

Things We Do For No Reason™: Ultrasonography After an Initial Negative CT in Patients Presenting With Acute Abdominal or Pelvic Pain

John M Cunningham, MD^{1,2*}, Sarah Wachtel, MD^{1,2}, Rehaan Shaffie, MD^{1,2}, Elizabeth Dee, MD³

¹Department of Internal Medicine, Denver Health and Hospital Authority, Denver, Colorado; ²Department of Internal Medicine, University of Colorado Anschutz Medical Campus, Aurora, Colorado; ³Department of Radiology, Denver Health and Hospital Authority, Denver, Colorado.

Inspired by the ABIM Foundation's Choosing Wisely® campaign, the "Things We Do for No Reason™" (TWDFNR) series reviews practices that have become common parts of hospital care but may provide little value to our patients. Practices reviewed in the TWDFNR series do not represent clear-cut conclusions or clinical practice standards but are meant as a starting place for research and active discussions among hospitalists and patients. We invite you to be part of that discussion.

CLINICAL SCENARIO

A 70-year-old woman presented to the emergency department (ED) with diffuse abdominal pain, nausea, and vomiting with normal liver function tests and lipase. Computed tomography (CT) of the abdomen and pelvis with intravenous contrast revealed no acute intraabdominal pathology except for an incidentally noted, mildly enlarged but nondistended gallbladder without evident cholelithiasis, pericholecystic fluid, or gallbladder wall edema. The hospitalist orders an abdominal ultrasound to evaluate for acute biliary pathology potentially missed by CT.

WHY YOU MIGHT CONSIDER ORDERING AN ABDOMINAL ULTRASOUND AFTER A NEGATIVE CT

Guidelines and expert opinion recommend an "ultrasound-first" approach when patients present with right upper quadrant (RUQ) abdominal pain or pelvic pain of suspected gynecologic origin.¹⁻³ When evaluating suspected biliary disease, experts recommend beginning with ultrasonography based on the speed of obtaining results, absence of radiation exposure, reduced cost, and good diagnostic accuracy.¹ Ultrasound has superior sensitivity, of 98%,⁴ in identifying radiolucent gallstones, compared to CT's 79% sensitivity.⁵ Ultrasonography also differentiates gallbladder sludge from cholelithiasis, evaluates the extrahepatic and intrahepatic bile ducts, and can identify alternate causes of RUQ pain.^{1,3} Since ultrasound has important advantages, a negative initial CT may lead the clinician to consider an ultrasound to evaluate for gallbladder diseases.

Additionally, ultrasound provides improved anatomic detail of pelvic structures when diagnosing endometrial or ovarian pathology² and improves diagnostic accuracy when the initial CT reveals an abnormal pelvic finding (eg, defining an enlarged ovary on CT as ovarian torsion, a cyst, or an adnexal mass).⁶ While CT excludes emergent surgical diagnoses, ultrasound may add value in elucidating a cause of the pain, even when urgent surgical management is not necessary.⁷

Many providers believe that a CT lacks sensitivity for acute biliary or pelvic pathology and will order an ultrasound to avoid missing an important diagnosis.⁷ Within 6 months at a single center, clinicians ordered 614 abdominal ultrasounds within 72 hours of an abdominal CT; 227 of these orders were to evaluate the gallbladder. Clinicians documented a discussion with a radiologist in only 19% of cases.⁸

WHY ORDERING AN ULTRASOUND AFTER A NEGATIVE CT IS UNNECESSARY

While ultrasound is more sensitive for detecting gallstones, the data do not indicate that it is more sensitive than CT for detecting acute cholecystitis. Abdominal ultrasound has a sensitivity for the diagnosis of acute cholecystitis of 81%, with a specificity of 83%,⁹ while CT has a comparable 85% to 94%^{9,10} sensitivity and specificity ranging from 59% to 99%.^{9,11} A recent study using more stringent radiographic criteria (two or more abnormal features) for diagnosing acute cholecystitis found ultrasound and CT had near equivalent sensitivities of 61% and 55%, respectively.¹² Even with these stringent criteria, CT had a negative predictive value of 90% and approached 95% when applying a less strict (one feature) criterion.¹² As a result, an abdominal ultrasound will rarely diagnose cholecystitis after a normal CT.

A 2020 study evaluated the diagnostic yield and clinical impact of ordering an abdominal or pelvic ultrasound within 24 hours of a negative abdominal CT.⁷ It found that only 3/132 (2.3%) of abdominal ultrasounds ordered after a negative CT revealed acute pathology potentially requiring surgery. Only one of these three patients (1/132) required surgical intervention for confirmed acute cholecystitis.⁷ The follow-up abdominal ultrasound identified asymptomatic gallstones in 9/132 (6.8%) and gallbladder polyps in 4/132 (3.0%) of cases.⁷ Selective use of ultrasound after CT for patients with clinically worsening or progressive RUQ pain will avoid missing a "can't miss" diagnosis and reduce low-yield testing for a majority of patients.

As with abdominal CT and ultrasound, the recommendation for an initial pelvic ultrasound when evaluating female pelvic pain also stems from the reduced cost, absence of radiation

*Corresponding Author: John M Cunningham, MD;
Email: John.cunningham@dhha.org; Telephone: 651-269-1449.

Find additional supporting information in the online version of this article.

Received: July 11, 2021; Revised: August 25, 2021; Accepted: August 30, 2021

© 2021 Society of Hospital Medicine DOI 10.12788/jhm.3704

exposure, and superior anatomic visualization of the pelvic organs when compared with pelvic CT.^{2,13} However, as with the results of studies investigating the use of abdominal ultrasound after negative CT, a study of pelvic ultrasound after a negative CT revealed that only 4/126 (3.2%) follow-up ultrasounds had an abnormal finding not identified on CT.¹³ Pelvic ultrasound found four endometrial abnormalities that did not alter acute management.¹³ Notably, in 58% of the cases, the indication for ordering the subsequent ultrasound was “rule out ovarian torsion.” However, CT almost always finds a morphologically abnormal ovary in the case of torsion.⁶ One study and literature review found that all 28 patients studied and all 85 patients from previous studies with proven ovarian torsion had either an adnexal mass or an enlarged ovary on pelvic CT.⁶ Harfouch et al found that 0 out of 199 pelvic ultrasounds ordered after a negative CT revealed acute surgical pathology, but pelvic ultrasound did identify nonsurgical uterine and ovarian abnormalities.⁷ In conclusion, when clinicians order CT as the first study to diagnose acute, surgical biliary or gynecologic causes of pain, follow-up ultrasound has a low probability of affecting diagnosis or management if the CT is normal.

WHEN YOU SHOULD CONSIDER ULTRASOUND AFTER CT

The previous discussion only applies if hospitalists order an ultrasound within 24 to 48 hours of the initial CT. Time and clinical course are critical diagnostic tools during an admission for abdominal pain. Consider pelvic or abdominal ultrasound based on guideline recommendations if a patient develops new or evolving RUQ or pelvic pain.^{1,2} The rationale for obtaining the initial negative CT may no longer apply, and the clinician must consider the changing characteristics of the patient’s symptoms. For example, initial CT imaging may miss cholelithiasis in a patient presenting for biliary colic. Under observation, the patient may develop acute cholecystitis, potentially requiring an abdominal ultrasound. Also, the data for pelvic ultrasound apply to a normal CT of the abdomen and pelvis. Ultrasound may help to further evaluate indeterminate findings present on initial CT or if recommended by radiology.

WHAT YOU SHOULD DO INSTEAD

When the hospitalist assumes care for a patient with abdominal pain and a negative CT, appropriate next steps include taking time to reexamine the differential diagnosis, repeating the history and physical, and communicating directly with a radiologist. These steps ensure the highest diagnostic yield and the lowest cost and help prevent diagnostic error arising from anchoring on the initial negative ED evaluation. Prior research demonstrates that the initial history alone can lead to the correct diagnosis in up to 76% of cases of abdominal pain.¹⁴ If repeat evaluation determines that additional imaging is necessary, the American College of Radiology provides evidence-based guidelines to help clinicians determine the correct imaging test based on the clinical situation (Appendix Table).^{1,2} For example, an equivocal ultrasound or CT exam with continued suspicion for acute cholecystitis or an alternate diagnosis, such as acalculous cholecystitis or choledocholithiasis,

merits alternative tests with improved sensitivity and specificity profiles (Tc 99 m hepatobiliary iminodiacetic acid scan, also known as cholescintigraphy, for cholecystitis and acalculous cholecystitis, or magnetic resonance cholangiopancreatography for choledocholithiasis).¹

Remember to communicate with the radiologist to rule out “can’t miss” diagnoses, increase mutual understanding of the radiographic test characteristics for specific disease processes, and improve the radiologist’s understanding of the patient’s history and clinical question.¹⁵ Collaboration with the radiologist can also determine the need for follow-up imaging and its timing. One single-center study found that surgeons’ diagnostic impression and management changed in 35/100 (35%) cases after an in-person review with the radiologist.¹⁵ Observing patients in the hospital with a nondiagnostic initial evaluation but concerning clinical features often allows for either a trial of cure or for the disease process to “declare itself.”¹⁴ This allows clinicians to target additional testing to a specific diagnosis and avoid reflexive ordering of additional radiographic studies.

RECOMMENDATIONS

- Order an ultrasound for initial imaging of RUQ and female pelvic pain.
- Do not reflexively order an ultrasound within 24 to 48 hours of a negative CT scan to pursue biliary or pelvic pathology.
- Only order repeat abdominal imaging if clinical circumstances evolve or discussions with a radiologist conclude it will answer a more specific diagnostic question.

CONCLUSION

In our clinical scenario involving a patient with diffuse abdominal pain and a negative CT, the hospitalist should reevaluate the history, exam, and differential diagnosis before pursuing further diagnostic imaging. Based on the evidence presented, CT has similar diagnostic accuracy to ultrasound for biliary and gynecologic pathologies necessitating urgent surgical management (eg, acute cholecystitis, ovarian torsion), and a follow-up ultrasound adds little. If the utility of imaging remains in question, hospitalist consultation with a radiologist can clarify whether prior imaging answered the clinical question and the diagnostic utility of repeat abdominal imaging. With thoughtful reevaluation of the history and physical, and communication with radiology, hospitalists can reduce unnecessary, low-yield imaging and reduce healthcare costs when evaluating patients with abdominal pain.

Do you think this is a low-value practice? Is this truly a “Thing We Do for No Reason™”? Share what you do in your practice and join in the conversation online by retweeting it on Twitter (#TWDFNR) and liking it on Facebook. We invite you to propose ideas for other “Things We Do for No Reason™” topics by emailing TWDFNR@hospitalmedicine.org

Disclosures: The authors reported no conflicts of interest.

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