
Task Force on Clinical Practice Guidelines and the Society for Cardiovascular Angiography and Interventions

Endorsed by the Latin American Society of Interventional Cardiology

PCI WRITING COMMITTEE*

Glenn N. Levine, MD, FACC, FAHA, Chair†; Eric R. Bates, MD, FACC, FAHA, FSCAI, Vice Chair‡;

James C. Blankenship, MD, FACC, FAHA, FSCAI, Vice Chair‡; Steven R. Bailey, MD, FACC, FSCAI*‡;

John A. Bittl, MD, FACC‡; Bojan Cerceck, MD, FACC, FAHA‡; Charles E. Chambers, MD, FACC, FSCAI‡;

Stephen G. Ellis, MD, FACC‡; Robert A. Guyton, MD, FACC‡; Steven M. Hollemburg, MD, FACC*‡;

Umesh N. Khot, MD, FACC*‡; Richard A. Lange, MD, FACC, FAHA‡; Laura Mauri, MD, MSc, FACC, FSCAI*†‡;

Roxana Mehran, MD, FACC, FAHA, FSCAI*‡; Issam D. Moussa, MD, FACC, FAHA, FSCAI‡;

Debabrata Mukherjee, MD, FACC, FAHA, FSCAI‡; Henry H. Ting, MD, FACC, FAHA‡

STEMI WRITING COMMITTEE*

Patrick T. O’Gara, MD, FACC, FAHA, Chair‡; Frederick G. Kushner, MD, FACC, FAHA, FSCAI, Vice Chair‡;

Deborah D. Aschim, MD, FACC‡; Ralph G. Brindis, MD, MPH, MACC, FSCAI, FAHAS; Donald E. Casey, Jr, MD, MPH, MBA, FAHA‡;

Mina K. Chung, MD, FACC, FAHA‡; James A. de Lemos, MD, FACC‡; Deborah B. Diercks, MD, MSc‡;

James C. Fang, MD, FACC, FAHA‡; Barry A. Franklin, PhD, FAHA‡; Christopher B. Granger, MD, FACC, FAHA‡;

Harlan M. Krumholz, MD, SM, FACC, FAHA‡; Jane A. Linderbaum, MS, CNP-BC‡; David A. Morrow, MD, MPH, FACC, FAHA‡;

L. Kristin Newby, MD, MHS, FACC, FAHA‡; Joseph P. Ornato, MD, FACC, FAHA, FACP, FACEP‡; Narith Ou, PharmD‡;

Martha J. Radford, MD, FACC, FAHA‡; Jacqueline E. Tamis-Holland, MD, FACC, FSCAI‡; Carl L. Tommaso, MD, FACC, FAHA, MSCAI‡;

Cynthia M. Tracy, MD, FACC, FAHA‡; Y. Joseph Woo, MD, FACC, FAHA‡; David X. Zhao, MD, FACC*‡

*Writing committee members are required to recuse themselves from voting on sections to which their specific relationships with industry may apply; see Appendices 1 and 2 for detailed information. †ACC/AHA Representative. §SCAI Representative. ¶ACC/AHA Task Force on Clinical Practice Guidelines Liaison. ||Deborah D. Aschim accepted a position at Capricorn Therapeutics in August 2015, after the writing effort was completed. In accordance with ACC/AHA policy, she recused herself from the final voting process. ||ACP Representative. #ACEP Representative. **Former Task Force member; current member during the writing effort.

This document was approved by the American College of Cardiology Board of Trustees and Executive Committee, the American Heart Association Science Advisory and Coordinating Committee, and the Society of Cardiovascular Angiography and Interventions in September 2015, and by the American Heart Association Executive Committee in October 2015.

The online-only Comprehensive RWI Data Supplement table is available with this article at http://circ.ahajournals.org/lookup/suppl/doi:10.1161/CIR.0000000000000336/-/DC1.

The online-only Data Supplement is available with this article at http://circ.ahajournals.org/lookup/suppl/doi:10.1161/CIR.0000000000000336/-/DC2.


© 2015 by the American College of Cardiology Foundation, the American Heart Association, Inc., and the Society for Cardiovascular Angiography and Interventions.
Preamble

To ensure that guidelines reflect current knowledge, available treatment options, and optimum medical care, existing clinical practice guideline recommendations are modified and new recommendations are added in response to new data, medications or devices. To keep pace with evolving evidence, the American College of Cardiology (ACC)/American Heart Association (AHA) Task Force on Clinical Practice Guidelines ("Task Force") has issued this focused update to revise guideline recommendations on the basis of recently published data. This update is not based on a complete literature review from the date of previous guideline publications, but it has been subject to rigorous, multilevel review and approval, similar to the full guidelines. For specific focused update criteria and additional methodological details, please see the ACC/AHA guideline methodology manual.¹

Modernization

In response to published reports from the Institute of Medicine²,³ and ACC/AHA mandates,⁴–⁷ processes have changed leading to adoption of a "knowledge byte" format. This entails delineation of recommendations addressing specific clinical questions, followed by concise text, with hyperlinks to supportive evidence. This approach better accommodates time constraints on busy clinicians, facilitates easier access to recommendations via electronic search engines and other evolving technology (eg, smart phone apps), and supports the evolution of guidelines as "living documents" that can be dynamically updated as needed.

Intended Use

Practice guidelines provide recommendations applicable to patients with or at risk of developing cardiovascular disease. The focus is on medical practice in the United States, but guidelines developed in collaboration with other organizations may have a broader target. Although guidelines may inform regulatory or payer decisions, they are intended to improve quality of care in the interest of patients.

Class of Recommendation and Level of Evidence

The Class of Recommendation (COR) and Level of Evidence (LOE) are derived independently of one another according to established criteria. The COR indicates the strength of recommendation, encompassing the estimated magnitude and certainty of benefit of a clinical action in proportion to risk. The LOE rates the quality of scientific evidence supporting the intervention on the basis of the type, quantity, and consistency of data from clinical trials and other sources (Table 1).¹⁷,⁸

Relationships With Industry and Other Entities

The ACC and AHA sponsor the guidelines without commercial support, and members volunteer their time. The Task Force zealously avoids actual, potential, or perceived conflicts of interest that might arise through relationships with industry or other entities (RWI). All Guideline Writing Committee (GWC) members and reviewers are required to disclose current industry relationships or personal interests from 12 months before initiation of the writing effort. Management of RWI involves selecting a balanced GWC and assuring that the chair and a majority of committee members have no relevant RWI (Appendixes 1 and 2). Members are restricted with regard to writing or voting on sections to which their RWI apply. For transparency, members’ comprehensive disclosure information is available online. Comprehensive disclosure information for the Task Force is also available online. The Task Force strives to avoid bias by selecting experts from a broad array of backgrounds representing different geographic
regions, sexes, ethnicities, intellectual perspectives/biases, and scopes of clinical practice, and by inviting organizations and professional societies with related interests and expertise to participate as partners or collaborators.

Related Issues
For additional information pertaining to the methodology for grading evidence, assessment of benefit and harm, shared decision making between the patient and clinician, structure of evidence tables and summaries, standardized terminology for articulating recommendations, organizational involvement, peer review, and policies for periodic assessment and updating of guideline documents, we encourage readers to consult the ACC/AHA guideline methodology manual.1

The recommendations in this focused update represent the official policy of the ACC and AHA until superseded by published addenda, statements of clarification, focused updates, or revised full-text guidelines. To ensure that guidelines remain current, new data are reviewed biannually to determine whether recommendations should be modified. In general, full revisions are posted in 5-year cycles.1

Jonathan L. Halperin, MD, FACC, FAHA
Chair, ACC/AHA Task Force on Clinical Practice Guidelines

1. Introduction
The scope of this focused update is limited to considerations relevant to multivessel percutaneous coronary intervention (PCI) and thrombus aspiration in patients with ST-elevation myocardial infarction (STEMI) undergoing primary PCI.

1.1. Methodology and Evidence Review
Clinical trials presented at the major cardiology organizations’ 2013 to 2015 annual scientific meetings and other selected reports published in a peer-reviewed format through August 2015 were reviewed by the 2011 PCI and 2013 STEMI GWCs and the Task Force to identify trials and other key data that might affect guideline recommendations. The information considered important enough to prompt updated recommendations is included in evidence tables in the Online Data Supplement.

Consult the full-text versions of the 2011 PCI and 2013 STEMI guidelines6,10 for recommendations in clinical areas not addressed in the focused update. The individual recommendations in this focused update will be incorporated into future revisions or updates of the full-text guidelines.

1.2. Organization of the GWC
For this focused update, representative members of the 2011 PCI and 2013 STEMI GWCs were invited to participate. Members were required to disclose all RWI relevant to the topics under consideration. The entire membership of both GWCs voted on the revised recommendations and text. The latter group was composed of experts representing cardiovascular medicine, interventional cardiology, electrophysiology, heart failure, cardiac surgery, emergency medicine, internal medicine, cardiac rehabilitation nursing, and pharmacy. The GWC included representatives from the ACC, AHA, American College of Physicians, American College of Emergency Physicians, and Society for Cardiovascular Angiography and Interventions (SCAI).

1.3. Review and Approval
This document was reviewed predominantly by the prior reviewers from the respective 2011 and 2013 guidelines. These included 8 official reviewers jointly nominated by the ACC and AHA, 4 official/organizational reviewers nominated by SCAI, and 25 individual content reviewers. Reviewers’ RWI information was distributed to the GWC and is published in this document (Appendix 3).

This document was approved for publication by the governing bodies of the ACC, the AHA, and the SCAI and was endorsed by the Latin American Society of Interventional Cardiology.

2. Culprit Artery–Only Versus Multivessel PCI
(See Section 5.2.2.2 of 2011 PCI guideline and Section 4.1.1 of 2013 STEMI guideline for additional recommendations.)

Approximately 50% of patients with STEMI have multivessel disease.25,26 PCI options for patients with STEMI and multivessel disease include: 1) culprit artery–only primary PCI, with PCI of nonculprit arteries only for spontaneous ischemia or intermediate- or high-risk findings on predischarge noninvasive testing; 2) multivessel PCI at the time of primary PCI; or 3) culprit artery–only primary PCI followed by staged PCI of nonculprit arteries. Observational studies, randomized controlled trials (RCTs), and meta-analyses comparing culprit artery–only PCI with multivessel PCI have reported conflicting results,11,12,14-24,27,28 likely because of differing inclusion criteria, study protocols, timing of multivessel PCI, statistical heterogeneity, and variable endpoints (Data Supplement).

Previous clinical practice guidelines recommended against PCI of nonculprit artery stenoses at the time of primary PCI in hemodynamically stable patients with STEMI.9,10 Planning for routine, staged PCI of noninfect artery stenoses on the basis of the initial angiographic findings was not addressed in these previous guidelines, and noninfect artery PCI was considered only in the limited context of spontaneous ischemia or high-risk findings on predischarge noninvasive testing. The earlier recommendations were based in part on safety concerns, which included increased risks for procedural complications, longer procedural time, contrast nephropathy, and stent thrombosis in a prothrombotic and proinflammatory state,9,10 and in part on the findings from many observational studies and meta-analyses of trends toward or statistically significant worse outcomes in those who underwent multivessel primary PCI.12-16,21-23

Four RCTs have since suggested that a strategy of multivessel PCI, either at the time of primary PCI or as a planned, staged procedure, may be beneficial and safe in selected patients with STEMI17,18,24-27 (Data Supplement). In the PRAMI (Preventive Angioplasty in Acute Myocardial Infarction) trial (n=465),24 the composite primary outcome of cardiac death, nonfatal myocardial infarction (MI), or refractory angina occurred in 21 patients (9%) treated with multivessel primary PCI, compared with 53 patients (22%) treated with culprit
artery–only PCI (HR: 0.35; 95% CI: 0.21 to 0.58; P<0.001). In the CvLPRIT (Complete Versus Culprit-Lesion Only Primary PCI) trial,18 296 patients were randomized to culprit artery–only or multivessel PCI during the index hospitalization (72% underwent multivessel PCI). The composite primary outcome of death, reinfarction, heart failure, and ischemia-driven revascularization at 12 months occurred in 15 patients (10%) who underwent multivessel PCI, compared with 31 patients (21%) receiving culprit artery–only PCI (HR: 0.49; 95% CI: 0.24 to 0.84; P=0.009). In the DANAMI 3 PRIMULTI (Third Danish Study of Optimal Acute Treatment of Patients with ST-segment Elevation Myocardial Infarction) trial,17 the composite primary outcome of all-cause death, nonfatal MI, or ischemia-driven revascularization of non-culprit artery disease occurred in 40 of 314 patients (13%) who underwent multivessel staged PCI guided by angiography and fractional flow reserve before discharge, versus 68 of 313 patients (22%) treated with culprit artery–only PCI (HR: 0.56; 95% CI: 0.38 to 0.83; P=0.004). In the PRAGUE-13 (Primary Angioplasty in Patients Transferred From General Community Hospitals to Specialized PTCA Units With or Without Emergency Thrombolysis) trial,27 214 patients with
STEMI were randomized to staged (3 to 40 days after the index procedure) revascularization of all ≥70% diameter stenosis noninfarct lesions or culprit-only PCI. Preliminary results at 38 months’ mean follow-up showed no between-group differences in the composite primary endpoint of all-cause death, nonfatal MI, and stroke.

On the basis of these findings,17,18,24,27 the prior Class III (Harm) recommendation with regard to multivessel primary PCI in hemodynamically stable patients with STEMI has been upgraded and modified to a Class IIb recommendation to include consideration of multivessel PCI, either at the time of primary PCI or as a planned staged procedure.11–24 (Level of Evidence: B-R)

Although several observational studies19,20 and a network meta-analysis13 have suggested that multivessel staged PCI may be associated with better outcome than multivessel primary PCI, there are insufficient observational data and no randomized data at this time to inform a recommendation with regard to the optimal timing of nonculprit vessel PCI. Additional trial data that will help further clarify this issue are awaited. Issues related to the optimal method of evaluating nonculprit lesions (eg, percent diameter stenosis, fractional flow reserve) are beyond the scope of this focused update.

### 3. Aspiration Thrombectomy

(See Section 5.5.2 of the 2011 PCI guideline and Section 4.2 of the 2013 STEMI guideline for additional recommendations.)

<table>
<thead>
<tr>
<th>2013 Recommendation</th>
<th>2015 Focused Update Recommendation</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class III: Harm</td>
<td>Class IIb</td>
<td></td>
</tr>
<tr>
<td>PCI should not be performed in a noninfarct artery at the time of primary PCI in patients with STEMI who are hemodynamically stable.11–13 (Level of Evidence: B)</td>
<td>PCI of a noninfarct artery may be considered in selected patients with STEMI and multivessel disease who are hemodynamically stable, either at the time of primary PCI or as a planned staged procedure.11–24 (Level of Evidence: B-R)</td>
<td>Modified recommendation (changed class from “II: Harm” to “IIb” and expanded time frame in which multivessel PCI could be performed).</td>
</tr>
</tbody>
</table>

PCI indicates percutaneous coronary intervention; and STEMI, ST-elevation myocardial infarction.

The 2011 PCI and 2013 STEMI guidelines9,10 Class IIa recommendation for aspiration thrombectomy before primary PCI was based on the results of 2 RCTs29,31,32 and 1 meta-analysis30 and was driven in large measure by the results of TAPAS (Thrombus Aspiration During Primary Percutaneous Coronary Intervention in Acute Myocardial Infarction Study), a single-center study that randomized 1071 patients with STEMI to aspiration thrombectomy before primary PCI or primary PCI only.29,32 Three multicenter trials, 2 of which enrolled significantly more patients than prior aspiration thrombectomy trials, have prompted reevaluation of this recommendation. In the INFUSE-AMI (Intracoronary Abciximab and Aspiration Thrombectomy in Patients With Large Anterior Myocardial Infarction) trial7 of 452 patients with anterior STEMI due to proximal or mid-left anterior descending occlusion, infarct size was not reduced by aspiration thrombectomy before primary PCI. The TASTE (Thrombus Aspiration During ST-Segment Elevation Myocardial Infarction) trial (n=7244) incorporated a unique design that allowed randomization within an existing national registry, resulting in enrollment of a remarkably high proportion of eligible patients.34,36 No significant 30-day or 1-year differences were found between the group that received aspiration thrombectomy before primary PCI and the group that received primary PCI only with regard to death, reinfarction, stent thrombosis, target lesion revascularization, or a composite of major adverse cardiac events. The TOTAL (Trial of Routine Aspiration Thrombectomy With PCI Versus PCI Alone in Patients With STEMI) trial randomized 10,732 patients with STEMI to aspiration thrombectomy before primary PCI or primary PCI only.35 Bailout thrombectomy was performed in 7.1% of the primary PCI–only group, whereas the rate of crossover from aspiration thrombectomy before primary PCI to primary PCI only was 4.6%. There were no differences between the 2 treatment groups, either in the primary composite endpoint of cardiovascular death, recurrent MI, cardiogenic shock, or New York Heart Association class IV heart failure at 180 days, or in the individual components of the primary endpoint, stent thrombosis, or target-vessel revascularization. There was a small but statistically significant increase in the rate of stroke in...
demonstrated in patients with STEMI undergoing primary PCI. A benefit for routine rheolytic thrombectomy has been suggested, but the definition of “bailout” glycoprotein IIb/IIIa use. Was later used during the procedure because of unsatisfactory initial result or procedural complication, analogous to the definition of “bailout” glycoprotein IIb/IIIa use.

It should be noted that the preceding recommendations and text apply only to aspiration thrombectomy; no clinical benefit for routine rheolytic thrombectomy has been demonstrated in patients with STEMI undergoing primary PCI.34,35

The aspiration thrombectomy group. An updated meta-analysis that included these 3 trials among a total of 17 trials (n=20,960) found no significant reduction in death, reinfarction, or stroke thrombosis with routine aspiration thrombectomy. Aspiration thrombectomy was associated with a small but nonsignificant increase in the risk of stroke.33

Several previous studies have shown that higher thrombus burden in patients with STEMI is independently associated with higher risks of distal embolization, no-reflow phenomenon, transmural myocardial necrosis, major adverse cardiac events, vent thrombosis, and death.38–42 However, subgroup analyses from the TASTE and TOTAL trials did not suggest relative benefit from aspiration thrombectomy before primary PCI in patients with higher thrombus burden or in patients with initial Thrombolysis in Myocardial Infarction (TIMI) flow grade 0–1 or left anterior descending artery/infarction.34,35

On the basis of the results of these studies, the prior Class IIa recommendation for aspiration thrombectomy has been changed. Routine aspiration thrombectomy before primary PCI is now not recommended (Class III: No Benefit, LOE A). There are insufficient data to assess the potential benefit of a strategy of selective or bailout aspiration thrombectomy (Class IIb, LOE C-LD). “Bailout” aspiration thrombectomy is defined as thrombectomy that was initially unplanned but was later used during the procedure because of unsatisfactory initial result or procedural complication, analogous to the definition of “bailout” glycoprotein IIb/IIIa use.

References


KEY WORDS: AHA Scientific Statements ● culprit vessel ● focused update ● multivessel ● myocardial infarction ● primary PCI ● thrombectomy
Appendix 1.  Author Relationships With Industry and Other Entities (Relevant)—2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction (Percutaneous Coronary Intervention Writing Committee) (November 2014)

<table>
<thead>
<tr>
<th>Committee Member</th>
<th>Employer/Title</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
<th>Voting Recusals by Section*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenn N. Levine, Chair</td>
<td>Baylor College of Medicine—Professor of Medicine; Director, Cardiac Care Unit</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Eric R. Bates, Vice Chair</td>
<td>University of Michigan—Professor of Medicine</td>
<td>• Merck</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>James C. Blankenship, Vice Chair</td>
<td>Geisinger Medical Center—Director of Cardiology and Cardiac Catheterization Laboratories</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Abbott Vascular†</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Steven R. Bailey</td>
<td>University of Texas Medical Center—Professor of Medicine and Radiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>John A. Bittl</td>
<td>Munroe Heart—Intervention Cardiologist</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Bojan Cersek</td>
<td>Cedars-Sinai Medical Center—Director, Coronary Care Unit</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Charles E. Chambers</td>
<td>Penn State Milton S. Hershey Medical Center—Professor of Medicine and Radiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Stephen G. Ellis</td>
<td>Cleveland Clinic Foundation—Section Head, Invasive and Interventional Cardiology</td>
<td>• Abbott</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Robert A. Guyton</td>
<td>Emory Clinic, Inc.—Professor and Chief, Division of Cardiothoracic Surgery</td>
<td>• Medtronic‡</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Steven M. Hollenberg</td>
<td>Cooper Medical School of Rowan University—Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Umesh N. Khot</td>
<td>Cleveland Clinic—Vice Chairman, Department of Cardiovascular Medicine</td>
<td>• AstraZeneca</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Richard A. Lange</td>
<td>Texas Tech University Health Sciences Center El Paso—President</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Laura Mauri</td>
<td>Brigham &amp; Women’s Hospital—Associate Professor of Medicine, Harvard Medical School</td>
<td>• Medtronic</td>
<td>None</td>
<td>None</td>
<td>• Abbott‡</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Roxana Mehran</td>
<td>Columbia University Medical Center—Associate Professor of Medicine; Director, Data Coordinating Analysis Center</td>
<td>• Abbott Vascular</td>
<td>None</td>
<td>• BMS/Sanofi-aventis‡</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Issam D. Moussa</td>
<td>University of Central Florida College of Medicine—Professor of Medicine; First Coast Cardiovascular Institute—Chief Medical Officer</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

(Continued)
### Appendix 1. Continued

<table>
<thead>
<tr>
<th>Committee Member</th>
<th>Employer/Title</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
<th>Voting Recusals by Section*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debabrata Mukherjee</td>
<td>Texas Tech University—Chief, Cardiovascular Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Henry H. Ting</td>
<td>New York–Presbyterian Hospital, The University Hospital of Columbia and Cornell—Senior Vice President and Chief Quality Officer</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

This table represents the relationships of committee members with industry and other entities that were determined to be relevant to this document. These relationships were reviewed and updated in conjunction with all meetings and/or conference calls of the writing committee during the document development process. The table does not necessarily reflect relationships with industry at the time of publication. A person is deemed to have a significant interest in a business if the interest represents ownership of ≥5% of the voting stock or share of the business entity, or ownership of ≥$5,000 of the fair market value of the business entity; or if funds received by the person from the business entity exceed 5% of the person’s gross income for the previous year. Relationships that exist with no financial benefit are also included for the purpose of transparency. Relationships in this table are modest unless otherwise noted.

According to the ACC/AHA, a person has a relevant relationship IF: a) the relationship or interest relates to the same or similar subject matter, intellectual property or asset, topic, or issue addressed in the document; or b) the company/entity (with whom the relationship exists) makes a drug, drug class, or device addressed in the document, or makes a competing drug or device addressed in the document; or c) the person or a member of the person’s household has a reasonable potential for financial, professional, or other personal gain or loss as a result of the issues/content addressed in the document.

*Significant relationship.

ACC indicates American College of Cardiology; AHA, American Heart Association; and SCAI, Society for Cardiovascular Angiography and Interventions.

### Appendix 2. Author Relationships With Industry and Other Entities (Relevant)—2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction (ST-Elevation Myocardial Infarction Writing Committee) (February 2014)

<table>
<thead>
<tr>
<th>Committee Member</th>
<th>Employment</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
<th>Voting Recusals by Section*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patrick T. O’Gara, Chair</td>
<td>Harvard Medical School—Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Frederick G. Kushner, Vice Chair</td>
<td>Tulane University School of Medicine—Clinical Professor of Medicine; Heart Clinic of Louisiana—Medical Director</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Deborah D. Ascheim†</td>
<td>Mount Sinai School of Medicine—Associate Professor; InCHOR—Clinical Director of Research</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ralph G. Brindis</td>
<td>UCSF Philip R. Lee Institute for Health Policy Studies—Clinical Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Donald E. Casey, Jr.</td>
<td>Thomas Jefferson College of Population Health—Adjunct Faculty; Alvarez &amp; Marsal IPO4Health—Principal and Founder</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Mina K. Chung</td>
<td>Cleveland Clinic Foundation—Professor of Medicine</td>
<td>• Boston Scientific§</td>
<td>• Medtronic§</td>
<td>• St. Jude Medical§</td>
<td>None</td>
<td>None</td>
<td>• Biosense Webster§</td>
<td>None</td>
</tr>
<tr>
<td>James A. de Lemos</td>
<td>UT Southwestern Medical Center—Professor of Medicine</td>
<td>• Abbott Diagnostics</td>
<td>• Novo Nordisk</td>
<td>• St. Jude Medical</td>
<td>None</td>
<td>None</td>
<td>• Abbott Diagnostics†</td>
<td>None</td>
</tr>
<tr>
<td>Deborah B. Diercks</td>
<td>UT Southwestern Medical Center—Audre and Bernard Rapport Distinguished Chair in Clinical Care and Research; Department of Emergency Medicine—Professor and Chair</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

*Writing group members are required to recuse themselves from voting on sections to which their specific relationships with industry and other entities may apply.

†No financial benefit.
### Appendix 2. Continued

<table>
<thead>
<tr>
<th>Committee Member</th>
<th>Employment</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
<th>Voting Recusals by Section*</th>
</tr>
</thead>
<tbody>
<tr>
<td>James C. Fang</td>
<td>University of Utah—Cardiovascular Division</td>
<td>• Boston Scientific</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Barry A. Franklin</td>
<td>William Beaumont Hospital—Director, Cardiac Rehabilitation and Exercise Laboratories</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Christopher B. Granger</td>
<td>Duke Clinical Research Institute—Director, Cardiac Care Unit; Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Medtronic Foundation; Merck†</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Harlan M. Krumholz</td>
<td>Yale University School of Medicine—Professor of Epidemiology and Public Health</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Johnson &amp; Johnson‡; Medtronic‡</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Jane A. Linderbaum</td>
<td>Mayo Clinic—Assistant Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>David A. Morrow</td>
<td>Harvard Medical School—Professor of Medicine</td>
<td>• Abbott</td>
<td>None</td>
<td>None</td>
<td>• Abbott†; GlicoSmithKline‡; Johnson &amp; Johnson‡; Merck‡</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>L. Kristin Newby</td>
<td>Duke University Medical Center, Division of Cardiology—Professor of Medicine</td>
<td>• Philips</td>
<td>None</td>
<td>None</td>
<td>• Merck‡</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Joseph P. Ornato</td>
<td>Department of Emergency Medicine Virginia Commonwealth University—Professor and Chairman</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Narith Ou</td>
<td>Mayo Clinic—Pharmacotherapy Coordinator, Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Martha J. Radford</td>
<td>NYU Langone Medical Center—Chief Quality Officer; NYU School of Medicine—Professor of Medicine (Cardiology)</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Jacqueline E. Tamis-Holland</td>
<td>Mount Sinai Saint Luke’s Hospital and The Icahn School of Medicine—Program Director, Interventional Cardiology Fellowship Program</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Carl L. Tommaso</td>
<td>Scripiaie Hospital—Director of Catheterization Laboratory; NorthShore University HealthSystems—Partner</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Cynthia M. Tracy</td>
<td>George Washington University Medical Center—Associate Director, Division of Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Y. Joseph Woo</td>
<td>Stanford University—Professor and Chair, Cardiothoracic Surgery</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>David X. Zhao</td>
<td>Wake Forest Baptist Health—Professor of Medicine, Heart and Vascular Center of Excellence Director</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• St. Jude Medical§; Medtronic§</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

This table represents the relationships of committee members with industry and other entities that were determined to be relevant to this document. These relationships were reviewed and updated in conjunction with all meetings and/or conference calls of the writing committee during the document development process. The table does not necessarily reflect relationships with industry at the time of publication. A person is deemed to have a significant interest in a business if the interest represents ownership of ≥5% of the voting stock or share of the business entity, or ownership of ≥$5,000 of the fair market value of the business entity; or if funds received by the person from the business entity exceed 5% of the person’s gross income for the previous year. Relationships that exist with no financial benefit are also included for the purpose of transparency. Relationships in this table are modest unless otherwise noted.

According to the ACC/AHA, a person has a relevant relationship if: a) the relationship or interest relates to the same or similar subject matter, intellectual property or asset, topic, or issue addressed in the document; or b) the company/entity (with whom the relationship exists) makes a drug, drug class, or device addressed in the document, or makes a competing drug or device addressed in the document; or c) the person or a member of the person’s household has a reasonable potential for financial, professional, or other personal gain or loss as a result of the issues/content addressed in the document.

*Writing group members are required to recuse themselves from voting on sections to which their specific relationships with industry and other entities may apply.
†Dr. Deborah D. Ascheim accepted a position at Capricor Therapeutics in August 2015, after the writing effort was completed. According to policy, she recused herself from the final voting process.
‡Significant relationship.
§No financial benefit.
ACC indicates American College of Cardiology; AHA, American Heart Association; NYU, New York University; UCSF, University of California San Francisco; and UT, University of Texas.
## Appendix 3. Reviewer Relationships With Industry and Other Entities (Relevant)—2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction (Combined Peer Reviewers From 2011 PCI and 2013 STEMI Guidelines)

<table>
<thead>
<tr>
<th>Reviewer</th>
<th>Representation</th>
<th>Employment</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elliott M. Antman</td>
<td>Official Reviewer—AHA</td>
<td>Harvard Medical School—Professor of Medicine, Associate Dean for Clinical and Translational Research</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Deepak L. Bhatt</td>
<td>Official Reviewer—AHA</td>
<td>Harvard Medical School—Professor; Interventional Cardiovascular Programs—Executive Director</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Bristol-Myers Squibb</td>
<td>None</td>
</tr>
<tr>
<td>Christopher P. Cannon</td>
<td>Official Reviewer—AHA</td>
<td>Harvard Medical School—Professor of Medicine; Brigham and Women’s Hospital—Senior Investigator, TIMI Study Group, Cardiovascular Division</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Bristol-Myers Squibb</td>
<td>None</td>
</tr>
<tr>
<td>Joaquin E. Cigarroa</td>
<td>Official Reviewer—ACC/AHA Task Force on Clinical Practice Guidelines</td>
<td>Oregon Health &amp; Science University—Clinical Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>George Dangas</td>
<td>Official Reviewer—ACC Board of Trustees</td>
<td>Icahn School of Medicine—Professor of Cardiology and Vascular Surgery; Mount Sinai Medical Center—Director, Cardiovascular Innovation</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Abbott</td>
<td>None</td>
</tr>
<tr>
<td>Charles J. Davidson</td>
<td>Official Reviewer—SCAI</td>
<td>Northwestern University Feinberg School of Medicine—Professor of Medicine, Director of Cardiac Catheterization Lab</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Baxter International†</td>
<td>None</td>
</tr>
<tr>
<td>Kirk N. Garratt</td>
<td>Official Reviewer—SCAI</td>
<td>Hofstra University Medical School—Associate Chair of Quality and Research; Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• LifeCuff Technologies</td>
<td>None</td>
</tr>
<tr>
<td>Steven L. Goldberg</td>
<td>Official Reviewer—SCAI</td>
<td>University of Washington Medical Center—Cath Lab Director</td>
<td>Terumo†</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>G. B. John Mancini</td>
<td>Official Reviewer—ACC Board of Governors</td>
<td>Vancouver Hospital Research Pavilion—Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Jonathan M. Tobis</td>
<td>Official Reviewer—SCAI</td>
<td>University of California Los Angeles—Professor of Medicine and Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• St. Jude Medical</td>
<td>None</td>
</tr>
<tr>
<td>Jeffrey L. Anderson</td>
<td>Content Reviewer—ACC/AHA Task Force on Clinical Practice Guidelines</td>
<td>Intermountain Medical Center—Associate Chief of Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Thomas M. Bashore</td>
<td>Content Reviewer</td>
<td>Duke University—Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>James A. Burke</td>
<td>Content Reviewer—ACC Interventional Scientific Council</td>
<td>Lehigh Valley Heart Specialists—Associate Chief, Division of Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Jeffrey J. Cavendish</td>
<td>Content Reviewer—ACC Prevention of Cardiovascular Disease Committee</td>
<td>Kaiser Permanente Cardiology—Interventional Cardiologist</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Abbott</td>
<td>None</td>
</tr>
</tbody>
</table>

(Continued)
## Appendix 3. Continued

<table>
<thead>
<tr>
<th>Reviewer</th>
<th>Representation</th>
<th>Employment</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gregory J. Dehmer</td>
<td>Content Reviewer—ACC Appropriate Use Criteria</td>
<td>Texas A&amp;M College of Medicine—Professor of Medicine; Scott &amp; White Healthcare</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>John S. Douglas, Jr.</td>
<td>Content Reviewer</td>
<td>Emory University Hospital—Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Abbott</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>John P. Erwin III</td>
<td>Content Reviewer—ACC/AHA Task Force on Performance Measures</td>
<td>Texas A&amp;M College of Medicine—Associate Professor; Scott &amp; White Healthcare—Vice Chair of the Department of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>T. Bruce Ferguson</td>
<td>Content Reviewer—ACC Surgeons’ Scientific Council</td>
<td>East Carolina Institute Brody School of Medicine—Professor of Surgery and Physiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Anthony Gershlick</td>
<td>Content Reviewer</td>
<td>University Hospitals of Leicester, Department of Cardiology</td>
<td>• Abbott</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Jonathan L. Halperin</td>
<td>Content Reviewer—ACC/AHA Task Force on Clinical Practice Guidelines</td>
<td>Mt. Sinai Medical—Professor of Medicine</td>
<td>• Bayer Healthcare</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Howard C. Herrmann</td>
<td>Content Reviewer</td>
<td>University of Pennsylvania Perelman School of Medicine—Professor of Medicine, Director of Interventional Cardiology Program</td>
<td>• Siemens Medical</td>
<td>None</td>
<td>None</td>
<td>• Abbott*</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Morton J. Kern</td>
<td>Content Reviewer</td>
<td>University of California Irvine—Professor of Medicine, Associate Chief of the Division of Cardiology</td>
<td>• Acist Medical</td>
<td>None</td>
<td>None</td>
<td>• St. Jude Medical*</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Fred M. Kosumoto</td>
<td>Content Reviewer</td>
<td>Mayo Clinic—Director, Pacing and Electrophysiology Service</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>David J. Maron</td>
<td>Content Reviewer</td>
<td>Stanford University School of Medicine—Professor of Medicine and Emergency Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Douglass A. Morrison</td>
<td>Content Reviewer</td>
<td>University of Arizona—Professor of Medicine; Southern Arizona VA Health Care System—Cardiac Catheterization Laboratories, Director</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Manesh R. Patel</td>
<td>Content Reviewer—ACC Appropriate Use Criteria</td>
<td>Duke University Medical Center—Associate Professor of Medicine</td>
<td>• Bayer Healthcare*</td>
<td>None</td>
<td>None</td>
<td>• Johnson &amp; Johnson*</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>M. Eugene Sherman</td>
<td>Content Reviewer—ACC Board of Governors</td>
<td>Aurora Denver Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Bristol-Myers Squibb*</td>
<td>None</td>
</tr>
<tr>
<td>Daniel I. Simon</td>
<td>Content Reviewer</td>
<td>University Hospitals Case Medical Center—Professor of Cardiovascular Research</td>
<td>• Cordis/Johnson &amp; Johnson*</td>
<td>None</td>
<td>None</td>
<td>• Abbott</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

(Continued)
Appendix 3.  Continued

<table>
<thead>
<tr>
<th>Reviewer</th>
<th>Representation</th>
<th>Employment</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richard W. Snyder</td>
<td>Content Reviewer—ACC Board of Governors</td>
<td>HeartPlace</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>William A. Tansey III</td>
<td>Content Reviewer</td>
<td>Summit Medical Group—Cardiologist</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>David D. Waters</td>
<td>Content Reviewer</td>
<td>San Francisco General Hospital—Chief, Division of Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Merck</td>
<td>None</td>
</tr>
<tr>
<td>Patrick L. Whitlow</td>
<td>Content Reviewer</td>
<td>Cleveland Clinic Foundation—Director, Interventional Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Abbott</td>
<td>• Medtronic*</td>
<td>None</td>
</tr>
<tr>
<td>David O. Williams</td>
<td>Content Reviewer</td>
<td>Harvard Medical School—Professor of Medicine; Brigham and Women’s Hospital</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Clyde W. Yancy</td>
<td>Content Reviewer—ACC/AHA Task Force on Practice Guidelines</td>
<td>Northwestern University Feinberg School of Medicine—Vice Dean for Diversity and Inclusion, Chief of Medicine—Cardiology, Professor</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Yerem Yeghazarians</td>
<td>Content Reviewer</td>
<td>University of California San Francisco—Associate Professor</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

This table represents the relationships of reviewers with industry and other entities that were disclosed at the time of peer review and determined to be relevant to this document. It does not necessarily reflect relationships with industry at the time of publication. A person is deemed to have a significant interest in a business if the interest represents ownership of ≥5% of the voting stock or share of the business entity, or ownership of ≥$5,000 of the fair market value of the business entity; or if funds received by the person from the business entity exceed 5% of the person’s gross income for the previous year. A relationship is considered to be modest if it is less than significant under the preceding definition. Relationships that exist with no financial benefit are also included for the purpose of transparency. Relationships in this table are modest unless otherwise noted. Names are listed in alphabetical order within each category of review.

According to the ACC/AHA, a person has a relevant relationship if: a) the relationship or interest relates to the same or similar subject matter, intellectual property or asset, topic, or issue addressed in the document; or b) the company/entity (with whom the relationship exists) makes a drug, drug class, or device addressed in the document, or makes a competing drug or device addressed in the document; or c) the person or a member of the person’s household has a reasonable potential for financial, professional, or other personal gain or loss as a result of the issues/content addressed in the document.

*Significant relationship.
†No financial benefit.

ACC indicates American College of Cardiology; AHA, American Heart Association; HF, heart failure; SCAI, Society for Cardiovascular Angiography and Interventions; STEMI, ST-elevation myocardial infarction; PCI, percutaneous coronary interventions; TIMI, Thrombolysis In Myocardial Infarction; and VA, Veterans Affairs.


Circulation. 2016;133:1135-1147; originally published online October 21, 2015; doi: 10.1161/CIR.0000000000000336

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2015 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/133/11/1135

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org/subscriptions/
An erratum has been published regarding this article. Please see the attached page for:
http://circ.ahajournals.org/content/suppl/2015/10/20/CIR.0000000000000336.DC1
http://circ.ahajournals.org/content/suppl/2015/10/20/CIR.0000000000000336.DC2

Data Supplement (unedited) at:
http://circ.ahajournals.org/content/suppl/2015/10/20/CIR.0000000000000336.DC1

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org//subscriptions/
Correction

In the article by Levine et al, “2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction: An Update of the 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention and the 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction,” which published online October 21, 2015, and appeared in the March 15, 2016, issue of the journal (Circulation. 2016;133:1135–1147. DOI: 10.1161/CIR.0000000000000336), several corrections were needed.

1. On page 1135, the reference to a collaborating organization has been removed. The text previously read, “Developed in Collaboration With the American College of Emergency Physicians.”
2. On page 1135, the text “Endorsed by the Latin American Society of Interventional Cardiology” was added to reflect that organization’s endorsement of the document after its initial release.
3. On page 1135, in the STEMI Writing Committee author list, the following updates have been made:
   a. “Deborah D. Ascheim, MD, FACC” has been added.
   b. The parallel symbol for Dr. Casey has been changed to a paragraph symbol.
   c. The dagger symbol for Dr. Diercks has been changed to a pound symbol.
4. On page 1135, in the footnotes, the following updates have been made:
   a. In the first paragraph, a footnote has been added: “[Dr. Deborah D. Ascheim accepted a position at Capricor Therapeutics in August 2015, after the writing effort was completed. In accordance with ACC/AHA policy, she recused herself from the final voting process.”
   b. In the first paragraph, the parallel symbol for “ACP Representative” has been changed to a paragraph symbol.
   c. In the first paragraph, the pound symbol for “ACEP Representative” has been added.
   d. In the first paragraph, the paragraph symbol for “Former Task Force member; current member during the writing effort” has been changed to a double asterisk.
   e. In the fifth paragraph, “Ascheim DD” was added to the list of authors’ names in the document citation.
5. On page 1136, in the ACC/AHA Task Force Members list, the paragraph symbols for Drs. Anderson, Albert, Kovacs, Ohman, Sellke, and Shen have been changed to a double asterisk.
6. On page 1143, in the body of Appendix 2, the Author Relationships With Industry and Other Entities (Relevant), “Deborah D. Ascheim, MD, FACC” has been added to the STEMI Writing Committee list.
7. On pages 1143 and 1144, in the body of Appendix 2, the Author Relationships With Industry and Other Entities (Relevant):
   a. The dagger symbols for “Significant relationship” have been changed to double dagger symbols.
   b. The double dagger symbols for “No financial benefit” have been changed to section symbols.
8. On page 1144, Appendix 2, the Author Relationships With Industry and Other Entities (Relevant), in the footnote:
   a. The paragraph, “Dr. Deborah D. Ascheim was not eligible to continue on the writing committee due to her employment by Capricor Therapeutics effective August 2015.” has been deleted.
   b. A paragraph has been added: “Dr. Deborah D. Ascheim accepted a position at Capricor Therapeutics in August 2015, after the writing effort was completed. In accordance with ACC/AHA policy, she recused herself from the final voting process.”
   c. The dagger symbol for “Significant relationship” has been changed to a double dagger.
   d. The double dagger symbol for “No financial benefit” has been changed to a section symbol.
   e. The explanation of the abbreviation “UT” was “Utah.” It has been changed to read, “University of Texas.”
9. In the online supplement, in the body of the table, “Author Relationships With Industry and Other Entities (Comprehensive)—2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction (ST-Elevation Myocardial Infarction Writing Committee) (February 2014),” “Deborah D. Ascheim, MD, FACC‡” has been added to the STEMI Writing Committee list.

10. In the online supplement, “Author Relationships With Industry and Other Entities (Comprehensive)—2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction (ST-Elevation Myocardial Infarction Writing Committee) (February 2014),” the following updates have been made to the footnotes:

a. The paragraph, “Dr. Deborah D. Ascheim was not eligible to continue on the writing committee due to her employment by Capricor Therapeutics effective August 2015.” has been deleted.

b. A paragraph has been added: “‡Dr. Deborah D. Ascheim accepted a position at Capricor Therapeutics in August 2015, after the writing effort was completed. In accordance with ACC/AHA policy, she recused herself from the final voting process.”

c. The explanation of the abbreviation “UT” was “Utah.” It has been changed to read, “University of Texas.”

These corrections have been made to the print version and to the current online version of the article, which is available at http://circ.ahajournals.org/lookup/doi/10.1161/CIR.0000000000000336.
### Data Supplement 1-A. Observational Studies Comparing Culprit Artery-Only Revascularization Versus Multivessel PCI (Section 2)

<table>
<thead>
<tr>
<th>Study Acronym</th>
<th>Author Year</th>
<th>Aim of Study; Study Type; Study Size (N)</th>
<th>Inclusion criteria</th>
<th>Patient Population</th>
<th>Primary Endpoint and Results</th>
<th>Relevant 2^ endpoint (if any); Study Limitations; Adverse Events and Summary</th>
</tr>
</thead>
</table>
| Iqbal MB, et al., 2014 (1) | 25371542 | Aim: To investigate mortality for COR vs. MV PCI at the time of PPCI for patients presenting with STEMI | STEMI and PPCI, MVD defined as >50% stenosis in ≥2 epicardial coronary arteries | Study type: Observational. Used multivariate analysis and propensity matching | **1^ endpoint:** 1-y mortality | • Total study population: 7.4% (COR) vs.10.1% (MV) (p=0.031)  
• Adjusted HR Total population: 0.65 (95% CI: 0.47-0.91; p=0.011)  
• Propensity matched cohort: 164/2418 (6.8%) vs. 41/403 (10.2%) , p=0.059  
• Adjusted propensity matched cohort HR: 0.64 (95% CI: 0.45-0.90; p=0.010)  
• Inverse probability treatment weighted analyses also confirmed COR as an independent predictor for reduced in-hospital MACE (odds ratio, 0.38; 95% CI, 0.15–0.96; p=0.040) and survival at 1 year (hazard ratio, 0.44; 95% CI, 0.21–0.93; p=0.033). |

| Santos AR, et al., 2014 (2) | 24502933 | *Aim:* To assess the impact of a MV PCI at the time of PPCI on in-hospital morbidity and mortality in patients with STEMI undergoing PCI | STEMI | Study type: Observational: Portuguese Society of Cardiology’s Registry of Acute Coronary Syndromes (ACS) | **1^ endpoint:** In-hospital mortality | COR vs. MV PCI at time of PPCI:  
• In-hospital Mortality: 14/180 (7.8%) vs. 2/77 (2.6%), p>0.99  
• Adjusted mortality OR: 12.92, 95% CI 0.67–248.4, p=0.09 |

| Jeger R, et al., 2014 (3) | 24461983 | *Aim:* To assess whether MV PCI at time of PPCI vs. COR in patients with STEMI and MVD influences 1-y outcome | STEMI or new LBBB, MVD defined as a ≥50% in ≥2 different major epicardial coronary arteries and/or involving the LM. | Study type: Observational: Swiss Nationwide Acute Myocardial Infarction in Switzerland Plus Registry (AMIS) | **1^ endpoint:** 1-y all-cause mortality  
MV PCI 12/442 (2.7%) vs COR: 40/1467 (2.7%), p>0.99 | • MACCE at 1 y (all-cause death, re-MI, any cardiac re-intervention, re-hospitalization due to any cardiovascular diagnosis, and CVA); Adjusted OR for MV PCI vs COR=0.69, 95% CI 0.51–0.93, p=0.017 |
<table>
<thead>
<tr>
<th>Study</th>
<th>Size</th>
<th>Aim</th>
<th>Exclusion criteria</th>
<th>Inclusion criteria</th>
<th>1ª endpoint</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Manari A, et al., 2014 (4) 24403174 | 1909 (MV PCI at time of PPCI 442 vs. COR 1467) | To examine the differences in cardiac outcomes for patients with STEMI and MVD as a function of whether they underwent COR or MV PCI, either at the time of PPCI or as a staged procedure. | Absence of follow-up data | STEMI and MVD enrolled in REAL registry | Mortality at 30 d and 2 y COR vs. staged MV PCI | - 30-d mortality: adjusted HR: 2.81 (95% CI: 1.34-5.89; p=0.006)  
- 2-y mortality: adjusted HR: 1.93 (95% CI: 1.35-2.74; p=0.0002)  
MV PCI at time of PPCI vs. staged MV PCI:  
- 30-d mortality adjusted HR: 2.58 (95% CI: 1.06-6.26; p=0.03)  
- 2-y adjusted HR: 1.08 (95% CI: 0.64-1.82; p=0.76)  
COR vs. MV PCI at time of PPCI  
- 2-y unadjusted mortality:127/706 (18.0%) vs. 26/367 (7.1%), p=0.0002 | - Study looked at timing of MV PCI and showed that staged MV PCI was associated with better outcomes than either COR or MV PCI at the time of PPCI |
| Jaguszewski M, et al., 2013 (5) 24384288 | 2061 (MV PCI at time of PPCI 367, Staged MV PCI within 60 d 988, COR 706) | To compare the outcomes with MV PCI at the time of PPCI with COR | N/A | STEMI and MVD enrolled in REAL registry | In-hospital mortality MV PCI at time of PPCI vs. COR:  
- 81/1108 (7.3%) vs. 168/3833 (4.4%), p<0.001  
- Low risk pts: 2.0% vs.2.0% (p=1.00)  
- High risk pts: 22.2% vs. 21.7% (p=1.00) | |
| Bauer T, et al., 2013 (6) 22192297 | 4941 (MV PCI at time of PPCI-1108 vs. COR-3833) | To evaluate the impact of MV-PCI during a single procedure on in-hospital outcomes of patients with MVD presenting with ACS | N/A | STEMI, MVD: stenosis ≥50% in at least two of three major coronary arteries and/or involving the LM (in pts with prior CABG) | In-hospital mortality MV PCI during single procedure vs. COR:  
- 6/419 (1.4%) vs. 72/2118 (3.4%), p=0.03  
- In-hospital mortality adjusted OR: 0.48 (95% CI: 0.21-1.13; p=0.73) | - Non-fatal MI: higher with MV PCI (8.8% vs.1.6%, p<0.0001) |
| Dziewierz A, et al., 2010 (7) 20643243 | 2537 (MV PCI during a single procedure 419 vs. COR 2118) | To assess the impact of MV PCI at time of PPCI vs COR in pts with STEMI and MVD | N/A | Hemodynamically stable patients with ACS  
- MVD defined as ≥2 vessels with ≥70% stenosis  
- Undergoing PCI | 1-y mortality MV PCI at time of PPCI vs. COR  
- 11/70 (15.7%) vs. 57/707 (8.1%), p=0.043  
- Adjusted OR: 2.04 (95% CI: 0.89-4.66; p=0.09) | - 30-d mortality: 12.9% vs.5.9% (p=0.039)  
- Adjusted 30-d mortality: OR: 2.42 (95% CI: 0.96-6.06; p=0.06) |
<table>
<thead>
<tr>
<th>Study</th>
<th>Aim:</th>
<th>Size:</th>
<th>Inclusion criteria:</th>
<th>1st endpoint:</th>
<th>Exclusion criteria:</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>APEX-AMI</td>
<td>To evaluate the 90-d outcomes for MV PCI performed at the time of PPCI</td>
<td>777</td>
<td>≥18 y &lt;6 h MVD with ≥70% stenosis of another major epicardial vessel and/or requiring PCI</td>
<td>90-d mortality and composite of death, CHF, and cardiogenic shock</td>
<td>MV PCI at time of PPCI vs. COR:</td>
<td>Limited inclusion of only STEMI pts that met the APEX-AMI trial criteria.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>90-d mortality: 27/217 (12.4%) vs. 111/1984 (5.6%), p&lt;0.001; Adjusted HR: 2.44, 95% CI 1.55–3.83, P &lt;0.001</td>
<td>Unadjusted 90-d death/CHF/shock 18.9% vs.13.1% (p=0.011); Adjusted HR 1.39 (95% CI: 0.96-2.01; p=0.083)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hannan EL</td>
<td>To examine the differences in in-hospital and longer-term mortality for patients with STEMI and MVD as a function of whether they underwent COR or MV PCI, either at the time of PPCI or as a staged procedure</td>
<td>4,024</td>
<td>STEMI within 24 h undergoing PCI MVD NY State resident</td>
<td>In hospital, 12-, 24-, and 42-mo mortality</td>
<td>Missing data on EF Thrombolytic therapy Shock Prior CABG</td>
<td>Used propensity matched data to evaluate the outcome of MV PCI at various time points compared with COR. Of note, for the subgroup of patients without shock, low EF or arrhythmias, MV PCI at the time of PPCI as compared with COR resulted in a higher in hospital mortality (2.4% vs. 0.9%, p=0.04) and trends toward higher 24-mo (7.2% vs. 4.9%, p=0.07) and 42-mo (10.4% vs. 6.7%, p=0.08) mortality</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cavender MA et al.</td>
<td>To examine the outcomes of patients</td>
<td>875</td>
<td>In-hospital mortality.</td>
<td>In-hospital mortality.</td>
<td></td>
<td>Bleeding (non-shock patients): 6.71%</td>
</tr>
</tbody>
</table>
2009 (10) 16660603

with STEMI undergoing MV PCI at time of PPCI vs. patients undergoing COR

**Study type:** Observational: NCDR Registry

**Size:** 28,936 (MV PCI at time of PPCI 3,134 vs. COR 25,802)

- STEMI treated with PCI
- ≥1 additional major artery with significant stenosis.

**Exclusion criteria:**
- PCI of LM
- Staged PCI in hospital
- Recent thrombolitics

**MV PCI at time of PPCI vs. COR:**
- In hospital mortality: 246/3134 (7.85%) vs. 1321/25802 (5.12%), p<0.01
- Patients without shock: 3.26% vs. 2.53% (p=0.09); Adjusted mortality: OR=1.23 (95% CI: 0.94-1.61; p=1.23)
- Patients with shock: 36.49% vs. 27.77% (p ≤ 0.01); Adjusted mortality: OR=1.54 (95% CI: 1.22-1.95; p<0.01)
- Trend towards more renal failure with MV PCI at time of PPCI 2.31% vs. 1.81% (p=0.09)
- Very large registry also analyzed outcomes according to presence or absence of shock.

Varani E, et al., 2008 (11) 18796239

**Aim:** To examine a strategy of COR vs. MV-PCI on clinical outcomes in a cohort of patients with STEMI treated with PPCI and compare the outcomes of MVD patients according to the type of revascularization (MV PCI at the time of PPCI vs. staged MV PCI vs. COR)

**Study type:** Observational: single center

**Size:** Total=399. MV PCI before discharge 243 (divided into groups: MV PCI at time of PPCI= 147; MV PCI within 24 h =48; and MV PCI after 24 h but before discharge=48); COR=156

- Inclusion criteria:
  - Ongoing symptoms within 24 h
  - STEMI
  - MVD (≥2 major epicardial coronary arteries or their major branches with stenosis ≥70%)

- Exclusion criteria:
  - PCI for acute occlusion after angiography

**Endpoints:**
- Death from any cause and any revascularization. Time point not specified.
- In-hospital mortality for COR vs. MV PCI at time of PPCI:
  - 8/156 (5.1%) vs. 12/147 (8.2%), p<0.05
- COR vs. MV PCI at time of PPCI vs. MV PCI within 24 h vs. MV PCI before discharge
  - 6.6% vs. 9.9% vs. 2.1% vs. 2.1% (p=0.066 for overall comparison)
  - excluding pts with shock or CHF: 6.3% vs. 3.3% vs. 2.1% vs. 2.1% (p=0.257)

Qarawani D, et al., 2008 (12) 17428557

**Aim:** To compare outcomes with two strategies used for treating MVD and acute MI

**Study type:** Observational: Single center

**Size:** 120 (MV PCI at time of PPCI 95 vs. COR 25)

- Inclusion criteria:
  - Prolonged >30 min ischemic chest pain
  - Symptom onset ≤12 h
  - STEMI
  - MVD defined as >70% stenosis of ≥1 additional coronary artery

- Exclusion criteria:
  - Cardiogenic shock
  - LM ≥50%

1° endpoint: In-hospital MACE (re-ischemia, re-MI, acute CHF and mortality)
- MV PCI vs. COR:
  - 16.7% vs. 52%, p=0.0001.
- Adjusted OR for In-hospital MACE: 14.68, 95% CI: 3.03–71.12, p=0.001
- Complete revascularization in 46% of patients with MVD
- In-hospital mortality: 4.2% vs. 4.0%, p=NS
- 1-year mortality for MV PCI vs. COR: 9/95 (9.5%) vs. 2/25 (8.0%), p=0.06
- MV PCI associated with improved hospital survival when compared with COR even after adjusting for other factors
- MV PCI had higher rates of transient renal failure (8.4% vs.4.0%, p=0.01) and trend toward higher 1-y mortality (9.4% vs.8.0%, p=0.06)

Corpus RA, et al., 2004 (13) 15389238

**Aim:** To compare outcomes between an aggressive MV PCI strategy either at time of PPCI or before hospital discharge and COR

**Study type:** Observational: Single Center

**Size:** 506 (MV PCI 152 [Divided into 2 groups: MV PCI at the time of PPCI=26; staged in hospital PCI=126] vs. COR 354)

- Inclusion criteria:
  - STEMI
  - Symptom onset ≤12 h
  - MVD defined as ≥70% stenosis of ≥2 epicardial coronary arteries or their major branches

- Exclusion criteria:
  - PCI of vein graft or LM

1° endpoint: Numerous endpoints at 1 year
- MV PCI (either at time of PPCI or staged) vs COR:
  - Death 11% vs 12 %, p=0.82
  - Re-infarction: 13.0% vs 2.8%, p<0.001
  - Revascularization: 25% vs 15%, p=0.007
  - MACE: 40% vs 28%, p=0.006
- Multivessel PCI was an independent predictor of MACE at 1 year (odds ratio=1.87, 95% CI 1.10-2.54, p=0.01).
### Roe MT, et al., 2001 (14)

**Study Acronym**: DANAMI 3-PRIMULTI

**Author Year**: Engstrom T, et al., 2015 (15) (Not yet in PubMed)

**Aim**: To determine whether staged angiographic or FFR guided revasc in STEMI patients with MVD reduces the primary endpoint of all cause death, reinfarction and repeat revascularisation compared with COR.

**Study Type**: Randomized

**Size**: 627 (314 staged MV PCI; 313 COR)

**Patient Population**
- STEMI ≤12 h
- Successful IRA PCI
- >50% stenosis >2mm in non-IRA suitable for PCI
- Non IRA suitable for stent implantation
- CTO of non-IRA

**Intervention**: Complete inhospital revasc with staged MV PCI for lesions >90% and staged FFR-guided MV PCI for lesions of 50-90% severity (n=314)

**Comparator**: COR (n=313)

**Primary Endpoint and Results**
- **1st endpoint**: MACE at 12 mo (Death, MI, ischemia-driven revasc of non-IRA lesions)
  - 40/314 (13%) patients treated with staged MV PCI vs 68 of 313 (22%) patients treated with COR, p=0.004; (HR 0.56, 95% CI 0.38-0.83, p=0.001)
  - 12-mo mortality: 15/314 (5%) vs. 11/313 (4%)
  - This study used FFR guidance for lesions of 50%-90% severity.
  - Benefit was driven by a significant reduction in ischemia-driven revascularization; death and MI rates were similar

### CvLPRIT

**Gershlick AH, et al., 2015 (16)

**Study Acronym**: CvLPRIT

**Aim**: To compare differences in outcome for patients with STEMI and MVD randomized to MV PCI or COR

**Study Type**: Randomized

**Size**: 296 (MV PCI=150; COR=146)

**Patient Population**
- STEMI <12 h
- Referrer for PCI
- MVD on cath with ≥1 vessel >2mm in diameter with >70% stenosis in 1 plane or >50% stenosis in 2 planes
- Non IRA suitable for stent implantation

**Intervention**: MV PCI either at time of PPIC or as a staged in-hospital procedure (n=150)

**Comparator**: COR (n=146)

**Primary Endpoint and Results**
- **1st endpoint**: Composite of death, re-MI, CHF and ischemia-driven revasc at 12 mo
  - MV PCI vs. COR
  - 10.0% vs. 21.2% (HR: 0.45; 95% CI: 0.24-0.84; p=0.009)
  - 65% of pts underwent MV PCI at time of PPCI
  - Benefit was driven by sum of individual endpoints; no statistically significant difference in outcome in individual components of primary endpoint
  - Total 12-mo mortality: 4/150 (2.7%) vs. 10/146 (6.9%) (HR: 0.38; 95% CI: 0.12-1.20; p=0.09)
| Exclusion criteria: | • Indication for or contraindication to complete revasc  
• Prior Q wave MI  
• Prior CABG  
• Shock, VSD or Moderate to severe mitral regurgitation  
• Chronic kidney disease  
• Stent thrombosis  
• CTO of the only non-IRA

(PRAMI) Wald DS, et al., 2013 (17) 23991625

| Aim: To compare the outcomes of MV PCI at the time of PPCI with COR and an ischemia guided approach to non-culprit artery disease. | Inclusion criteria: | • Acute STEMI (incl LBBB)  
• Successful PPCI  
• MVD with ≥50% stenosis in ≥1 other artery suitable for PCI

| Exclusion criteria: | • Shock,  
• Prior CAGB,  
• LM or ostia of both LAD and circumflex with >50% stenosis  
• CTO of non-IRA

| Intervention: MV PCI at the time of PPCI (n=234)  
Comparator: COR with ischemia guided approach to non-culprit artery disease (n=231)

1° endpoint: MACE: (death from cardiac causes, nonfatal MI, or refractory angina). Results assessed after mean f/u of 23 mo

- MV PCI at the time of PPCI vs. COR
  - 9.0% vs. 22.9%, (HR 0.35, 95% CI 0.21–0.58, <0.001)

Trial stopped early by DSMB
• HR for components of primary endpoint (MV PCI vs PPCI only):
  - Death from cardiac causes: 0.34 (95% CI, 0.11 to 1.08)
  - Non-fatal MI: 0.32 (95% CI, 0.13 to 0.75)
  - Refractory angina: 0.35 (95% CI, 0.18 to 0.69)
  - All-cause mortality: 12/234 (5.1%) vs 16/231 (6.9%), p=NS

Dambrink JH, et al., 2010 (18) 20542783

| Aim: To compare effect of early invasive FFR guided management vs. COR and ischemia-guided management on LV EF | Inclusion criteria: | • STEMI patients undergoing successful PPCI  
• MVD  
• with ≥1 additional major artery or branch  
• with ≥50 % disease and at least 2.5 mm diameter

| Exclusion criteria: | • Urgent indication for additional revasc  
• >80 y  
• CTO of non IRA  
• Prior CAGB  
• LM ≥50 %  
• Restenotic  
• lesions in non-IRA  
• Chronic atrial fibrillation,  
• Limited life expectancy  
• Other factors that made complete follow-up unlikely.

| Intervention: PPCI and elective (within 3 wk) FFR guided management of non IRA disease (n=80)  
Comparator: COR with conservative ischemia-guided management of non IRA (n=41)

1° endpoint: EF at 6 mo

- FFR guided staged PCI vs. COR and ischemia-guided approach:
  - EF 59± 9% vs. 57± 9%, p=0.362

- MACE at 6 mo: 21% vs. 22%, p=0.929
- MACE at 3 years: 35.4% vs 35.0%, p=0.96
- Death or MI at 3 years: 20.3% vs 0%, p=0.002
- Death at 3 years: 2/80 vs. 0/41

- EF 59± 9% vs. 57± 9%, p=0.362

- MACE at 6 mo: 21% vs. 22%, p=0.929
- MACE at 3 years: 35.4% vs 35.0%, p=0.96
- Death or MI at 3 years: 20.3% vs 0%, p=0.002
- Death at 3 years: 2/80 vs. 0/41
<table>
<thead>
<tr>
<th>Study</th>
<th>Aim</th>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
<th>Intervention</th>
<th>1st endpoint</th>
<th>Comparator</th>
<th>1st endpoint details</th>
</tr>
</thead>
</table>
| Politi L, et al., 2010 (19) 19778920 | To compare long-term outcomes of three different strategies during PPCI in patients with STEMI and MVD: COR vs. staged MV PCI vs. MV PCI at the time of PPCI | **Inclusion criteria:**  
- Chest pain within 12 h  
- STEMI | **Exclusion criteria:**  
- Cardiogenic shock  
- LM ≥50%  
- Prior CABG  
- Severe valvular heart disease  
- Unsuccessful PPCI | **Intervention:** PPCI plus staged MV PCI: 65; MV PCI at the time of PPCI (n=65) | **1st endpoint:** MACE at mean f/u 2.5 y: (death, re-MI, re-hospitalization for ACS and repeat coronary revascularization) | **Comparator:** COR (n=84) | **MV PCI at the time of PPCI vs. staged MV PCI vs. COR:**  
- 23.1% vs. 20% vs. 50% p<0.001  
- Adjusted HR for MACE for MV PCI at the time of PPCI vs COR: 0.495, 95% CI 0.262 to 0.933, p=0.030  
- Adjusted HR for MACE for Staged MV PCI vs COR: 0.377, 95% CI 0.194 to 0.732 p=0.004 |
| HELP-AMI, et al., Di Mario C, et al., 2004 (20) 16146905          | To evaluate the efficacy of a complete revascularization strategy at the time of PPCI on reducing repeat revascularizations in follow-up | **Inclusion criteria:**  
- Ischemic CP and STEMI  
- MVD on angiogram technically amenable to PCI | **Exclusion criteria:**  
- Lesion in bypass grafts  
- Prior PCI or stent in segment with disease  
- Thrombolysis within past wk;  
- Shock  
- LM disease  
- Intention to treat more than 1 lesion;  
- Calcified or tortuous vessels with lesions; side branch >2 mm | **Intervention:** MV PCI at time of PPCI (n=52) | **1st endpoint:** Any repeat revascularization at 1 y | **Comparator:** COR then PCI of other vessels at operators discretion (n=17) | **MV PCI at time of PPCI vs. COR:**  
- 17.3% vs. 35.3%, p=0.174  
- Very small study; Unbalanced randomization  
- 12-mo mortality: 1/52 (1.9%) vs. 0/17 (0%), p=0.754 |
# Data Supplement 2. RCTs for Aspiration Thrombectomy (Section 3)

<table>
<thead>
<tr>
<th>Study Acronym</th>
<th>Author</th>
<th>Year</th>
<th>Study Type; Study Size (N)</th>
<th>Patient Population</th>
<th>Study Intervention</th>
<th>Primary Endpoint and Results</th>
<th>Relevant 2° Endpoint (if any); Study Limitations; Adverse Events and Summary</th>
</tr>
</thead>
</table>
| TOTAL         | Jolly SS, et al., 2015 (21) | 25853743 | Aim: To assess whether thrombus aspiration reduces MACE in patients with STEMI  
Study Type: Randomized  
Size: 10,732 (thrombectomy 5372, PCI alone 5360);  
Inclusion criteria:  
• Symptoms of myocardial ischemia lasting for ≥ 30 min  
• Definite ECG changes indicating STEMI  
• Patients referred for primary PCI  
• Randomized within 12 h of symptom onset and prior to diagnostic angiography  
Exclusion criteria:  
• Prior CABG  
• Life expectancy <6 mo due to non-cardiac condition  
• Treatment with fibrinolytic therapy for qualifying index STEMI event | Intervention: Thrombus aspiration before PCI (5033)  
 Comparator: PCI alone (5030)  
1° endpoint: Composite of CV death, re-MI, cardiogenic shock, NYHA heart failure within 180 d  
Thrombectomy vs PCI alone: 6.9% vs. 7.0% (HR: 0.99; 95% CI: 0.85-1.15; p=0.86)  
• Safety endpoint: Stroke within 30 d: thrombectomy 0.7% vs. 0.3% PCI alone (HR: 2.06; 95% CI: 1.13-3.75; p=0.02)  
• CV death: thrombectomy 3.1% vs. 3.5% PCI alone (HR: 0.90; 95% CI 0.73-1.12; p=0.34).  
• Primary outcome + stent thrombosis +TVR: thrombectomy 9.9% vs. 9.8% PCI alone, (HR: 1.00; 95% CI: 0.89-1.14; p=0.95).  
Summary:  
• No group differences with respect to re-MI, shock, NYHA heart failure, stent thrombosis, TVR, major bleeding, net clinical benefit (primary efficacy outcome or stroke).  
• No differences in rate of primary outcome in pre-specified subgroups, including extent of thrombus burden.  
• Improved ST resolution and lower rates of distal embolization with thrombectomy  
• Bailout thrombectomy rate 7.1% among patients randomized to PCI alone.  
• No or possible thrombus present (TIMI thrombus grade 0-1) in 6.7% thrombectomy patients, 8.1% PCI-alone patients. |  

| TASTE         | Lagerqvist B, et al., 2014 (22) | 25176395 | Aim: To assess if thrombus aspiration reduces mortality in STEMI pts at 1 y in the TASTE study  
Study Type: Randomized  
Size: 7244 (3621 thrombectomy, 3623 PCI alone) | Inclusion criteria:  
• Chest pain, at least for 30 min, onset of sx to admission <24 h  
• STEMI or LBBB  
Exclusion criteria:  
• Need for CABG  
• Previous randomization in TASTE trial | Intervention: Thrombus aspiration before PCI (3621)  
 Comparator: PCI only (3623)  
1° endpoint: N/A (previously reported in TASTE)  
• Events at 1 year flu:  
  • Death from any cause 5.3% vs. 5.6% (HR: 0.94; 95% CI: 0.78-1.15; p=0.57),  
  • Rehospitalization for MI 2.7% vs. 2.7% (HR: 0.97; 95% CI: 0.73-1.28; p=0.81), stent thrombosis 0.7% vs. 0.9% (HR: 0.84; 95% CI: 0.50-1.40; p=0.51)  
  • Incidence of composite of death, rehospitalization for MI, or stent thrombosis: 8.0% v. 8.5% (HR: 0.94; 95% CI: 0.8-1.1; p=0.48).  
  • Outcome events were recorded on the |
**TASTE**
Frobert O et al., 2013 (23) 23991656

**Aim:** To assess if thrombus aspiration reduces mortality in STEMI pts.

**Study type:** Randomized

**Size:** 7244 (3621 thrombectomy, 3623 PCI alone)

**Inclusion criteria:**
- Chest pain, at least for 30 min
- Onset of sx to admission<24 h
- STEMI or LBBB

**Exclusion criteria:**
- Need for CABG
- Previous randomization in TASTE trial

**Intervention:** Thrombus aspiration before PCI (3621)

**Comparator:** PCI only (3623)

**1st endpoint:** All-cause mortality at 30 d

- Thrombus aspiration vs PCI only:
  - 2.8% vs 3.0%; HR: 0.94; 95% CI: 0.72-1.22; p=0.63

- Rate of rehospitalization for recurrent MI at 30 d: HR:0.61; 95% CI:0.34-1.07; p=0.09
- Rate of stent thrombosis: HR: 0.47; 95% CI: 0.20-1.02; p=0.06.
- TVR did not differ between groups
- Bias due to the treating physician being aware of the group to which pt was assigned and entering the angiographic variables. No adjudication of events and no blinded review of angiograms

**INFUSE-AMI**
Stone GW, et al., 2012 (24) 22447598

**Aim:** To evaluate reduction of infarct size by IC abxiximab, manual aspiration thrombectomy or both (with bivalirudin anticoagulation)

**Study type:** Randomized, 2x2 factorial design

**Size:** 353 with evaluable MRI in thrombectomy arms (thrombectomy=174; no thrombectomy=179)

**Inclusion criteria:**
- STEMI >30 min and ≥1 mm
- PPCI sx-onset-to-device time of ≤5 h

**Exclusion criteria:**
- Prior MI, CABG, or LAD stent
- Shock or CPR
- Prior lytic or IIb/IIIa inhibitor for the present admission

**Intervention:** Thrombectomy (174)

**Comparator:** No thrombectomy (179)

**1st endpoint:** Infarct size at 30 d as assessed by cardiac MRI

- Thrombectomy vs no thrombectomy: Infarct size 17.0% vs 17.3% (p=0.51)

- There were also no significant differences in absolute infarct mass or abnormal wall motion score

**EXPIRA**
Sardella G, et al., 2009 (25) 19161878

**Aim:** To determine the effects of manual thrombectomy device on myocardial perfusion and infarct size assessed by CE-MRI

**Study type:** Randomized

**Size:** 175

**Inclusion criteria:**
- 1st STEMI <9 h from sx onset
- Infarct-related artery ≥2.5 mm in diameter
- Thrombus score ≥3
- TIMI flow grade ≤1

**Exclusion criteria:**
- Cardiogenic shock, 3 vessel/ left main disease, TIMI ≥0,1, TS <3, contra to GPlib/IIia

**Intervention:** Manual thrombectomy-PCI (88)

**Comparator:** PCI alone (87)

**1st endpoint:** Occurrence of final myocardial blush grade ≥2

- Manual thrombectomy vs PCI alone
  - 88% vs. 60%; p=0.001

- Rate of ST resolution >70%; (manual thrombectomy-PCI vs. PCI [84% vs.39%; p=0.001])
- Cardiac death at 9 mos lower with manual thrombectomy-PCI (p=0.02)
- CE-MRI substudy: presence and extent of MVO in acute phase (significantly lower with manual thrombectomy-PCI) and infarct size extent at 3 mo (significant reduction with manual thrombectomy-PCI)
- Single center experience with small no. of pts.
### TAPAS
Vlaar PJ, et al., 2008 (26)

<table>
<thead>
<tr>
<th><strong>Aim</strong></th>
<th>To determine cardiac death or reinfarction rate at 1y</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study type:</strong></td>
<td>Randomized</td>
</tr>
<tr>
<td><strong>Size:</strong></td>
<td>1071</td>
</tr>
</tbody>
</table>
| **Inclusion criteria:** | - AMI sx >30 min  
- Time from sx onset <12 h, STE >0.1mV in ≥2 leads |
| **Exclusion criteria:** | - Rescue PCI after thrombolysis  
- Known concomitant disease with life expectancy <6 mo |
| **Intervention:** | Thrombus aspiration (535); 1 y f/u (530) |
| **Comparator:** | PCI (536); 1 y f/u PCI (530) |
| **1st endpoint:** | Combined cardiac death or non-fatal re-MI at 1y;  
Thrombus aspiration vs. PCI alone: 5.6% vs. 9.9% [HR: 1.81; 95% CI: 1.16-2.84; p=0.009] |

#### 1° endpoint:
- 1 y cardiac death: Thrombus aspiration vs. PCI: 3.6% vs. 6.7% [HR: 1.93; 95% CI: 1.11-3.37; p=0.02]  
- Limited power to assess clinical outcome. No systematic measurement of infarct size or LVF performed.  

---

### Svilaas T, et al., 2008 (27)

<table>
<thead>
<tr>
<th><strong>Aim</strong></th>
<th>To assess whether manual thrombus aspiration is superior to conventional treatment during primary PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study type:</strong></td>
<td>Randomized</td>
</tr>
<tr>
<td><strong>Size:</strong></td>
<td>1071</td>
</tr>
</tbody>
</table>
| **Inclusion criteria:** | - AMI sx >30 min  
- Time from sx onset <12  
- STE >0.1 mV in ≥2 leads |
| **Exclusion criteria:** | - Rescue PCI after thrombolysis  
- Known concomitant disease with life expectancy <6 mo |
| **Intervention:** | Thrombus aspiration (535) |
| **Comparator:** | PCI alone (536) |
| **1st endpoint:** | Post procedure myocardial blush grade of 0 (no myocardial blush) or 1 (minimal myocardial blush or contrast density).  
Thrombus aspiration vs. PCI alone: 17.1% vs. 26.3% [RR: 0.65; 95% CI: 0.51-0.83; p<0.001] |

#### 1° endpoint:
- Major bleeding: 3.8% vs. 3.4%, RR: 1.11; 95% CI: 0.60-2.08; p=0.11  
- Target vessel revascularization: 4.5% vs. 5.8%, RR: 0.77; 95% CI 0.46-1.30; p=0.34  
- Reinfarction: 0.8% vs. 1.9%, RR: 0.40; 95% CI 0.13-1.27, p=0.11  
- Death: 2.1% vs. 4.0%, RR: 0.52; 95% CI 0.26-1.07; p=0.07  
- MACE: 6.8% vs. 9.4%, RR: 0.72; 95% CI 0.48-1.08; p=0.12  
- Single-center study using surrogate endpoints (myocardial blush grade and ECG variables); performed randomization prior to coronary angiography (selection bias since some patients did not undergo PCI/received alternative therapy)  

---

CABG indicates coronary artery bypass graft; CE-MRI, contrast enhanced MRI; CI, confidence interval; cMRI, cardiac magnetic resonance imaging; Contra, contraindications; CrCl, creatinine clearance; CV, cardiovascular; ECG, electrocardiogram; EM, Export Medtronic; GP2B/3A, glycoprotein IIb/IIIa; Hgb, hemoglobin; Hosp., hospitalization; HR, hazard ratio; IC, intracoronary; ITT, intention-to-treat; LVF, Left ventricular function; MACE, major adverse cardiac events; MACCE, major adverse cardiac and cerebrovascular events; MI, myocardial infarction; MVO, microvascular obstruction; NYHA, New York Heart Association; OR, odds ratio; PCI, percutaneous coronary intervention; PL, platelet count; RCT, randomized controlled trial; RR, relative risk; STEMI, ST-elevation myocardial infarction; STR, ST-segment resolution; SVG, Saphenous venous graft; TIMI, Thrombolysis In Myocardial Infarction; TS, thrombus score; and TVR, target vessel revascularization.
References


© 2015 by the American College of Cardiology Foundation, the American Heart Association, Inc., and the Society for Cardiovascular Angiography and Interventions.
### Author Relationships With Industry and Other Entities (Comprehensive)—2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction (Percutaneous Coronary Intervention Writing Committee) (November 2014)

<table>
<thead>
<tr>
<th>Committee Member</th>
<th>Employer/Title</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenn N. Levine</td>
<td>Baylor College of Medicine—Professor of Medicine; Director, Cardiac Care Unit</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None (Chair)</td>
</tr>
<tr>
<td>Eric R. Bates</td>
<td>University of Michigan—Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None (Vice Chair)</td>
</tr>
</tbody>
</table>
| James C. Blankenship | Geisinger Medical Center—Director, Cardiology and Cardiac Catheterization Laboratories | None | None | None | • Abbott Vascular*  
• Abiomed*  
• AstraZeneca*  
• Boston Scientific*  
• Regado Biosciences*  
• Tryton Medical*  
• Volcano* | • AMA Relative Value Update Committee*  
• SCAI* | None (Vice Chair) |
| Steven R. Bailey | University of Texas Medical Center—Professor of Medicine and Radiology | • Biotronix (DSMB) | None | None | • Edwards—PARTNER II trial | None | None |
| John A. Bittl    | Munroe Heart—Interventional Cardiologist | None | None | None | None | None | None |
| Bojan Cercek     | Cedars-Sinai Medical Center—Director, Coronary Care Unit | None | None | None | None | None | None |
| Charles E. Chambers | Penn State Milton S. Hershey Medical Center—Professor of Medicine and Radiology | None | None | None | None | None | None |
| Stephen G. Ellis | Cleveland Clinic Foundation—Section Head, Invasive and Interventional Cardiology | • Abbott  
• Boston Scientific  
• Medtronic | None | None | None | None | None |
| Robert A. Guyton | Emory Clinic, Inc.— | • Medtronic† | None | None | • NIH* | None | None |

© 2015 by the American College of Cardiology Foundation, the American Heart Association, Inc., and the Society for Cardiovascular Angiography and Interventions.
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Companies</th>
<th>Grants/Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steven M. Hollenberg</td>
<td>Cooper University Hospital—Director, Coronary Care Unit</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Umesh N. Khot</td>
<td>Cleveland Clinic—Vice Chairman, Robert and Suzanne Tomsich Department of Cardiovascular Medicine</td>
<td>AstraZeneca</td>
<td>NIH*</td>
</tr>
<tr>
<td>Richard A. Lange</td>
<td>Texas Tech University Health Sciences Center El Paso—President; Paul L. Foster School of Medicine, Dean</td>
<td>None</td>
<td>NIH*</td>
</tr>
<tr>
<td>Laura Mauri</td>
<td>Brigham &amp; Women’s Hospital—Associate Professor of Medicine, Harvard Medical School</td>
<td>Biotronik, Medtronic, St. Jude Medical</td>
<td>Abbott†, ABIM, Boston Scientific†, Bristol-Myers Squibb†, Cordis†, Daiichi-Sankyo†, Eli Lilly†, Medtronic Cardiovascular†, Sanofi-aventis†</td>
</tr>
<tr>
<td>Roxana Mehran</td>
<td>Columbia University Medical Center—Associate Professor of Medicine; Director, Data Coordinating Analysis Center</td>
<td>Abbott Vascular, AstraZeneca, Boston Scientific, Covidien, CSL Behring, Janssen (Johnson &amp; Johnson)†, Maya Medical†, Merck, Sanofi-aventis†</td>
<td>Bristol-Myers Squibb/Sanofi-aventis†, Eli Lilly†, Daiichi-Sankyo†, Regado, Stentys*, The Medicines Company†, ACC Interventional Council*, ACC NCDR CathPCI Committee*, NHLBI, SCAI*</td>
</tr>
<tr>
<td>Issam D. Moussa</td>
<td>Mayo Clinic—Chair</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

© 2015 by the American College of Cardiology Foundation, the American Heart Association, Inc., and the Society for Cardiovascular Angiography and Interventions.
<table>
<thead>
<tr>
<th>Division of Cardiovascular Diseases</th>
<th>None</th>
<th>None</th>
<th>None</th>
<th>None</th>
<th>• ACC</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debabrata Mukherjee Texas Tech University—Chief, Cardiovascular Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Henry H. Ting Mayo Clinic—Professor of Medicine; Assistant Dean for Quality</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

This table represents all relationships of committee members with industry and other entities that were reported by authors, including those not deemed to be relevant to this document, at the time this document was under development. The table does not necessarily reflect relationships with industry at the time of publication. A person is deemed to have a significant interest in a business if the interest represents ownership of $\geq 5\%$ of the voting stock or share of the business entity, or ownership of $\geq 5,000$ of the fair market value of the business entity; or if funds received by the person from the business entity exceed 5% of the person’s gross income for the previous year. Relationships that exist with no financial benefit are also included for the purpose of transparency. Relationships in this table are modest unless otherwise noted. Please refer to [http://www.acc.org/guidelines/about-guidelines-and-clinical-documents/relationships-with-industry-policy](http://www.acc.org/guidelines/about-guidelines-and-clinical-documents/relationships-with-industry-policy) for definitions of disclosure categories or additional information about the ACC/AHA Disclosure Policy for Writing Committees.

*No financial benefit.
†Significant relationship.

ABIM indicates American Board of Internal Medicine; ACC, American College of Cardiology; AHA, American Heart Association; AMA, American Medical Association; CathPCI, catheterization and/or percutaneous intervention; DSMB, data safety monitoring board; ECG, electrocardiogram; NCDR, National Cardiovascular Data Registry; NHLBI, National Heart, Lung, and Blood Institute; NIH, National Institutes of Health; PARTNER II trial, Placement of Aortic Transcatheter Valves; and SCAI, Society for Cardiovascular Angiography and Interventions.
## Author Relationships With Industry and Other Entities (Comprehensive)—2015 ACC/AHA/SCAI Focused Update on Primary Percutaneous Coronary Intervention for Patients With ST-Elevation Myocardial Infarction (ST-Elevation Myocardial Infarction Writing Committee) (February 2014)

<table>
<thead>
<tr>
<th>Committee Member</th>
<th>Employment</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
<th>Institutional, Organizational or Other Financial Benefit</th>
<th>Expert Witness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patrick T. O’Gara <em>(Chair)</em></td>
<td>Harvard Medical School—Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• Lantheus Medical Imaging (DSMB) • NIH Steering Committee Co-Chair*</td>
<td>None</td>
</tr>
<tr>
<td>Frederick G. Kushner <em>(Vice Chair)</em></td>
<td>Tulane University School of Medicine—Clinical Professor of Medicine; Heart Clinic of Louisiana—Medical Director</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• FDA Science Board†</td>
<td>• Defendant, use of clopidogrel (for BMS), 2014 • Defendant, 2014</td>
</tr>
<tr>
<td>Deborah D. Ascheim‡</td>
<td>Capricor Therapeutics, Inc.—Chief Medical Officer</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ralph G. Brindis</td>
<td>UCSF Phillip R. Lee Institute for Health Policy—Clinical Professor of Medicine • Ivivi Health Sciences • Volcano Corp.</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>• California State Elective PCI Project Advisory Board (DSMB)† • C-PORT Elective RCT (DSMB)† • DAPT Trial Advisory Board (DSMB)† • FDA Cardiovascular Device Panel • State of California OSHPD (DSMB)†</td>
<td>None</td>
</tr>
<tr>
<td>Donald E. Casey, Jr.</td>
<td>Thomas Jefferson College of Population Health—Adjunct Faculty; Alvarez &amp; Marsal IPO4Health—Principal and Founder</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Mina K. Chung</td>
<td>Cleveland Clinic • ACCF</td>
<td>None</td>
<td>• Jones &amp; • AliveCor†</td>
<td>• Amarin (DSMB)†</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

© 2015 by the American College of Cardiology Foundation, the American Heart Association, Inc., and the Society for Cardiovascular Angiography and Interventions.
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Authorship Royalties</th>
<th>Advisory Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Butler W. Bartlett</td>
<td>Foundation—Professor of Medicine</td>
<td>• Biotronik† &lt;br&gt; • Boston Scientific† &lt;br&gt; • Medtronic† &lt;br&gt; • Nexcura† &lt;br&gt; • NIH/NHLBI &lt;br&gt; • St. Jude Medical†</td>
<td>• Biosense Webster† &lt;br&gt; • Biotronik† &lt;br&gt; • Boston Scientific† &lt;br&gt; • CardioInsight† &lt;br&gt; • Gilead† &lt;br&gt; • Janssen† &lt;br&gt; • Medtronic† &lt;br&gt; • NIH* &lt;br&gt; • St. Jude Medical† &lt;br&gt; • Zoll†</td>
</tr>
<tr>
<td>James A. de Lemos</td>
<td>UT Southwestern Medical School—Professor of Medicine</td>
<td>• Abbott Diagnostics &lt;br&gt; • Amgen &lt;br&gt; • Diadexus &lt;br&gt; • Janssen Pharmaceuticals &lt;br&gt; • Novo Nordisc &lt;br&gt; • Roche Diagnostics† &lt;br&gt; • St. Jude Medical</td>
<td>• Abbott Diagnostics* &lt;br&gt; • Daiichi-Sankyo Endpoint Committee†</td>
</tr>
<tr>
<td>Deborah B. Diercks</td>
<td>UT Southwestern Medical Center—Audre and Bernard Rapoport Distinguished Chair in Clinical Care and Research; Department of Emergency Medicine—Professor and Chair</td>
<td>• Daiichi-Sankyo &lt;br&gt; • Janssen Pharmaceuticals &lt;br&gt; • Novartis</td>
<td>• Beckman Coulter† &lt;br&gt; • Cardiorentis† &lt;br&gt; • Otsuko† &lt;br&gt; • Radiometer† &lt;br&gt; • Emergencies in Medicine† &lt;br&gt; • Society of Academic Emergency Medicine† &lt;br&gt; • Society of Chest Pain Centers and Providers†</td>
</tr>
<tr>
<td>James C. Fang</td>
<td>University of Utah—Cardiovascular Division</td>
<td>• Abiomed &lt;br&gt; • Boston Scientific &lt;br&gt; • Maquet</td>
<td>• NIH† &lt;br&gt; • Pfizer† &lt;br&gt; • None</td>
</tr>
<tr>
<td>Barry A. Franklin</td>
<td>William Beaumont Hospital—Director, Cardiac Rehabilitation and Exercise Laboratories</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Christopher B.</td>
<td>Duke Clinical Research</td>
<td>• AstraZeneca</td>
<td>• AstraZeneca* &lt;br&gt; • Duke Advisory &lt;br&gt; • None</td>
</tr>
</tbody>
</table>
| Granger Institute—Director, Cardiac Care Unit; Professor of Medicine | • Boehringer Ingelheim *  
• Bristol-Myers Squibb *  
• Daiichi-Sankyo  
• Eli Lilly  
• GlaxoSmithKline  
• Hoffman LaRoche  
• Janssen Pharmaceuticals  
• Pfizer  
• Ross Medical  
• Salix Pharmaceuticals  
• Sanofi-aventis  
• Takeda  
• The Medicines Company  
| None | Committee (telemetry and monitoring equipment purchases)*  
• Site research for clinical trials* |

| Harlan M. Krumholz, Yale University School of Medicine—Professor of Epidemiology and Public Health | • Institute for Healthcare Improvement Scientific Advisory Group Premier*  
• UnitedHealth Cardiac Scientific Advisory Board*  
• VHA, Inc.* | None | None | • AHRQ*  
• Catherine and Patrick Weldon Donaghue Medical Research Foundation *  
• Johnson & Johnson*  
• Medtronic*  
• National Cancer Institute*  
• NHLBI*  
• Robert Wood Johnson Foundation*  
• The Commonwealth Fund*  
• U.S. FDA, medical  
| None | • ABIM  
• AHA editor*  
• ImageCOR†  
• Massachusetts Medical Society—Editor*  
• PCORI Board of Governors† |
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution and Qualification</th>
<th>None</th>
<th>None</th>
<th>None</th>
<th>device post-market surveillance*</th>
<th>None</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jane A. Linderbaum</td>
<td>Mayo Clinic—Assistant Professor of Medicine</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
| David A. Morrow             | Harvard Medical School—Professor of Medicine   | • Abbott  
• Beckman-Coulter  
• BG Medicine  
• Daiichi-Sankyo  
• diaDexus  
• Eli Lilly  
• Gilead  
• Instrumentation Laboratory  
• Konica Minolta  
• Merck  
• Novartis  
• OrthoClinical Diagnostics/Joh  
son & Johnson  
• Radiometer Servier  
• Roche Diagnostics | None | None | • Abbott*  
• Amgen*  
• AstraZeneca*  
• Athera*  
• Beckman-Coulter*  
• BG Medicine*  
• Bristol-Myers Squibb*  
• Buhlmann*  
• Daichii-Sankyo*  
• Eli Lilly*  
• GlaxoSmithKline*  
• Johnson & Johnson*  
• Merck*  
• Novartis*  
• Roche Diagnostics*  
• Sanofi-aventis*  
• Singulex* | None | None |
| L. Kristin Newby            | Duke University Medical Center, Division of Cardiology—Professor of Medicine | • AstraZeneca MedScape/The Heart.org  
• BioKier  
• Daiichi-Sankyo  
• Janssen Pharmaceuticals  
• Philips  
• Roche Diagnostics | None | None | • Amylin  
• Bristol-Myers Squibb*  
• GlaxoSmithKline*  
• Merck*  
• NIH–MURDOCK Study*  
• PCORI* | None | None |
| Joseph P. Ornato            | Department of Emergency Medicine, Virginia Commonwealth University—Professor | None | None | None | • NIH Resuscitation Outcomes Consortium*  
• NIH/NINDS | None | None |

© 2015 by the American College of Cardiology Foundation, the American Heart Association, Inc., and the Society for Cardiovascular Angiography and Interventions.
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>None</th>
<th>None</th>
<th>None</th>
<th>None</th>
<th>None</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narith Ou</td>
<td>Mayo Clinic—Pharmacotherapy Coordinator, Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Martha J. Radford</td>
<td>NYU Langone Medical Center—Chief Quality Officer; NYU School of Medicine—Professor of Medicine (Cardiology)</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Jacqueline E. Tamis-Holland</td>
<td>Mount Sinai Saint Luke's Hospital and The Icahn School of Medicine—Program Director, Interventional Cardiology Fellowship Program</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Carl L. Tommaso</td>
<td>Skokie Hospital—Director of Catheterization Laboratory; NorthShore University HealthSystems—Partner</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Cynthia M. Tracy</td>
<td>George Washington University Medical Center—Associate Director, Division of Cardiology</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Y. Joseph Woo</td>
<td>Stanford University—Professor and Chair, Cardiothoracic Surgery</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>David X. Zhao</td>
<td>Wake Forest Baptist</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

*Impact of English Comprehension on Delays to Presentation and Treatment of Patients with an Acute ST-Elevation Infarction†

†ISCHEMIA trial

†PIGLET-PCI study

†Interventional Cardiology Fellowship Program Director

†Women’s Health New York

†Society for Cardiovascular Angiography and Interventions
| Health—Professor of Medicine, Heart and Vascular Center of Excellence Director |  | • Medtronic† |

This table represents all relationships of committee members with industry and other entities that were reported by authors, including those not deemed to be relevant to this document, at the time this document was under development. The table does not necessarily reflect relationships with industry at the time of publication. A person is deemed to have a significant interest in a business if the interest represents ownership of ≥5% of the voting stock or share of the business entity, or ownership of ≥$5,000 of the fair market value of the business entity; or if funds received by the person from the business entity exceed 5% of the person’s gross income for the previous year. Relationships that exist with no financial benefit are also included for the purpose of transparency. Relationships in this table are modest unless otherwise noted. Please refer to http://www.acc.org/guidelines/about-guidelines-and-clinical-documents/relationships-with-industry-policy for definitions of disclosure categories or additional information about the ACC/AHA Disclosure Policy for Writing Committees.

*Significant relationship.
†No financial benefit.
‡Dr. Deborah D. Ascheim accepted a position at Capricor Therapeutics in August 2015, after the writing effort was completed. In accordance with ACC/AHA policy, she recused herself from the final voting process.

AHRQ indicates Agency for Healthcare Research and Quality; ABIM indicates American Board of Internal Medicine; ACC indicates American College of Cardiology; AHA, American Heart Association; DSMB, Data Safety Monitoring Board; HRS, Heart Rhythm Society; ISCHEMIA, International Study of Comparative Health Effectiveness with Medical and Invasive Approaches; NYU, New York University; NHLBI, National Heart, Lung, and Blood Institute; NIH, National Institutes of Health; PARTNER II trial, Placement of Aortic Transcatheter Valves; PCORI, Patient-Centered Outcomes Research Institute; SCAI, Society for Cardiovascular Angiography and Interventions; UCSF, University of California San Francisco; U.S. Food and Drug Administration; and UT, University of Texas.