Right Patient, Right Test, Right Time
Clinical Use of Appropriate Use Criteria

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Greenville Health System
Professor, University of South Carolina School of Medicine - Greenville
Disclosure

• No financial disclosures
How did we get where we are today?
Escalating Healthcare Costs

- Medicare fee-for-service spending for physician services grew by 73% - from $37 b to $64 b from 2000-2010
  - Growth in the volume & intensity of services


*Medicare Economic Index is a measure of inflation
MedPAC Evaluation of Growth in Physician Services From 1999 to 2000

Hendel, R. C. J Am Coll Cardiol Img 2008;1:241-248

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Regional Variation
Imaging Stress Tests

Trends in the Use of Cardiac Stress Testing


59%
87%

p=NS for any over time
p<0.001 for imaging over time
Response to the Utilization and Cost Problem

• Reimbursement reduction
  – 2008 reimbursement adjustment
• Radiology benefits managers
• Appropriate Use Criteria
• MIPPA
  – Requirement for accreditation
  – Emphasis on quality
IMAGING UTILIZATION AND A NEED FOR GUIDANCE

• Unprecedented focus on assessment and improving quality
• Explosive growth of CV imaging
• Substantial regional variation
• True nature of utilization unknown — Overuse/ Under-use/ Appropriate
• Clinicians, patients, and especially payers seeking guidance
1. Develop list of indications, assumptions, and definitions

2. Literature review and guideline mapping

3. Review Panel >30 members provide feedback

4. Writing Group revises indications

5. Rating Panel rates the indications in 2 rounds
   - First Round – No interaction
   - Second Round – Panel interaction

6. Appropriate Use Score
   - (7-9) Appropriate
   - (4-6) May be Appropriate
   - (1-3) Rarely Appropriate

7. Retrospective comparison with clinical records
   - % use that is Appropriate, May Be Appropriate, Rarely Appropriate

8. Prospective clinical decision aids
   - Increase Appropriate Use
DEVELOPMENT OF CLINICAL PRACTICE GUIDELINES, PERFORMANCE MEASURES, AND APPROPRIATE USE DOCUMENTS

Future sources of evidence:
- Comparative effectiveness
- Patient preference

EVIDENCE (RCTs*, Registries)

EXPERT CONSENSUS

CLINICAL PRACTICE GUIDELINES

PERFORMANCE MEASURES

APPROPRIATE USE CRITERIA

1. Increase use of effective therapies
2. Decrease use of inappropriate, unnecessary, potentially harmful therapies

Improve patient outcomes
Reduce costs of healthcare delivery

*RCT = randomized clinical trial
APPROPRIATE USE CRITERIA

Balancing the Risks and Benefits

Appropriate Indication

Test risk is less than potential CV risk reduction following targeted treatment

Benefit of imaging results to guide patient management decision making

Appropriate Use Criteria for Testing

Inappropriate Indication

Test risk is not warranted given the lack of benefit

No clear benefit of imaging to guide patient management decision making

APPROPRIATE USE CRITERIA

• CT and MR - 2006
• Nuclear Cardiology – 2009
• Echocardiography – 2011
• Catheterization - 2012
• Revascularization – 2012
• ICD and resynchronization – 2013
• Peripheral vascular – venous/arterial – 2012/2013
• Multi-modality
  – Congestive Heart Failure – 2013
  – Stable Ischemic Heart Disease - 2013
ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS
2013 Multimodality Appropriate Use Criteria for the Detection and Risk Assessment of Stable Ischemic Heart Disease

### EXAMPLE OF MULTIMODALITY RATING

<table>
<thead>
<tr>
<th>Indication Text</th>
<th>Exercise ECG</th>
<th>Stress RNI</th>
<th>Stress Echo</th>
<th>Stress CMR</th>
<th>Calcium Scoring</th>
<th>CCTA</th>
<th>Invasive Coronary Angiography</th>
</tr>
</thead>
</table>
| 1. Low pre-test probability of CAD  
ECG interpretable AND able to exercise | A            | R          | M           | R          | R               | R    | R                             |
| 2. Low pre-test probability of CAD  
ECG uninterpretable OR unable to exercise |              |            | A           | A          | M               | M    | R                             |
| 3. Intermediate pre-test probability of CAD  
ECG interpretable AND able to exercise | A            | A          | A           | M          | R               | M    | R                             |
| 4. Intermediate pre-test probability of CAD  
ECG uninterpretable OR unable to exercise | A            | A          | A           | A          | R               | A    | M                             |
| 5. High pre-test probability of CAD  
ECG interpretable AND able to exercise | M            | A          | A           | A          | R               | M    | A                             |
| 6. High pre-test probability of CAD  
ECG uninterpretable OR unable to exercise |              |            | A           | A          | R               | M    | A                             |

**Appropriate Use Key:**
- A = Appropriate; M = May Be Appropriate; R = Rarely Appropriate.

A = Appropriate; CAD = coronary artery disease; CCTA = coronary computed tomography angiography; CMR = cardiac magnetic resonance; ECG = electrocardiogram; Echo = echocardiography; M = May Be Appropriate; R = Rarely Appropriate; RNI = radionuclide imaging.

**69 Indications**

Similar format to prior documents

Wolk MJ et al, 2014
J Am Coll Cardiol 63: 380
MULTIMODALITY AUC

Key Points

• Guided by pre-test probability, exercise ability, ECG interpretability
  – Stress radionuclide and echo imaging are appropriate for most categories

• For asymptomatic patients, only exercise ECG is appropriate for high risk patients who can exercise and had an interpretable ECG

• Stress testing appropriate for patients with syncope who have at least an intermediate likelihood of CAD

• Follow-up testing is largely inappropriate in asymptomatic patients or those with stable symptoms

• Among asymptomatic patients who have undergone revascularization, only those with incomplete revascularization should be tested

• For preoperative assessment, testing is indicated only for high risk surgery in patients with poor or unknown functional capacity who also have at ≥1 risk factor
AUC: NOT JUST FOR CARDIAC IMAGING
BAD NEWS GETS ALL THE PRESS ATTENTION

Louisiana cardiologist sentenced on health fraud charges

July 13, 2009

A Louisiana cardiologist, Dr. Virendra Patel, was recently sentenced to ten years in prison after his criminal conviction last year for making false claims to government health programs as well as private insurers for medically unnecessary stents and angioplasties. The doctor was sentenced by U.S. District Judge Tucker Melancon to the maximum allowable penalty of ten years in prison, in addition to a $375,000 fine and restitution charges of $387,511.

Now that the criminal case is over and the doctor is serving his sentence, a federal False Claims Act lawsuit against the doctor and his health care firm continues. Under the False Claims Act, state and federal citizens may bring “qui tam” suits against companies or individuals to recover government funds paid to them under false pretenses. The Qui Tam suit was filed by Dr. Christopher Moomaw, one of Patel’s former associates. The suit was filed in federal court in Louisiana, where he worked, Our Lady of Louisiana Regional Medical Center and Lafayette General Medical Center. Both hospitals have paid substantial settlements to resolve claims that their staff failed to respond to complaints that Patel was performing unnecessary medical procedures.

Patel was to report to federal prison on July 6.

St. Joseph Medical Center in Towson, whose cardiology business is a focus of a continuing federal health-care fraud investigation, has notified hundreds of its heart patients that they may have received expensive and potentially dangerous coronary implants they didn’t need.

An internal review, begun last May at the behest of federal investigators and in response to a patient complaint, has turned up 369 patients with stents that appear to have been implanted in their arteries unnecessarily, CEO Jeffrey K. Normann said in an interview yesterday. Patients began receiving letters alerting them to the finding early last month, and more notifications are expected as the review continues.

“We take our interaction and the care of our patients with the utmost seriousness, and so we wanted to alert...
Coronary Revascularization Procedures: Growth of PCI

Trends in Cardiovascular Operations and Procedures. Source: NCHS and NHLBI.
15-FOLD VARIATION IN THE USE OF PCI

Figure 11. Rates of PCI Among Hospital Referral Regions, 2003
Each point represents the rate in one of the 306 HRRs in the United States.
LOW-RISK FINDINGS ON NONINVASIVE IMAGING STUDY AND ASYMPTOMATIC (NO PRIOR BYPASS SURGERY)

<table>
<thead>
<tr>
<th>Symptoms/Rx</th>
<th>Low Risk Findings on Noninvasive Study</th>
<th>Asymptomatic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms</strong></td>
<td><strong>Med. Rx</strong></td>
<td><strong>Stress</strong></td>
</tr>
<tr>
<td>Class III or IV Max Rx</td>
<td>U</td>
<td>A</td>
</tr>
<tr>
<td>Class I or II Max Rx</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Asymptomatic Max Rx</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Class III or IV No/min Rx</td>
<td>I</td>
<td>U</td>
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</tr>
<tr>
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<td>I</td>
<td>I</td>
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</tbody>
</table>

**Coronary Anatomy**
- CTO of 1 vz.; no other disease
- 1-2 vz. disease; no Prox. LAD
- 1 vz. disease of Prox. LAD
- 2 vz. disease with Prox. LAD
- 3 vz. disease; no Left Main

**Coronary Anatomy**
- CTO of 1 vz.; no other disease
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- 1 vz. disease of Prox. LAD
- 2 vz. disease with Prox. LAD
- 3 vz. disease; no Left Main
CONSIDERATION FOR REVASCULARIZATION AMONG PATIENTS WITH HIGH-RISK FINDINGS ON NONINVASIVE IMAGING STUDY AND CCS CLASS III OR IV ANGINA

<table>
<thead>
<tr>
<th>High-Risk Findings on Noninvasive Study</th>
<th>CCS Class III or IV Angina</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms Med. Rx</strong></td>
<td>Stress Test Med. Rx</td>
</tr>
<tr>
<td>Class III or IV Max Rx</td>
<td></td>
</tr>
<tr>
<td>Class I or II Max Rx</td>
<td>High Risk Max Rx</td>
</tr>
<tr>
<td>Asymptomatic Max Rx</td>
<td>Int. Risk Max Rx</td>
</tr>
<tr>
<td>Class III or IV Nol/min Rx</td>
<td>Int. Risk Nol/min Rx</td>
</tr>
<tr>
<td>Class I or II Nol/min Rx</td>
<td>Low Risk Nol/min Rx</td>
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</tr>
<tr>
<td>2-vz. disease with prox. LAD</td>
<td>2-vz. disease with prox. LAD</td>
</tr>
<tr>
<td>3-vz. disease; no left main</td>
<td>3-vz. disease; no left main</td>
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</tbody>
</table>
# APPROPRIATE USE OF PERCUTANEOUS CORONARY INTERVENTION
Results of the NCDR Registry

<table>
<thead>
<tr>
<th></th>
<th>OVERALL</th>
<th>ACUTE</th>
<th>NON-ACUTE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=500,154</td>
<td>n=355,417</td>
<td>n=144,737</td>
</tr>
<tr>
<td>Appropriate</td>
<td>84.6%</td>
<td>98.6%</td>
<td>50.4%</td>
</tr>
<tr>
<td>Uncertain</td>
<td>11.2%</td>
<td>0.3%</td>
<td>38.0%</td>
</tr>
<tr>
<td>Inappropriate</td>
<td>4.1%</td>
<td>1.1%</td>
<td>11.6%</td>
</tr>
</tbody>
</table>

Chan PS et al. JAMA 2011;306:53-61
# Appropriateness of Coronary Revascularization

Most Common Reasons for Inappropriate Use

<table>
<thead>
<tr>
<th>Anatomy</th>
<th>Symptoms</th>
<th>Stress test, risk</th>
<th>Anti-Ischemic Rx</th>
<th>n  (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CABG</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2 V, non-PLAD</td>
<td>Asymptomatic</td>
<td>Interm</td>
<td>None/Min.</td>
<td>51 (55%)</td>
</tr>
<tr>
<td>1, 2 V, non-PLAD</td>
<td>CCS I-II</td>
<td>Low</td>
<td>None/Min.</td>
<td>20 (22%)</td>
</tr>
<tr>
<td><strong>PCI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2 V, non-PLAD</td>
<td>Asymptomatic</td>
<td>Interm</td>
<td>None/Min.</td>
<td>1,583 (45%)</td>
</tr>
<tr>
<td>1, 2 V, non-PLAD</td>
<td>CCS I-II</td>
<td>Low</td>
<td>None/Min.</td>
<td>1,203 (34%)</td>
</tr>
<tr>
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<td>Asymptomatic</td>
<td>Low</td>
<td>None/Min.</td>
<td>488 (12%)</td>
</tr>
</tbody>
</table>
OPPORTUNITIES FOR COST SAVINGS OR BETTER RESOURCE DEPLOYMENT

3.2% of PCI procedures considered inappropriate.
If we dropped that to 2.2%, we could better utilize $44,000,000.

Source: Chan et al, internal ACC analysis
STRESS TESTING AND SPECT MPI AFTER REVASCULARIZATION

- Medicare database review in 28,172 patients
- High frequency of post-procedural stress testing
  - 39% @ 1 year
  - 59% @ 2 year
  - Clustering at 6 and 12 months (“routine”)
- SPECT is most common
- Geographic variation noted
- Rate exceeds historical recurrence rate of angina (18%)
- Post-test: 11% cath, 5% revascularization

Shah et al, 2010 JACC 56: 1328
# EVALUATION OF APPROPRIATENESS FOR RADIONUCLIDE IMAGING

<table>
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<td>Mehta, 2006</td>
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<td><strong>5%</strong></td>
</tr>
</tbody>
</table>
### Appropriateness Classification (n=5,928)

<table>
<thead>
<tr>
<th>INDICATION</th>
<th>% INAPPRO INDICATION</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>16.1%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Interpretable ECG and able to exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asymptomatic/stable symptoms, known CAD,&lt; 1 year after cath/abnormal 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>
</tr>
</tbody>
</table>

Hendel RC et al, 2010
JACC 55: 156-62
INAPPROPRIATE USE OF RADIONUCLIDE IMAGING BASED ON ORDERING CLINICIAN AND INSTITUTION

VAMC

UMH

<table>
<thead>
<tr>
<th></th>
<th>MD</th>
<th>Non-MD</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAMC</td>
<td>20.1%</td>
<td>26.8%</td>
<td>0.022</td>
</tr>
<tr>
<td>UMH</td>
<td>10.1%</td>
<td>23.9%</td>
<td>0.001</td>
</tr>
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PROGNOSTIC IMPACT OF AUC Adverse Cardiac Events Based On MPI Results And Appropriateness (n=1,511)

• Abnormal MPI among patients with *appropriate* indication *predicted* MACE, with HR as above

• Abnormal MPI among patients with *inappropriate* indication *failed* to predict MACE

Doukky R et al, 2013 Circulation 128; 1634
APPROPRIATE USE OF CARDIOVASCULAR TECHNOLOGY

*Potential Impact of AUC*

- 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”
- Support for requirement of preauthorization or denial of reimbursement for “rarely appropriate” indications
- Optimize cardiovascular care
- Improve cost-effectiveness
IMPROVING Appropriateness

• Does education work?

• What methods?
  – Multifaceted approach (cases, peer discussions)
  – Interactive
  – Longitudinal
  – Behavior reinforcement (feedback)
  – Integrated into workflow (clinical decision support)
So What Works?

• Education (99 RCT’s and Cochrane analysis)
  – CME alone – very little effect
  – Printed materials – small effect
  – Outreach with opinion leaders – additive effect

• Academic detailing (Cochrane analysis 18 trials)
  – Multi-factorial approach (written, conferences) – somewhat effective
  – Professional societies – most effective
Education Alone

- Grand Rounds presentation
- Staff newsletter
- Administrator meetings
- Dept/division presentations
EDUCATIONAL INTERVENTION TO REDUCE INAPPROPRIATE ECHOCARDIOGRAMS

- Randomized, controlled trial of physicians-in-training
- Educational targets easily identified
- Intervention: lecture, “pocket card”, monthly individual feedback

OR: 2.7 (1.5-5.1); p<0.002

Bhatia RS et al JACC Imaging 2014; 7: 857
So What Works?

- **Reminders (42 RCT’s)**
  - Effective on processes of care
    - Preventive measures
    - At time of care delivery

- **Audit and feedback**
  - Significant but minimal effect on utilization
    - 12 studies, p<0.05 for direction of effect
    - 8 studies, p<0.05 direct comparison groups
    - 5 studies, OR 1.091, CI 1.045 – 1.136
Utilization of Data

- Data analysis allows for targeted intervention
- Pre-op testing by anesthesia was an outlier
- Focused education

So What Works?

• Guidelines (72 trials)
  – 55/59 demonstrated process improvements
  – 9/11 significant outcome improvements
  – 5/13 (38%) statistically significant differences in primary care
  – High degree of variability in results
Multi-Center Approach

- Internal analysis, group meetings, education prioritized by management – Site 1
- No active review or educational sessions – Sites 2-4

So What Works?

• Combined interventions
  – Passive information dissemination ineffective
  – Small dose education ineffective
  – Guideline dissemination effective but source important
  – Disparate results for any one method
  – Multiple methods are most effective
A collaborative community
- Share knowledge, experience, and best practices
- Standardized order sets

Develop educational materials
- Non-confrontational
- Blogs, listservs, webinars
- Letters to referring clinicians

Advantage for participation
- Competitive advantage
- Laboratory accreditation
- QI through PIM
- CME credit opportunities

Formation of Optimal Cardiovascular Utilization Strategies: IMAGING IN FOCUS

More than 1,100 sites
More than 12,000 physicians
25,000+ cases
50% reduction in the inappropriate rate (10% to 5%) (p<0.0001)

Saifi S et al, 2013
JACC Imaging 6: 823
Decision Support

• Quick reference at point of order
• App, EHR, or Web portal
• Free for individual cases
• Subscription for tracking cases
• Currently deployed in several markets with single payer
• Lab accreditation, MOC Part IV, PQRS
• Future mandate for CMS
AUC App Decision Support

USE OF A DECISION SUPPORT TOOL FOR OPTIMIZING UTILIZATION OF CARDIAC IMAGING

• Point-of-order decision support tool (CycleMD™; MDDX)
• Use for stress echo, SPECT MPI, and CCTA
• Required less than 1 min in >50% of cases; mean=2 min
• Features educational component

• Results
  – Appropriateness increased from 49% to 61% (p=0.02)
  – Inappropriateness decreased from 22% to 6% (p=0.0001)
  – Medical therapy changes increased from 11% to 32%

• Effective alternative to RBM

Lin FY et al, 2013 JACC 62: 308
FOCUS: Cardiovascular Imaging Strategies

POTENTIAL SAVINGS

• Replace inefficient utilization control with more efficient utilization control

• Reduce /realign 2 – 3 FTE currently devoted to third party authorization

• Reduce costs of utilization management from $.30 - $1.00 PMPM to $.06 - .08 PMPM

• Save or better utilize $271,000,000 - $926,400,000 currently spent on third party control
• A national campaign led by the ABIM Foundation to promote commonly misused or overused medical tests.
• ACR, ACC, ASNC are among partnering organizations
• Consumer Reports is also campaign partner
• Campaign Web site: www.choosingwisely.org
Choosing Wisely
Four Things Physicians and Patients Should Question

Don’t perform stress cardiac imaging or advanced non-invasive imaging in the initial evaluation of patients without cardiac symptoms unless high-risk markers are present.

Asymptomatic, low-risk patients account for up to 45 percent of unnecessary “screening.” Testing should be performed only when the following findings are present: diabetes in patients older than 40-years-old; peripheral arterial disease; or greater than 2 percent yearly risk for coronary heart disease events.
Choosing Wisely
Four Things Physicians and Patients Should Question

Don’t perform annual stress cardiac imaging or advanced non-invasive imaging as part of routine follow-up in asymptomatic patients.

Performing stress cardiac imaging or advanced non-invasive imaging in patients without symptoms on a serial or scheduled pattern (e.g., every one to two years or at a heart procedure anniversary) rarely results in any meaningful change in patient management. This practice may, in fact, lead to
Choosing Wisely
Four Things Physicians and Patients Should Question

Don’t perform stress cardiac imaging or advanced non-invasive imaging as a pre-operative assessment in patients scheduled to undergo low-risk non-cardiac surgery.

Non-invasive testing is not useful for patients undergoing low-risk non-cardiac surgery (e.g., cataract removal). These types of tests do not change the patient’s clinical management or outcomes and will result in increased costs.
Choosing Wisely
Four Things Physicians and Patients Should Question

Don’t perform echocardiography as routine follow-up for mild, asymptomatic native valve disease in adult patients with no change in signs or symptoms.

Patients with native valve disease usually have years without symptoms before the onset of deterioration. An echocardiogram is not recommended yearly unless there is a change in clinical status.
AUC AND CONGRESS/CMS
Protecting Access to Medicare Act of 2014

• “Establish a program to promote the use of AUC...for applicable (advanced) imaging services”
• “Criteria developed or endorsed by national professional medical specialty societies ...to the extent feasible, such criteria shall be evidence-based” ; To be completed by 11/15/15
• Applicable to physician’s office or hospital outpatient setting
• Use of clinical decision support, within and independent of EHR’s
• To be initiated on January 1, 2017
• Determine “outlier ordering physician...based on low adherence to applicable AUC” and initiate prior authorization for outliers on 1/1/20
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
CONCLUSIONS

• CV tests and procedures have exhibited substantial growth and geographic variability, suggesting possible overuse.

• AUC have been developed/revised for cardiac imaging, coronary revascularization, ICD/pacemaker implantation and other procedures.

• Appropriate use can be measured and relative performance may be evaluated.
CONCLUSIONS

• Multiple educational tools have been developed with a goal of reducing inappropriate testing; provider feedback and clinical decision support appear essential for improvement

• Goal of AUC “movement” is optimized patient care, with a consciousness of cost
Thank You!