEDAB-19: Indeterminate Renal Lesion

- Indeterminate renal lesion characterization imaging indications in pediatric patients are very similar to those for adult patients. See **AB-35: Indeterminate Renal Lesion** in the Abdomen Imaging Guidelines
- Indeterminate renal lesion imaging indications in pediatric patients are uncommon and are usually cysts or congenital anomalies.
- Pediatric-specific imaging considerations include the following:
  - Pediatric renal cysts have a lower risk of malignant progression than do renal cysts in adults.
  - For patients who have simple cysts but are symptomatic and surgical intervention is being considered, CT Abdomen with contrast (CPT® 74160) or MRI Abdomen without and with contrast (CPT® 74183) is indicated.
  - For pediatric patients with complex renal cyst identified on ultrasound, CT Abdomen without and with contrast (CPT® 74170) or MRI Abdomen without and with contrast (CPT® 74183) is indicated.
  - For patients with congenital anomalies, nuclear medicine studies with diuretic renography (CPT® 78708 or CPT® 78709) can be performed to determine function and cystography to determine presence of associated reflux.
  - Patients with solid renal masses should be imaged according to guidelines in section **PEDONC-7: Pediatric Renal Tumors** in the Pediatric Oncology Imaging Guidelines.

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PEDAB-20: Hydronephrosis

Hydronephrosis is a relatively common finding in pediatric patients, with the following imaging considerations:

- Patients with prenatal hydronephrosis can be evaluated with retroperitoneal ultrasound (CPT® 76770) within the first week of life, and again after 6 weeks of age.
- Patients with known hydronephrosis can be followed with retroperitoneal ultrasound (CPT® 76770) every 3 to 12 months.
  - This imaging represents a guideline-supported, scheduled follow-up imaging evaluation, as described in **PREFACE-3: Clinical Information** in the Preface Imaging Guidelines. A Current evaluation (within 60 days) would not be required for authorization.
- For patients with hydronephrosis associated with urinary tract infection or vesicoureteral reflux See **PEDAB-5: Urinary Tract Infection (UTI)** for imaging guidelines.
- Patients with obstructive uropathy (including ureteropelvic junction obstruction (UPJO), ureterovesical junction obstruction (UVJO), and bladder outlet obstruction) can be evaluated with retroperitoneal ultrasound (CPT® 76770), and diuretic renography (CPT® 78707, CPT® 78708, or CPT® 78709) for preoperative planning and postoperatively at 3 to 12 months.
  - If hydronephrosis has resolved on postoperative imaging then no further routine imaging is indicated.
- Magnetic resonance urography (MRU) (CPT® 74183 and CPT® 72197) is rarely indicated, but can be approved in patients with inconclusive ultrasound and diuretic renography.
- CT Abdomen with contrast (CPT® 74160) is rarely indicated, but can be approved in patients with inconclusive ultrasound and a suspected vascular cause of UPJO.

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PEDAB-21: Polycystic Kidney Disease

- An abdominal ultrasound (CPT® 76700) or a retroperitoneal ultrasound (CPT® 76770) is indicated if there is clinical concern for polycystic kidney disease, or for screening individuals who are at risk for autosomal dominant polycystic kidney disease (ADPCKD).

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PEDAB-22: Blunt Abdominal Trauma

- Blunt abdominal trauma imaging indications in pediatric patients are identical to those for adult patients. See **AB-10.1: Blunt Abdominal Trauma** in the Abdomen Imaging Guidelines.

PEDAB-23: Hernias

- Hernia imaging indications in pediatric patients are identical to those for adult patients. See **AB-12: Hernias** in the Abdomen Imaging Guidelines.

PEDAB-24: Abdominal Lymphadenopathy

- Abdominal lymphadenopathy imaging indications in pediatric patients are identical to those for adult patients. See **AB-8: Abdominal Lymphadenopathy** in the Abdomen Imaging Guidelines.

PEDAB-25: Left Upper Quadrant Pain

- Left upper quadrant pain imaging indications in pediatric patients are identical to those for adult patients. See **AB-2: Abdominal Pain** in the Abdomen Imaging Guidelines.
- Nuclear medicine spleen imaging (CPT® 78185) is rarely performed, but can be approved for left upper quadrant pain when neither ultrasound nor CT is available.

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PEDAB-26: Spleen

- Spleen imaging indications in pediatric patients are very similar to those for adult patients. See **AB-34: Spleen** in the Abdomen Imaging Guidelines.
- Nuclear medicine spleen imaging (CPT® 78185) is rarely performed, but can be approved for the following indications when CT is unavailable:
  - Splenic trauma.
  - Evaluation of splenic function.
  - Suspected splenic mass, cyst, abscess, infarct, or metastasis.
  - Radiation treatment planning.
  - Asplenia.
  - Suspected functional accessory spleen:
    - Can approve CPT® 78215 or CPT® 78216 instead of CPT® 78185, if requested.
- Pediatric-specific imaging considerations include the following:
  - MRI is preferred over CT when possible to reduce radiation exposure.

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PEDAB-27: Intussusception

- Intussusception, telescoping of one bowel loop into another, is a frequent cause of abdominal pain in young children. It may be associated with bloody stool. Plain x-rays (supine and left lateral decubitus views) should be performed initially to exclude mass or bowel obstruction from other causes and to detect possible bowel perforation which may be an indication for emergent surgical intervention.
  - Ultrasound (CPT® 76700 or CPT® 76705) is indicated as an initial study if there is a strong suspicion for intussusception, but if negative, plain x-rays of the abdomen should follow.
  - In some institutions, Ultrasound guidance (CPT® 76942) may be used for reduction of colonic or ileocolic intussusception. Generally, this is an urgent or emergent procedure and may not require prior authorization. See Health Plan specific guidance for prior authorization requirements.

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PEDAB-28: Bowel Obstruction

- Bowel obstruction imaging indications in pediatric patients are identical to those for adult patients. See **AB-20: Bowel Obstruction and Gastroparesis** in the Abdomen Imaging Guidelines.

PEDAB-29: Left Lower Quadrant Pain

Diverticulitis is the most common cause of left lower quadrant pain in adults but is extremely rare in children.

Gastroenterologist evaluation is helpful in determining the appropriate diagnostic pathway in patients with left lower quadrant pain with or without heme-positive stools or rectal bleeding, since advanced imaging is rarely helpful in the initial evaluation of these patients.

- Pelvic ultrasound (CPT® 76856) is the initial imaging study of choice for children for detecting gynecologic abnormalities that may cause left lower quadrant pain.
- For male patients or if ultrasound is inconclusive, advanced imaging may be appropriate for management as directed by gastroenterologic evaluation

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PEDAB-30: Celiac Disease (Sprue)

- Celiac disease imaging indications in pediatric patients are identical to those for adult patients. See **AB-24: Celiac Disease (Sprue)** in the Abdomen Imaging Guidelines.

PEDAB-31: Transplant

- Liver and kidney transplant imaging indications in pediatric patients are identical to those for adult patients. See **AB-42: Transplant** in the Abdomen Imaging Guidelines.
- For post-transplant lymphoproliferative disorder in pediatric patients, See **PEDONC-5.3: Pediatric Aggressive Mature B-Cell Non-Hodgkin Lymphomas (NHL)** in the Pediatric Oncology Imaging Guidelines.

PEDAB-32: Gaucher Disease

See **PEDPN-4: Gaucher Disease** in the Pediatric Peripheral Nerve Disorders Imaging Guidelines.

PEDAB-33: Vomiting Infant, Malrotation, and Hypertrophic Pyloric Stenosis

- Vomiting in infants is generally classified as either bilious (implying obstruction distal to the Sphincter of Oddi) or non-bilious.
- Bilious vomiting may be a true emergency, as some of the conditions causing this could result in compromise of blood supply to the intestines, a potentially life-threatening situation.
- Nonbilious vomiting in otherwise healthy infants may be imaged with Upper GI series (UGI)
- Suspected malrotation is an indication for emergent imaging. If malrotation with mid-gut volvulus is suspected, acute abdominal series (Chest X-ray and abdominal views, including supine and upright or supine and left lateral decubitus views), followed by UGI series (preferred) and/or Ultrasound abdomen, limited (CPT® 76705) should be performed. If the abdominal X-rays suggest distal bowel obstruction, water soluble contrast enema should be considered.
- Hypertrophic Pyloric Stenosis is an idiopathic condition wherein the circular muscle controlling emptying of the stomach thickens, causing a relative obstruction of the gastric outlet. The condition can occur at any age (including occasionally in adults), but the typical child is male, aged 2 to 6 weeks. Projectile non-bilious vomiting is the most common presenting complaint, but the description of projectile vomiting is subjective. The differential diagnosis for non-bilious vomiting includes common conditions such as viral gastroenteritis and gastro-esophageal reflux.
  - Infants with projectile non-bilious vomiting should be evaluated with Ultrasound abdomen, limited (CPT® 76705). If initial studies are not diagnostic, repeat studies should be performed, as frequently as daily, until the vomiting resolves or the diagnosis is made. UGI series may be useful as a confirmatory test, may be preferred if ultrasound expertise is not available for this condition, or if the clinical presentation is atypical for Hypertrophic Pyloric Stenosis. Ultrasound is preferred when available, as it involves no contrast or ionizing radiation use.

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