

## 2011 Imaging Criteria

Computed Tomography (CT), Abdomen<sup>(1\*RIN, 2\*RIN)</sup>

ICD-9-CM: 87.71, 88.01, 88.02  
 CPT: 74150, 74160, 74170  
 I/O Setting: Outpatient

## INDICATION(S)

- 100 Suspected complication post cholecystectomy
- 200 Gallbladder evaluation
- 300 Jaundice
- 400 Suspected acute pancreatitis
- 500 Suspected pancreatic pseudocyst
- 600 Evaluation of known pancreatic pseudocyst
- 700 Acute pancreatitis with complication
- 800 Continued acute pancreatitis after Rx
- 900 Pancreatic mass by US
- 1000 Liver mass by US
- 1100 Suspected pheochromocytoma
- 1200 Suspected adrenal cortical tumor (cortisol secreting)
- 1300 Suspected aldosterone-producing adrenal tumor/bilateral adrenal hyperplasia
- 1400 Periodic assessment of adrenal mass
- 1500 Known splenomegaly with new/worsening LUQ pain ♦
- 1600 Suspected ventral/incisional hernia

- 100 Suspected complication post cholecystectomy [**Both**]<sup>(3)</sup>
  - 110 Abdominal/back pain
  - 120 Findings [**One**]
    - 121 Abdominal distention/ileus
    - 122 Jaundice
    - 123 Temperature > 100.4 F(38.0 C)
    - 124 Direct bilirubin and alkaline phosphatase > normal
- 200 Gallbladder evaluation [**One**]
  - 210 Calcified gallbladder wall by x-ray<sup>(4)</sup>
  - 220 Suspected cancer of the gallbladder by US<sup>(5, 6)</sup>
  - 230 Gallbladder mucosal wall tumor by US<sup>(7)</sup>
- 300 Jaundice [**All**]<sup>(8)</sup>
  - 310 Total bilirubin > normal

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- 320 Alkaline phosphatase > normal
- 330 US nondiagnostic for etiology of jaundice
- 400 Suspected acute pancreatitis **[All]**<sup>(9)</sup>
- 410 Abdominal pain
- 420 Abdominal tenderness
- 430 Abnormal lab **[One]**
- 431 Amylase > normal
- 432 Lipase > normal
- 500 Suspected pancreatic pseudocyst **[All]**<sup>(10, 11)</sup>
- 510 Pancreatitis by Hx **[One]**
- 511 Acute pancreatitis with onset  $\geq$  2 wks
- 512 Chronic pancreatitis
- 513 Pancreatitis secondary to trauma
- 520 Abdominal/back pain
- 530 Findings by PE **[One]**
- 531 Abdominal tenderness
- 532 Abdominal mass
- 600 Evaluation of known pancreatic pseudocyst **[One]**<sup>(10, 11)</sup>
- 610 Periodic evaluation for change in size<sup>(12)</sup>
- 620 New/worsening Sx/findings **[One]**
- 621 Abdominal/back pain
- 622 Vomiting
- 623 Weight loss by Hx/PE
- 624 Temperature > 100.4 F(38.0 C)
- 625 WBC > 10,000/cu.mm( $10 \times 10^9/L$ )
- 626 Hemodynamic instability **[One]** ♦<sup>(13)</sup>
- 1 Systolic BP < 100 mmHg
- 2 Decrease in systolic BP  $\geq$  30 mmHg from baseline
- 3 Shock by PE<sup>(14)</sup>
- 4 Orthostatic changes **[One]**<sup>(15)</sup>
- A) Decrease in systolic BP  $\geq$  20 mmHg<sup>(16)</sup>
- B) Decrease in diastolic BP  $\geq$  10 mmHg<sup>(16)</sup>
- C) Increase in heart rate  $\geq$  20/min
- 627 Abdominal tenderness
- 628 Direct bilirubin and alkaline phosphatase > normal
- 700 Acute pancreatitis with complication **[All]**<sup>(9, 17)</sup>
- 710 Abdominal pain

## 720 Lab finding [One]

721 Amylase &gt; normal

722 Lipase &gt; normal

730 Associated complication [One]<sup>(18)</sup>

## 731 Findings by PE [One]

- 1 Hemodynamic instability [One] ♦<sup>(13)</sup>
  - A) Systolic BP < 100 mmHg
  - B) Decrease in systolic BP ≥ 30 mmHg from baseline
  - C) Shock by PE<sup>(14)</sup>
  - D) Orthostatic changes [One]<sup>(15)</sup>
    - 1) Decrease in systolic BP ≥ 20 mmHg<sup>(16)</sup>
    - 2) Decrease in diastolic BP ≥ 10 mmHg<sup>(16)</sup>
    - 3) Increase in heart rate ≥ 20/min

-2 Temperature &gt; 100.4 F(38.0 C)

-3 Rebound tenderness ♦

## 732 Lab finding [One]

- 1 Hct decrease ≥ 6% w/in 4 hrs ♦
- 2 Po<sub>2</sub> < 60 mmHg(8.0 kPa) on RA ♦
- 3 Creatinine > 3.0 mg/dL(265 μmol/L)
- 4 Blood culture positive
- 5 WBC > 14,000/cu.mm(14x10<sup>9</sup>/L) or < 5,000/cu.mm(5x10<sup>9</sup>/L)
- 6 Ca < 8 mg/dL(2.00 mmol/dL) ♦
- 7 Glucose > 220 mg/dL(12.21 mmol/L)
- 8 Persistently elevated/increasing LFTs ≥ 24 hrs<sup>(19)</sup>

800 Continued acute pancreatitis after Rx [All]<sup>(9)</sup>

## 810 Symptoms [One]

811 Abdominal pain

812 Vomiting with attempted oral intake

## 820 Lab findings [One]

821 Amylase &gt; normal

822 Lipase &gt; normal

## 830 Therapy [All]

831 NPO ≥ 5 days

832 Analgesic ≥ 5 days

833 IV fluids ≥ 5 days

## 900 Pancreatic mass by US

1000 Liver mass by US<sup>(20)</sup>

- 1100 Suspected pheochromocytoma [**One**]<sup>(21, 22, 23)</sup>
- 1110 24 hr urine [**One**]
    - 1111 VMA/metanephrine > normal
    - 1112 Total catecholamines > normal
  - 1120 Plasma catecholamine > normal
- 1200 Suspected adrenal cortical tumor (cortisol secreting) [**All**]<sup>(24\*MDR, 25, 26)</sup>
- 1210 24 hr urine free cortisol > normal<sup>(27)</sup>
  - 1220 No suppression by low-dose dexamethasone<sup>(28)</sup>
  - 1230 No suppression by high-dose dexamethasone<sup>(29)</sup>
- 1300 Suspected aldosterone-producing adrenal tumor/bilateral adrenal hyperplasia [**All**]<sup>(30)</sup>
- 1310 Aldosterone > normal
  - 1320 Plasma renin < normal
  - 1330 Contributory conditions excluded<sup>(31)</sup>
  - 1340 Medications deemed noncontributory<sup>(31)</sup>
- 1400 Periodic assessment of adrenal mass [**All**]<sup>(32)</sup>
- 1410 Nonfunctioning mass<sup>(33, 34)</sup>
  - 1420 Size [**One**]<sup>(35)</sup>
    - 1421 ≤ 4 cm
    - 1422 > 4 cm and ≤ 6 cm and no surgery planned<sup>(36)</sup>
  - 1430 Periodic assessment [**One**]<sup>(37)</sup>
    - 1431 12 wks after initial Dx
    - 1432 Every 6 mos after initial Dx
- 1500 Known splenomegaly with new/worsening LUQ pain ♦
- 1600 Suspected ventral/incisional hernia<sup>(38, 39)</sup>

## Notes

**(1)-RIN:**

These criteria cover indications for CT of the abdomen only. If the pathology extends into the pelvis, a CT of the pelvis should be performed and does not require additional approval.

**(2)-RIN:**

For evaluation of the genitourinary system, (e.g., kidney stones, hematuria, work-up of a genitourinary tract tumor), see the "Computed Tomography (CT), Abdomen and Pelvis" criteria subset.

**(3)**

Possible complications after cholecystectomy include abscess formation, hemorrhage, biliary-enteric fistula, and bile leaks. In addition, the CBD may be obstructed by stones, intraductal blood clots, or extrinsic compression (Fauci, ed. Harrison's principles of internal medicine. 2008). US is sensitive for detecting biliary obstruction, HIDA scan can detect a bile leak, and CT can accurately diagnose hematoma or biloma. Which imaging study to perform is a matter of clinical judgment.

**(4)**

Calcification of the gallbladder wall (sometimes called "porcelain" gallbladder) is associated with a significantly increased incidence of gallbladder cancer. Five percent to 7% of patients undergoing cholecystectomy for porcelain gallbladder have primary gallbladder cancer. The prognosis is poor, with a survival rate < 5%. Because of the strong association of a calcified gallbladder wall with cancer, prophylactic cholecystectomy should be performed, even in the absence of symptoms (Gore et al., Radiol Clin North Am 2002; 40(6): 1307-1323, vi; Stephen and Berger, Surgery 2001; 129(6): 699-703).

**(5)**

An intramural mass more commonly represents gallbladder cancer than a benign condition.

**(6)**

CT is superior to US for identifying gallbladder wall thickening suggestive of neoplastic disease (Gore et al., Gastroenterol Clin North Am 2010, 39: 265-87, ix; Park et al., J Comput Assist Tomogr 2010; 34(1): 135-139). MRI is particularly useful for visualizing portal vein and lymph node involvement.

**(7)**

Gallbladder mucosal wall tumors are seen on US as internally protruding thickenings of the gallbladder wall. Gallbladder polyps represent concentrations of cholesterol and are not the same as gallbladder wall tumors. Endoscopic US (EUS) is useful for the preoperative diagnosis and staging of these lesions (Maluf-Filho et al., Endoscopy 2009; 41(11): 979-987; Sadamoto et al., Gastrointest Endosc 2003; 58(4): 536-541). Gallbladder mucosal wall tumors may be precancerous and, when detected, the gallbladder should be removed.

**(8)**

Painless jaundice in adults is most commonly due to pathology of the pancreatic head causing biliary obstruction. Imaging can detect a tumor in the head of the pancreas or other causes of obstruction, such as CBD stones or an ampullary tumor.

**(9)**

CT is the imaging study of choice for assessing the degree of inflammation and complications associated with acute pancreatitis (Turner, Gastrointest Endosc 2002; 56(6 Suppl): S241-245).

**(10)**

A pancreatic pseudocyst is associated with either acute or chronic pancreatitis or pancreatic trauma and evolves when fluid leakage from a damaged pancreas becomes encapsulated. Usually 4 to 6 weeks are required after the onset of acute pancreatitis for the pseudocyst to mature; however, a pseudocyst can be diagnosed by imaging prior to this time (Baron et al., Gastrointest Endosc 2002; 56(1): 7-17; Kloppel, Semin Diagn Pathol 2000; 17(1): 7-15). Pancreatic pseudocysts can be classified as simple (fluid-filled and unilocular), complicated (associated with fever, hemorrhage, and necrosis), or as neoplastic. The majority of pseudocysts resolve with prolonged observation and nonsurgical treatment; intervention is required for symptomatic pseudocysts with complications (e.g., hemorrhage, obstruction, infection, perforation) or for large, persistent cysts (Cooperman, Surg Clin North Am 2001; 81(2): 391-397, xii).

**(11)**

CT is the most sensitive imaging technique in the evaluation of pancreatic disease and is better than US in evaluating complications of pancreatitis. Although newer US technology and scanning techniques have increased the usefulness of US in pancreatic imaging, CT is recommended as the initial imaging study for suspected pancreatic pseudocyst and is preferred over US in the evaluation of a known

pancreatic pseudocyst (Ralls et al., *Gastroenterol Clin North Am* 2002; 31(3): 801-825, vii).

**(12)**

The interval between imaging studies varies and is a matter of clinical judgment.

**(13)**

These criteria apply to hemodynamic instability at initial presentation or any time during hospitalization. While this may be due simply to volume depletion, it is a matter of clinical judgment whether it represents severe disease with sepsis, volume loss, or retroperitoneal bleeding.

**(14)**

PE findings in shock include clouded sensorium, hypotension, decreased urine output, tachycardia, and cool, mottled extremities with diminished or absent peripheral pulses.

**(15)-DEF:**

Orthostatic changes are alterations in the patient's vital signs upon rising to a standing position, and are usually indicative of hypovolemia or autonomic dysfunction.

**(16)-DEF:**

Orthostatic hypotension is a reduction of systolic BP  $\geq$  20 mmHg or diastolic BP  $\geq$  10 mmHg after standing from the supine position.

**(17)**

The purpose of CT in acute pancreatitis is to provide the initial staging of the disease and the early detection of complications (Mayerle et al., *Gastroenterol Clin North Am* 2004; 33(4): 855-869, viii). Complications can be lethal in the course of acute pancreatitis. Those occurring early (immediately or within first 2 to 3 days of acute attack) are generally systemic and those described as intermediate complications (2 to 5 weeks post acute attack) are generally local septic complications, often occurring in patients with pancreatic necrosis. In patients with late complications (occurring months to years after an acute attack), vascular or hemorrhagic complications or chronic pancreatic ascites may be present (Balthazar, *Radiol Clin North Am* 2002; 40(6): 1211-1227).

**(18)**

Fifteen to 25% of all episodes of pancreatitis are considered severe and are associated with a mortality rate approaching 10% (Vlodov and Tenner, *Prim Care* 2001; 28(3): 607-628, vii). These criteria address major findings indicative of severe disease and a poor prognosis.

**(19)**

Elevated LFTs suggest gallstone pancreatitis. The mechanism of pancreatic injury from gallstones remains uncertain, but probably involves obstruction to biliary flow and subsequent reflux of bile into the pancreatic tree (Nathens et al., *Crit Care Med* 2004; 32(12): 2524-2536). Most stones pass spontaneously and are evidenced by initially increased LFTs which rapidly drop thereafter. Some gallstones cause persistent blockage and require intervention to reduce the likelihood of complications such as cholangitis. If gallstone pancreatitis is diagnosed, cholecystectomy should be performed to prevent recurrent episodes. For CBD stones, removal via ERCP sphincterotomy is safe and effective (Law and Freeman, *Gastroenterol Clin North Am* 2003; 32(4): 1169-1194, ix).

In the absence of other complications, these criteria require persistently elevated or increasing LFTs because this finding is the best clinical predictor of retained stones (Chang et al., *Am J Gastroenterol* 1998; 93(4): 527-531).

**(20)**

US is the initial diagnostic test of choice for suspected biliary or liver disease (Ros and Morteale, *Clin Liver Dis* 2002; 6(1): 1-16). Liver masses may be incidental findings discovered during US performed for another indication. In general, US or contrast-enhanced CT are adequate for classifying the majority of focal liver lesions, particularly cysts, metastases, and hemangiomas. MRI is also helpful in defining focal nodular hyperplasia, focal fatty infiltration, lesions < 2 cm, or those lesions adjacent to large blood vessels or the heart (Harisinghani and Hahn, *Gastroenterol Clin North Am* 2002; 31(3): 759-776, vi).

**(21)**

A pheochromocytoma is an adrenal tumor that produces, stores, and secretes catecholamine. Approximately 90% of pheochromocytomas are benign, 10% are malignant, and 10% are bilateral (Israel and Krinsky, *Radiol Clin North Am* 2003; 41(1): 145-159). They are a very rare but potentially lethal cause of HTN. Most patients present in mid-adult life with refractory HTN or "spells" of sudden onset headache, sweating, and palpitations. Other symptoms include tremor, anxiety, nervousness, fatigue, unexplained abdominal or chest pain, and weight loss.

**(22)**

The diagnosis of pheochromocytoma is usually established by demonstrating increased urinary excretion of catecholamines or catecholamine metabolites (metanephrine and VMA). The preferred screening method involves a 24-hour collection of urine obtained

during a period of "spells" or HTN. Plasma catecholamine measurement (total and fractionated) can also be performed, but it is more expensive, more difficult to obtain because of the need for ideal conditions (patient in a totally nonstimulated restful state at time of blood draw), and is less sensitive and specific than a 24-hour urine catecholamine measurement.

Prior to obtaining the sample, the patient should rest and ideally discontinue all medications. At the very least, those drugs known to interfere with catecholamine assays (e.g., amphetamines, ethanol, methyldopa, quinidine, theophylline) should be avoided prior to testing.

### (23)

The majority (90%) of pheochromocytomas are intra-adrenal lesions and are usually identified by MRI or CT (Fauci, ed. Harrison's principles of internal medicine. 2008). MRI may offer an advantage over CT by providing the anatomic relationship between the tumor and its surrounding structures (Vaughan, *Med Clin North Am* 2004; 88(2): 443-466). MRI is becoming the imaging study of choice for diagnosing pheochromocytomas (Elsayes et al., *AJR Am J Roentgenol* 2005; 184(3): 860-867). The addition of MIBG scintigraphy may improve sensitivity for diagnosing pheochromocytoma when catecholamine levels are normal (Guller et al., *Ann Surg* 2006; 243(1): 102-107).

### (24)-MDR:

**Some patients with adrenal cortical tumors have Cushingoid findings without lab abnormalities. Requests for imaging in these cases require secondary medical review.**

### (25)

CT is the primary imaging modality for investigating an adrenal mass and can determine tumor size, tumor relationship to surrounding structures, lymph node involvement, and the presence of distant metastases (Jossart et al., *Endocrinol Metab Clin North Am* 2000; 29(1): 57-68, viii). Measurement of the fat content in Hounsfield units can distinguish benign from malignant lesions; higher values signify more fat and are less likely to be malignant. A value < 10 HU has been established by the NIH as the threshold for determining adrenal malignancy (Gopan et al., *Cleve Clin J Med* 2006; 73(6): 561-568). MRI is helpful in tissue characterization and is indicated when malignancy is suspected. Various MRI techniques can be used to distinguish adrenal adenomas from metastases (Sohaib et al., *Best Pract Res Clin Endocrinol Metab* 2005; 19(2): 293-310; Israel and Krinsky, *Radiol Clin North Am* 2003; 41(1): 145-159).

### (26)

Whether to perform CT or MRI in this situation is a matter of clinical judgment.

### (27)

Cortisol hypersecretion is demonstrated by 24-hour urine tests. Three 24-hour urine samples may be necessary when the initial test is normal and the index of suspicion is high (Vaughan, *Med Clin North Am* 2004; 88(2): 443-466; Arnaldi et al., *J Clin Endocrinol Metab* 2003; 88(12): 5593-5602).

### (28)

In the overnight low-dose dexamethasone test, dexamethasone is given between 11 PM and 12 AM and a fasting plasma cortisol measurement is taken the next morning between 8 AM and 9 AM. Recently the normal level of suppression has changed from less than 5 µg/dL to less than 1.8 µg/dL, improving the sensitivity of this test in detecting patients with Cushing's syndrome. Patients with cortisol levels below 1.8 µg/dL do not have active Cushing's syndrome. This outpatient screening option is easy to perform and cost-effective. A low-dose dexamethasone suppression test can also be performed over a two day period (Arnaldi et al., *J Clin Endocrinol Metab* 2003; 88(12): 5593-5602).

### (29)

Suppression of cortisol excretion with high-dose dexamethasone is useful in distinguishing Cushing's disease (an ACTH-secreting pituitary adenoma) from other forms of Cushing's syndrome. Failure to suppress plasma or urine corticosteroids generally indicates an adrenal cortical or ectopic ACTH-secreting tumor; suppression of corticosteroids supports the diagnosis of a pituitary adenoma instead. Individuals with pituitary disease should demonstrate suppression in cortisol of 50% or more (Vaughan, *Med Clin North Am* 2004; 88(2): 443-466).

### (30)

Primary hyperaldosteronism stems from either an adrenal tumor (benign adenoma or rarely, adrenal carcinoma) or bilateral adrenal hyperplasia. Symptoms and findings of primary hyperaldosteronism may include HTN, headaches, muscle weakness, hypokalemia and hypernatremia (Fauci, ed. Harrison's principles of internal medicine. 2008; Vaughan, *Med Clin North Am* 2004; 88(2): 443-466). CT of the adrenal glands is the imaging study of choice in making the distinction between unilateral adenoma and bilateral adrenal hyperplasia (Al Fehaily and Duh, *Surg Clin North Am* 2004; 84(3): 887-905; Vaughan, *Med Clin North Am* 2004; 88(2): 443-466). CT is able to see smaller lesions, is technically easier to perform, and is more cost-effective than MRI. Aldosterone-secreting tumors are

generally resected, while bilateral adrenal hyperplasia is usually managed medically (South-Paul et al., *Current diagnosis & treatment in family medicine*. 2004, xv, 750 p. p.).

**(31)**

Medications (e.g., B-adrenergic blockers, spironolactone, ACE inhibitors, calcium channel blockers, diuretics, and NSAIDs) and factors such as high sodium intake, older age, renal insufficiency can interfere with the laboratory testing for primary hyperaldosteronism (Al Fehaily and Duh, *Surg Clin North Am* 2004; 84(3): 887-905).

**(32)**

Many adrenal tumors are discovered incidentally during imaging studies performed for unrelated reasons, with an estimated range of incidence from 0.1% to 4.3%. The likelihood of discovering an adrenal mass increases with age (Grumbach et al., *Ann Intern Med* 2003; 138(5): 424-429). Management decisions are dependent upon the risk of underlying malignancy or hormonal hypersecretion, which correlate with the size of the mass, its radiographic appearance, and its present secretory activity (Young, *N Engl J Med* 2007; 356(6): 601-610; Gopan et al., *Cleve Clin J Med* 2006; 73(6): 561-568; National Institutes of Health, *NIH Consens State Sci Statements* 2002; 19(2): 1-25). All patients with an incidentally discovered adrenal mass should be screened for pheochromocytoma and Cushing's syndrome.

**(33)**

The evaluation of an adrenal mass includes an assessment of hormonal function, tumor size, and tumor growth. The need for biopsy has been significantly reduced due to the high specificity of new imaging techniques in determining benign from malignant disease (Sohaib et al., *Best Pract Res Clin Endocrinol Metab* 2005; 19(2): 293-310). Pheochromocytoma should be excluded before attempting adrenal biopsy to avoid the potential for hypertensive crisis.

**(34)**

Appropriate laboratory screening tests include 24-hour urinary free cortisol, metanephrines, catecholamines, vanillylmandelic acid, and potassium levels (if hyperaldosteronism is suspected) (Higgins, *Clin Fam Pract* 2002; 4(3): 505).

**(35)**

Various size cutoffs have been cited in the literature. The risk of malignancy is much less for adrenal tumors < 6 cm. According to the National Institutes of Health, tumors > 6 cm in size should be excised, while those < 4 cm can be observed. In patients with tumors between 4 and 6 cm, however, factors in addition to size should be considered (Grumbach et al., *Ann Intern Med* 2003; 138(5): 424-429; National Institutes of Health, *NIH Consens State Sci Statements* 2002; 19(2): 1-25).

**(36)**

Nonfunctioning tumors > 4 cm in size or tumors which have increased in size by serial imaging or appear malignant should be removed since the probability of adrenal carcinoma is higher in these cases (Young, *N Engl J Med* 2007; 356(6): 601-610; Sturgeon and Kebebew, *Surg Clin N Am* 2004; 84: 755-774).

**(37)**

Nonfunctioning adrenal masses should undergo periodic assessment by serial imaging (commonly done at 6, 12, and 24 months) to assess for changes in size (Young, *N Engl J Med* 2007; 356(6): 601-610). Since size correlates with the risk of malignancy, any change in size should prompt referral to a specialist for evaluation.

**(38)**

Repair of ventral hernias is recommended, as they do not resolve spontaneously and may enlarge. It is important to distinguish diastasis recti (a wide separation of the rectus muscle) from a ventral hernia (abdominal contents which project through the abdominal wall fascia). Diastasis is a normal anatomic variation which poses no health risk, and repair is purely for cosmetic purposes.

**(39)**

Obesity may predispose to the development of an abdominal wall hernia and obscure its diagnosis by exam. Imaging with CT or US allows visualization of hernia contents (e.g., bowel) and defines the size of the abdominal wall defect.