ACR Q&S Tools for Patient Care

Provide quality patient care with ACR Q&S tools:

- ACR Appropriateness Criteria®
- ACR accreditation — 10 modalities
- Diagnostic Imaging Center of Excellence™ (DICOE)
- Collaborative radiation safety awareness initiatives: Image Wisely® and Image Gently®
- National Radiology Data Registry
- Radiology Support, Communication and Alignment Network (R-SCAN)
- ACR Practice Parameters and Technical Standards
- RADPEER® and e-RADPEER™
Objectives

- Review the ACR Appropriateness Criteria® (AC) and their role in promoting appropriate imaging utilization.
- Review AC development process/methodology.
- Review specific AC features their use in clinical practice.
CMS.gov

- Protecting Access to Medicare Act (PAMA) 2014 directed CMS to establish program to promote use of appropriate use criteria (AUC) for advanced diagnostic imaging services
- AUC- evidence-based and assist professionals who order and furnish applicable imaging services to make most appropriate decisions for a specific clinical condition.
CMS

- The CY 2018 Physician Fee Schedule proposes requirements for consulting and reporting under the Medicare AUC program
- ACR is a “qualified Provider-Led Entity” (qPLE) approved to provide AUC under the Medicare program for advanced diagnostic imaging
ACR Appropriateness Criteria

- Evidence-based guidelines that assist providers to review the evidence for the most appropriate medical imaging or intervention

- Access
  - Continually updated criteria at acr.org/AC
  - Incorporated into clinical decision support (acrselect.org)
Reasons for Inappropriate Imaging

- Patient expectations and demands
- Concerns of liability exposure if diagnosis is delayed.
- Conflict of interest presented by physician ownership of imaging equipment (self-referral).
- Lack of specific guidance from radiologists.
- Lack of knowledge by ordering physicians and other providers:
  - Increasingly image ordering may be delegated to other allied health professionals
  - “Customary practice”
AC Patient Safety Goal

- To maximize the benefits of performing medical imaging and radiological procedures and minimize risk of harm to patients:
  - Eliminate unnecessary procedures (not needed or too often).
  - Eliminate inappropriate utilization (wrong procedure or procedure with unnecessary risk).
ACR Appropriateness Criteria®

- Based on best-available clinical data supplemented by expert opinion.

- Intended uses:
  1. Education
  2. Clinical decision guidance
     For a specific situation, what study is most likely to provide the necessary information?
Organization

- Task Force formed late 1993
- Quality and Safety Commission
- 22 expert panels
- Sub-committees
  - Methodology
  - Radiation Exposure

Table 1. Relative radiation level designations along with common example examinations for each classification

<table>
<thead>
<tr>
<th>Relative Radiation Level*</th>
<th>Adult Effective Dose Estimate Range</th>
<th>Pediatric Effective Dose Estimate Range</th>
<th>Example Examinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0 mSv</td>
<td>Ultrasound, MRI</td>
</tr>
<tr>
<td>★</td>
<td>&lt;0.1 mSv</td>
<td>&lt;0.03 mSv</td>
<td>Chest radiographs, Hand radiographs</td>
</tr>
<tr>
<td>★★</td>
<td>0.1-1 mSv</td>
<td>0.03-0.3 mSv</td>
<td>Pelvis radiographs, Mammography</td>
</tr>
<tr>
<td>★★★</td>
<td>1-10 mSv</td>
<td>0.3-3 mSv</td>
<td>Abdomen CT, Nuclear medicine bone scan</td>
</tr>
<tr>
<td>★★★★</td>
<td>10-30 mSv</td>
<td>3-10 mSv</td>
<td>Abdomen CT without and with contrast, Whole body PET</td>
</tr>
<tr>
<td>★★★★★</td>
<td>30-100 mSv</td>
<td>10-30 mSv</td>
<td>CTA chest abdomen and pelvis with contrast; Transjugular intrahepatic portosystemic shunt placement</td>
</tr>
</tbody>
</table>

*The RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (eg, the region of the body exposed to ionizing radiation, the imaging guidance that is used, etc.). The RRLs for these examinations are designated as “Varies.”
Expert Panel Composition

- Chaired by acknowledged expert.
- Generally, 10-14 members/topic.
- Broad representation
  - Geographic
  - Imaging modalities
  - Type of practice (while ensuring specialty expertise)
- Panel members appointed from non-radiological specialty societies.
  - >100 physicians from more than 25 societies now serving
  - Include AUA, ASN, ACEP
Factors Driving Selection of Clinical Conditions (Topics)

- Frequency of scenario.
- Economic importance.
- Potential to improve clinical outcomes.
- Sufficient number of high-quality studies to allow valid conclusions.
- Includes the development of clinical variants to encompass the spectrum of presentations of each condition.
Appropriateness Criteria Development

Panelist Selected as Topic Author:

- May collaborate with colleague or trainee
- Reviews and selects from available literature
- Based on selected articles, develops topic narrative using standard template
- Develops clinical variants with relevant imaging modalities or treatments
Appropriateness Criteria Development

- Systematic literature search (PubMed) by staff based on key words provided by author.
- Author assesses literature; identifies articles to retain and remove.
- Staff creates evidence table and evaluates study quality for citations.
Appropriateness Criteria Development

Evidence Table - Summarizes most important articles

- Citation/Reference
- Study Objective / Purpose of Study
- Number and Type of Patients or Events in Study
- Study Results
- Study Quality
## Sample Evidence Table: Hematuria

<table>
<thead>
<tr>
<th>Reference</th>
<th>Study Type</th>
<th>Patients/Events</th>
<th>Study Objective (Purpose of Study)</th>
<th>Study Results</th>
<th>Study Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Turney BW, Willatt JM, Nixon D, Crew JP, Cowan NC. Computed tomography urography for diagnosing bladder cancer. <em>BJU Int.</em> 2006;98(2):345-348.</td>
<td>Observational-Dx</td>
<td>200 patients</td>
<td>To evaluate the use of CTU for diagnosing bladder tumors in patients with macroscopic hematuria and aged ≥40 years.</td>
<td>The prevalence of bladder tumors was 34%; when CTU was compared with the histopathological findings, there was 1 false-positive and 3 false-negative diagnoses, indicating a sensitivity of 0.93 and a specificity of 0.99, with a 0.98 positive and 0.97 NPV for detecting bladder cancer. A review of the 3 false-negative cases showed that one was missed on original CTU reporting, the second had the appearance of prostate cancer on CTU and the third was a squamous metaplasia.</td>
<td>3</td>
</tr>
<tr>
<td>11. Park SB, Kim JK, Lee HJ, Choi HJ, Cho KS. Hematuria renal venous phase multidetector row CT of the bladder—a prospective study. <em>Radiology.</em> 2007;245(3):798-805.</td>
<td>Observational-Dx</td>
<td>118 patients</td>
<td>To prospectively determine the accuracy of renal venous phase helical multidetector row CT for bladder lesion evaluation in patients with hematuria by using cystoscopy as the reference standard.</td>
<td>Multidetector row CT showed excellent per lesion (kappa = 0.838) and per patient (kappa = 0.881) agreement between the 2 reviewers. Respective per lesion and per patient agreement between the CT and cystoscopic findings was also excellent in the first (kappa = 0.866 and kappa = 0.881) and second (kappa = 0.802 and kappa = 0.863) reviewers. The sensitivity and specificity of multidetector row CT were 89%–92% and 88%–97%, respectively, in the per lesion analysis and 95% and 91%–93%, respectively, in the per patient analysis for both reviewers. All statistical parameters of diagnostic accuracy were similar between the 2 reviewers (P &gt; 0.05).</td>
<td>2</td>
</tr>
<tr>
<td>12. Sadow CA, Silverman SG, O’Leary MP, Simorovitch JE. Bladder cancer detection with CT urography in an Academic Medical Center. <em>Radiology.</em> 2008;249(1):195-202.</td>
<td>Observational-Dx</td>
<td>838 CT urograms in 779 patients</td>
<td>To evaluate the performance characteristics of CTU for the detection of bladder cancer in patients at risk for the disease.</td>
<td>The overall sensitivity, specificity, accuracy, PPV, and NPV for bladder cancer detection were 75% (117/149), 94% (649/689), 91% (766/838), 75% (117/157), and 95% (649/681) for CTU and 95% (142/149), 92% (634/689), 93% (776/838), 72% (142/197), and 99% (634/641) for cystoscopy. The NPV of CTU was higher in patients evaluated for hematuria alone (98%, 589/603). However, the accuracy of CTU was considerably lower in patients with a prior urothelial malignancy (78%, 123/158).</td>
<td>3</td>
</tr>
</tbody>
</table>
Evidence Table: Study Quality Elements

1. Uncertainty measure (or range) of the statistical measure, e.g., CI, \( P \)-values, etc.
2. Prospective study, i.e., data collection planned in advance.
3. Systematic recruitment or a consecutive series.
4. Imaging, pathologic, or clinical reference standard or comparison of at least 2 tests.
5. Reference standard/tests have been applied to all the same way.
6. Two or more independent readers (i.e., not consensus reads).
7. Index test blinded interpretation.
8. Reference standard or tests blinded.
Appropriateness Criteria Development

- Evidence Table: Study Quality Categories
  - Category 1: Well-designed and accounts for common biases.
  - Category 2: Moderately well-designed and accounts for most common biases.
  - Category 3: Important study design limitations.
  - Category 4: Not useful as primary evidence: may not be clinical study, study design is invalid, or conclusions are based on expert consensus.
  - Category M: Meta-analysis studies are not rated for study quality using the study element method
Appropriateness Criteria Development

Evidence Table: Study Quality Categories

- Category 1: All study elements present
- Category 2: 6-7 study elements present
- Category 3: 3-5 study elements present
- Category 4: ≤ 2 study elements present
Appropriateness Criteria Development

- Author(s) update/create topic and variants with imaging procedures or treatments.
- Panel review and rating rounds.
- Final AC Committee review.
- Topics updated every 3 years or more frequently when needed.
Criteria Development

Rating Process-Modified Delphi Technique

- Based on RAND/UCLA Appropriateness Method.
- Ratings are individual’s assessment of the risks balanced with benefits of performing a specific procedure for a specific clinical scenario.
- Two rating rounds. Conference call after first round.
- To determine panel’s final recommendation, rating category containing median group rating without disagreement is selected.
- The ratings based on available evidence. If evidence is incomplete or unavailable, expert opinion used.
- Ratings do NOT take into account expertise, availability, or cost.
## Appropriateness Category Names and Definitions

<table>
<thead>
<tr>
<th>Rating</th>
<th>Category Name</th>
<th>Category Definition</th>
<th>Disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>7, 8, or 9</td>
<td>Usually appropriate</td>
<td>The imaging procedure or treatment is indicated in the specified clinical scenarios at a favorable risk-benefit ratio for patients.</td>
<td>The dispersion of the individual ratings from the panel median rating is assessed to determine if there is no disagreement.</td>
</tr>
<tr>
<td>4, 5, or 6</td>
<td>May be appropriate</td>
<td>The imaging procedure or treatment may be indicated in the specified clinical scenarios as an alternative to imaging procedures or treatments with a more favorable risk-benefit ratio, or the risk-benefit ratio for patients is equivocal.</td>
<td>When the individual ratings are too dispersed from the panel median (disagreement), “May be appropriate” is the designated rating category.</td>
</tr>
<tr>
<td>1, 2, or 3</td>
<td>Usually not appropriate</td>
<td>The imaging procedure or treatment is unlikely to be indicated in the specified clinical scenarios, or the risk-benefit ratio for patients is likely to be unfavorable.</td>
<td></td>
</tr>
</tbody>
</table>
Sample Topic

Clinical Condition: Incidentally discovered adrenal mass

**Variant 1:** No history of malignancy; mass 1-4 cm. Initial evaluation.

**Variant 2:** No history of malignancy; mass 1-4 cm. Follow-up evaluation for indeterminate lesion on initial evaluation.

**Variant 3:** No history of malignancy; mass >4 cm. (if not typical for adenoma, myelolipoma, hemorrhage or simple cyst, consider resection.)

**Variant 4:** History of malignancy; mass <4cm. Initial evaluation.

**Variant 5:** History of malignancy; mass > 4cm.
Sample Variant Table

Variant 1: No history of malignancy; mass 1-4 cm in diameter. Initial evaluation.

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT abdomen without IV contrast</td>
<td>8</td>
<td>Presumes that a noncontrast CT has not already been performed and that there are no suspicious imaging features. Should be evaluated by radiologist to determine if contrast administration is needed.</td>
<td>4</td>
</tr>
<tr>
<td>CT abdomen without and with IV contrast</td>
<td>8</td>
<td>Indicated if noncontrast CT is not diagnostic or if there are concerning imaging features of malignancy. Delayed imaging obtained to calculate washout.</td>
<td>6</td>
</tr>
<tr>
<td>MRI abdomen without IV contrast</td>
<td>8</td>
<td>May be helpful when nonenhanced CT is equivocal or if there is suspicious imaging features. Appropriate for patient with iodinated contrast allergy.</td>
<td>0</td>
</tr>
<tr>
<td>MIBG</td>
<td>2</td>
<td>Only for suspicion of pheochromocytoma.</td>
<td>3</td>
</tr>
<tr>
<td>MRI abdomen without and with IV contrast</td>
<td>2</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>US adrenal gland</td>
<td>1</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Biopsy adrenal gland</td>
<td>1</td>
<td>Varies</td>
<td></td>
</tr>
<tr>
<td>CT abdomen with IV contrast</td>
<td>1</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>X-ray abdomen</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Iodocholesterol scan</td>
<td>1</td>
<td>This agent may be used to detect functionally active adenomas.</td>
<td>5</td>
</tr>
<tr>
<td>FDG-PET/CT skull base to mid-thigh</td>
<td>1</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

* Relative Radiation Level
# Hematospermia

**Variant 1:** Man <40 years of age, transient or episodic hematospermia, and no other symptoms or signs of disease.

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>US pelvis (prostate) transrectal</td>
<td>3</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>MRI pelvis without IV contrast</td>
<td>3</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>MRI pelvis without and with IV contrast</td>
<td>3</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CT pelvis with IV contrast</td>
<td>1</td>
<td></td>
<td>★★★</td>
</tr>
<tr>
<td>CT pelvis without IV contrast</td>
<td>1</td>
<td></td>
<td>★★★</td>
</tr>
<tr>
<td>CT pelvis without and with IV contrast</td>
<td>1</td>
<td></td>
<td>★★★★</td>
</tr>
<tr>
<td>Arteriography pelvis</td>
<td>1</td>
<td></td>
<td>★★★★</td>
</tr>
</tbody>
</table>

*Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

**Variant 2:** Man ≥40 years of age, or man of any age with persistent hematospermia, or hematospermia accompanied by associated symptoms or signs of disease.

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>US pelvis (prostate) transrectal</td>
<td>8</td>
<td>This procedure is indicated if TRUS is negative or inconclusive. MRI can be used to evaluate for suspected prostate cancer or ejaculatory duct obstruction. This procedure should include dynamic contrast-enhanced MRI for suspected prostate cancer.</td>
<td>O</td>
</tr>
<tr>
<td>MRI pelvis without and with IV contrast</td>
<td>8</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>MRI pelvis without IV contrast</td>
<td>7</td>
<td>This procedure is indicated if TRUS is negative or inconclusive. MRI can be used to evaluate for suspected prostate cancer or ejaculatory duct obstruction.</td>
<td>O</td>
</tr>
<tr>
<td>CT pelvis with IV contrast</td>
<td>2</td>
<td></td>
<td>★★★</td>
</tr>
<tr>
<td>Arteriography pelvis</td>
<td>2</td>
<td></td>
<td>★★★★</td>
</tr>
<tr>
<td>CT pelvis without and with IV contrast</td>
<td>1</td>
<td></td>
<td>★★★★</td>
</tr>
<tr>
<td>CT pelvis without IV contrast</td>
<td>1</td>
<td></td>
<td>★★★★</td>
</tr>
</tbody>
</table>

*Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level
Summary of Literature Review

Introduction/Background

Hematospermia (HS), or hemospermia, the presence of blood in the ejaculate or semen, has been recognized for centuries. Although it is not uncommon to encounter HS in clinical practice, the exact prevalence and incidence are not known. Most men with HS are young (<40 years of age), and HS may occur either as a single episode or repeatedly over time. It is typically a cause of great anxiety to men, mainly because of the imagined possibility of underlying malignancy or venereal disease. HS may be associated with pathology in the prostate gland, seminal tract (vesicles, vasa deferentia, and ejaculatory ducts), verumontanum, urethra, urinary bladder, epididymis, or testes, with cited causes reported to include prior prostatic biopsy, prostatic calculi, inflammatory or infectious conditions such as prostate or seminal vesiculitis, ductal obstruction, prostatic cyst formation, and rarely vascular malformations. The majority of cases of HS were thought to be idiopathic in nature; however, as a result of improved imaging techniques, the number of cases labeled as idiopathic has decreased significantly, with one of the main sites of bleeding occurring in the seminal vesicles [1-13]. Of specific etiologies, infectious or inflammatory conditions are the most common, accounting for approximately 40% of HS cases overall. An infectious or inflammatory condition of the urogenital tract is the most common etiology in men <40 years of age [1,6,9,14].

Malignant tumors are infrequently associated with HS but need to be excluded in men ≥40 years of age. In a study by Han et al [15] involving 26,126 men who underwent routine prostate cancer screening, only 0.5% had HS, but 13.7% who reported HS were diagnosed with prostate cancer. Moreover, the presence of HS was shown to be a significant predictor of prostate cancer diagnosis (odds ratio =1.73) after adjusting for age, serum prostate-specific antigen (PSA), and digital rectal examination results through a logistic regression model. Other studies have reported a lower percentage of prostate cancer in men ≥40 years of age presenting with hematospermia, ranging from 2.6% to 6% [1,5,13,14,16]. Therefore, when a man ≥40 years of age presents with HS, screening for prostate cancer is recommended. Furthermore, when HS is persistent or refractory or has concomitant urological tract symptoms, noninvasive imaging and other diagnostic testing are typically performed to exclude an underlying correctible etiology, which includes obstruction or stricture at the level of the verumontanum, calculi, and cysts [7,17-19].

Overview of Imaging Modalities

Transrectal ultrasound (ultrasound pelvis [prostate] transrectal)

Transrectal ultrasound (TRUS) is a safe, inexpensive, effective, noninvasive, radiation-free imaging technique often used as the primary screening or diagnostic modality in men with HS to evaluate the prostate gland and seminal tract. Patients are typically placed in the left lateral decubitus position, and grayscale images are obtained with a 5.0- to 10-MHz TRUS transducer in axial and sagittal planes [12,13,19,20]. Color and power Doppler images can also be acquired, particularly when prostate cancer is suspected and prostatic biopsy is contemplated [2,8]. TRUS-guided aspiration or biopsy of the seminal vesicles or prostate gland can be performed to further elucidate the site of bleeding, to provide a definitive diagnosis if a lesion is detected, or to confirm the presence of ejaculatory duct obstruction [4,15].
Magnetic resonance imaging
Magnetic resonance imaging (MRI), with its excellent soft-tissue contrast, provides radiation-free, multiplanar, high-spatial-resolution anatomic evaluation of the prostate gland and seminal tract. Imaging should be performed at either 1.5T or 3T, although there is no consensus at this time on the appropriate coil selection or field strength. The fundamental advantage of 3T over 1.5T is increased signal-to-noise ratio, which improves the spatial, temporal, and spectral resolution. Comparable performance between multichannel phased array coil MRI of the prostate at 3T and endorectal phased array coil MRI at 1.5T has been reported [20]. As opposed to TRUS, MRI is operator independent and can be performed when TRUS is unsatisfactory or nondiagnostic. Subsequently, small field-of-view axial T1-weighted images and axial, sagittal, and coronal T2-weighted images are obtained for high-resolution evaluation of the prostate gland, seminal vesicles, ejaculatory ducts, and ampullary portions of the vasa deferentia, followed by large field-of-view images to evaluate for pelvic lymphadenopathy [3,7,10,21]. The increasing availability of 3T MRI, which offers a higher signal-to-noise ratio and improved spatial resolution, may preclude the use of an endorectal coil for evaluating the seminal tract [22].

Computed tomography
Computed tomography (CT) is a noninvasive imaging modality that uses ionizing radiation to identify calcifications, gross soft-tissue masses, or cystic lesions of the prostate gland and seminal vesicles. However, it has limited value in the etiologic determination of HS given its lack of soft-tissue contrast and limitation in differentiating structural changes of the prostate and seminal tract [11,21].

Pelvic angiography
Pelvic angiography can be useful to evaluate for vascular causes of HS and is mainly reserved for men with intractable HS with or without hematuria when clinical, laboratory, and noninvasive imaging evaluations have not revealed an etiology. If an arterial source of hemorrhage is identified, such as from the internal pudendal artery, transcatheter arterial embolization can be performed in the same session for therapeutic purposes [23].

Discussion of Imaging Modalities by Variant
Factors that determine the extent of investigation are patient age, duration of HS, and associated symptoms and signs. However, a confounding issue is that currently there are no consensus or society guidelines on the distinction between transient or episodic HS and persistent HS. The distinction has been based on either the number of ejaculates or a specific time period, with differing opinions. Ultimately the decision to pursue further investigation will be made by the referring physician, typically a urologist.

Variant 1: Man <40 years of age, transient or episodic hematospermia, and no other symptoms or signs of disease.
Imaging assessment is not generally recommended for this patient population because watchful waiting, reassurance, and routine clinical evaluation may suffice, given that HS is apt to be a benign and self-limited condition unassociated with a significant underlying disease process [1,5,6,9,11,14,24]. The approach to any patient with HS begins with a detailed history and physical examination. Determination of the origin of bleeding within the ejaculate is vital, as postcoital hemorrhage from the patient’s sexual partner may sometimes be mistaken for HS. Laboratory testing includes visual analysis of the ejaculate for red discoloration, microbiological testing, semen analysis, urinalysis, urine culture, assessment of serum coagulation, a serum chemistry panel, and a complete blood count [1,6,20,25].
Variant 2: Man ≥40 years of age, or man of any age with persistent hematospermia, or hematospermia accompanied by associated symptoms or signs of disease.

Noninvasive imaging techniques, predominantly TRUS and MRI, are recommended in patients ≥40 years of age with persistent or refractory HS or other associated symptoms or signs of disease [1,7,9-13,19,20,26]. All patients ≥40 years of age should be screened for prostate cancer by checking a PSA level [6,14,15,20,25,27]. Although not addressed by the medical literature, TRUS or pelvic MRI can be performed to allay anxiety and provide reassurance that no significant pathology exists in patients with negative history and physical examination.

TRUS

Many investigators have reported that TRUS should be used as the first-line imaging tool in this patient population. TRUS is very sensitive for detecting a variety of abnormalities that may involve the prostate gland and seminal tract in the setting of HS, reportedly demonstrating abnormalities in 82% to 95% of men with HS [4,12,13,19,21]. Abnormalities may include calcifications or calculi in the prostate, ejaculatory ducts, or seminal vesicles; seminal vesicle, ejaculatory duct, or prostatic cysts; benign prostatic hypertrophy; prostatitis; and Cowper gland masses. However, it is important to consider that some of these abnormalities can be found in asymptomatic patients, such as benign prostatic hyperplasia and prostatic calcifications, which are age-related changes, and nonobstructing prostatic cysts [10,13,28,29]. TRUS has shown utility in guiding transperineal aspiration of the seminal vesicles [4]. A recent prospective trial enrolled 106 patients with persistent HS and found the diagnostic accuracy of TRUS and transurethral seminal vesiculoloscopy was 45.3% and 74.5%, respectively, although the diagnostic accuracy was higher when both modalities were combined. Vesiculoloscopy was most useful in the detection of calculi and obstruction/stricture at the level of the verumontanum orifice or ejaculatory duct [19].

Magnetic resonance imaging

MRI has been recommended when TRUS results are negative or inconclusive [1,3,6,10,20]. It should be emphasized that MRI has no established role in screening for prostate cancer; the utility of MRI in this patient population is in demonstrating anatomic abnormalities in the prostate gland and ejaculatory tract that may be accounting for the HS. The multiplanar ability of MRI to accurately depict structural changes in the prostate, seminal vesicles, ampulla of vas deferens, and ejaculatory ducts has enabled the modality to be particularly useful in determining the organ of origin of midline or paramedian prostatic cysts and to provide more accurate causative information compared to TRUS regarding ejaculatory duct obstruction and location and age of hemorrhage within the seminal tract [3,7,10,21]. Seminal vesicle width ≥1.7 cm or tubular duct diameter >5 mm is consistent with dilatation or enlargement and more likely caused by distal ejaculatory duct obstruction in the setting of persistent HS. This information aids in determining optimal surgical management in cases of transurethral resection of the ejaculatory duct or appropriate selection of ejaculatory duct orifice for cannulation during vesiculoloscopy [3,7,10,21].
Hematospermia

Summary of Recommendations
- HS is an anxiety-provoking but otherwise generally benign and self-limited condition that is infrequently associated with significant underlying pathology and is most often considered to be idiopathic in nature.
- Watchful waiting, reassurance, and routine clinical evaluation typically suffice in men <40 years of age with transient HS and no other symptoms or signs of disease. When a cause can be identified, infection of the urogenital tract is the most common etiology of HS in men <40 years of age.
- Noninvasive imaging techniques, predominantly TRUS and MRI, can be used in men ≥40 years of age or men of any age with persistent or refractory HS or other associated symptoms or signs of disease. In men ≥40 years of age who have HS, screening for prostate cancer is advised.

Summary of Evidence
Of the 29 references cited in the ACR Appropriateness Criteria® Hematospermia document, 23 are categorized as diagnostic references, including 2 good-quality studies and 3 quality studies that may have design limitations. Additionally, 6 references are categorized as therapeutic references, including 1 good-quality study and 3 quality studies that may have design limitations. There are 20 references that may not be useful as primary evidence.

The 29 references cited in the ACR Appropriateness Criteria® Hematospermia document were published from 1974 through 2014.

Although there are references that report on studies with design limitations, 3 good-quality studies provide good evidence.
Current Status

- Latest release – April 2017
- 230 topics/clinical conditions with over 1,100 variants
- Available on ACR website at [www.acr.org/ac](http://www.acr.org/ac)
  - Basic Access (Browse the AC topic listing)
  - Advanced Search: Interactive view; Log in (registration is free) to access these additional features:
    - Enhanced navigation
    - Advanced search and filtering
    - Mobile-friendly access
ACR Appropriateness Criteria®

Access the appropriateness criteria ratings tables and narratives

Best viewed in Firefox 15+, Chrome 15+, Internet Explorer 9+, and Safari 5+

Use the buttons below to access the AC rating tables and narrative documents. "Basic Access" lists topics by panel and does not require login.

- BASIC ACCESS
  - Browse the list of AC topics and ratings tables

- ADVANCED SEARCH
  - Search and filter AC topics and ratings tables (login required)

The ACR Appropriateness Criteria® (AC) are evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition. Employing these guidelines helps providers enhance quality of care and contribute to the most efficacious use of radiology. Learn More

November 2015 Update — The latest release of the ACR Appropriateness Criteria includes three new and 19 revised topics covering a total of 211 clinical conditions.

- NEW & REVISED TOPICS
## 21 Urologic Topics

<table>
<thead>
<tr>
<th>Topic</th>
<th>Narrative &amp; Rating Table</th>
<th>Evidence Table</th>
<th>Lit Search</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Onset Flank Pain-Suspicion of Stone Disease (Urolithiasis)</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Acute Onset of Scrotal Pain — without Trauma, without Antecedent Mass</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Acute Pyelonephritis</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Hematospermia</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Hematuria</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Incidentally Discovered Adrenal Mass</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Indeterminate Renal Mass</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Lower Urinary Tract Symptoms: Suspicion of Benign Prostatic Hyperplasia</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Post-treatment Follow-up of Prostate Cancer</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Post-treatment Follow-up of Renal Cell Carcinoma</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Post-Treatment Surveillance of Bladder Cancer</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Pretreatment Staging of Invasive Bladder Cancer</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Prostate Cancer—Pretreatment Detection, Surveillance, and Staging</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Recurrent Lower Urinary Tract Infections in Women</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Renal Cell Carcinoma Staging</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Renal Transplant Dysfunction</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Renal Trauma</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Renovascular Hypertension</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Staging of Testicular Malignancy</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
<tr>
<td>Suspected Lower Urinary Tract Trauma</td>
<td>Narrative &amp; Rating Table</td>
<td>Evidence Table</td>
<td>Lit Search</td>
</tr>
</tbody>
</table>
Uses of ACR Appropriateness Criteria®

Order Entry / EMR / Radiology Decision Support

ACR Select

- Web based radiology decision support that contains the AC.
- www.acrselect.org
Questions?