Open Evidence

Below is a CT-specific summary of when **IV contrast is and is not recommended**, organized by body region, based on the ACR Appropriateness Criteria and supporting evidence.

CT Head

- **Non-contrast CT** is the standard first-line study for nearly all acute indications: suspected stroke (ACR rating 9/9), acute hemorrhage, trauma, headache (rating ≥7), and altered mental status. [1]
- **Contrast-enhanced CT head** does not add significant value over non-contrast CT as a first-line test in the acute setting. It may be considered if intracranial infection, tumor, or inflammatory pathology is suspected, but MRI with contrast is generally preferred for these indications. [2]
- **CT angiography (CTA) of the head/neck** (with contrast) is appropriate for suspected large vessel occlusion in stroke, carotid/vertebral dissection, and aneurysm evaluation. [1]

CT Neck

- **CT neck with IV contrast** is usually appropriate (rating ≥7) for palpable neck masses away from the thyroid or parotid glands. [1]
- **Non-contrast CT neck** has limited utility for soft tissue evaluation.

CT Chest

- **CT pulmonary angiography (with IV contrast)** is the preferred test for suspected pulmonary embolism (rating 9/9). V/Q scan is reserved for patients with eGFR <30 or contrast allergy. [1]
- **CT chest without contrast** is appropriate for:
    - Lung parenchymal disease (interstitial lung disease, emphysema)
    - Lung cancer screening (low-dose CT)
    - Coronary artery calcium scoring (rating 8/9 for intermediate-risk patients) [1]

- **CT chest with IV contrast** adds value for:
    - Pleural disease (thickening, enhancement, complex effusions) [3]
    - Chest wall masses and malignancy
    - Mediastinal pathology and staging
- **CT chest without and with IV contrast** (dual-phase) does not add value over a single contrast or non-contrast study for chronic dyspnea workup. [3]

CT Abdomen and Pelvis

Contrast-enhanced CT is the default standard for most abdominal/pelvic indications:

- **CT with IV contrast** is the most appropriate imaging test for acute abdominal pain in nonpregnant adults. Unenhanced CT is approximately **30 percentage points less accurate** than contrast-enhanced CT for primary and secondary actionable findings. [4-5]
- Specific indications where **IV contrast is recommended**:
    - Acute nonlocalized abdominal pain (increases spectrum of detectable pathology) [6]
    - Suspected appendicitis in adults (rating ≥7) [1]
    - Left lower quadrant pain / suspected diverticulitis (improves characterization of bowel wall pathology and pericolic abnormalities) [7]
    - Left upper quadrant pain with fever (superior for vasculature, colitis, gastroenteritis; more sensitive for microabscesses in immunocompromised patients) [8]
    - Sepsis with unknown source (non-contrast CT is less likely to detect a source of infection) [9]
    - Suspected visceral or vascular injury in trauma (essential for detecting active bleeding, dissection) [10]
- Specific indications where **non-contrast CT is preferred or sufficient**:
    - **Urolithiasis/renal colic** — "stone protocol" CT without contrast is the standard, as IV contrast may obscure small renal stones. However, if the

patient has no history of stones and negative urinalysis, contrast-enhanced CT is indicated to evaluate alternative diagnoses. [11]

- **Appendicitis** — non-contrast CT is conclusive in ~75% of cases (sensitivity 90%, specificity 96%), though the remaining 25% of inconclusive cases benefit from follow-up contrast-enhanced CT. [11]

- **Oral contrast** is no longer routinely used at many institutions due to delays in throughput with questionable diagnostic advantage; multiplanar reformations on modern CT provide comparable diagnostic confidence. [6]

1. Diagnostic Imaging: Appropriate and Safe Use. American Family Physician. 2021. Ford B, Dore M, Moullet P.Clinical Reference

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3. ACR Appropriateness Criteria® Chronic Dyspnea-Noncardiovascular Origin: 2024 Update. Journal of the American College of Radiology : JACR. 2025. Christensen JD, Harowicz M, Walker CM, et al.Guideline

4. Diagnostic Accuracy of Unenhanced Computed Tomography for Evaluation of Acute Abdominal Pain in the Emergency Department. JAMA Surgery. 2023. Shaish H, Ream J, Huang C, et al.Observational

5. Acute Abdomen in the Modern Era. The New England Journal of Medicine. 2024. Rogers SO, Kirton OC.Review

6. ACR Appropriateness Criteria Acute Nonlocalized Abdominal Pain. Journal of the American College of Radiology : JACR. 2018. Scheirey CD, Fowler KJ, Therrien JA, et al.Guideline

7. ACR Appropriateness Criteria® Left Lower Quadrant Pain: 2023 Update. Journal of the American College of Radiology : JACR. 2023. Weinstein S, Kim DH, Fowler KJ, et al.Guideline

8. ACR Appropriateness Criteria® Acute Left Upper Quadrant Pain. Journal of the American College of Radiology : JACR. 2025. Expert Panel on Gastrointestinal Imaging, Soleimani S, Kamel IR, et al.NewGuideline

9. ACR Appropriateness Criteria® Sepsis. Journal of the American College of Radiology : JACR. 2024. Brixey AG, Fung A, De Leon AD, et al.Guideline

10. Best Practices Guidelines In Imaging. American College of Surgeons (2018). 2018. Gail T. Tominaga MD FACS, Mark Bernstein MD, Michael R. Aquino MD MHSc, et alGuideline

11. ACR Appropriateness Criteria® Acute Pelvic Pain in the Reproductive Age Group: 2023 Update. Journal of the American College of Radiology : JACR. 2024. Brook OR, Dadour JR, Robbins JB, et al.Guideline

12. ACR Appropriateness Criteria® Penetrating Trauma-Abdomen and Pelvis: Update 2026. Journal of the American College of Radiology : JACR. 2026. Expert Panel on Urologic Imaging, Costa DN, Bass M, et al.NewReview

UpToDate

Head CT

- Acute traumatic brain injury: head CT **without contrast** is recommended to detect injuries that may require neurosurgical intervention; IV contrast is not routine, but is used when CT angiography of head/neck is needed for suspected vascular injury.
- Suspected acute intracerebral hemorrhage: **noncontrast head CT** identifies acute ICH and distinguishes it from ischemic stroke; CT angiography may be performed with the noncontrast CT to identify an underlying vascular cause.
- Suspected subarachnoid hemorrhage: the cornerstone of diagnosis is **noncontrast head CT**.

Chest CT

UpToDate content retrieved here did not provide a general "chest CT with vs without contrast" indications list across common ED chest complaints (eg, PE, aortic dissection, pneumonia). One explicit example present in the retrieved content is:

- Incidental pulmonary nodule surveillance: CT chest **without contrast** is preferred for follow-up imaging.
- Suspected mediastinal granuloma: chest CT **with contrast** is indicated, and IV contrast is preferred to delineate vascular from other mediastinal structures.

Abdominal and pelvic CT

- Undifferentiated abdominal pain in the ED: CT is the most accurate imaging modality, and routine IV contrast improves diagnostic accuracy for many diagnoses; in the emergency setting, contrast-enhanced imaging should not be delayed when it is anticipated to meaningfully impact diagnosis or management. Patient evaluation for contrast administration for computed tomography: Concern for contrast-associated acute kidney injury
- Lower abdominal, LUQ, or diffuse abdominal pain with suspected nongynecologic etiology (male or nonpregnant female): IV contrast-enhanced abdominopelvic CT has the best accuracy; CT can still be helpful without IV contrast, but inflammatory changes can be obscured in young, slender patients with little mesenteric fat.
- Suspected appendicitis in adults: IV contrast administration is recommended; noncontrast CT is an acceptable alternative if IV contrast is contraindicated.

- Suspected nephrolithiasis when CT is chosen and suspicion is high: noncontrast abdominopelvic CT is preferred because contrast-enhanced parenchyma and early excretion can obscure collecting-system calculi; if the diagnosis is less certain and other etiologies are being evaluated, IV contrast-enhanced CT is reasonable while preserving high sensitivity for clinically important stones.