Present Status & Future Perspective of Coronary Intervention
Angioplasty Summit TCTAP 2011
Seoul, Korea

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Presenter Disclosure Information

David R. Holmes, Jr., M.D.

“Present Status & Future Perspective of Coronary Intervention”

The following relationships exist related to this presentation:

None
The Landscape
Anatomy

- High SYNTAX Score
- CTO
- Culprit vs non Culprit lesions
Mortality by SYNTAX Score
3VD/LM Diabetic and Non-Diabetic Patients

Non-Diabetic

Diabetic

Revascularization by SYNTAX Score
3VD/LM Diabetic and Non-Diabetic Patients

Non-Diabetic

Diabetic

SYNTAX score

Revascularization (%)

CABG

TAXUS

3 Vessel & Left Main Disease
Post SYNTAX

- CABG or PCI – 28%
- PCI – 6%
- CABG – 66%
CTO
Issues

• Boutique item or not
• Evidence based RCT’s – do we need them?
• Case selection
• Procedural performance
• Radiation exposure
Baseline PLCX
QCA: RVD 2.82 mm,
DS 28.6%, length 6.8 mm
IVUS: MLA 5.3 mm²
VH: ThCFA
Conclusions – In patients who presented with ACS and underwent PCI, MACE occurring during follow-up were equally attributable to recurrence at the site of culprit lesions and to nonculprit lesions. Although nonculprit lesions that were responsible for unanticipated events were frequently angiographically mild, most were thin-cap fibroatheromas or were characterized by a large plaque burden, a small luminal area, or some combination of these characteristics, as determined by gray-scale and radiofrequency intravascular ultrasonography.
Variation in Care
PCI Rates per 1,000 Medicare Enrollees (2002-03)

- 13.5 to 38.1 (63)
- 11.5 to <13.5 (53)
- 10.0 to <11.5 (75)
- 8.5 to <10.0 (53)
- 3.5 to <8.5 (62)
- Not populated

http://www.dartmouthatlas.org/
What can we do to address variation, misuse and overuse? (and underuse!)
The Responsibilities of a Professional Society

**Activities**
- Collecting and analysing data
- Public release
- Education and training

**Aims**
- Quality improvement
- Maintenance of public trust
- Regulation

Collecting and analysing data leads to Public release, then to Education and training. Education and training contributes to Quality improvement, which leads to Maintenance of public trust. Maintenance of public trust leads to Regulation.
## ACC Guidelines
### Unprotected Left Main Coronary Artery Disease

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class IIa</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. It is reasonable that patients undergoing PCI to unprotected left main coronary obstructions be followed up with coronary angiography between 2 and 6 months after PCI (level of evidence C)</td>
<td>Deleted recommendation (no longer recommended)</td>
<td></td>
</tr>
<tr>
<td><strong>Class IIb</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. PCI of the left main coronary artery with stents as an alternative to CABG may be considered in patients with anatomic conditions that are associated with a low risk of PCI procedural complications and clinical conditions that predict an increased risk of adverse surgical outcomes (level of evidence B)</td>
<td>New recommendation</td>
<td></td>
</tr>
<tr>
<td><strong>Class III</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005 PCI Guideline, Section 5.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI is not recommended in patients with [...] f. Left main disease and eligibility for CABG (<em>level of evidence C</em>)</td>
<td>Modified recommendation (bullet “f”) from Section 5.1 and bullet “e” from Sections 5.2 and 5.3, are no longer current; see 2009 Class IIb recommendation #1)</td>
<td></td>
</tr>
<tr>
<td>2005 PCI guideline, Sections 5.2, 5.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI is not recommended in patients with [...] e. Left main disease and eligibility for CABG (<em>level of evidence C</em>)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appropriate Use Criteria

- Diagnostic effectiveness
- Therapeutic effectiveness
- Patient empowerment
Existing AUC

- SPECT-MPI (Updated 2009)
- CCT/MRI (Updated 2010)
- TTE/TEE
- Stress Echocardiography (Updated 2010)
- Coronary Revascularization: PCI
- SPECT-MPI Update

- **In Progress:** Peripheral Vascular Disease, Diagnostic Cath
The Revascularization AUC

180 clinical scenarios in acute and chronic CAD patient presentation
# Method of Revascularization of Advanced Coronary Artery Disease

## Patients Without Prior Bypass Surgery

<table>
<thead>
<tr>
<th>CABG</th>
<th>PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No diabetes and normal LVEF</strong></td>
<td><strong>Depressed LVEF</strong></td>
</tr>
<tr>
<td>Two vessel coronary artery disease with proximal LAD stenosis</td>
<td>A</td>
</tr>
<tr>
<td>Three vessel coronary artery disease</td>
<td>A</td>
</tr>
<tr>
<td>Isolated left main stenosis</td>
<td>A</td>
</tr>
<tr>
<td>Left main stenosis and additional coronary artery disease</td>
<td>A</td>
</tr>
</tbody>
</table>

LVEF: Left Ventricular Ejection Fraction

A: CABG

U: PCI

I: PCI
Appropriate Use Criteria

- 85 cardiologists from 10 U.S. institutions
- Review of AUC criteria prior to AUC publications
- Purpose: compare consistency of AUC among broad range of cardiologists and the AUC technical panel

Chan et al: JACC 2011; 57:1546-53
### Agreement Between the AUC Technical Panel and Survey Participants in Ratings of Appropriateness for Coronary Revascularization

<table>
<thead>
<tr>
<th>Indications</th>
<th>N</th>
<th>All Physicians (n = 85)</th>
<th>Interventionalist?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>68</td>
<td>84%</td>
<td>Yes (n = 44)</td>
<td>No (n = 41)</td>
</tr>
<tr>
<td>Appropriate</td>
<td>36</td>
<td>94%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncertain</td>
<td>22</td>
<td>73%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inappropriate</td>
<td>10</td>
<td>70%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chan et al: JACC 2011; 57:1546-53
Appropriate Use Criteria

- Good overall concordance in assessments of appropriate use of coronary revascularization between physicians and AUC Technical Panel
- Marked variation in ratings between individual physicians and the AUC Technical Panel

Chan et al: JACC 2011; 57:1546-53
WHY FEEL HELPLESS ABOUT YOUR CORONARY ARTERY DISEASE?

TRY

HIGH TECH
ROTO-ROOTER!

- No better than cheap heart meds
- Accounts for 10% of recent increase in Medicare spending
- Proven useless unless you're in the middle of a heart attack or have severe ischemia on stress test
- Chance of heart attack or stroke right there on the operating table

COOL!

SPECIAL:
Only $20,000 - $200,000
Act now, and Medicare (your tax dollars) or your insurance company will pick up most of the tab!

GET THAT FEELING OF DOING SOMETHING:
The 21st Century's Answer to Leeches
WAS YOUR STENT UNNECESSARY?

1-888-DR-LEGAL

COlkitt Law Firm, PC

Colkitt Law Firm, P.C. Indiana, PA., 15701
with offices in Pittsburgh and Johnstown
Dr. Oz – Stents Unnecessary?
Using Revascularization AUC to Improve Quality and Reduce Unnecessary Spending
Change is an Iterative, Collaborative Process

- Identify objective
- Re-design tools and recruit new skill sets
- Build prototypes
- Re-design workflow
- Test flow
- Improve flow

Change process
18-24 months = well-oiled machine

Improved value
Personalized Lifelong Learning

Keeping current is my biggest challenge. I know I have Maintenance of Certification requirements, I know with the rate of development my gaps grow with each day that passes, I no longer have an unbiased perspective assuring me I am doing OK and recommending things I can do to be the best.

Beginning of 52-week educational initiative

Personal Lifelong Learning Portfolio

- Ability to access specific chunks of clinical documents
- Point-of-care MOC
- Practice guidelines
- My transcript and self-assessments
- Personalized blended curriculum
The Landscape

Issues

Anatomy

Societal

Regulatory
Vein Grafts

Issues

Distal Embolization

Restenosis
The Pace of Innovation
Adoption of New Technology

Declining input and manufacturing costs have lowered prices to drive faster adoption.

Shrinking form factors have unleashed the potential of devices by eliminating mobility constraints.

Enhanced computing power and improved user interfaces have drastically increased device usability.

Technologies have evolved from static creation devices to dynamic consumption and connection devices.

Why?

Deloitte UK and Gartner Research (www.gartner.com)
Title/drp–author: WT/BK – Holmes, David
Sub/drp–Job#: YW105/BK – 3106481

Subject: Accessible Information

Background: BU3
Banner/brdr: 0-40-159/BU41
Side title: YW105
• /colhdgs: YW105
Text: WT/BK
Highlight: YO114
Subdue: BU31
Footnotes: BU41

COLOR REFERENCE ONLY
Match: Mayo2bu-2002 (CP1111378)

PPT shooting instructions
PPT File to Server
(2 images)
Artist: ma Due Date: 4-20-2011
“Education is part of the Cure…”

Pat O’Gara 2000
Annual Curriculum Planning – April, 2012

Review competency milestones by pathway

Review performance

Outcomes reports, evaluations and assessments

Data/gaps from quality and science

Planning by pathway

Cardiac arrhythmias
Cardiac function and heart failure
Congenital cardiology
Hypertension, lipids and prevention
Imaging and diagnostic testing
Interventional cardiology

Lifelong learning/MOC
Myocardial ischemia and infarction
Quality of care and outcomes assessment
Valvular heart disease
Vascular disease

Develop success metrics based on competency milestones

Assessment, evaluation and outcome planning by activity
Business management

Annual meeting and i2 operations

Online learning operations

Live program operations

Academic affairs
Lifelong Learning Division

- Foundation of strategically focused departments
  - Academic affairs
  - Business management

- Overarching compass by which operational groups design, develop and disseminate

- Department missions are distinct, but also innately connected

- Unified circle of strategic influence governing the entire division
A Well Coordinated Team Effort

• Strategic departments will build the essential frameworks and plans for success

• Operational groups will deliver the right content, at the right time, in the right format to our member and non-member learners
A Well Coordinated Team Effort

- Strategic departments will build the essential frameworks and plans for success.

- Operational groups will deliver the right content, at the right time, in the right format to our member and non-member learners.
Getting There

- Joe’s Direct Report meetings: leadership expectations
- Town meetings
- Work groups
  - Curriculum planning
  - Academic affairs
  - Business management
  - Online operations
  - Live operations
- May 31st retreat
- June: Work flow re-engineering
- Committee Alignment for Success
Academic Affairs: Mission

The Academic Affairs Department transforms scientific, regulatory and environmental forces shaping cardiovascular healthcare into an integrated system for performance improvement and lifelong learning.

“A team of strategic experts grounded in science and education inspiring and infusing lifelong learning principles into practice”
The Business Management Department strategically plans educational products, services and experiences to optimize quality and drive revenue for continued growth and leadership.

“A team of experts grounded in keeping stakeholders aligned, identifying market opportunities, meeting member needs and leading education quality and continual improvement”
Annual Meeting Operations executes strategic intent through designing, developing and implementing innovative annual scientific conventions and derivative meetings.

“A team of operational experts in delivering scientific and clinical content through innovative medical education conventions”
Live Program Operations: Mission

Live Program Operations executes strategic intent through designing, developing and implementing innovative live educational programs and activities

“A team of operational experts in delivering scientific and clinical content through innovative live programs and activities”
Online Learning Operations: Mission

Online Operations executes strategic intent through designing, developing and implementing innovative online educational activities and managing the Lifelong Learning Portfolio toolset

“A team of operational experts in delivering scientific and clinical content through innovative online programs and activities”
Re-establish division

Re-craft vision of blended learning and MOC

Design infrastructure to power vision

Integrate tools, skill sets, workflow and re-alignment of committees

Lead value driven education model

Improved Patient Care
- Higher value education
- Competency based curriculum
- > capacity
- > responsiveness to market
- > revenue
- Improved quality and consistency
- Improved productivity

Outcome

Business management
- Annual meeting and i2 operations
- Online learning operations
- Live program operations

New capacity
New accountability
New skills
New work flow

Change
Subject: Ed Vision Slides

Background: BU3
Banner/brdr: 0-40-159/BU41
Side title: YW105
• /colhdgs: YW105
Text: WT/BK
Highlight: YO114
Subdue: BU31
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Addressing Variation in Care
The Case for Appropriate Use

David R. Holmes, MD
Mayo Clinic, MN
An end-to-end, system that translates science into practice

PLAN

Guidelines/Standards
- Guidelines
- AUC / PM

ACT

Improvement
- D2B
- H2H
- FOCUS

DO

Implementation - “Bridge”
- Quality Practice Assessment
- Clinical Decision Support
- Operation Management Tools

STUDY

Measurement
- NCDR

Education and Training
ACC Translation of Science

- Guidelines: 19 topics plus 3 new topics in process
- Performance Measures: 6 topics plus 2 new topics in process
- AUC: 5 topics plus 1 new topic in process
- Data Standards: 5 topics plus 1 new topic in process
The Case for AUC

- FOCUS and potential imaging savings

UnitedHealthCare SPECT-MPI Pilot
AUC Revascularization

- Define key variables for appropriate use
  - Medication
  - Symptom status
  - Non-invasive test results
  - Coronary artery anatomy
- Embedded in NCDR CathPCI Registry
- Opportunity for shared decision making
“Science tells us what we can do;
Guidelines what we should do;
Registries what we are actually doing.”
The Pace of Innovation
Adoption of New Technology

Days taken to sell 1 million units

- **IPod™**
- **Blackberry™**
- **Netbooks**
- **IPhone™**
- **IPad™**

**Why?**

- Declining input and manufacturing costs have lowered prices to drive faster adoption.
- Shrinking form factors have unleashed the potential of devices by eliminating mobility constraints.
- Enhanced computing power and improved user-interfaces have drastically increased device usability.
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The Responsibilities of a Professional Society

The SCTS Model

**Activities**
- Collecting and analysing data
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**Aims**
- Quality improvement
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- Regulation
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PPT shooting instructions
PPT File to Server
(2 images)
Artist: ma  Due Date: 4-20-2011

COLOR REFERENCE ONLY
Match: Mayo2bu-2002 (CP1111378)
Conclusions – Patients undergoing noncardiac surgery after recent coronary stent implantation are at increased risk of perioperative myocardial ischemia, myocardial infarction, and death, particularly after an acute coronary syndrome. For at least 2 years after percutaneous coronary intervention, cardiac outcomes after noncardiac surgery are similar for both drug-eluting and bare-metal stents.
Stent Implantation & Non Cardiac Surgery
Scottish Coronary Revascularization Register

- Patients treated with stent implantation 2003-2007 who underwent non coronary surgery

1,953 patients

- DES: 29%
- BMS: 71%

Perioperative death, ischemia

- <42 Days: 42.4%
- >42 Days: 12.8%

Effect of Stent Type

Time from stent implantation to non-cardiac surgery (mo)

In-Hospital Mortality & Ischemic Cardiac Events

Effect of Stent Type

In-Hospital Mortality & Ischemic Cardiac Events

Time from stent implantation to non-cardiac surgery (mo)

Ex Vivo Stent Thrombogenicity

[LDH adsorbance for stent formulation]/[LDH adsorbance for ML VISION (81 µm)]

ML VISION (81 µm)  TS Vision (162 µm)  XIENCE V (96.6 µm)

Kolandaivelu et al: Circ 123:1400, 2011
Ex Vivo Stent Thrombogenicity

Kolandaivelu et al: Circ 123:1400, 2011
In Vivo Stent Thrombogenicity

Kolandaivelu et al: Circ 123:1400, 2011
Ex Vivo Stent Thrombogenicity

Kolandaivelu et al: Circ 123:1400, 2011
Ex Vivo Stent Thrombogenicity

Kolandaivelu et al: Circ 123:1400, 2011
Subject: Stent Thrombogenicity, Kolandaivelu

Background: BU3
Banner/brdr: 0-40-159/BU41

Side title: YW105
• /colhdgs: YW105

Text: WT/BK
Highlight: YO114
Subdue: BU31
Footnotes: BU41

PPT shooting instructions
PPT File to Server (5 images)

Artist: MN         Due Date: 4-21-2011

COLOR REFERENCE ONLY
Match: Mayo2bu-2002 (CP1111378)
Trends in Medical Therapy

### PCI and Stable CAD

- Single center analysis
- 8,912 patients undergoing elective PCI for 1979-2006

<table>
<thead>
<tr>
<th>Time Periods</th>
<th>% Success</th>
<th>4-Year Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTCA</td>
<td>81%</td>
<td>11%</td>
</tr>
<tr>
<td>Early stent</td>
<td>92%</td>
<td>13%</td>
</tr>
<tr>
<td>BMS</td>
<td>96%</td>
<td>10%</td>
</tr>
<tr>
<td>DES</td>
<td>97%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Long-Term Mortality & Composite Endpoints

Conclusions: Procedural success rates in contemporary practice of PCI for stable CAD are excellent with very low in-hospital mortality. Introduction of drug-eluting stents has reduced target lesion revascularization but not mortality among all comers. Outcomes similar to that observed in recent clinical trials are being achieved in routine clinical practice.
Title/drp–author: WT/BK – Holmes, David
Sub/drp–Job#: YW105/BK – 3107483

Subject: Perc Revasc for Stable CAD, Hilliard
Background: BU (6-61-232)  Plot/brdr: open/BU41
Banner/brdr: BU4/BU41  x, y only
Side title: YW105
• /colhdgs: YW105
Text: WT/BK
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Subdue: BU31
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Match: Mayo2bu-2002