CABG vs PCI: What do the Guidelines Say?

David P Taggart  MD PhD FRCS FESC
Professor of Cardiovascular Surgery, University of Oxford

Conflicts of Interest:
(i) Clinical: Cardiac Surgeon
(ii) One of 25 ESC/EACTS Guidelines Writers on Myocardial Revascularization
CABG vs PCI: What do the Guidelines Say?

1. Development of Joint Guidelines by the Heart Team
2. Role of the Heart Team in the Rationale for Guidelines
3. Current Guidelines
   1. Main Guideline Recommendations
   2. Differences in Guidelines in Europe and North America?
   3. Likely Changes in Guideline Recommendations Based on New Evidence
Coronary Artery Bypass Grafting is Still the Best Treatment for Multivessel and Left Main Disease, But Patients Need to Know

David P. Taggart, MD(Hons), PhD
John Radcliffe Hospital, University of Oxford, Oxford, United Kingdom

<table>
<thead>
<tr>
<th>Society</th>
<th>Recommendations for PCI</th>
<th>Written by</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC/AHA</td>
<td>‘Patients with 2 or 3 vessel disease who are otherwise eligible for CABG including diabetes’</td>
<td>23 cardiologists 1 surgeon</td>
</tr>
<tr>
<td>Circulation 2006</td>
<td>NO SURGICAL OPINION RECOMMENDED</td>
<td></td>
</tr>
<tr>
<td>ESC</td>
<td>‘all patients except diabetics with multivessel disease, unprotected left main, CTO’</td>
<td>46 cardiologists 0 surgeon</td>
</tr>
<tr>
<td>Eur Heart J 2005</td>
<td>NO SURGICAL OPINION RECOMMENDED</td>
<td></td>
</tr>
<tr>
<td>BCS</td>
<td>‘patients to be fully informed in decisions, treatment options’ (GMC Good Medical Practice)</td>
<td>8 cardiologists 1 surgeon</td>
</tr>
<tr>
<td>Heart 2005</td>
<td>NO SURGICAL OPINION RECOMMENDED</td>
<td></td>
</tr>
<tr>
<td>Summary of Guidelines</td>
<td>almost all patients can be treated by PCI</td>
<td>77 cardiologists 2 surgeons</td>
</tr>
<tr>
<td></td>
<td>NONE RECOMMEND SURGICAL OPINION</td>
<td></td>
</tr>
</tbody>
</table>

‘I believe that surgical societies should no longer provide a ‘token’ surgeon on cardiology guidelines as they are hopelessly ‘outgunned’ and ineffectual against what are, in effect, exclusive cardiology dictates. **If surgical opinion is genuinely to be heard, there must be comparable numbers of surgeons on writing committees.** ’
Percutaneous Coronary Intervention versus Coronary-Artery Bypass Grafting for Severe Coronary Artery Disease

Patrick W. Serruys, M.D., Ph.D., Marie-Claude Morice, M.D., A. Pieter Kappetein, M.D., Ph.D., Antonio Colombo, M.D., David R. Holmes, M.D., Michael J. Mack, M.D., Elisabeth Stähle, M.D., Ted E. Feldman, M.D., Marcel van den Brand, M.D., Eric J. Bass, B.A., Nic Van Dyck, R.N., Katrin Leadley, M.D., Keith D. Dawkins, M.D., and Friedrich W. Mohr, M.D., Ph.D., for the SYNTAX Investigators*
2013 ESC guidelines on the management of stable coronary artery disease

The Task Force on the management of stable coronary artery disease of the European Society of Cardiology

Task Force Members: Gilles Montalescot* (Chairperson) (France), Udo Sechtem* (Chairperson) (Germany), Stephan Achenbach (Germany), Felicita Andreotti (Italy), Chris Arden (UK), Andrzej Budaj (Poland), Raffaele Bugiardini (Italy), Filippo Crea (Italy), Thomas Cuisset (France), Carlo Di Mario (UK), J. Rafael Ferreira (Portugal), Bernard J. Gersh (USA), Anselm K. Gitt (Germany), Jean-Sebastien Hulot (France), Nikolaus Marx (Germany), Lionel H. Opie (South Africa), Matthias Pfisterer (Switzerland), Eva Prescott (Denmark), Frank Ruschitzka (Switzerland), Manel Sabaté (Spain), Roxy Senior (UK), Ernst E. van der Wall (Netherlands), Christiaan J.M. Vrints (Belgium).

23 cardiologists and 1 surgeon!!
Inserted 2 Flow Algorithms for LM and MVD
Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Developed with the special contribution of the European Association for Percutaneous Cardiovascular Interventions (EAPCI)

Authors/Task Force Members: William Wijns (Chairperson) (Belgium)*, Philippe Kolt (Chairperson) (Belgium)*, Nicolas Danchin (France), Carlo Di Mario (UK), Volkmar Falk (Switzerland), Thierry Folliguet (France), Scott Garg (The Netherlands), Kurt Huber (Austria), Stefan James (Sweden), Juhani Knuuti (Finland), Jose Lopez-Sendon (Spain), Jean Marco (France), Lorenzo Menicanti (Italy), MIodrag Ostojic (Serbia), Massimo F. Piepoli (Italy), Charles Pirlet (Belgium), Jose L. Pomar (Spain), Nikolaus Reifart (Germany), Flavio L. Ribichini (Italy), Martin J. Schalij (The Netherlands), Paul Sergeant (Belgium), Patrick W. Serruys (The Netherlands), Sigmund Silber (Germany), Miguel Sousa Uva (Portugal), David Taggart (UK)

- Joint Cardiology (ESC) and Cardiac Surgery (EACTS): A First
- 25 members from 13 European countries
  - 9 non interventional cardiologists,
  - 8 interventional cardiologists,
  - 8 cardiac surgeons
- Extensively reviewed by external referees before publication

Reflects the 'Heart Team' !!!
# Table of Contents

**Guidelines on myocardial revascularization**

- 14 chapters
- 270 references

## 4. Process for decision making and patient information

4.1 Patient information

4.2 Multidisciplinary decision making (Heart Team)

### 9. Special conditions

9.1 Diabetes

9.1.1 Indications for myocardial revascularization

9.1.2 Type of intervention: coronary artery bypass grafting vs. percutaneous coronary intervention

9.1.3 Specific aspects of percutaneous coronary intervention

9.1.4 Type of coronary artery bypass grafting intervention

9.1.5 Antithrombotic pharmacotherapy

9.1.6 Antidiabetic medications

9.2 Myocardial revascularization in patients with chronic kidney disease

9.3 Myocardial revascularization in patients requiring valve surgery

9.4 Associated cerebrovascular disease

9.4.1 Associated coronary and carotid artery disease

9.4.2 Associated coronary and peripheral arterial disease

9.5 Myocardial revascularization in chronic heart failure

9.6 Crossed revascularization procedures

9.6.1 Revascularization for acute graft failure

9.6.2 Revascularization for late graft failure

9.6.3 Revascularization for acute failure after percutaneous coronary intervention

9.6.4 Elective revascularization for late failure after percutaneous coronary intervention

9.6.5 Hybrid procedures

9.7 Arrhythmias in patients with ischaemic heart disease

9.7.1 Atrial fibrillation

9.7.2 Supraventricular arrhythmias other than atrial fibrillation or flutter

9.7.3 Ventricular arrhythmias

9.7.4 Concomitant revascularization in heart failure patients who are candidates for resynchronization therapy

10. Procedural aspects of coronary artery bypass grafting

10.1 Pre-operative management

10.2 Surgical procedures

10.2.1 Coronary vessel

10.2.2 Bypass graft

10.3 Early post-operative risk
2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention: Executive Summary

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions

2011 ACCF/AHA Guideline for Coronary Artery Bypass Graft Surgery: Executive Summary

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American Association for Thoracic Surgery, Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons

2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease

2014 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI)

ACC/AHA/AATS/PCNA/SCAI/STS Focused Update

2014 ACC/AHA/AATS/PCNA/SCAI/STS Focused Update of the Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease

Transatlantic editorial: A comparison between European and North American guidelines on myocardial revascularization

Philippe Kolh, MD, PhD, Paul Kurlansky, MD, Jochen Cremer, MD, PhD, Jennifer Lawton, MD, Matthias Siepe, MD, and Stephen Frenes, MD, MSc

Broadly Similar

Some Minor Differences in Class of Recommendation (COR) and Levels of Evidence (LOE)
APPROPRIATE USE CRITERIA

ACC/AATS/AHA/ASE/ASNC/SCAI/SCCT/STS 2017 Appropriate Use Criteria for Coronary Revascularization in Patients With Stable Ischemic Heart Disease

2014 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI)

Heart Team

COR: I

LOE: C
Clinical update

The rationale for Heart Team decision-making for patients with stable, complex coronary artery disease

Stuart J. Head1, Sanjay Kaul2, Michael J. Mack3, Patrick W. Serruys1, David P. Taggart4, David R. Holmes Jr5, Martin B. Leon6,7, Jean Marco8, Ad J.J.C. Bogers1, and A. Pieter Kappetein1*

1Department of Cardiothoracic Surgery, Erasmus University Medical Centre, Rotterdam, The Netherlands; 2Cedars-Sinai Medical Center, University of California, Los Angeles, CA, USA; 3The Heart Hospital, Baylor Health Care Systems, Dallas, TX, USA; 4John Radcliffe Hospital, Oxford University Hospitals NHS Trust, Oxford, UK; 5Mayo Clinic Rochester, Rochester, MN, USA; 6Columbia University Medical Center/New York Presbyterian Hospital, New York, NY, USA; 7Cardiovascular Research Foundation, New York, NY, USA; and 8Clinique Pasteur, Toulouse, France

Received 11 October 2012; revised 8 January 2013; accepted 27 January 2013; online publish-ahead-of-print 20 February 2013

☑ Current evidence: PCI and CABG in multi-vessel and left main
☑ AND ALSO DOCUMENTED
1. GROSS variations (up to 20 fold !) in ratio of PCI vs CABG (between countries, within single countries, within single regions)
2. DIFFERENCES LARGELY DICTATED by PHYSICIAN PREFERENCE
3. Widespread Inappropriate use of investigations and interventions (PCI)
4. Most patients misunderstand the rationale for PCI (improved survival etc
# 2014 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

## Recommendations according to extent of CAD

**Complex CAD should be discussed by Heart Team IC**

<table>
<thead>
<tr>
<th>CABG</th>
<th>PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class</strong></td>
<td><strong>Level</strong></td>
</tr>
<tr>
<td>One or two-vessel disease without proximal LAD stenosis.</td>
<td>IIb</td>
</tr>
<tr>
<td>One-vessel disease with proximal LAD stenosis.</td>
<td>I</td>
</tr>
<tr>
<td>Two-vessel disease with proximal LAD stenosis.</td>
<td>I</td>
</tr>
<tr>
<td>Left main disease with a SYNTAX score ≤ 22.</td>
<td>I</td>
</tr>
<tr>
<td>Left main disease with a SYNTAX score 23–32.</td>
<td>I</td>
</tr>
<tr>
<td>Left main disease with a SYNTAX score &gt;32.</td>
<td>I</td>
</tr>
<tr>
<td>Three-vessel disease with a SYNTAX score ≤ 22.</td>
<td>I</td>
</tr>
<tr>
<td>Three-vessel disease with a SYNTAX score 23–32.</td>
<td>I</td>
</tr>
<tr>
<td>Three-vessel disease with a SYNTAX score &gt;32.</td>
<td>I</td>
</tr>
</tbody>
</table>

CABG would be even better with more arterial grafts and greater use of OMT.
Left Main Coronary Artery With Relevant Stenosis

± 1 Vessel Disease

Ostium/mid shaft
High surgical risk *
PCI

Distal bifurcation

Syntax score ≤ 32
Low surgical risk *
CABG

+ 2 or 3 Vessel Disease

Syntax score ≥ 33

Heart Team Discussion *
### 2014 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

#### Recommendations according to extent of CAD

Complex CAD should be discussed by Heart Team IC

<table>
<thead>
<tr>
<th></th>
<th>CABG</th>
<th>PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Level&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>One or two-vessel disease without proximal LAD stenosis.</td>
<td>IIb</td>
<td>C</td>
</tr>
<tr>
<td>One-vessel disease with proximal LAD stenosis.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>Two-vessel disease with proximal LAD stenosis.</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Left main disease with a SYNTAX score ≤ 22.</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Left main disease with a SYNTAX score 23–32.</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Left main disease with a SYNTAX score &gt;32.</td>
<td>66%</td>
<td>I</td>
</tr>
<tr>
<td>Three-vessel disease with a SYNTAX score ≤ 22.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>Three-vessel disease with a SYNTAX score 23–32.</td>
<td>79%</td>
<td>I</td>
</tr>
<tr>
<td>Three-vessel disease with a SYNTAX score &gt;32.</td>
<td>I</td>
<td>A</td>
</tr>
</tbody>
</table>

CABG would be even better with more arterial grafts and greater use of OMT
Percutaneous coronary intervention in stable angina (ORBITA): a double-blind, randomised controlled trial

Rasha Al-Lamee, David Thompson, Hakim-Moulay Dehbi, Sayan Sen, Kare Tang, John Davies, Thomas Keeble, Michael Mielewczik, Raffi Kaprielian, Iqbal S Malik, Sukhjinder S Nijjer, Ricardo Petraco, Christopher Cook, Yousif Ahmad, James Howard, Christopher Baker, Andrew Sharp, Robert Gerber, Suneel Talwar, Ravi Assomull, Jamil Mayet, Roland Wensel, David Collier, Matthew Shun-Shin, Simon A Thom, Justin E Davies, Darrel P Francis, on behalf of the ORBITA investigators*

Summary
Background Symptomatic relief is the primary goal of percutaneous coronary intervention (PCI) in stable angina and is commonly observed clinically. However, there is no evidence from blinded, placebo-controlled randomised trials to show its efficacy.

- 200 patient with stable angina and significant stenoses >80% and FFR <0.7
- RCT of PCI (DES) vs ‘sham’ invasive procedure (FFR)
- At 6 weeks improvements in exercise test and frequency and severity of angina similar
- ? PLACEBO EFFECT of PCI
CONCLUSIONS CABG, as compared with PCI with drug-eluting stents, significantly reduced the long-term risk of mortality in nondiabetic patients with multivessel CAD. (J Am Coll Cardiol 2016;68:29-36)
Everolimus-Eluting Stents or Bypass Surgery for Left Main Coronary Artery Disease


NEJM 2016

LM: EXCEL Trial
SYNTAX scores <33
1905 RCT patients (of 2600)
1000 Registry Patients
3 years follow-up

A Death, Stroke, or Myocardial Infarction

B Death from Any Cause

C Stroke

No Difference in Stroke

D Myocardial Infarction

At 5 years?
## EXCEL: The 'Money' Shot

<table>
<thead>
<tr>
<th></th>
<th>From randomization to 30 days</th>
<th>From 30 days to 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PCI (n=948)</td>
<td>CABG (n=957)</td>
</tr>
<tr>
<td>Death, stroke or MI</td>
<td>4.9%</td>
<td>7.9%</td>
</tr>
<tr>
<td>- Death</td>
<td>1.0%</td>
<td>1.1%</td>
</tr>
<tr>
<td>- Stroke</td>
<td>0.6%</td>
<td>1.3%</td>
</tr>
<tr>
<td>- MI</td>
<td>3.9%</td>
<td>6.2%</td>
</tr>
</tbody>
</table>

**Repeat Revasc** 12.6% PCI vs 7.5% CABG (p<0.001)

By 3 years CABG mortality 2.4% lower (p=0.06) BUT:

1. **DIVERGING SURVIVAL CURVES** in favour of CABG
2. **NO increased risk of stroke** with CABG
Percutaneous coronary angioplasty versus coronary artery bypass grafting in treatment of unprotected left main stenosis (NOBLE): a prospective, randomised, open-label, non-inferiority trial

Timo Mäkikallio, Niels R Holm, Mitchell Lindsay, Mark S Spence, Andrejs Erglis, Ian B A Menown, Thor Trovik, Markku Eskola, Hannu Romppanen,

LM: NOBLE
1201 RCT patients @ 5 years
No Registry Patients
Lancet 2016

**Mortality**
- CABG: 12%
- PCI: 9%

**MI**
- CABG: 7%
- PCI: 2%

**REVASC**
- CABG: 16%
- PCI: 10%

**STROK E**
- CABG: 5%
- PCI: 2%
What do the Guidelines Say?: Summary and Conclusions

1. Guidelines give clear indications when intervention is appropriate and emphasize the role of the Heart Team in making recommendations.
2. Guidelines state that ‘ad hoc’ PCI should not be a default procedure.
3. Guidelines recommend that institutional protocols can be used to avoid systematic need to review every case.
4. 79% of 3 vessel disease (SYNTAX >22) and 65% of all left main disease (SYNTAX >32) have strong survival advantage with CABG continuing to increase past 5 years.
5. Consistent ‘unwarranted’ variation in ratios of PCI:CABG between countries, within single countries and within single regions.
6. Strong evidence that ABSENCE of Heart results in the majority of elective PCI patients failing to understand its rationale and also a large number of inappropriate or wrong PCI interventions.
7. Guidelines are transparent and protect the patients (from receiving wrong interventions) and doctors (from administering wrong interventions) and should be mandatory.
8. Professional bodies should persuade statutory bodies/payers to only reimburse interventions which are approved by the Heart Team based on guidelines (or documented as to why guidelines were not followed).