Appropriateness of Percutaneous Coronary Interventions in Washington State

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Objectives

- Reasons to measure PCI appropriateness
- Appropriate Use Criteria for Coronary Revascularization
- Appropriateness of PCI in Washington State
- Future directions
Objectives

- Reasons to measure PCI appropriateness
- Appropriate Use Criteria for Coronary Revascularization
- Appropriateness of PCI in Washington State
- Future directions
Background

- PCI is critical tool in the management of CAD
- In patients with ACS, PCI reduces mortality and recurrent MI
- For stable coronary disease, PCI offers symptom relief in appropriate patients
Pressures to Reduce Use of PCI

- More than 1.2 million PCI are performed annually in the U.S. at $26 billion in cost

- Volume- and cost-control efforts by payers have been amplified

- Payer mechanisms are often intrusive, fail to improve quality, or optimal patient care
Appropriate Use Criteria for Coronary Revascularization

- Developed by the ACC in partnership with multiple professional organizations
- National standard to quantify ‘appropriateness’ of PCI for clinical scenarios
- Stewards of self-regulation and an opportunity to improve effective utilization

COAP IN 2012

Framework to Improve PCI Quality

**Systems to Promote Quality PCI**
- Proper patient selection:
  - Avoiding treatment in asymptomatic patients
  - Assessment of ischemic risk
  - Anti-anginal therapy

**Patients Considered for PCI**

**Minimizing complications:**
- Bleeding avoidance strategies
- Renal protective measures
- Post-PCI care pathways

**Measurement of PCI Quality**
- Patient Selection
  - PCI Appropriateness
- Procedural Care
  - Complications
  - Discharge meds

**PCI Outcomes**

**Patients Undergoing PCI**
Objectives

- Reasons to measure PCI appropriateness
- Appropriate Use Criteria for Coronary Revascularization
- Appropriateness of PCI in Washington State
- Future directions
**Appropriateness Method**

- Literature review and synthesis of the evidence
- List of clinical scenarios

**Expert panel rates the indications**

1. **1st Round – No interaction**
2. **2nd Round – Panel interaction**

**Appropriateness Score**

(7-9) Appropriate
(4-6) Uncertain
(1-3) Inappropriate

Elements Defining Clinical Scenarios

- Clinical presentation (e.g. ACS, stable angina)
- Severity of angina (CCS classification)
- Extent of ischemia on noninvasive testing and other prognostic factors (e.g. low EF, DM)
- Extent of anti-anginal therapy
- Extent of anatomic disease

“Coronary revascularization is appropriate when the expected benefits, in terms of survival or health outcomes (symptoms, functional status, and/or quality of life) exceed the expected negative consequences of the procedure.”

Example Ratings - ACS

UA/NSTEMI → Cardiogenic shock  → STEMI

High Risk features

A

Primary Reperfusion

< 12 hrs  > 12 hrs

Severe HF, persistent ischemia, hemodynamic or electrical instability present

Asymptomatic; no hemodynamic instability and no electrical instability

A

A

Thrombolytic therapy

Evidence of HF, recurrent ischemia, or unstable ventricular arrhythmias present

A

Asymptomatic; no HF, no recurrent ischemic symptoms, and no unstable ventricular arrhythmias

Normal LVEF with 1 vessel CAD

Depressed LVEF with 3 vessel CAD

U

### Example Ratings – Non-ACS

#### Low Risk Findings on Noninvasive Study

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

<table>
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<tr>
<th>Symptoms</th>
<th>Med. Rx</th>
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<tr>
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<tr>
<td>Asymptomatic No/min Rx</td>
<td>I</td>
<td>I</td>
<td>U</td>
<td>U</td>
<td>A</td>
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</table>

#### Coronary Anatomy

<table>
<thead>
<tr>
<th>Coronary Anatomy</th>
<th>CTO of 1 vz.; no other disease</th>
<th>1-2 vz. disease; no Prox. LAD</th>
<th>1 vz. disease of Prox. LAD</th>
<th>2 vz. disease with Prox. LAD</th>
<th>3 vz. disease; no Left Main</th>
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<tbody>
<tr>
<td>Class III or IV Max Rx</td>
<td>U</td>
<td>A</td>
<td>A</td>
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<tr>
<td>Asymptomatic No/min Rx</td>
<td>I</td>
<td>I</td>
<td>U</td>
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PCI Appropriateness in NCDR

- More than 350,000 PCI performed nationally, 85% appropriate and 4% inappropriate
  - Acute indications 99% appropriate
  - Non-acute indications 50% appropriate and 12% inappropriate
Non-Acute PCI Facility-Level Variation

- Median 10.8%
- Range 0%-55%
Role of Appropriate Use Criteria

- Appropriate use criteria may identify appropriate practice patterns and facilitate highly effective and efficient care.

- Similar appropriateness across practice settings is a reasonable goal; complete elimination of “inappropriate” use is not.
Limitations of the Criteria

- Patient-preferences
- Unique clinical scenarios
- Emerging technology
- Although important, these limitations are unlikely to explain >10x variation
Objectives

- Reasons to measure PCI appropriateness
- Appropriate Use Criteria for Coronary Revascularization
- Appropriateness of PCI in Washington State
- Future directions
Appropriateness of PCI in Washington State

- Apply the Appropriate Use Criteria to all PCI performed in Washington State
- Identify opportunities to improve PCI quality by reducing variation in appropriateness
Methods

Washington State COAP
- Statewide QI program for coronary revascularization
- NCDR version 4 data elements

Mapping to the Appropriate Use Criteria
- Significant stenosis ≥ 50% left main or ≥ 70% other epicardial coronary
- Maximal anti-ischemic medical therapy at least 2 classes of therapy
- Mapping minimized influence of missing data

Appropriateness of PCI by Indication

- **Acute** (acute myocardial infarction or unstable angina with high-risk features)

- **Non-acute** (stable angina)
## Appropriateness of Acute PCI

<table>
<thead>
<tr>
<th>Indication</th>
<th>Appropriate</th>
<th>Uncertain</th>
<th>Inappropriate</th>
<th>Not Classified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Indications, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>83.4</td>
<td>0.4</td>
<td>0.9</td>
<td>15.3</td>
</tr>
<tr>
<td>2011</td>
<td>84.6</td>
<td>0.6</td>
<td>0.8</td>
<td>14.0</td>
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</tbody>
</table>
PCI Appropriateness for Acute Indications

<table>
<thead>
<tr>
<th>PCI Indication</th>
<th>Total (n=9452)</th>
<th>Appropriate (n=7887)</th>
<th>Uncertain (n=39)</th>
<th>Inappropriate (n=84)</th>
<th>Not Classified (n=1442)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute STEMI</td>
<td>2144 (23%)</td>
<td>94%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
</tr>
<tr>
<td>STEMI &gt; 12 hrs from symptom onset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstable</td>
<td>95 (1%)</td>
<td>61%</td>
<td>0%</td>
<td>0%</td>
<td>39%</td>
</tr>
<tr>
<td>Stable</td>
<td>70 (1%)</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>STEMI with PCI after lytics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful lytics</td>
<td>67 (1%)</td>
<td>0%</td>
<td>58%</td>
<td>13%</td>
<td>28%</td>
</tr>
<tr>
<td>Failed lytics (Rescue PCI)</td>
<td>71 (1%)</td>
<td>90%</td>
<td>0%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>Non-STEMI or high-risk UA</td>
<td>5900 (62%)</td>
<td>94%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
</tr>
<tr>
<td>Non-high risk UA</td>
<td>902 (11%)</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Acute PCI by Facility

Percent PCI

- Appropriate
- Not Classified
## Appropriateness of Non-Acute PCI

<table>
<thead>
<tr>
<th>Indication</th>
<th>Appropriate</th>
<th>Uncertain</th>
<th>Inappropriate</th>
<th>Insufficient Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Acute Indications, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>22.1</td>
<td>19.5</td>
<td>8.3</td>
<td>50.1</td>
</tr>
<tr>
<td>2011</td>
<td>26.2</td>
<td>18.5</td>
<td>8.3</td>
<td>47.0</td>
</tr>
</tbody>
</table>
### PCI Appropriateness for Non-Acute Indications – Part I

<table>
<thead>
<tr>
<th>PCI Indication</th>
<th>Total (n=3839)</th>
<th>Appropriate (n=847)</th>
<th>Uncertain (n=748)</th>
<th>Inappropriate (n=319)</th>
<th>Not Classified (n=1925)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Angina Severity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No symptoms</td>
<td>1097 (29%)</td>
<td>7%</td>
<td>16%</td>
<td>17%</td>
<td>60%</td>
</tr>
<tr>
<td>Class I</td>
<td>359 (9%)</td>
<td>16%</td>
<td>21%</td>
<td>8%</td>
<td>55%</td>
</tr>
<tr>
<td>Class II</td>
<td>1489 (39%)</td>
<td>19%</td>
<td>25%</td>
<td>6%</td>
<td>50%</td>
</tr>
<tr>
<td>Class III</td>
<td>678 (18%)</td>
<td>51%</td>
<td>14%</td>
<td>1%</td>
<td>34%</td>
</tr>
<tr>
<td>Class IV</td>
<td>200 (5%)</td>
<td>44%</td>
<td>12%</td>
<td>&lt;1%</td>
<td>44%</td>
</tr>
<tr>
<td><strong>Number of anti-anginal medications</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1328 (35%)</td>
<td>16%</td>
<td>20%</td>
<td>10%</td>
<td>54%</td>
</tr>
<tr>
<td>1</td>
<td>1739 (45%)</td>
<td>17%</td>
<td>20%</td>
<td>10%</td>
<td>53%</td>
</tr>
<tr>
<td>&gt; 2</td>
<td>772 (20%)</td>
<td>44%</td>
<td>17%</td>
<td>2%</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Noninvasive risk assessment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-risk</td>
<td>295 (8%)</td>
<td>16%</td>
<td>40%</td>
<td>42%</td>
<td>2%</td>
</tr>
<tr>
<td>Intermediate-risk</td>
<td>540 (14%)</td>
<td>20%</td>
<td>62%</td>
<td>16%</td>
<td>2%</td>
</tr>
<tr>
<td>High-risk</td>
<td>407 (11%)</td>
<td>72%</td>
<td>24%</td>
<td>3%</td>
<td>1%</td>
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</table>
## PCI Appropriateness for Non-Acute Indications – Part II

<table>
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<tr>
<th>PCI Indication</th>
<th>Total (n=3839)</th>
<th>Appropriate (n=847)</th>
<th>Uncertain (n=748)</th>
<th>Inappropriate (n=319)</th>
<th>Not Classified (n=1925)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 or 2 borderline</td>
<td>108 (3%)</td>
<td>7%</td>
<td>36%</td>
<td>53%</td>
<td>4%</td>
</tr>
<tr>
<td>1 non-prox LAD</td>
<td>1573 (41%)</td>
<td>10%</td>
<td>15%</td>
<td>9%</td>
<td>66%</td>
</tr>
<tr>
<td>2 non-prox LAD</td>
<td>769 (18%)</td>
<td>18%</td>
<td>18%</td>
<td>7%</td>
<td>56%</td>
</tr>
<tr>
<td>1 proximal LAD</td>
<td>345 (9%)</td>
<td>37%</td>
<td>19%</td>
<td>1%</td>
<td>44%</td>
</tr>
<tr>
<td>2 proximal LAD</td>
<td>293 (8%)</td>
<td>34%</td>
<td>16%</td>
<td>9%</td>
<td>41%</td>
</tr>
<tr>
<td>3 vessel disease</td>
<td>774 (20%)</td>
<td>40%</td>
<td>31%</td>
<td>9%</td>
<td>20%</td>
</tr>
<tr>
<td>Left main</td>
<td>278 (7%)</td>
<td>43%</td>
<td>34%</td>
<td>9%</td>
<td>15%</td>
</tr>
<tr>
<td>CTO</td>
<td>268 (7%)</td>
<td>11%</td>
<td>25%</td>
<td>8%</td>
<td>56%</td>
</tr>
</tbody>
</table>
Non-Acute PCI – Ordered by Non-Acute Volume

Number cases

Procedural Volume

COAP IN 2012
Inappropriate Non-Acute PCI – Ordered by Non-Acute Volume

Percent Inappropriate

COAP IN 2012
Non-Acute PCI – Ordered by Appropriate
Non-Acute PCI – Ordered by Inappropriate

Percent PCI

Inappropriate

Insufficient Information
Non-Acute PCI – Ordered by Insufficient Information
Non-Acute PCI Sensitivity Analysis – Assumed Stress Test Results

<table>
<thead>
<tr>
<th>Assumption for Missing Stress Test</th>
<th>Appropriate</th>
<th>Uncertain</th>
<th>Inappropriate</th>
<th>Not Classified</th>
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</thead>
<tbody>
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<td>Low-Risk</td>
<td>19%</td>
<td>41%</td>
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<td>Intermediate-Risk</td>
<td>28%</td>
<td>51%</td>
<td>20%</td>
<td>1%</td>
</tr>
<tr>
<td>High-Risk</td>
<td>58%</td>
<td>32%</td>
<td>8%</td>
<td>1%</td>
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</tbody>
</table>
Inappropriate PCI with Assumed Stress Test Results – Low Risk

Statewide

Low-Risk
High-Risk
Inappropriate PCI with Assumed Stress Test Results – High Risk
Appropriateness Summary

More than 85% of PCI were appropriate

Of PCI for non-acute indications, 8% were inappropriate even in best-case scenarios

Broad facility-level variation

Half of non-acute PCI lacked documentation of stress tests necessary for appropriateness
Objectives

- Reasons to measure PCI appropriateness
- Appropriate Use Criteria for Coronary Revascularization
- Appropriateness of PCI in Washington State
- Future directions
Future/Current Directions

- Incorporation of PCI appropriateness in dashboard reports
  - Inappropriate PCI for acute/non-acute indications
  - Insufficient data for classification

- Strategies to reduce variation in PCI appropriateness
Insufficient Data – Non-Acute PCI
2010 and 2011
Conclusion

Appropriate use criteria are important to measuring PCI quality

Strategies to improve capture of noninvasive stress tests are needed to improve applicability

Similar appropriateness across practice settings is a reasonable goal; complete elimination of “inappropriate” use is not
Thank you