QUALITY AND APPROPRIATENESS IN CARDIAC IMAGING

Robert C. Hendel, MD, FACC, FAHA, FASNC

Chair, ACCF/UHC SPECT Pilot
Chair, Appropriateness Use Criteria Implementation and Evaluation (ACC)
Member, Appropriateness Use Criteria Task Force (ACC)
### Robert C. Hendel, MD

The following relationships exist related to this presentation:

<table>
<thead>
<tr>
<th>Category</th>
<th>Company/Institution</th>
<th>Modesty</th>
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<tr>
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<td>Organizational</td>
<td>ACC (Appropriate Use Criteria Task Force, others)</td>
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<td>ICANL (Board of Directors)</td>
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</table>
FOCUS ON MEDICAL IMAGING
MEDPAC Evaluation of Physician Services

Growth of All Physician Services

Includes all Services in the Physician Fee Schedule
Source: MEDPAC Analysis of Medicare Claims Data
March 17, 2005, Executive Director, Medicare Payment Advisory Commission, Mark Miller, htm
MEDICARE PAYMENT ADVISORY COMMISSION (MEDPAC) EVALUATION OF THE GROWTH IN PHYSICIAN SERVICES 2000-2004 AND 2004-2005

Report to Congress, Medicare Payment Advisory Commission
Physician Services, March, 2007

Hendel RC. 2008
JACC-Imaging 1: 241.
GEOGRAPHIC VARIATIONS IN IMAGING STRESS TESTING PROCEDURE RATES

- Up to 8-fold variation
- Often not risk-adjusted (GAO)

THE “CASE” FOR SELF-REFERRAL
SPECT MYOCARDIAL PERFUSION IMAGING UTILIZATION
RADIOLOGISTS & CARDIOLOGISTS, MEDICARE 1998-2006

*98-’02 data in Levin DC, Intenzo CM, Rao VM et al, JACR 2005; 2: 821

**Data from Intenzo CM, Rao VM et al, JACR 2005; 2: 821

Cardiologists: +159%
Radiologists: -8%
THE INCREASE OF IN-OFFICE IMAGING
Factors Beyond Self-Referral

- Technological advances
- Expanded applications
- “True” expertise
- Avoidance of “other” methods
- Patient-centered (demand)
- Fear of litigation
Patients deserve (and demand) the highest level quality of health care, including ready access to imaging.

Providing imaging within specialities and practices does not make it “bad” by definition:
- Allows for clinical integration
- May allow for earlier, less invasive, more accurate diagnosis
- Quality is critical, irrespective of location
UTILIZATION MANAGEMENT FOR CARDIAC IMAGING

METHODS

- Non-coverage
- Privileging (exclusion)
- Profiling
- Prior notification
- Pre-certification (prior authorization)

RBM (RADIOLOGY BENEFITS MANAGERS)

- Procedural governors
- Increasing penetration
- Focus on ordering clinician, often PCP
- Incentivized to reduce volume/cost
CONCERNS REGARDING PRE-CERTIFICATION AND PRIOR NOTIFICATION

- No evidence for improved quality of care
- Favors indiscriminant volume reduction
- Lack of transparency
- Not firmly based on appropriateness criteria
- Inconsistent processes, with confusion and inefficiency
- Reduced timeliness
- Labor intensive
- Negative economic impact
- Steerage to the test of least resistance
- Scant data available for feedback/education
- No opportunity to refine process
- No correlation with imaging results or outcome
- No mechanism to understand practice variation or local expertise

Hendel RC, 2008
JACC-Imaging 1: 241-8
WHY APPROPRIATENESS?

Background

• Unprecedented focus on assessment and improving quality

• Explosive growth of CV imaging

• Substantial regional variation

• True nature of utilization unknown
  – Overuse/Underuse/Appropriate

• Clinicians, patients, and especially payers seeking guidance
• “We are not aware of any peer-review studies that conclusively show the role of imaging in reducing overall health care costs”
  –GAO, 2008

• “I am not aware of any studies that conclusively show the role of RBM’s in reducing overall health costs or improving quality
  –R. Hendel, 2009
PHYSICIAN RESPONSES TO MEDICAL IMAGING "CRISIS"

Individual Practitioner

- Ignorance of problem
- Medicolegal fears
- Arrogance
- Gratuitous practice
- Economic incentive
ORGANIZATIONAL RESPONSES TO MEDICAL IMAGING “CRISIS”
ASNC, ACC and Subspecialty Organizations

- Think Tank meetings on image quality
- Support of accreditation
- Establishment of policy on self-referral
- Focus on quality and access
- Development of AUC
- Development of alternatives to RBM, including point-of-service decision support tools.
CONTINUED EMPHASIS ON QUALITY IN IMAGING

Patient selection → Image acquisition → Image interpretation → Results communication → Better patient care

- Appropriateness criteria
- Provider education
- Lab accreditation
- Certification
- Accuracy
- Reproducibility
- Physician competency
- Key data elements
- Uniform structured reports
- Timeliness standards
- Registries
- Research
- Outcomes, Value
MANDATORY IMAGING
LABORATORY ACCREDITATION

- Endorsed by ACC and subspecialty organizations (ASNC, ASE)

- Provided by ACR or ICA (Intersocietal Accreditation Commission)
  - ICAVL, ICANL, ICAEL, ICAMRL, ICACTL

- United Healthcare and other require accreditation
  - CT and CTA
  - CMR and MRA
  - Nuclear cardiology
  - PET
  - Echocardiography

- CMS to require lab accreditation by 2012
ICANL  
Intersocietal Commission for the Accreditation of Nuclear Medicine Laboratories

- 1,719 accredited labs, 2,406 sites (8/25/09)
- Sponsored by ASNC, ACC, SNM, SNM-TS, AMI, ACNP
- Substantial QA review, sample reports
- Site visits now selective
- 33% re-accreditation applications

ICACTL  
Intersocietal Commission for the Accreditation of Computed Tomography Laboratories

- 45 accredited lab/sites for CCS, CCTA
- Sponsoring organizations:
  - American Academy of Neurology
  - American Academy of Otolaryngology
  - American Association of Physicists in Medicine
  - American College of Cardiology
  - American Society of Echocardiography
  - American Society of Nuclear Cardiology
  - Society for Cardiovascular Angiography and Interventions
  - Society for Vascular Surgery
  - Society of Cardiovascular Computed Tomography
  - Society of Nuclear Medicine
- Substantial QA review, sample reports, representative cases

• Ensures quality
• Basis for reimbursement

  Payers often now requiring accreditation
  Accreditation mandated by ACC and ASNC
Sponsoring organizations
- American College of Cardiology
- American Society of Nuclear Cardiology
- Society of Cardiovascular Angiography and Interventions
- Society of Cardiovascular Computed Tomography

First exam, September 22, 2008

731 diplomates (as of 8/26/09)

www.cbcct.org

NRC recognized pathway for AU Status

Sponsoring organizations
- American College of Cardiology
- American Society of Nuclear Cardiology

First exam, September 7, 1996

6,508 diplomates (as of 8/26/09)

www.cbnc.org

The mission of the Certification Board of Cardiovascular Computed Tomography (CBCCT) is to promote and enhance patient care by defining the domain of cardiovascular computed tomography and identifying the requisite knowledge and skills for quality practice through a certification program that fosters excellence and encourages continual learning.

731 diplomates (as of 8/26/09)

www.cbcct.org
GUIDELINES, MEASURES, AND APPROPRIATENESS CRITERIA

• Clinical Guidelines\(^1\)
  – Exhaustive review of literature
  – Virtually all-inclusive
  – Best practice
  – “Should do, should not do”

• Performance Measures\(^2\)
  – Selective, focused, measurable
  – Based on guidelines
  – “Must do”
  – Tools for quality measurement

• Appropriateness Criteria\(^3\)
  – Selective indications
  – Largely guideline based
  – Clinical scenarios
  – “Reasonable to do”


ACCF APPROPRIATENESS USE CRITERIA

- Literature-based (when possible) approach to improve utilization of resource-intensive tests and procedures
  - Developed by physicians/providers
  - Initial focus on cardiac imaging
  - Expansion to revascularization, potential for other procedures

- Serves as a method for focused reduction of procedures based on clinical value, not indiscriminant volume reduction

- Keeps money within the system and permits continuous quality improvement though education

- Preserves patient/provider relationship

- Provides for continued patient access
APPROPRIATE USE CRITERIA

The ACC Queue

- ☑ Nuclear cardiology (SPECT)
  October, 2005
- ☑ Cardiac CT/CMR
  September, 2006
- ☑ Echocardiography (TTE, TEE)
  July, 2007
- ☑ Echocardiography (Stress)
  December, 2007
- ✔ Percutaneous coronary intervention
  December, 2008
- ✔ Revised radionuclide imaging criteria (5/16/09)
  • CV imaging cross modality (efficiency) evaluation
  • Revised CT criteria
WHAT IS AN APPROPRIATE IMAGING STUDY?

An appropriate imaging study is one in which the expected incremental information, combined with clinical judgment, exceeds the expected negative consequences* by a sufficiently wide margin for a specific indication that the procedure is generally considered acceptable care and a reasonable approach for the indication.

*Negative consequences include the risks of the procedure (i.e., radiation or contrast exposure) and the downstream impact of poor test performance such as delay in diagnosis (false negatives) or inappropriate diagnosis (false positives).
APPROPRIATE USE CRITERIA USING THE RAND/DELPHI METHODOLOGY

Balanced panel comprised of different types of experts rates the indications in two rounds

1st Round – No interaction
Face-to-Face Meeting

2nd Round – Panel interaction

Appropriateness Score
(7-9) Appropriate
(4-6) Possibly Appropriate/Uncertain
(1-3) Inappropriate

% Use that is Appropriate, Uncertain, Inappropriate

Increase Appropriateness

A Report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the American College of Emergency Physicians, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the Society of Cardiovascular Computed Tomography, the Society of Cardiovascular Magnetic Resonance, and the Society of Nuclear Medicine

CARDIAC RADIONUCLIDE IMAGING WRITING GROUP
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Marcelo F. Di Carli, MD, FACC, FSNM
Paul A. Heidenreich, MD, FACC
Robert E. Henkin, MD, FACR
Patricia A. Pellikka, MD, FACC, FASE
Gerald M. Pohost, MD, FACC, FSCMR
Kim A. Williams, MD, FACC, FAHA

J Am Coll Cardiol, 2009; 53:2201-2229
KEY DEFINITION

ISCHEMIC EQUIVALENT:

Chest Pain Syndrome, Anginal Equivalent, or Ischemic

ECG abnormalities: Any constellation of clinical findings
that the physician feels is consistent with obstructive coronary
artery disease. Examples of such findings include, but are not
exclusive to, chest pain, chest tightness, burning, shoulder
pain, palpitations, jaw pain, and new ECG abnormalities
suggestive of ischemic heart disease. Non-chest pain
symptoms, such as dyspnea or worsening effort tolerance that
are felt to be consistent with CAD may also be considered to
be an anginal equivalent.
## APPROPRIATENESS USE CRITERIA FOR RADIONUCLIDE CARDIOVASCULAR IMAGING

### Clinical Stratification (1)

### PRE-TEST PROBABILITY OF CAD

Diamond, GA, Forrester JS  
NEJM 1979; 300: 1350-8

Adapted from ACC/AHA Exercise Testing Guidelines Gibbons et al, 2002  
Available [www.acc.org](http://www.acc.org)

Modified for AUC RNI (Hendel et al, 2009)

### CORONARY HEART DISEASE RISK

Adapted from 3rd Report of the NCEP Panel Adult Treatment Panel III (ATP III)  
ACC/AHA Scientific Statement: NIH Publication No. 02-5215  
[www.nhlbi.nih.gov](http://www.nhlbi.nih.gov)

- **Low:** 10-year absolute CHD risk <10%
- **Moderate:** 10-year absolute CHD risk 10-20%
- **High:** DM ≥ 40 y.o.a, PAD, or 10-year absolute CHF risk > 20%

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Typical/Definite Angina Pectoris</th>
<th>Atypical/Probable Angina Pectoris</th>
<th>Nonanginal Chest Pain</th>
<th>Asymptomatic</th>
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</thead>
<tbody>
<tr>
<td>&lt; 39</td>
<td>Men</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Low</td>
<td>Very low</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>Intermediate</td>
<td>Low</td>
<td>Low</td>
<td>Very low</td>
</tr>
<tr>
<td>40 S 49</td>
<td>Men</td>
<td>High</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>Intermediate</td>
<td>Low</td>
<td>Intermediate</td>
<td>Very low</td>
</tr>
<tr>
<td>50 - 59</td>
<td>Men</td>
<td>High</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>Intermediate</td>
<td>Low</td>
<td>Low</td>
<td>Very low</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>Men</td>
<td>High</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>High</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Low</td>
</tr>
</tbody>
</table>
HIERARCHY OF POTENTIAL TEST ORDERING FOR AUC DETERMINATION

Asymptomatic?

Ischemic equivalent?

Prior Imaging?

Prior Revasc?

w/i 3 mo ACS?

Pre-op?

NO

YES Table 4
Figure 5

NO

YES Table 5

NO

YES Table 6
Figure 6

YES Table 3
Figure 4

YES Table 1
Figure 2

YES Table 3
Figure 3

NO

NO

NO

NO
APPROPRIATE USE OF RNI
Evaluation of Suspected CAD

Symptomatic, chronic Ischemic equivalent

Low Probability
- ECG Interp AND Able to exercise

High Probability
- ECG uninterp OR Unable to exercise

Intermediate Probability
- APPROPRIATE

Possible ACS
- ECG w/o ischemic Δ’s, or with LBBB, pacer
- Normal or low-level troponin elevation
- Low or high risk TIMI scores

INAPPROPRIATE
APPROPRIATE USE OF MPI-REVISED AUC
Perioperative Evaluation for Elective Noncardiac Surgery

RISK FACTORS
• History of CAD
• History of HF
• Cerebrovasc. disease
• Insulin-requiring DM
• Renal insufficiency

* Inappropriate if asymptomatic up to 1 year s/p normal angiogram, non-invasive test of previous revascularization
APPROPRIATENESS OF CARDIOVASCULAR IMAGING

Potential Impact of Appropriateness Criteria

- Establishment of partnership among clinicians, educators, and payers regarding rational practices in cardiovascular imaging and fair reimbursement
- Education of clinicians regarding their practice habits
- Emphasis of clinical indications to drive testing
- Facilitate reimbursement for “appropriate” and “uncertain” indications
- Support for requirement of preauthorization or denial of reimbursement for “inappropriate” indications
- Improve cost-effectiveness of cardiovascular imaging
APPROPRIATENESS USE CRITERIA
Concerns and Limitations

• Appropriateness criteria are NOT substitutes for sound clinical judgment and practice experience

• Should NOT be used to provide information regarding the technical aspects of imaging nor delineate training/performance requirements

• Imperfect product
  – Indications not inclusive but also too specific
  – May differ from guidelines
  – Difficult to use, but logistics improving
APPROPRIATE USE CRITERIA

Implementation and Evaluation

- Integration within practice workflow
  - Point-of-service
  - Point-of-order

- Logistics
  - Requisitions
  - Web tools
  - POE/EMR

- Must preserve physician autonomy and flexibility
### B. History & Risk Factors

| Last Name: Wright | First Name: Robert | Test Date: 01/31/2008 | ACC Patient ID: 10 |

#### History & Risk Factors:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Total Cholesterol</td>
<td>125</td>
</tr>
<tr>
<td>HDL</td>
<td>100</td>
</tr>
<tr>
<td>LDL</td>
<td>75</td>
</tr>
</tbody>
</table>

#### Use of Lipid-Lowering Medication
- **Yes**

#### Blood Pressure (resting)
- **120** / **65** (mmHg)

#### Use of Anti-Hypertensive Medication
- **Yes**

#### Current Smoker (within 1 month)
- **Yes**

#### HF or LV Systolic Dysfunction (new onset)
- **Yes**

#### Diabetes Mellitus
- **Yes**

#### Atrial Fibrillation (new onset)
- **Yes**

#### Symptoms
- **Asymptomatic**

#### If Asymptomatic, Estimated CHD Risk (Framingham)
- **Low**

#### Chest Pain Type (Angina)
- Typical (3 below); Atypical (2 below); Non-anginal (1 or none)
  - **Substernal chest pain or discomfort**
  - **Not provoked by exertion or emotional distress**
  - **Not relieved by rest and/or nitroglycerin**

#### Estimated Pre-test Probability of CAD
- **Low**

#### Exercise Tolerance
- **< 4 METS**

#### Ability to Achieve Max Predicted HR
- **Yes**

#### Acute Coronary Syndrome (within 1 mo.)
- **No**
ACCF/UNITEDHEALTHCARE SPECT PILOT Appropriateness Classification (n = 5,928)

- Inappropriate: 14%
- Uncertain: 15%
- Appropriate: 71%

Hendel RC et al
ACC, 2009
## EVALUATION OF APPROPRIATENESS

<table>
<thead>
<tr>
<th></th>
<th>Appropriate</th>
<th>Uncertain</th>
<th>Inappropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hendel, 2006</td>
<td>83%</td>
<td>6%</td>
<td>11%</td>
</tr>
<tr>
<td>Mehta, 2006</td>
<td>78%</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>Ayyad, 2007</td>
<td>85%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Druz, 2007</td>
<td>57%</td>
<td>33%</td>
<td>10%</td>
</tr>
<tr>
<td>Gaztanega, 2007</td>
<td>55%</td>
<td>28%</td>
<td>17%</td>
</tr>
<tr>
<td>Al-Mallah, 2007</td>
<td>75%</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>Gibbons, 2008</td>
<td>64%</td>
<td>11%</td>
<td>14%</td>
</tr>
<tr>
<td>Hendel, 2009</td>
<td>71%</td>
<td>15%</td>
<td>14%</td>
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</tbody>
</table>
### ACCF/UNITEDHEALTHCARE SPECT PILOT

#### Most Common “Inappropriate” Indications

<table>
<thead>
<tr>
<th>INDICATION</th>
<th>% INAPPRO INDICATIONS</th>
<th>% TOTAL STUDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection of CAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asymptomatic, low CHD risk</td>
<td>44.5%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Asymptomatic, post-revascularization &lt; 2 years after PCI, symptoms before PCI</td>
<td>23.8%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Evaluation of chest pain, low probability pt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpretable ECG and able to exercise</td>
<td>16.1%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Asymptomatic or stable symptoms, known CAD &lt; 1 year after cath or abnormal prior SPECT</td>
<td>3.9%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Pre-operative assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low risk surgery</td>
<td>3.8%</td>
<td>0.5%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>92.1%</strong></td>
<td><strong>12.4 %</strong></td>
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APPROPRIATENESS CATEGORY
Based on Referral

<table>
<thead>
<tr>
<th>Category</th>
<th>Cardiologist (n = 4,792)</th>
<th>Non-Cardiologist (n = 1,136)</th>
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</thead>
<tbody>
<tr>
<td>Inappropriate</td>
<td>13.2%</td>
<td>19.5%</td>
</tr>
<tr>
<td>Uncertain</td>
<td>16.1%</td>
<td>9.9%</td>
</tr>
<tr>
<td>Appropriate</td>
<td>70.7%</td>
<td>70.7%</td>
</tr>
</tbody>
</table>

p < 0.0001

Hendel RC et al
ACC, 2009
APPROPRIATE USE CRITERIA

Educational Initiatives

• Target inappropriate indications
  – Determine most common inappropriate indications
  – Pocket cards, explanatory information

• Joint attribution
  – Ordering and performing/interpreting physicians
  – Provide sample letter to practices for education on ordering patterns and focused discouragement of key inappropriate indications

• Improvement in ordering patterns
  – PDA and web-based tools to provide immediate feedback
  – Interim reports to practices
  – Establishment of inappropriate “threshold”
  – Order entry and decision support tools
  – Threshold values or percent reduction of inappropriate exams
CHANGING PATTERNS OF APPROPRIATENESS

*Impact of Education (n=862)*

2006
- 76.0% Appropriate
- 12.0% Uncertain
- 12.0% Inappropriate

2007
- 85.0% Appropriate
- 5.0% Uncertain
- 10.0% Inappropriate

Ayyad et al
AHA 2007
AUC: IMPLEMENTATION AND EVALUATION

New Technology

- Migration towards point-of-order
- Embedded clinical decision support
- Tracking/data registry
- Reporting/feedback
APPROPRIATE USE CRITERIA

Potential Impact on Physician

- Education regarding practice habits
- Emphasize clinical indications to drive testing
- Documentation of quality metric
- Facilitation of reimbursement
- Recognition that rate of inappropriate testing is not zero, nor should it be
- Avoidance of RBM
“With the support of Congress and others, the ACC is willing to commit to reducing the rate of inappropriate cardiovascular imaging by 15 percent in the first year through the use of physician created appropriate use criteria…[to] reduce the financial burden of our health care system.”

W. Douglas Weaver, MD
President, ACC
QUALITY ISSUES IMPACTING PRACTICE

Conclusions

• Utilization management of cardiac imaging will continue
  –Self-regulation is a large and bitter “pill to swallow”

• Most physicians are not knowingly ordering inappropriate tests or self-referring for economic reasons
  –Physicians must take responsibility for all aspects of cardiac imaging, including utilization
  –Must be joint effort by physicians, policymakers and patients

• Practices must begin/continue quality improvement processes

• AUC, accreditation, and other quality metrics should serve as the foundation for utilization strategies
  –AUC, CPG, PM have been developed to provide guidance, but their implementation and evaluation are key to improving performance
  –These provide alternatives to more onerous utilization management strategies, including prior authorization