Complete Summary

GUIDELINE TITLE

Acute onset flank pain, suspicion of stone disease.

BIBLIOGRAPHIC SOURCE(S)

Rosenfield AT, Choyke PL, Bluth E, Bush WH Jr, Casalino DD, Francis IR, Jafri SZ, Kawashima A, Kronthal A, Older RA, Papanicolaou N, Ramchandani P, Sandler C, Segal AJ, Tempany C, Resnick MI, Expert Panel on Urologic Imaging. Acute onset flank pain, suspicion of stone disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 4 p. [32 references]

GUIDELINE STATUS

This is the current release of the guideline.

It updates a previous published version: Acute onset flank pain, suspicion of stone disease. Reston (VA): American College of Radiology (ACR); 2001. 3 p. (ACR appropriateness criteria). [25 references]

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

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SCOPE

DISEASE/CONDITION(S)

Acute onset of flank pain, suspicion of stone disease

GUIDELINE CATEGORY

Diagnosis
Evaluation
Screening

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Nephrology
Obstetrics and Gynecology
Radiology
Urology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of radiologic examinations for patients with acute onset flank pain or suspected urinary tract stones (calculi)

TARGET POPULATION

Patients with suspected ureteral stones who present with acute onset flank pain

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
    - Kidney, intravenous urography, intravenous pyelogram (IVP)
    - Abdomen, kidneys, ureters, bladder (KUB)
2. Computed tomography (CT), helical, without contrast
3. Ultrasound (US), renal, with Doppler and plain abdominal radiography of the KUB
4. Magnetic resonance imaging (MRI), kidney

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in evaluating patients with suspected ureteral stones who present with acute onset flank pain

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of peer-reviewed medical journals, and the major applicable articles were identified and collected.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed for reaching agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The

survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty percent agreement is considered a consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by the Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not performed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Acute Onset Flank Pain

Variant 1: Suspicion of stone disease.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, kidney, intravenous urography, IVP	8	
CT, kidney, helical, without contrast	8	

Radiologic Exam Procedure	Appropriateness Rating	Comments
US, renal, with Doppler and KUB	6	Preferred exam in pregnant and allergic patients.
MRI, kidney	4	
X-ray, abdomen, KUB	1	Most useful in patients with known stone disease.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Urinary tract stones (calculi) are thought to result from either excessive excretion and precipitation of salts in the urine or a relative lack of inhibiting substances. Men are more commonly affected than women, and the incidence increases with age until age 60. Blacks and children are affected less frequently. Renal calculi tend to be recurrent; therefore, evaluation with imaging is recommended at the initial presentation.

A renal calculus small enough to pass into the ureter may cause blockage of urine flow with distension of the upper urinary tract. Ureteral hyperperistalsis occurs, resulting in acute onset of sharp, spasmodic flank pain and hematuria. The ureter contains several areas where calculi commonly become lodged (i.e., at the ureteropelvic junction, the iliac vessels, and the ureterovesical junction). The probability of spontaneous passage of a ureteral calculus measuring 5 mm in axial diameter or less is very high. A 10 mm calculus, however, is very unlikely to pass spontaneously. Therefore, the treating physician wants to know the size of the calculus as well as its location and its effect on renal function.

Patients with a suspected diagnosis of renal colic have traditionally been evaluated with urinalysis, plain abdominal radiography (KUB), or excretory urography, commonly referred to as IVP. More recently, US, CT, and MRI have been used.

The plain film of the abdomen may be sufficient to diagnose ureterolithiasis in patients with known stone disease and previous KUBs. The sensitivity of the KUB for ureterolithiasis in other patients is poor. Studies found sensitivities of 62% and 58% when the radiographs were interpreted retrospectively. Another study correlated the KUB with noncontrast CT (NCT) retrospectively, so that an exact correlation was made between stones on the CT scan and the calcific density on the KUB. A sensitivity of only 59% was found for detecting ureteral calculi on the KUB. While the KUB may be a valuable part of the IVP or ultrasound evaluation of flank pain, it has a very limited role when used alone, and it should not be used to triage which patient should receive noncontrast CT.

Since the introduction of the use of NCT as the initial study in the evaluation of flank pain, numerous investigations have confirmed it to be the study with the

highest sensitivity (95%-96%) and specificity (98%) for ureterolithiasis. Virtually all stones are radio-opaque, and stone size can be accurately measured in cross-section, aiding in predicting outcome. Recently, coronal reconstruction of axial CT scans has been shown to more accurately predict stone size in the craniocaudad direction, although this dimension is not critical to estimating the likelihood of stone passage. The degree of perinephric stranding present on the affected side on NCT has also been shown to correlate inversely with the likelihood of stone passage, giving additional prognostic information, but this has been disputed in other studies.

The amount of stranding is related to the time after onset of pain and is usually not seen in the first two hours following the onset of flank pain. It may take up to 8 hours after the onset of pain to become maximal. Secondary signs such as ureteral dilatation and perinephric stranding allow CT to make the diagnosis of a recently passed stone. Noncontrast CT has been directly compared with the IVP in three series. Noncontrast CT was equal to the IVP in diagnosing obstruction and more reliable in diagnosing the presence of nephrolithiasis. Noncontrast CT is also reliable for the diagnosis of flank pain due to causes other than ureterolithiasis such as appendicitis, diverticulitis, and torsed ovarian masses. Noncontrast CT is safer than the IVP since it uses no contrast media, is rapid with the entire study taking minutes, and does not require the technical expertise that US does. When CT is available, it is the best first study in the nonpregnant adult presenting with flank pain likely to be due to stone disease and has been shown to be more cost effective. Concerns over radiation exposure, especially in young stone patients, have led to the development of reduced dose regimens.

The IVP is the previous standard study for ureterolithiasis and is still the best investigation if NCT is not available. It provides information regarding site and degree of obstruction, size of stone, and effect of obstruction on renal excretion. This examination has a number of relative contraindications, including renal insufficiency, dehydration, past reaction to iodinated contrast agents, and pregnancy. The availability of nonionic iodinated contrast material has reduced the risk of reaction. It may take several hours for excretion to occur in the presence of acute obstruction, in which case it is more time-consuming than the alternative techniques. Another disadvantage is the inability of the IVP to identify alternative diagnoses.

US is a safe, noninvasive imaging modality that can be used to study the urinary tract effectively. The diagnosis of obstructive urinary tract calculi depends on identification of the offending calculus and concomitant pelvicaliectasis and ureterectasis extending to the obstructing site. Because it may take many hours for pelvicaliectasis and ureterectasis to develop, US reportedly will miss over 30% of acute obstructions caused by a ureteral stone in patients who are not specifically hydrated for the study. Studies detected hydronephrosis in 7/20 (35%) and 16/22 (73%), respectively, nonhydrated patients with ureteral calculi. The use of intrarenal Doppler US improves the detection of early obstruction by evaluating for elevated resistive index (RI) in kidneys with nondilated collecting systems.

Since KUB is superior to US in detecting ureteral calculi, studies have recommended a combination of KUB and US. Ultrasound in these cases is used to detect ureteropyelocaliectasis and then to trace the dilated ureter to a shadowing

stone; US could also evaluate the presence and type of ureteral jet (with obstruction the jets were absent, diminished significantly in frequency or a constant slow trickle). In a series of 180 patients, the authors showed a 95% negative predictive value of the KUB/US combination, indicating that IVP was not likely to be helpful if the KUB/US tests were negative. However, IVP was indicated if the KUB/US combination was equivocal or if interventional treatment was anticipated. A comparison of KUB, US, combination of KUB/US, and IVP in 49 patients was also performed. The accuracy of KUB (61%) and US (69%) was lower than that of IVP (92%). The accuracy of the combination of KUB/US was 71%, still lower than that of IVP. In an effort to reduce the number of IVP examinations needed, a model was tested in which only patients with negative US results went on to have an IVP. This algorithm showed 93% sensitivity and 79% specificity. The advantage of US is the lack of ionizing radiation and its ability to show some calculi. For this reason it has been suggested for evaluating stones in pregnant women. Its disadvantages include the need for skilled personnel, the inability to accurately measure the size of the calculus, the need to observe the ureteral jet phenomenon at the ureterovesical junction, and the inability to differentiate dilatation without obstruction from true obstruction.

One study applied magnetic resonance urography (MRU) to the evaluation of 23 patients with acutely obstructed kidneys. They found 100% sensitivity for diagnosing obstruction, with perirenal fluid seen in 21 of 23 obstructed kidneys (87%) and in no normal kidneys. The site of the obstruction was seen in 80% of these obstructed kidneys. Round signal voids corresponding to the location of stones on correlative IVPs were seen in 12 of 18 patients with ureteric obstruction caused by a stone. These appearances were nonspecific and were also seen secondary to blood clot or tumor. MRU has been successfully used in pregnant patients with flank pain.

Anticipated Exceptions

Noncontrast CT is the most rapid and accurate technique for the evaluation of flank pain. If there is uncertainty about whether a calcific density represents a ureteral calculus or a phlebolith, contrast medium can be injected and the scan repeated for definitive diagnosis. The IVP, which is readily available and is familiar to nonradiologic physicians, is the technique of choice if CT is not available. In pregnant patients with flank pain, ultrasound is the best initial study. While a limited IVP is currently used to evaluate flank pain in pregnancy when the ultrasound study is not diagnostic, MRU has potential utility in diagnosing acute urinary tract obstruction without the use of ionizing radiation.

Abbreviations

- CT, computed tomography
- IVP, intravenous pyelogram
- KUB, kidneys, ureters, bladder
- MRI, magnetic resonance imaging
- US, ultrasound

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate evaluation of radiologic exam procedures for imaging in acute onset of flank pain, suspicion of stone disease

POTENTIAL HARMS

- Ultrasound (US) will reportedly miss over 30% of acute obstructions caused by a ureteral stone in patients who are not specifically hydrated for the study. Disadvantages of US include the need for skilled personnel, the inability to accurately measure the size of the calculus, the need to observe the ureteral jet phenomenon at the ureterovesical junction, and the inability to differentiate dilatation without obstruction from true obstruction
- Intravenous pyelogram (IVP): It may take several hours for excretion to occur in the presence of acute obstruction, so IVP is more time-consuming than the alternative techniques. IVP is also unable to identify alternative diagnoses.

CONTRAINDICATIONS

CONTRAINDICATIONS

Relative contraindications to intravenous pyelogram (IVP) include renal insufficiency, dehydration, past reaction to iodinated contrast agents, and pregnancy.

QUALIFYING STATEMENTS

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An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The

availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Rosenfield AT, Choyke PL, Bluth E, Bush WH Jr, Casalino DD, Francis IR, Jafri SZ, Kawashima A, Kronthal A, Older RA, Papanicolaou N, Ramchandani P, Sandler C, Segal AJ, Tempany C, Resnick MI, Expert Panel on Urologic Imaging. Acute onset flank pain, suspicion of stone disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 4 p. [32 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1995 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Urologic Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Arthur T. Rosenfield, MD (Principal Author); Peter L. Choyke, MD; Edward Bluth, MD; William H. Bush, Jr, MD; David D. Casalino, MD; Isaac R. Francis, MD; S. Zafar H. Jafri, MD; Akira Kawashima, MD, PhD; Alan Kronthal, MD; Robert A. Older, MD; Nicholas Papanicolaou, MD; Parvati Ramchandani, MD; Carl Sandler, MD; Arthur J. Segal, MD; Clare Tempany, MD; Martin I. Resnick, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

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GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

ACR Appropriateness Criteria® Anytime, Anywhere™ (PDA application). Available from the ACR Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This summary was updated by ECRI on September 7, 2004. The updated information was verified by the guideline developer on October 8, 2004. This summary was updated by ECRI on February 7, 2006.

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Date Modified: 10/9/2006