

# Quality markers in cardiology: measures of outcomes and clinical practice—a perspective of the Spanish Society of Cardiology and of Thoracic and Cardiovascular Surgery

José-Luis López-Sendón\*, José Ramón González-Juanatey, Fausto Pinto, José Cuenca Castillo, Lina Badimón, Regina Dalmau, Esteban González Torrecilla, José Ramón López Mínguez, Alicia M. Maceira, Domingo Pascual-Figal, José Luis Pomar Moya-Prats, Alessandro Sionis, and José Luis Zamorano

Cardiology/Planta 1, Hospital Universitario La Paz, Paseo de la Casellana 261, Madrid, Spain

Received 3 June 2015; revised 4 August 2015; accepted 18 September 2015; online publish-ahead-of-print 21 October 2015

## Introduction

The complexity of the individual patient and organization of medical practice results in important institutional and country quality of care variability.<sup>1–17</sup> Attempts to assess the quality of clinical practice have established rating systems that may yield completely different results and rating for the same hospital during the same period of time, adding confusion rather than help to prove their usefulness and, questioning whether existing measures can actually measure quality.<sup>18–35</sup> Most important, benchmarking may be associated with progressive improvement both in performance and outcomes,<sup>18,26,28,36–38</sup> highlighting the relevance of standardization of quality measures and the responsibility of scientific societies.

## Objectives

The Spanish Society of Cardiology (SSC) and the Spanish Society of Thoracic and Cardiovascular Surgery (SSTCS) organized a task force to identify and define two sets of quality metrics in hospital cardiology practice: (i) *outcome measures* (metrics of the final quality of the practice of cardiology) and (ii) *performance measures* (metrics of clinical practice which are known to positively influence desirable outcomes). Beyond this objective, Scientific Societies and Health Care Authorities should be responsible for the implementation of programmes to measure quality, ensure the quality of the data, benchmarking, and certification/accreditation of cardiology services.

## Methods

All European Society of Cardiology (ESC)<sup>32</sup> and American Heart Association/American College of Cardiology<sup>33</sup> guidelines were reviewed and recommendations related to quality standards were included in the document.

### Grading of quality markers

Three levels were established both for class recommendation and level of evidence considering (i) clinical and practical relevance, (ii) source and difficulty to obtain the information, (iii) difficulty to audit and ascertain the information, and (iv) evidence in the literature (*Table 1*). Mortality and stroke were considered as self-evident. To avoid confusion with general clinical practice guidelines nomenclature, Class of recommendation was graded in 1, 2, and 3 grades instead of I, II, and III.

### Type of hospital

For quality benchmarking, the task force established three types of hospitals defined as low, intermediate, and high complexity according to their organization, resources, and the need to transfer patients to other hospitals.

### Clusters to assess overall quality in clinical practice

Quality of care parameters may be grouped in clusters including institution characteristics, available technologies, staffing of the hospital and cardiac unit, organization, certification and accreditation, reputation and patients opinion.<sup>17,39,40</sup> All of them may influence outcomes, most are clearly identified in guidelines for clinical practice and all should be taken in consideration in every hospital.

This article has been co-published in the *European Heart Journal* and *Cirugía Cardiovascular*. Either citation can be used when citing the article. The opinions expressed in this article are not necessarily those of the Editors of the *European Heart Journal* or of the European Society of Cardiology.

\* Corresponding author. Tel: +34 91 5868293, Fax: +34 91 5866672, Email: [jlopezsendon@gmail.com](mailto:jlopezsendon@gmail.com)

© The Author 2015. Published by Oxford University Press on behalf of the European Society of Cardiology.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact [journals.permissions@oup.com](mailto:journals.permissions@oup.com)

**Table 1** Grading of quality markers/metrics

Class of recommendation				Level of evidence	
Class	Relevance	Data source. Reliability and difficulty to obtain	Auditable	Level	Evidence
1	<ul style="list-style-type: none"> <li>• Major outcomes (usual outcomes in clinical trials)</li> </ul>	<ul style="list-style-type: none"> <li>• Data available in all hospitals by law (e.g. minimal health care database)</li> <li>• Obligatory registries</li> </ul>	<ul style="list-style-type: none"> <li>• Data public, available on file</li> <li>• Obligatory registries</li> </ul>	A	<ul style="list-style-type: none"> <li>• Self-evident</li> <li>• Level A in ESC/AHA-ACC guidelines</li> <li>• Recommendations of regulatory agencies</li> </ul>
2	<ul style="list-style-type: none"> <li>• Outcome surrogates</li> <li>• Class I in guidelines other than major outcomes in clinical trials</li> </ul>	<ul style="list-style-type: none"> <li>• Voluntary registries including all patients</li> <li>• Difficult to obtain; may be unreliable</li> </ul>	<ul style="list-style-type: none"> <li>• Voluntary disclosures</li> <li>• Difficult to audit</li> </ul>	B	<ul style="list-style-type: none"> <li>• Level B in guidelines</li> </ul>
3	<ul style="list-style-type: none"> <li>• Class &lt; I in guidelines</li> <li>• Opinions</li> </ul>	<ul style="list-style-type: none"> <li>• Voluntary registries (not including all consecutive patients)</li> <li>• Opinions, surveys</li> </ul>	<ul style="list-style-type: none"> <li>• Data on file but difficult to obtain</li> <li>• Data impossible to obtain in majority of hospitals</li> </ul>	C	<ul style="list-style-type: none"> <li>• Level C in guidelines</li> <li>• Opinion surveys</li> <li>• Recommended by other agencies for quality grading</li> </ul>

**Table 2** Principal markers frequently used to assess overall quality of results in clinical practice

Metric	Relevance	Difficulty	Auditable	Evidence	Comments
All-cause mortality	1	1	1	A	<ul style="list-style-type: none"> <li>• Self-evident. Reliable only in auditable registries/databases</li> </ul>
Cardiovascular mortality	1	2	2	A	<ul style="list-style-type: none"> <li>• Difficult to ascertain. Needs adjudication</li> </ul>
Number of days in hospital	1	2	2	A	<ul style="list-style-type: none"> <li>• Reason for hospitalization dependent of health care systems, individual preferences and co-morbidities</li> <li>• Number of days in any hospital 30 days after index hospitalization preferred to days in hospital until discharge</li> </ul>
Stroke	1	2	2	A	<ul style="list-style-type: none"> <li>• Difficult to ascertain. Needs adjudication</li> <li>• No reliable risk scores for corrections between different hospitals</li> </ul>
Re-infarction	1	2	2	A	<ul style="list-style-type: none"> <li>• Difficult to ascertain. Needs adjudication</li> </ul>
Safety (major bleeding, severe infections, medical errors, etc.)	1	2	2	A	<ul style="list-style-type: none"> <li>• Difficult to ascertain. Needs adjudication</li> </ul>

## Main markers to measure quality of results (measures of outcomes) in clinical cardiology practice

Clinical outcomes are the ultimate measure of quality of care in cardiology and there is no excuse to ignore them. The main outcomes in cardiology trials (mortality, hospitalization, myocardial infarction/re-infarction, and stroke) constitute the strongest reference for guideline recommendations.<sup>29,30,32,33,41–47</sup> Ideally, an outcome at a pre-defined follow-up (e.g. 30 days after index hospitalization) is preferred instead of during hospitalization, but this may be difficult or impossible to ascertain except in well-organized dedicated registries. Outcomes should be measured in uniform groups of patients and need corrections for case mix complexity (Table 2).

## Mortality

Mortality constitutes the first and most important metric recommended by this task force to measure quality results in clinical practice. The relevance of mortality is self-evident, remains the most important outcome measure in clinical trials designed to change clinical practice, and is the most powerful evidence to support recommendations in practice guidelines. In many clinical settings, it is related to guideline adherence as well as performance measures,<sup>2,47</sup> it is included in different programmes that evaluate quality of care,<sup>3–7,10,13,16,19,21,31</sup> and certainly it can be audited (Class of recommendation 1 and Level of evidence A). All-cause mortality during the index hospitalization is the recommended metric by this Task Force, as different causes of mortality need adjudication for uniformity and this will not be possible except in dedicated registries. Mortality,

particularly in acute coronary syndromes (ACS), is not evenly distributed, i.e. mortality for stable patients is currently around 3–5%, while resuscitated or intubated patients have a lethality of 35–50%. Thus, mean mortality rates have to be adjusted for case complexity to be fair for centres with a large number of ACS patients in shock or after cardiopulmonary resuscitation.

### Length of hospitalization stay and re-admission rates

Length of hospitalization stay and re-admission rates constitute the second metric recommended by this Task Force. Hospitalization reflects quality of care, impacts health care cost, is commonly used in quality programmes,<sup>2,41–47</sup> and is also included in many quality control databases. On the other hand, length of stay may not be reliable as an outcome metric to compare results of practice in different countries/areas where hospitalization may be driven not only by medical but also by administrative and social reasons. In addition, it may be dependent of other conditions or comorbidities, always difficult to properly determine. For this reason, hospitalization is recommended as a quality metric only when hospitals participate in a prospective, dedicated registry, where criteria for admission and discharge are pre-defined or the cluster of hospitals is uniform (Class of recommendation 2 and Level of evidence B).

### Myocardial infarction

In-hospital or post-discharge myocardial infarction is one of the components of the main outcomes in clinical trials and registries in patients with ischaemic heart disease. However, it may be a poor metric for outcomes due to the difficulties to standardize the diagnosis in large populations, in particular during the first few days after hospital admission for ACS,<sup>2,41–48</sup> and should only be used in dedicated, prospective controlled registries (Class of recommendation 2 and Level of evidence B).

### Stroke

Disabling stroke is self-relevant, is related with iatrogenia, percutaneous interventions (PCI) surgery, and the use of antithrombotic therapy. Stroke is a metric included in registries and some quality programmes.<sup>49</sup> However, minor forms of stroke are difficult to diagnose without the routine use of brain imaging techniques, there are not reliable scales for stroke risk in different clinical settings and this metric may represent a confounding factor for benchmarking if not centrally adjudicated.<sup>50–52</sup> Stroke is only recommended as a quality measure when considering well organized, controlled, and audited registries (Class of recommendation 2 and Level of evidence B).

### Safety

Safety parameters such as major bleeding, medical errors, infections, cardiac tamponade during PCI, and other relevant clinical complications of clinical practice should be considered in quality performance reports. Again, the complexity of achieving uniform diagnosis and reporting in large number of hospitals preclude the use of safety parameters for benchmarking of quality except when data are prospectively obtained in dedicated, controlled registries (Class of recommendation 2 and Level of evidence B).

## Adjustment of outcomes metrics

### Selection of uniform populations

Comparisons should be made only between similar hospitals and in selected, well-defined, high-risk-specific populations with prognosis known to be dependent on overall cardiology management (Groups of Related Diagnosis or GRDs).<sup>39,53–55</sup> Extreme high-risk and low-prevalence groups of patients should be excluded from analysis rather than corrected for risk.<sup>53,54</sup> Sometimes this information is not well reflected in registries or databases, stressing the importance of dedicated databases for the measurement of quality outcomes.<sup>54</sup> Table 3 shows the recommended populations for benchmarking.

### Risk adjustment

The use of specific and *validated* risk scores recommended in guidelines (GRACE or TIMI risk scores for ACS,<sup>70,71</sup> Euro2 risk score,<sup>72–74</sup> and others<sup>75–77</sup>) will provide further refinement and make the metrics reliable for benchmarking. Some are too complex and difficult to assess in large populations (e.g. including biological markers not universally used<sup>74–77</sup>). In such circumstances, adjusted models considering common risk factors are recommended.<sup>16,78</sup>

## Measures of the performance of the practice of clinical cardiology: quality markers related with better results in clinical practice (performance measures)

These metrics are the reference for a better health care organization but must not be considered as important as outcomes. Benchmarking of some of these parameters may be difficult, and obtaining the appropriate information may require a dedicated database very difficult to standardize or complete, and even more difficult to audit accurately. Accordingly, the most important use of these parameters is for internal quality controls, not for benchmarking different hospitals. Eight different sections have been identified:

### Clinical cardiology

Some quality markers are recommended for the accreditation of cardiology units of all hospitals (e.g. staffing, technology, volumes); others are directed to control internal quality or to identify problems and opportunities for improvement and are recommended for all hospitals.<sup>79–121</sup> The most relevant recommendations are the use of local protocols for diagnosis and treatment, based in the ESC/AHA or country-specific guidelines and approved by the hospital.<sup>32,33,89</sup> Teamwork with internal medicine and other related specialties, with special reference to primary care should constitute a priority.<sup>81–88</sup>

### Cardiac imaging

Cardiac imaging constitutes the core for diagnosis in cardiology.<sup>122–137</sup> Transthoracic echocardiography performed by well-trained cardiologists is recommended in all patients, in all hospitals. More complex

**Table 3** Recommended measures to assess quality of results in clinical practice

Metric	Suggested reference value	Relevance	Difficulty	Auditable	Evidence	References
<i>Mortality<sup>a</sup></i>						
STEMI mortality (excluding Killip IV class patients and patients after cardiopulmonary resuscitation)	<5% (a)	1	1	1	A	41,42
Non-STE-ACS mortality (excluding Killip IV class patients and patients after cardiopulmonary resuscitation)	<3% (a)	1	1	1	A	43,44
Staged PCI mortality	<1% (a)	1	1	1	A	56
TAVI mortality	<6% (a)	1	1	1	A	57,58
VT after AMI and other complex catheter ablation mortality	<3% (a)	1	1	1	A	59–61
Pacemaker, ICD, CRT implant mortality	<1% (a)	1	1	1	A	62,63
Heart failure mortality	<7% (a)	1	1	1	A	67
Staged first aortic valve surgery replacement mortality (excluding TAVI)	<5% (a) <7% (b)	1	1	1	A	64–66
Staged first mitral valve surgery replacement mortality	<7% (a) <9% (b)	1	1	1	A	64–66
Staged first mitral valve surgery repair mortality	<3% (a) <5% (b)	1	1	1	A	64–66
Staged first CABG (without combined surgery) mortality	<3% (a) <5% (b)	1	1	1	A	64–66
Staged first combined CABG + AVR mortality	<6% (a) <8% (b)	1	1	1	A	64–66
Heart transplant	<15% (a)(c)	1	1	1	A	184
<i>Hospitalization<sup>b</sup></i>						
STEMI number of days in hospital	<10	2	2	1	A	41,42
Non-STE-ACS number of days in hospital	<10	2	2	1	A	43,44
Heart failure number of days in hospital	<9	2	2	1	A	5,11,18,67
Staged first CABG, aortic or mitral surgery number of days in hospital	<15	2	2	1	A	64,68,69
Rehospitalization after ACS, heart failure, or surgery as above <sup>c</sup>	Less than mean value in national registries					

Reference values are orientative. For benchmarking, a target reference value less than median value in participating hospitals is strongly suggested.

<sup>a</sup>Mortality: 30 days all-cause mortality is preferred over mortality before hospital discharge only if reliable data can be obtained.

<sup>b</sup>Hospitalization: the number of days in any hospital during the first 30 days after index hospitalization is preferred over number of days from hospitalization to discharge.

<sup>c</sup>Rehospitalization: unplanned readmission for any cause to any acute care hospital within 30 days of discharge from a hospitalization. (a) Observed mortality (mean value).

(b) Expected mortality corrected for the logistic euroscore for this population. (c) Mortality or re-transplant. CABG, coronary artery bypass-grafting; TAVI, transaortic valve implant.

techniques require specific training, accreditation and certification are highly recommended and may benefit from teamwork with radiologists (nuclear imaging, cardiac computed tomography, and cardiovascular magnetic resonance). Accreditation of image laboratories by the ESC or other official accreditation agencies is recommended. Quality controls include accreditation, low inter-observer variability, timely performed studies (waiting list's), and prompt systematic reports.

### Acute cardiac care measures related to better results in clinical practice

Acute cardiac care requires teamwork with out-of-hospital professionals, emergency departments, internal medicine, and intensive care physicians following well-defined protocols for common cardiac conditions such as acute myocardial infarction (AMI) and ACS.<sup>41–44,90,138</sup> Patients with ST elevation myocardial infarction

(STEMI) should be referred immediately and only to hospitals with available primary PCI. Well-trained nurses are of utmost importance in emergency departments, medical wards in type II and III hospitals, and intensive care units. Time do first medical contact to balloon or needle, risk score determinations, revascularization in intermediate and high-risk patients, and adherence to guidelines recommended medication are the most relevant quality performance measures. Outcomes include mortality in STEMI and ACS. Local safety controls should focus on antithrombotic complications.

### Interventional cardiology

The results of percutaneous cardiac interventions are highly dependent on the expertise and training of interventional cardiologists, as well as on the volume of performed procedures at each hospital and by individual interventional cardiologists.<sup>41–44,56–58,139–149</sup>

Complex cases should be only treated in hospitals with cardiac surgery support.<sup>142</sup> Low volume, highly complex interventions [transcatheter aortic valve implant (TAVI) closure of left atrial appendage and foramen ovale, valvular and adult congenital heart disease interventions] should be considered only in selected type III hospitals with specific training and accreditation. Adherence to local protocols based on guidelines and heart team decisions for non-urgent interventions should be considered in all cases. Outcome metrics include STEMI and ACS mortality, as well as TAVI mortality and elective PCI mortality. The main safety control is focused on bleeding and vascular complications requiring surgery or extended length of stay.

## Electrophysiology and complex arrhythmia

Interventional treatment of complex arrhythmias (e.g. atrial fibrillation) requires accreditation of both laboratory and electrophysiologists.<sup>59–63,150–161</sup> Indication for ablation should be established after a Heart Team approach that adheres to the guideline recommendations. Outcome targets should include complex electrophysiological procedures and device implantation mortality. Safety should focus on complications requiring surgery, transfusions, or prolongation of hospitalization.

## Heart failure

Diagnosis and treatment of heart failure is rapidly changing and increasing in complexity and adherence to guidelines is likely to assure better outcomes including survival.<sup>5,18,45,46,67,162–164</sup> Cardiac care must be continued after discharge from hospital in all cases. Teamwork as opposed to admitting patients in cardiology or internal medicine is crucial and strongly recommended. A heart failure unit adapted to local characteristics of the hospital is always highly recommended. Outcomes include mortality and readmissions to the hospital.

## Cardiac rehabilitation

Cardiac rehabilitation is more than controlled exercise training.<sup>41–44,165–180</sup> The main objective should be the patient education for long-term changes related to life-style, adherence to medical treatment for the specific condition and use of appropriate secondary prevention strategies. Cardiac rehabilitation units or programmes should be implemented to offer all patients appropriate counselling and follow-up for secondary prevention. Teamwork especially with general physicians is essential. Quality controls should include access to rehabilitation programmes for patients with ischaemic heart disease and adherence to guidelines during long-term follow-up.

## Cardiac surgery

Quality controls in cardiac surgery have already been implemented in some countries.<sup>64–66,181–184</sup> Heart Team approach is recommended in all cases; hospital volumes, training and expertise of surgeons, anaesthesiologist, nurses and referring cardiologists highly impact outcomes. Outcomes are relatively easy to measure and should focus on mortality and length of hospitalization in prevalent, well-defined surgical procedures such as CABG, aortic and mitral valve staged, first time surgery.

## Current limitations

### Capture of information

Registries and databases currently used for benchmarking may not have the appropriate quality. Audited, dedicated, prospective mandatory reports would be arguably the best way of capturing simple but essential/core information.<sup>185</sup>

This document is based on the ESC and AHA-ACC guidelines recommendations. Nevertheless, the document is mainly intended for the health care system in Spain. It may not apply in other countries with different health care systems. There is a need for defining quality standards universally acceptable to compare quality of care between different health care systems and countries, within and out of the European Union and ESC.

### Future challenges

Unmet needs and opportunities for improvement include: (i) standardization of data (data capture and availability, risk corrections, target values and reporting); (ii) standardization of audits to ascertain data quality; (iii) universal participation; (iv) identification of quality metrics for outpatient clinical practice<sup>68,69,186</sup> and long-term follow-up; and (v) refinement of the quality metrics considering the feedback from participants in benchmarking programmes.

### Acknowledgements

We express our gratitude to the following persons/institutions that have contributed to the final manuscript: Sharon Legendre (SSC) for her assistance in coordinating the Scientific Societies involved in the project. Irene Santamaría and Paco Campos (LUZAN5) for coordinating the relationship of the task force members, review of the references, and secretarial work. Inmaculada Roldan, MD and Javier Elola, MD, for her advise on ICD codes, GRDs, and risk correction recommendations. Sandra Rosillo (MD), Eduardo Sánchez (MD, AHA), and all cardiologists that review the manuscript and provided input to improve the recommendations and the reading of the manuscript. We also acknowledge and thank the formal review and comments from the following institutions: Asociación Española de Enfermería (Mercedes Rodríguez), Agency for Health Quality and Assessment of Catalonia (Josep M. Argimón); Sociedad Gallega de Cardiología (José Manuel Vazquez); SSC Research Agency (Paco Marin, Nacho Ferreira, Jose Manuel Vazquez); SSTCS; Subdirección de Gestión y Seguimiento de Objetivos en Hospitales. Consejería de Salud de la Comunidad de Madrid (Rosa de Andrés de Colsa), Spanish Ministry of Health (Jose Javier Castrodeza Sanz, Sonia Pelaez Moya), and the reviewers of the ESC.

**Conflict of interest:** This manuscript has been prepared by members of the SSC and the SSTCS, and is fully supported by the two societies. All members of the task force volunteered their time and services and received no fees or payment in exchange for their services. No funding from industry was received by the members of the task force or the scientific societies involved in the preparation of this document. J.R.L.M.: Proctor Sant Jude Medical for left atrial appendage closure.

## References

- Fox KAA, Goodman SG, Klein W, Brieger D, Steg PhG, Dabbous O, Avezum Á, for the GRACE Investigators. Management of acute coronary syndromes. Variations in practice and outcome. Findings from the Global Registry of Acute Coronary Events (GRACE). *Eur Heart J* 2002;**23**:1177–1189.
- Granger CB, Steg PG, Peterson E, López-Sendón J, Van de Werf F, Kline-Rogers E, Allegro J, Dabbous O, Klein W, Fox KAA, Eagle K, for the GRACE Investigators. Medication performance measures and mortality following acute coronary syndromes. *Am J Med* 2005;**118**:858–865.
- Jernberg T, Johanson P, Held C, Svennblad B, Lindbäck J, Wallentin L, for SWEDHEART/RIKS-HIA. Association between adoption of evidence-based treatment and survival for patients with ST-elevation myocardial infarction. *JAMA* 2011;**305**:1677–1684.
- Morrison LJ, Neumar RW, Zimmerman JL, Link MS, Newby LK, McMullan PW Jr, Vanden Hoek T, Halverson CC, Doering L, Peberdy MA, Edelson DP, on behalf of the American Heart Association Emergency Cardiovascular Care Committee, Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation, Council on Cardiovascular Nursing, Council on Clinical Cardiology, and Council on Peripheral Vascular Disease. Strategies for improving survival after in-hospital cardiac arrest in the United States: 2013 consensus recommendations: a consensus statement from the American Heart Association. *Circulation* 2013;**127**:1538–1563.
- Cabadés A, López-Bescós L, Arós F, Loma-Osorio A, Bosch X, Pabón P, Marrugat J. Variability in the management and prognosis at short- and medium-term of myocardial infarct in Spain: the PRIAMHO study. Registration Project of Hospital Acute Myocardial Infarct. *Rev Esp Cardiol* 1999;**52**:767–775.
- Cleland JGF, Swedberg K, Cohen-Solal A, Cosin-Aguilar J, Dietz R, Follath F, Gavazzi A, Hobbs R, Korewicki J, Madeira HC, Preda I, van Gilst WH, Widimsky J, Mareev V, for The study group on Diagnosis of the Working Group on Heart Failure of the European Society of Cardiology, Mason J, Freemantle N, Eastaugh J. The Euro Heart Failure Survey of the EUROHEART Survey Programme. A survey on the quality of care among patients with heart failure in Europe. *Eur J Heart Fail* 2000;**2**:123–132.
- Tunstall-Pedoe H, Kuulasmaa K, Mahonen M, Tolonen H, Ruokokoski E, Amouyel P. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA project populations. Monitoring trends and determinants in cardiovascular disease. *Lancet* 1999;**353**:1547–1557.
- Fox KA, Cokkinos DV, Deckers J, Keil U, Maggioni A, Steg G. The ENACT study: a pan-European survey of acute coronary syndromes. European Network for Acute Coronary Treatment. *Eur Heart J* 2000;**17**:1440–1449.
- Hasdai D, Behar S, Wallentin L, Danchin N, Gitt AG, Boersma E, Fioretti PM, Simoons M, Battler A. A prospective survey of the characteristics, treatments and outcomes of patients with acute coronary syndromes in Europe and the Mediterranean basin. The Euro Heart Survey of Acute Coronary Syndromes (Euro Heart Survey ACS). *Eur Heart J* 2002;**23**:1190–1201.
- Fox KAA, Goodman SG, Anderson FA, Granger CB, Moscucci M, Flather MD, Spencer F, Budaj A, Dabbous OH, Gore JM, on behalf of the GRACE Investigators. From guidelines to clinical practice: the impact of hospital and geographical characteristics on temporal trends in the management of acute coronary syndromes. The Global Registry of Acute Coronary Events (GRACE). *Eur Heart J* 2003;**24**:1414–1424.
- Komagda M, Follath F, Swedberg K, Cleland J, Aguilar JC, Cohen-Solal A, Dietz R, Gavazzi A, Van Gilst WH, Hobbs R, Korewicki J, Madeira HC, Moiseyev VS, Preda I, Widimsky J, Freemantle N, Eastaugh J, Mason J, Study Group on Diagnosis of the Working Group on Heart Failure of the European Society of Cardiology. The EuroHeart Failure Survey Programme – a survey on the quality of care among patients with heart failure in Europe. Part 2: Treatment. *Eur Heart J* 2003;**24**:464–474.
- Eagle KA, Kline-Rogers E, Goodman SG, Gurfinkel EP, Avezum Á, Flather MD, Granger CB, Erickson S, White K, Steg PhG, for the GRACE Investigators. Adherence to evidence-based therapies after discharge for acute coronary syndromes. An ongoing, prospective, observational study. *Am J Med* 2004;**117**:73–81.
- Admission-based in-hospital case-fatality rates within 30 days after admission for AMI, 2009 Health at a Glance: Europe 2012 - © OECD 2012. doi.org/10.1787/888932704874.
- Puymirat E, Battler A, Birkhead J, Bueno H, Clemmensen P, Cottin Y, Fox KA, Gorenek B, Hamm C, Huber K, Lettino M, Lindahl B, Müller C, Parkhomenko A, Price S, Quinn T, Schiele F, Simoons M, Tatu-Chitoui G, Tubaro M, Vrints C, Zahger D, Zeymer U, Danchin N; EHS 2009 snapshot participants. Euro Heart Survey 2009 Snapshot: regional variations in presentation and management of patients with AMI in 47 countries. *Eur Heart J Acute Cardiovasc Care* 2013;**4**:359–370.
- Reiner Z, De Bacquer D, Kotseva K, Prugger C, De Backer G, Wood D, on behalf of The EUROASPIRE III Study Group. Treatment potential for dyslipidaemia management in patients with coronary heart disease across Europe: Findings from the EUROASPIRE III survey. *Atherosclerosis* 2013;**231**:300–307.
- Bertomeu V, Cequier A, Bernal J, Alfonso F, Anguita MP, Muñoz J, Barrabe JA, García-Dorado D, Goicolea J, Elola F. In-hospital mortality due to acute myocardial infarction. Relevance of type of hospital and care provided. RECALCAR study. *Rev Esp Cardiol* 2013;**66**:935–942.
- Bonow RO, Masoudi FA, Rumsfeld JS, DeLong E, Estes NA 3rd, Goff DC Jr, Grady K, Green LA, Loth AR, Peterson ED, Piña IL, Radford MJ, Shahian DM. ACC/AHA classification of care metrics: performance measures and quality metrics: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures. *Circulation* 2008;**118**:2662–2666.
- Maeda JL. Evidence-based heart failure performance measures and clinical outcomes: a systematic review. *J Card Fail* 2010;**16**:411–418.
- Observatorio de resultados del Servicio Madrileño de Salud. [www.observatorioresultados.sanidadmadrid.org](http://www.observatorioresultados.sanidadmadrid.org) (30 December 2014).
- Werner RM, Bradlow ET. Relationship between medicare's hospital compare performance measures and mortality rates. *JAMA* 2011;**305**:1677–1684.
- NICOR (National Institute For Cardiovascular Outcomes Research) and the clinical data transparency initiative. [www.ucl.ac.uk/nicor/nicor-news-publication/nicorandtheclinicaldatatransparencyinitiative](http://www.ucl.ac.uk/nicor/nicor-news-publication/nicorandtheclinicaldatatransparencyinitiative) (28 January 2015).
- Krumholz HM, Wang Y, Mattera JA, Wang Y, Han LF, Ingber MJ, Roman S, Normand SL. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with heart failure. *Circulation* 2006;**113**:1693–1701.
- Lewis WR, Peterson ED, Cannon CP, Super DM, LaBresh KA, Quealy K, Liang L, Fonarow GC. An organized approach to improvement in guideline adherence for acute myocardial infarction: results with the Get With The Guidelines quality improvement program. *Arch Intern Med* 2008;**168**:1813–1819.
- Austin JM, Jha AK, Romano PS, Singer SJ, Vogus TJ, Wachter RM, Pronovost PJ. National hospital ratings systems share few common scores and may generate confusion instead of clarity. *Health Affairs* 2015;**34**:423–430.
- Bardach NS, Wang JJ, De Leon S, Shih SC, Boscardin J, Goldman E, Dudley A. Effect of Pay-for-Performance Incentives on Quality of Care in Small Practices With Electronic Health Records. A Randomized Trial. *JAMA* 2013;**310**:1051–1059.
- Chatterjee P, Joyn KE. Do cardiology quality measures actually improve patient outcomes? *J Am Heart Assoc* 2014;**3**:e000404.
- Chen J, Radfor MJ, Wang Y, Marciniak TA, Krumholz HM. Do 'America's best hospitals' perform better for acute myocardial infarction? *N Engl J Med* 1999;**340**:286–292.
- Simms AD, Baxter PD, Cattle BA, Batin PD, Wilson JI, West RM, Hall AS, Weston CF, Deanfield JE, Fox KA, Gale KP. An assessment of composite measures of hospital performance and associated mortality for patients with acute myocardial infarction. Analysis of individual hospital performance and outcome for the National Institute for Cardiovascular Outcomes Research (NICOR). *Eur Heart J Acute Cardiovasc Care* 2012;**2**:9–18.
- NICOR (National Institute For Cardiovascular Outcomes Research) statement regarding National Adult Cardiac Surgery Audit data validation. [www.ucl.ac.uk/nicor/nicor-news-publication/adultcardiacsurgerydatavalidation](http://www.ucl.ac.uk/nicor/nicor-news-publication/adultcardiacsurgerydatavalidation) (28 January 2015).
- MINAP and National Heart Failure Audit Patient Reports. [www.ucl.ac.uk/nicor/nicor-news-publication/minaphpatientreports2012](http://www.ucl.ac.uk/nicor/nicor-news-publication/minaphpatientreports2012) (16 January 2015).
- Portal estadístico del Sistema Nacional de Salud. [www.mssi.gob.es/estadEstudios/estadisticas/sisInfSanSNS/home.htm](http://www.mssi.gob.es/estadEstudios/estadisticas/sisInfSanSNS/home.htm) (13 January 2015).
- European Society of Cardiology clinical practice guidelines. [www.escardio.org/GUIDELINES-SURVEYS/ESC-GUIDELINES/Pages/GuidelinesList.aspx](http://www.escardio.org/GUIDELINES-SURVEYS/ESC-GUIDELINES/Pages/GuidelinesList.aspx) (15 January 2015).
- AHA/ACC Guidelines & Quality Standards. [www.cardiosource.org/Science-And-Quality/Practice-Guidelines-and-Quality-Standards.aspx](http://www.cardiosource.org/Science-And-Quality/Practice-Guidelines-and-Quality-Standards.aspx) (15 January 2015).
- Scott A, Sivey P, Ait Ouakrim D, Willenberg L, Naccarella L, Furler J, Young D. The effect of financial incentives on the quality of health care provided by primary care physicians. *Cochrane Database Syst Rev* 2011;**9**:CD008451.
- Houle SK, McAlister FA, Jackevicius CA, Chuck AW, Tsuyuki RT. Does performance-based remuneration for individual health care practitioners affect patient care? A systematic review. *Ann Intern Med* 2012;**157**:889–899.
- Douglas PS, Brindis RG. A question of quality: why national benchmarking? *J Am Coll Cardiol* 2006;**47**:1076–1078.
- Auton GM. Using benchmarking techniques to improve efficiency and quality in cardiology services: Part one and two. *J Cardiovasc Manag* 1994;**5**:16–18 and 20–25.
- Fox KA, Steg PG, Eagle KA, Goodman SG, Anderson FA Jr, Granger CB, Flather MD, Budaj A, Quill A, Gore JM; GRACE Investigators. Decline in rates

- of death and heart failure in acute coronary syndromes, 1999–2006. *JAMA* 2007; **297**:1892–1900.
39. Instituto de informacion sanitaria. Ministerio de Sanidad. Servicios Sociales e Igualdad. Indicadores clave del Sistema Nacional de Salud. [www.mssi.gob.es](http://www.mssi.gob.es) (28 January 2015).
  40. Olmsted MG, Murphy J, Geisen E, Williams J, Bell D, Pitts A, Morley M, Stanley M. Methodology: U.S. News & World Report Best Hospitals 2013–14. [www.usnews.com/pubfiles/BH\\_Methodology\\_Report.pdf](http://www.usnews.com/pubfiles/BH_Methodology_Report.pdf) (6 February 2015).
  41. Steg PG, James SK, Atar D, Badano LP, Blömmström-Lundqvist C, Borger MA, Di Mario C, Dickstein K, Ducrocq G, Fernandez-Aviles F, Gershlick AH, Giannuzzi P, Halvorsen S, Huber K, Juni P, Kastrati A, Knuuti J, Lenzen MJ, Mahaffey KW, Valgimigli M, van 't Hof A, Widimsky P, Zahger D. Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC). Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J* 2012; **33**:2569–2619.
  42. O'Gara PT, Kushner FG, Ascheim DD, Casey DE Jr, Chung MK, de Lemos JA, Ettinger SM, Fang JC, Fesmire FM, Franklin BA, Granger CB, Krumholz HM, Linderbaum JA, Morrow DA, Newby LK, Ornato JP, Ou N, Radford MJ, Tamis-Holland JE, Tommaso CL, Tracy CM, Woo YJ, Zhao DX. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2013; **61**:e78–140.
  43. Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H, Caso P, Dudek D, Gielen S, Huber K, Ohman M, Petrie MC, Sonntag F, Uva MS, Storey RF, Wijns W, Zahger D; ESC Committee for Practice Guidelines. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The Task Force for the management of acute coronary syndromes (ACS) in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2011; **32**:2999–3054.
  44. Amsterdam EA, Wenger NK, Brindis RG, Casey DE Jr, Ganiats TG, Holmes DR Jr, Jaffe AS, Jneid H, Kelly RF, Kontos MC, Levine GN, Liebson PR, Mukherjee D, Peterson ED, Sabatine MS, Smalling RW, Zieman SJ. 2014 /ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2014; **64**:e139–e228.
  45. McMurray J, Adamopoulos S, Anker S, Auricchio A, Böhm M, Dickstein K, Falk V, Filippatos G, Fonseca C, Gomez-Sanchez M, Jaarsma T, Køber L, Lip G, Maggioni A, Parkhomenko A, Pieske B, Popescu B, Rønnevik P, Rutten F, Schwitler J, Seferovic P, Stepinska J, Trindade P, Voors A, Zannad F, Zeheer A. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012. The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. *Eur Heart J* 2012; **33**:1787–1847.
  46. Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JVV, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WHW, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation* 2013; **128**:e240–e327.
  47. Hicks KA, Tchong JE, Bozkurt B, Chaitman BR, Cutlip DE, Farb A, Fonarow G, Jacobs J, Jaff M, Lichtman JH, Limacher M, Mahaffey K, Mehran R, Nissen S, Smith EE, Targum S. 2014 ACC/AHA Key Data Elements and Definitions for Cardiovascular Endpoint Events in Clinical Trials. A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (Writing Committee to Develop Cardiovascular Endpoints Data Standards). *Circulation* 2015; **131**. Published online before print 29 December, 2014, doi:10.1161/CIR.0000000000000156.
  48. Thygesen K, Alpert JS, White HD, Jaffe AS, Katus HA, Apple FS, Lindahl B, Morrow DA, Chaitman BA, Clemmensen PM, Johanson P, Hod H, Underwood R, Bax JJ, Bonow RO, Pinto F, Gibbons RJ, Fox KA, Atar D, Newby LK, Galvani M, Hamm CW, Uretsky BF, Steg PG, Wijns W, Bassand JP, Menasché P, Ravkilde J, Ohman EM, Antman EM, Wallentin LC, Armstrong PW, Simoons ML, Januzzi JL, Nieminen MS, Gheorghiade M, Filippatos G, Luepker RV, Fortmann SP, Rosamond WD, Levy D, Wood D, Smith SC, Hu D, Lopez-Sendon JL, Robertson RM, Weaver D, Tendera M, Bove AA, Parkhomenko AN, Vasilieva EJ, Mendis S. ESC/ACCF/AHA/WHF Task Force for the Universal Definition of Myocardial Infarction. Third universal definition of myocardial infarction. *Eur Heart J* 2012; **33**:2551–2567.
  49. Hong Y, LaBresh KA. Overview of the American Heart Association 'Get With the Guidelines' Programs: coronary heart disease, stroke, and heart failure. *Crit Pathw Cardiol* 2006; **5**:179–186.
  50. Anyanwu AC, Filsoofi F, Salzberg SP, Bronster DJ, Adams DH. Epidemiology of stroke after cardiac surgery in the current era. *J Thorac Cardiovasc Surg* 2007; **134**:1121–1127.
  51. Shahian DM, O'Brien SM, Filardo G, Ferraris VA, Haan CK, Rich JB, Normand SL, DeLong ER, Shewan CM, Dokholyan RS, Peterson ED, Edwards FH, Anderson RP. Society of Thoracic Surgeons Quality Measurement Task Force. The Society of Thoracic Surgeons 2008 Cardiac Surgery Risk Models: Part 1—coronary artery bypass grafting surgery. *Ann Thorac Surg* 2009; **88**:S2–22.
  52. Fonarow GC, Alberts MJ, Broderick JP, Jauch EC, Kleindorfer DO, Saver JR, Solis P, Suter R, Schwamm LH. Stroke outcomes measures must be appropriately risk-adjusted to ensure quality care of patients. A presidential advisory from the American Heart Association/American Stroke Association. *Stroke* 2014; **45**:1589–1601.
  53. Li Q, Goodman SG, Yan RT, Gore JM, Polasek P, Lai K, Baer C, Goldberg RJ, Pinter A, Ahmad K, Kornder JM, Yan AT. Global Registry of Acute Coronary Events and the Canadian Registry of Acute Coronary Events Investigators. Pre-hospital cardiac arrest in acute coronary syndromes: insights from the Global Registry of Acute Coronary Events and the Canadian Registry of Acute Coronary Events. *Cardiology* 2013; **126**:27–34.
  54. Awad HH, Anderson FA Jr, Gore JM, Goodman SG, Goldberg RJ. Cardiogenic shock complicating acute coronary syndromes: insights from the Global Registry of Acute Coronary Events. *Am Heart J* 2012; **163**:963–971.
  55. Fox KA, Eagle KA, Gore JM, Steg PG, Anderson FA; GRACE and GRACE2 Investigators. The Global Registry of Acute Coronary Events, 1999 to 2009 – GRACE. *Heart* 2010; **96**:1095–1101.
  56. Harold JG, Bass TA, Bashore TM, Brindis RG, Brush JE Jr, Burke JA, Dehmer GJ, Deychak YA, Jneid H, Jollis JG, Landzberg JS, Levine GN, McClurken JB, Messenger JC, Moussa ID, Muhlestein JB, Pomerantz RM, Sanborn TA, Sivaram CA, White CJ, Williams ES. American College of Cardiology Foundation; American Heart Association; Society of Cardiovascular Angiography and Interventions. ACCF/AHA/SCAI 2013 Update of the Clinical Competence Statement on Coronary Artery Interventional Procedures. This document is available on the World Wide Web sites of the American College of Cardiology (<http://www.cardiosource.org>), the American Heart Association (<http://my.americanheart.org>), and the Society for Cardiovascular Angiography and Interventions (<http://www.scai.org>). Copublished: JACC, Circulation, Cath Cardiovasc Interventions. 2013 (6 February 2015).
  57. Schymik G, Würth A, Bramlage P, Herbinger T, Heimeshoff M, Pilz L, Schymik JS, Wondraschek R, Süselbeck T, Gerhardus J, Luik A, Gonska BD, Posival H, Schmitt C, Schröfel H. Long-Term Results of Transapical Versus Transfemoral TAVI in a Real World Population of 1000 Patients With Severe Symptomatic Aortic Stenosis. *Circ Cardiovasc Interv* 2014; **8**. doi:10.1161/CIRCINTERVENTIONS.113.000761.
  58. Sabaté M, Cánovas S, García E, Hernández Antolín R, Maroto L, Hernández JM, Maroto L, Hernández JM, Alonso Briaies JH, Muñoz García AJ, Gutiérrez-Ibañes E, Rodríguez-Roda J. TAVI National Group collaborators. Predictores de mortalidad hospitalaria y a medio plazo tras el reemplazo valvular aórtico transcathéter: datos del registro nacional TAVI 2010–2011. *Rev Esp Cardiol* 2013; **66**:949–958.
  59. Aliot EM, Stevenson WG, Almendral Garrote JM, Bogun F, Calkins H, Delacretaz E, Della Bella P, Hindricks G, Jais P, Josephson ME, Kautzner J, Kay GN, Kuck KH, Lerman BB, Marchlinski F, Reddy V, Schalij MJ, Schilling R, Soejima K, Wilber D; EHRA/HRS Expert consensus on catheter ablation of ventricular arrhythmia. *Heart Europace* 2009; **11**:771–817.
  60. Katz DF, Turakhia MP, Sauer WH, Tzou WS, Heath RR, Zipse MM, Aleong RG, Varosy PD, Kao DP. Safety of ventricular tachycardia ablation in clinical practice: findings from 9,699 hospital discharge records. *Circ Arrhythm Electrophysiol* 2015; **8**:362–370.
  61. Stevenson WG, Wilber DJ, Natale A, Jackman WM, Marchlinski FE, Talbert T, Gonzalez MD, Worley SJ, Daoud EG, Hwang C, Schuger C, Bump TE, Jazayeri M, Tomassoni GF, Kopelman HA, Soejima K, Nakagawa H, for the Multicenter Thermocool VT Ablation Trial Investigators. Irrigated radiofrequency catheter ablation guided by electroanatomic mapping for recurrent ventricular tachycardia after myocardial infarction: the multicenter thermocool ventricular tachycardia ablation trial. *Circulation* 2008; **118**:2773–2782.
  62. Brignole M, Auricchio A, Baron-Esquívias G, Bordachar P, Boriani G, Breithardt OA, Cleland J, Deharo JC, Delgado V, Elliott PM, Gorenek B, Isaac CW, Leclercq C, Linde C, Mont L, Padeletti L, Sutton R, Vardas P. 2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy. *Eur Heart J* 2013; **34**:2281–2329.
  63. Freeman JV, Wang Y, Curtis JP, Heidenreich PA, Hlatky MA. The relation between hospital procedure volume and complications of cardioverter defibrillator implantation from the implantable cardioverter-defibrillator registry. *J Am Coll Cardiol* 2010; **56**:1133–1139.
  64. Hillis LD, Smith PK, Anderson JL, Bittl JA, Bridges CR, Byrne JG, Cigarroa JE, Disesa VJ, Hiratzka LF, Hutter AM Jr, Jessen ME, Keeley EC, Lahey SJ,

- Lange RA, London MJ, Mack MJ, Patel MR, Puskas JD, Sabik JF, Selnes O, Shahian DM, Trost JC, Winniford MD. Association Task Force on Practice Guidelines 2011 ACCF/AHA Guideline for Coronary Artery Bypass Graft Surgery: Executive Summary: A Report of the American College of Cardiology Foundation/American Heart Association. *Circulation* 2011;**124**:2610–2642.
65. Josa M, Cortina JM, Mestres C, Pereda D, Walton P, Kinsman R. *First report of the Spanish Quality Adult Cardiovascular Surgery Project 2013*. Published by SECTCV and Dendrite Clinical System Ltd. Henley-on-Thames. ISBN 978-84-9926-504-9.
66. Centella T, Hornero F. Cirugía Cardiovascular en España en el año 2012. Registro de intervenciones de la Sociedad Española de Cirugía Torácica-Cardiovascular. *Cir Cardiov* 2014;**21**:18–36.
67. Bonow RO, Ganiats TG, Beam CT, Blake K, Casey DE, Goodlin SJ, Grady KL, Hundley RF, Jessup M, Lynn TE, Masoudi FA, Nilasena D, Piña IL, Rockswold PD, Sadwin LB, Sikkema JD, Sincak CA, Spertus J, Torrcson PJ, Torres E, Williams MV, Wong JB. ACCF/AHA/AMA-PCPI 2011 Performance Measures for Adults With Heart Failure. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Performance Measures and the American Medical Association—Physician Consortium for Performance Improvement. *J Am Coll Cardiol* 2012;**59**:1812–1832.
68. Gibbons RJ, Smith S, Antman E. American College of Cardiology/American Heart Association Clinical Practice Guidelines: Part I. Where do they come from? *Circulation* 2003;**107**:2979–2986.
69. Gibbons RJ, Smith S, Antman E. American College of Cardiology/American Heart Association Clinical Practice Guidelines: Part II. Evolutionary Changes in a Continuous Quality Improvement Project. *Circulation* 2003;**107**:3101–3107.
70. Fox KA, Dabbous OH, Goldberg RJ, Pieper KS, Eagle KA, Van de Werf F, Avezum A, Goodman SG, Flather MD, Anderson FA Jr, Granger CB. Prediction of risk of death and myocardial infarction in the six months after presentation with acute coronary syndrome: prospective multinational observational study (GRACE). *Br Med J* 2006;**333**:1091.
71. Morrow DA, Antman EM, Charlesworth A, Cairns R, Murphy SA, de Lemos JA, Giugliano RP, McCabe CH, Braunwald E. TIMI risk score for ST-elevation myocardial infarction: a convenient, bedside, clinical score for risk assessment at presentation: an intravenous nPA for treatment of infarcting myocardium early II trial substudy. *Circulation* 2000;**102**:2031–2037.
72. Euroscore2 Nashef SA, Roques F, Sharples LD, Nilsson J, Smith C, Goldstone AR, Lockowandt U. 5246 EuroSCORE II. *Eur J Cardiothorac Surg* 2012;**41**:734–744.
73. Euroscore II online calculator. [www.euroscore.org/calc.html](http://www.euroscore.org/calc.html) (25 January 2015).
74. Papadopoulou SL, Girasis C, Dharampal A, Farooq V, Onuma Y, Rossi A, Morel MA, Krestin GP, 5255 Serruys PW, de Feyter PJ, Garcia Garcia HM. CT-SYNTAX score: a feasibility and reproducibility Study. *JACC Cardiovasc Imaging* 2013;**6**:413–415.
75. Pocock SJ, Ariti CA, McMurray JJ, Maggioni A, Køber L, Squire IB, Swedberg K, Dobson J, Poppe KK, Whalley GA, Doughty RN; Meta-Analysis Global Group in Chronic Heart Failure. Predicting survival in heart failure: a risk score based on 39 372 patients from 30 studies. *Eur Heart J* 2013;**34**:1404–1413.
76. Peterson PN, Rumsfeld JS, Liang L, Albert NM, Hernandez AF, Peterson ED, Fonarow GC, Masoudi FA; American Heart Association Get With the Guidelines-Heart Failure Program. A validated risk score for in-hospital mortality in patients with heart failure from the American Heart Association get with the guidelines program. *Circ Cardiovasc Qual Outcomes* 2010;**3**:25–32.
77. Rahimi K, Bennett D, Conrad N, Williams TM, Basu J, Dwight J, Woodward M, Patel A, McMurray J, MacMahon S. Risk prediction in patients with heart failure. A Systematic Review and Analysis. *J Am Coll Cardiol HF* 2014;**2**:440–446.
78. Institute for Clinical Evaluative Sciences. *Cardiovascular health and services in Ontario*. An ICES atlas (cited 12 June 2012). Toronto: ICES; 1999. Available at: [www.ices.on.ca/webpage.cfm?site\\_id=1&org\\_id=67&morg\\_id=0&gsec\\_id=0&item\\_id=1390&type=atlas](http://www.ices.on.ca/webpage.cfm?site_id=1&org_id=67&morg_id=0&gsec_id=0&item_id=1390&type=atlas) (16 January 2015).
79. Anderson JL, Co-Chair, Heidenreich PA, Co-Chair, Barnett PG, Creager MA, Fonarow GC, Gibbons RJ, Halperin JL, Hlatky MA, Jacobs AK, Mark DB, Masoudi FA, Peterson ED, Shaw LJ. A Report of the American College of Cardiology/American Heart Association Task Force on Performance Measures and Task Force on Practice Guidelines. ACC/AHA Statement on Cost/Value Methodology in Clinical Practice Guidelines and Performance Measures. *J Am Coll Cardiol* 2014;**63**:2304–2322.
80. Truven Health Analytics. 50 Top cardiovascular hospitals. A National benchmarks report. [www.100tophospitals.com/portals/2/assets/2014\\_Cardio\\_Benchmarks\\_SampleReport.pdf](http://www.100tophospitals.com/portals/2/assets/2014_Cardio_Benchmarks_SampleReport.pdf) (29 January 2015).
81. Peterson ED, Ho PM, Barton M, Beam C, Burgess LH, Casey DE Jr, Drozda JP Jr, Fonarow GC, Goff D Jr, Grady KL, King DE, King ML, Masoudi FA, Nielsen DR, Stankovic S. ACC/AHA/AACVPR/AAFP/ANA concepts for clinician-patient shared accountability in performance measures: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures. *Circulation* 2014;**130**:1984–1994.
82. Lewis WR, Piccini JP, Turakhia MP, Curtis AB, Fang M, Suter RE, Page RL 2nd, Fonarow GC. Get With The Guidelines AFIB: novel quality improvement registry for hospitalized patients with atrial fibrillation. *Circ Cardiovasc Qual Outcomes* 2014;**7**:770–777.
83. Dorsch MP, Lose JM, DiDomenico RJ. The effect of cardiovascular credentialed pharmacists on process measures and outcomes in myocardial infarction and heart failure. *Pharmacotherapy* 2014;**34**:803–808.
84. Drozda J Jr, Messer JV, Spertus J, Abramowitz B, Alexander K, Beam CT, Bonow RO, Burkiewicz JS, Crouch M, Goff DC Jr, Hellman R, James T 3rd, King ML, Machado EA Jr, Ortiz E, O'Toole M, Persell SD, Pines JM, Rybicki FJ, Sadwin LB, Sikkema JD, Smith PK, Torrcson PJ, Wong JB; ACCF/AHA/AMA-PCPI 2011 performance measures for adults with coronary artery disease and hypertension: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Performance Measures and the American Medical Association-Physician Consortium for Performance Improvement. *J Am Coll Cardiol* 2011;**58**:316–336.
85. Kullo JJ, Trejo-Gutierrez JF, Lopez-Jimenez F, Thomas RJ, Allison TG, Mulvagh SL, Arruda-Olson AM, Hayes SN, Pollak AW, Kopecky SL, Hurst RT. A perspective on the New American College of Cardiology/American Heart Association guidelines for cardiovascular risk assessment. *Mayo Clin Proc* 2014;**89**:1244–1256.
86. Kociol RD, Hammill BG, Fonarow GC, Heidenreich PA, Go AS, Peterson ED, Curtis LH, Hernandez AF. Associations between use of the hospitalist model and quality of care and outcomes of older patients hospitalized for heart failure. *JACC Heart Fail* 2013;**1**:445–453.
87. Arnold SV, Masoudi FA, Rumsfeld JS, Li Y, Jones PG, Spertus JA. Derivation and validation of a risk standardization model for benchmarking hospital performance for health-related quality of life outcomes after acute myocardial infarction. *Circulation* 2014;**129**:313–320.
88. Bonow RO, Douglas PS, Buxton AE, Cohen DJ, Curtis JP, Delong E, Drozda JP Jr, Ferguson TB Jr, Heidenreich PA, Hendel RC, Masoudi FA, Peterson ED, Taylor AJ, American College of Cardiology Foundation; American Heart Association Task Force on Performance Measures. ACCF/AHA methodology for the development of quality measures for cardiovascular technology: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Performance Measures. *Circulation* 2011;**124**:1483–1502.
89. Deewania P. Gaps in Guideline Implementation. A Cause for Concern, Time for Action. *J Am Coll Cardiol* 2015;**65**:278–280.
90. Hasin Y, Danchin N, Filippatos GS, Heras M, Janssens U, Leor J, Nahir M, Parkhomenko A, Thygesen K, Tubaro M, Wallentin LC, Zakke I, Working Group on Acute Cardiac Care of the European Society of Cardiology. Recommendations for the structure, organization, and operation of intensive cardiac care units. *Eur Heart J* 2005;**26**:1676–1682.
91. Morrow DA, Fang JC, Fintel DJ, Granger CB, Katz JN, Kushner FG, Kuvin JK, Lopez-Sendon J, McAreavey D, Nallamothu B, Page RL II, Parrillo JE, Peterson PE, Winkelman C. Evolution of Critical Care Cardiology: Transformation of the Cardiovascular Intensive Care Unit and the Emerging Need for New Medical Staffing and Training Models A Scientific Statement From the American Heart Association. *Circulation* 2012;**126**:1408–1428.
92. Ballo P, Bandini F, Capecci I, Chiodi L, Ferro G, Fortini A, Giuliani G, Landini G, Laureano R, Milli M, Nenci G, Pizzarelli F, Santoro GM, Vannelli P, Cappelletti C, Zuppiroli A, American College of Cardiology Foundation; American Society of Echocardiography. Application of 2011 American College of Cardiology Foundation/American Society of Echocardiography appropriateness use criteria in hospitalized patients referred for transthoracic echocardiography in a community setting. *J Am Soc Echocardiogr* 2012;**25**:589–598.
93. Garbi M, McDonagh T, Cosyns B, Bucciarelli-Ducci C, Edvardsen T, Kitsiou A, Nieman K, Lancellotti P; EACVI Imaging Task Force. Appropriateness criteria for cardiovascular imaging use in heart failure: report of literature review. *Eur Heart J Cardiovasc Imaging* 2015;**16**:147–153.
94. Tu JV, Chu A, Donovan LR, Ko DT, Booth GL, Tu K, Maclagan LC, Guo H, Austin PC, Hogg W, Kapral MK, Wijesundera HC, Atzema CL, Gershon AS, Alter DA, Lee DS, Jackevicius CA, Bhatia RS, Udell JA, Rezai MR, Stukel TA. The Cardiovascular Health in Ambulatory Care Research Team (CANHEART): Using Big Data to Measure and Improve Cardiovascular Health and Healthcare Services. *Circ Cardiovasc Qual Outcomes* 2015;**8**:204–212.
95. McAlister FA, Wang J, Donovan L, Lee DS, Armstrong PW, Tu JV. The influence of patient goals of care on performance measures in patients hospitalized for heart failure: an analysis of the EFFECT registry. *Circ Heart Fail* 2015;**8**:481–488.
96. Jollis JG, Granger CB, Henry TD, Antman EM, Berger PB, Moyer PH, Pratt FD, Rokos IC, Acuña AR, Roettig ML, Jacobs AK. Systems of care for ST-segment-elevation myocardial infarction: a report from the American Heart Association's Mission: Lifeline. *Circ Cardiovasc Qual Outcomes* 2012;**5**:423–428.
97. Dégano IR, Subirana I, Torre M, Grau M, Vila J, Fusco D, Kirchberger I, Ferrières J, Malmivaara A, Azevedo A, Meisinger C, Bongard V, Farmakis D, Davoli M, Häkkinen U, Araújo C, Lekakis J, Elosua R, Marrugat J, on behalf of the



- EURHOBOP investigators. A European benchmarking system to evaluate in-hospital mortality rates in acute coronary syndrome: The EURHOBOP project. *Int J Cardiol* 2015;**182**:509–516.
98. López-Sendón J, Mills P, Weber H, Michels R, Di Mario C, Philippatos G, Geras M, Merino JL, Pennell D, Sochor H. Recommendations on Sub-speciality Accreditation in Cardiology. By The Coordination Task Force on Subspeciality Accreditation of the European Board for the Speciality of Cardiology. *Eur Heart J* 2007;**28**: 2163–2171.
  99. International Accreditation Comision. [www.intersocietal.org](http://www.intersocietal.org) (Consulted 21 February 2015).
  100. European Union of Medical Spacialists. [www.uems.eu](http://www.uems.eu) (Consulted 21 February 2015).
  101. Popescu BA, Stefanidis A, Nihoyannopoulos P, Fox KF, Ray S, Cardim N, Rigo F, Badano LP, Fraser AG, Pinto F, Zamorano JL, Habib G, Maurer G, Lancellotti P, Andrade MJ, Donal E, Edvardsen T, Varga A. Updated standards and processes for accreditation of echocardiographic laboratories from The European Association of Cardiovascular Imaging. *Eur Heart J Cardiovasc Imaging* 2014;**15**:717–727.
  102. Anderson JL, Antman EM, Harold JG, Jessup M, O'Gara P, Pinto FJ, Vardas PE, Zamorano JL. Clinical practice guidelines on perioperative cardiovascular evaluation collaborative efforts among the ACC, AHA, and ESC. *Circulation* 2014;**130**:2213–2214.
  103. Fihn S, Blankenship JC, Alexander KP, Bittl JA, Byrne J, Fletcher BJ, Fonarow GC, Lange RA, Levine GL, Maddox TM, Naidu SS, Ohman EM, Smith PK. 2014 ACC/AHA/AATS/PCNA/SCAI/STS focused update of the guideline for the diagnosis and management of patients with stable ischemic heart disease. *Circulation* 2014;**130**:1749–1767.
  104. Arnett DK, Goodman RA, Halperin JL, Anderson JL, Parekh AK, Zoghbi WA. AHA/ACC/HHS strategies to enhance application of clinical practice guidelines in patients with cardiovascular disease and comorbid conditions from the American Heart Association, American College of Cardiology, and US Department of Health and Human Services. *Circulation* 2014;**130**:1662–1667.
  105. Nishimura RA, Otto KM, Bonow RO, Carabello BA, Erwin JP III, Guyton RA, O'Gara PT, Ruiz CE, Skubas NJ, Sorajja P, Sundt TM III, Thomas JD, ACC/AHA Task Force Members. 2014 AHA/ACC Guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation* 2014;**129**:2440–2492.
  106. Konstantinides S, Torbicki A, Agnelli G, Danchin N, Fitzmaurice D, Galie N, Gibbs JS, Huisman M, Humbert M, Kucher N, Lang I, Lankeit M, Lekakis J, Maack C, Mayer E, Meneveau N, Perrier A, Pruszczyk P, Rasmussen LH, Schindler TH, Svitol P, Vonk Noordegraaf A, Zamorano JL, Zompatori M. 2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism. *Eur Heart J* 2014;**35**:3033–3080.
  107. Elliott PM, Anastasakis A, Borger MA, Borggrefe M, Cecchi F, Charron Ph, Hagege AA, Lafont A, Limongelli G, Mahrholdt H, McKenna W, Mogensen J, Nihoyannopoulos P, Nistri S, Pieper GP, Pieske B, Rapezzi C, Frans H, Rutten J, Tillmanns C, Watkins H. 2014 ESC Guidelines on diagnosis and management of hypertrophic cardiomyopathy. *Eur Heart J* 2014;**35**:2733–2779.
  108. Erbel R, Aboyans V, Boileau C, Bossone E, Di Bartolomeo R, Eggebrecht H, Evangelista A, Falk V, Frank H, Gaemperli O, Grabenwöger M, Haverich A, Iung B, Manolis A, Meijboom F, Nienaber KA, Roffi M, Rousseau H, Sechtem U, Sirnes PA, von Allmen R, Vrints KJM. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases. *Eur Heart J* 2014;**35**:2873–2926.
  109. Kristensen SD, Anker S, Knuuti J, Saraste A, Bøtker HE, De Hert S, Ford I, Gonzalez-Juanatey JR, Pocock S, Price S, Roffi M, Sirnes PA, Sousa-Uva M, Voudris V, Funck-Brentano C. 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management. *Eur Heart J* 2014;**35**:2383–2431.
  110. Rydén L, Grant PJ, Anker S, Berne C, Cosentino F, Danchin N, Deaton C, Escaned J, Hammes HP, Huikuri H, Marre M, Marx N, Mellbin L, Oestergren J, Patrono C, Seferovic P, Sousa Uva M, Taskinen MR, Tendera M, Tuomilehto J, Valensi P, Zamorano JL. ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD. *Eur Heart J* 2013;**34**: 3035–3087.
  111. Task Force Members, Montalescot G, Sechtem U, Achenbach S, Andreotti F, Arden C, Budaj A, Bugiardini R, Crea F, Cuisset T, Di Mario C, Ferreira JR, Gersh BJ, Gitt AK, Hulot JS, Marx N, Opie LH, Pfisterer M, Prescott E, Ruschitzka F, Sabaté M, Senior R, Taggart DP, van der Wall EE, Vrints CJ, ESC Committee for Practice Guidelines, Zamorano JL, Achenbach S, Baumgartner H, Bax JJ, Bueno H, Dean V, Deaton C, Erol C, Fagard R, Ferrari R, Hasdai D, Hoes AW, Kirchhof P, Knuuti J, Kolh P, Lancellotti P, Linhart A, Nihoyannopoulos P, Piepoli MF, Ponikowski P, Sirnes PA, Tamargo JL, Tendera M, Torbicki A, Wijns W, Windecker S, Document Reviewers, Knuuti J, Valgimigli M, Bueno H, Claeys MJ, Donner-Banzhoff N, Erol C, Frank H, Funck-Brentano C, Gaemperli O, Gonzalez-Juanatey JR, Hämäläinen M, Hasdai D, Husted S, James SK, Kervinen K, Kolh P, Kristensen SD, Lancellotti P, Maggioni AP, Piepoli MF, Pries AR, Romeo F, Rydén L, Simoons-Sel A, Sirnes PA, Steg PG, Timmis A, Wijns W, Windecker S, Yildirim A, Zamorano JL. 2013 ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. *Eur Heart J* 2013;**34**:2949–3003.
  112. Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Böhm M, Christiaens T, Cifkova R, De Backer G, Dominiczak A, Galderisi M, Grobbee DE, Jaarsma T, Kirchhof P, Kjeldsen SE, Laurent S, Manolis AJ, Nilsson PM, Ruilope LM, Schmieder RE, Sirnes PA, Sleight P, Viigimaa M, Waeber B, Zannad F, Redon J, Dominiczak A, Narkiewicz K, Nilsson PM, Burnier M, Viigimaa M, Ambrosioni E, Caulfield M, Coca A, Olsen MH, Schmieder RE, Tsioufis C, van de Borne P, Zamorano JL, Achenbach S, Baumgartner H, Bax JJ, Bueno H, Dean V, Deaton C, Erol C, Fagard R, Ferrari R, Hasdai D, Hoes AW, Kirchhof P, Knuuti J, Kolh P, Lancellotti P, Linhart A, Nihoyannopoulos P, Piepoli MF, Ponikowski P, Sirnes PA, Tamargo JL, Tendera M, Torbicki A, Wijns W, Windecker S, Clement DL, Coca A, Gillebert TC, Tendera M, Rosei EA, Ambrosioni E, Anker SD, Bauersachs J, Hitij JB, Caulfield M, De Buyzere M, De Geest S, Derumeaux GA, Erdine S, Farsang C, Funck-Brentano C, Gerc V, Germano G, Gielen S, Haller H, Hoes AW, Jordan J, Kahan T, Komajda M, Lovic D, Mahrholdt H, Olsen MH, Ostergren J, Parati G, Perk J, Polonia J, Popescu BA, Reiner Z, Rydén L, Sirenko Y, Stanton A, Struijker-Boudier H, Tsioufis C, van de Borne P, Vlachopoulos C, Volpe M, Wood DA. 2013 ESH/ESC guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Eur Heart J* 2013;**34**:2159–2219.
  113. Baumgartner H, Bonhoeffer P, De Groot N, de Haan F, Deanfield J, Galie N, Gatzoulis M, Gohlke-Baerwolf K, Kammerer H, Kilner K, Meijboom F, Mulder B, Oechslin E, Oliver Serraf JA, Szatmari A, Thaulow E, Vouhe PR, Walma E. ESC Guidelines for the management of grown-up congenital heart disease. *Eur Heart J* 2010;**31**:2915–2957.
  114. Moya A, Sutton R, Ammirati F, Blanc JJ, Brignole M, Dahm JB, Deharo JC, Gajek J, Gjesdal K, Krahn A, Massin M, Pepi M, Pezawas T, Ruiz Granell R, Sarasin F, Ungar A, van Dijk G, Wlame E, Wieling W. Guidelines for the diagnosis and management of syncope (version 2009). *Eur Heart J* 2009;**30**:2631–2671.
  115. Galie N, Hoeper MM, Humbert M, Torbicki A, Vachiery JL, Barbera AJ, Beghetti M, Corris P, Gaine S, Gibbs JS, Gomez-Sanchez MA, Jondeau G, Klepetko W, Opitz C, Peacock A, Rubin L, Zellweger M, Simonneau G. Guidelines for the diagnosis and treatment of pulmonary hypertension. *Eur Heart J* 2009;**30**:2493–2537.
  116. Maisch B, Spherovic P, Ristic AD, Erbel R, Riemmuller R, Adler Y, Tomkowski W, Thiene G, Magdi H. Yacoub guidelines on the diagnosis and management of pericardial diseases. *Eur Heart J* 2004;**25**:1–28.
  117. López-Sendón J, Swedberg K, McMurray J, Tamargo J, Maggioni AP, Dargie H, Tendera M, Waagstein F, Kiekkhus J, Lechat P, Torp-Pedersen C. Expert consensus document on angiotensin converting enzyme inhibitors in cardiovascular disease. The task force on ACE-inhibitors of the European Society of Cardiology. *Eur Heart J* 2004;**25**:1454–1470.
  118. López-Sendón J, Swedberg K, McMurray J, Tamargo J, Maggioni AP, Dargie H, Tendera M, Waagstein F, Kiekkhus J, Lechat P, Torp-Pedersen C. Expert consensus document on beta-adrenergic receptor blockers. The task force on beta-blockers of the European Society of Cardiology. European Society of Cardiology consensus statement. *Eur Heart J* 2004;**25**:1341–1362.
  119. Seferovic PM, Stoerk S, Filippatos G, Mareev V, Kaveliuniene A, Ristic AD, Ponikowski P, McMurray J, Maggioni A, Ruschitzka F, van Veldhuisen DJ, Coats A, Piepoli M, McDonagh T, Riley J, Hoes A, Pieske B, Dobric M, Papp Z, Mebazaa A, Parissis J, Ben Gal T, Vinereanu D, Brito D, Altenberger J, Gatzov P, Milinkovic I, Hradec J, Trochu JN, Amir O, Moura B, Lainscak M, Comin J, Wikström G, Anker S. Organization of heart failure management in European Society of Cardiology member countries: survey of the Heart Failure Association of the European Society of Cardiology in collaboration with the Heart Failure National Societies/Working Groups. *Eur J Heart Fail* 2013;**15**: 947–959.
  120. Sánchez Fernández PL, Alvarez Rodríguez J, Casado Flores I, Botas Rodríguez J, de Alba Montero JM, del Corral Torres E, Honrubia Fernández T, Huertas Alcázar P, Goicolea Rupérez J, Hernández Antolin RA, Jiménez Mena M, López de Sá y Areses E, Martín Reyes R, Salanova González GS. *Reperfusion del infarto agudo de miocardio con elevación de ST en Código Infarto en la comunidad de Madrid. Plan Estratégico CARDIOLOGIA 2011–2015*. <http://www.madrid.org/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-disposition&blobheadername2=cadena&blobheadervalue1=filename%3DLibro+Codigo+infarto.pdf&blobheadervalue2=language%3Des%26site%3DPortalSalud&blobkey=id&blobtable=MungoBlobs&blobwhere=1352853918919&ssbinary=true>.

121. Breuckmann F, Hochadel M, Darius H, Giannitsis E, Münzel T, Maier LS, Schmitt C, Schumacher B, Heusch G, Voigtländer T, Mudra H, Senges J. Guideline-adherence and perspectives in the acute management of unstable angina – initial results from the German chest pain unit registry. *J Cardiol* 2014. doi:10.1016/j.jcc.2014.11.003.
122. Douglas PS, Chen J, Gillam L, Hendel R, Hundley WG, Masoudi F, Patel MR, Peterson E. Achieving quality in cardiovascular imaging II Proceedings from the ACC-Duke University Medical Center Think Tank on quality in cardiovascular imaging. *JACC Cardiovascular Imaging* 2009;**2**:231–240.
123. Stainback RF. Overview of quality in cardiovascular imaging and procedures for clinicians: focus on appropriate-use-criteria guidelines. *Methodist DeBakey Cardiovasc J* 2014;**10**:178–184.
124. Douglas PS, DeCara JM, Devereux RB, Duckworth S, Gardin JM, Jaber WA, Morehead AJ, Oh JK, Picard MH, Solomon SD, Wei K, Weissman NJ; American Society of Echocardiography Standards; American College of Cardiology Foundation. Echocardiographic imaging in clinical trials: American Society of Echocardiography Standards for echocardiography core laboratories: endorsed by the American College of Cardiology Foundation. *J Am Soc Echocardiogr* 2009;**22**:755–765.
125. Ryan T, Armstrong WF, Khandheria BK; American Society of Echocardiography Task Force 4: training in echocardiography. *J Am Coll Cardiol* 2008;**51**:361–367.
126. Thomas JD, Zoghbi WA, Beller GA, Bonow RO, Budoff MJ, Cerqueira MD, Creager MA, Douglas PS, Fuster V, Garcia MJ, Holmes DR Jr, Manning WJ, Pohost GM, Ryan TJ, Van Decker WA, Wieggers SE, American College of Cardiology Foundation (ACCF); American Heart Association (AHA); American College of Physicians (ACP) Task Force on Clinical Competence and Training. ACCF 2008 Training Statement on Multimodality Noninvasive Cardiovascular Imaging A Report of the American College of Cardiology Foundation/American Heart Association/American College of Physicians Task Force on Clinical Competence and Training Developed in Collaboration With the American Society of Echocardiography, the American Society of Nuclear Cardiology, the Society of Cardiovascular Computed Tomography, the Society for Cardiovascular Magnetic Resonance, and the Society for Vascular Medicine. *J Am Coll Cardiol* 2009;**53**:125–146.
127. Intersocietal Accreditation Commission. *Standards and Guidelines for adult echocardiography accreditation*. [http://intersocietal.org/echo/main/helpful\\_resources.htm](http://intersocietal.org/echo/main/helpful_resources.htm) (6 January 2015).
128. Plein S, Schulz-Menger J, Almeida A, Mahrholdt H, Rademakers F, Pennell D, Nagel E, Schwitler J, Lombardi M, Working Group on Cardiovascular Magnetic Resonance, European Society of Cardiology. Training and accreditation in cardiovascular magnetic resonance in Europe: a position statement of the working group on cardiovascular magnetic resonance of the ESC. *Eur Heart J* 2011;**32**:793–798.
129. Picard MH, Adams D, Bierig SM, Dent JM, Douglas PS, Gillam LD, Keller AM, Malenka DJ, Masoudi FA, McCulloch M, Pellikka PA, Peters PJ, Stainback RF, Strachan GM, Zoghbi WA, American Society of Echocardiography. American Society of Echocardiography recommendations for quality echocardiography laboratory operations. *J Am Soc Echocardiogr* 2011;**24**:1–10.
130. IAC International Accreditation Commission. *IAC Standards and Guidelines for Adult Echocardiography Accreditation*. [www.intersocietal.org/echo/standards/IACAdultEchoStandardsJuly2014.pdf](http://www.intersocietal.org/echo/standards/IACAdultEchoStandardsJuly2014.pdf) (6 February 2015).
131. American College of Radiology accreditation program requirements. [www.acr.org/~media/ACR/Documents/Accreditation/MRI/Requirements.pdf](http://www.acr.org/~media/ACR/Documents/Accreditation/MRI/Requirements.pdf) (Consulted 24 February 2015).
132. Taylor AJ, Cerqueira M, Hodgson JM, Mark D, Min J, O’Gara P, Rubin GD, American College of Cardiology Foundation Appropriate Use Criteria Task Force; Society of Cardiovascular Computed Tomography; American College of Radiology; American Heart Association; American Society of Echocardiography; American Society of Nuclear Cardiology; North American Society for Cardiovascular Imaging; Society for Cardiovascular Angiography and Interventions; Society for Cardiovascular Magnetic Resonance. ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 Appropriate Use Criteria for Cardiac Computed Tomography. A Report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance. *Circulation* 2010;**122**:e525–ee55.
133. Voros S, Rivera JJ, Berman DS, Blankstein R, Budoff MJ, Cury RC, Desai MY, Dey D, Halliburton SS, Hecht HS, Nasir K, Santos RD, Shapiro MD, Taylor AJ, Valeti US, Young PM, Weissman G; Society for Atherosclerosis Imaging and Prevention Tomographic Imaging and Prevention Councils; Society of Cardiovascular Computed Tomography. Guideline for minimizing radiation exposure during acquisition of coronary artery calcium scans with the use of multidetector computed tomography. *J Cardiovasc Comput Tomogr* 2011;**5**:75–83.
134. Douglas PS, Khandheria B, Stainback RF, Weissman NJ, Peterson ED, Hendel RC, Stainback RF, Blaivas M, Des Prez RD, Gillam LD, Golash T, Hiratzka LF, Kussmaul WG, Labovitz AJ, Lindenfeld J, Masoudi FA, Mayo PH, Porembka D, Spertus JA, Wann LS, Wieggers SE, Brindis RG, Douglas PS, Patel MR, Wolk MJ, Allen JM, American College of Cardiology Foundation Appropriateness Criteria Task Force; American Society of Echocardiography; American College of Emergency Physicians; American Heart Association; American Society of Nuclear Cardiology; Society for Cardiovascular Angiography and Interventions; Society of Cardiovascular Computed Tomography; Society for Cardiovascular Magnetic Resonance. ACCF/ASE/ACEP/AHA/ASNC/SCAI/SCCT/SCMR 2008 appropriateness criteria for stress echocardiography. *Circulation* 2008;**117**:1478–1497.
135. Porter TR, Abdelmoneim S, Belcik JT, McCulloch ML, Mulvagh SL, Olson JJ, Porcelli C, Tsutsui GM, Wei KW. Guidelines for the cardiac sonographer in the performance of contrast echocardiography: a focused update from the American Society of Echocardiography. *J Am Soc Echocardiogr* 2014;**27**:797–810.
136. Case J, Bateman T. Taking the perfect nuclear image: quality control, acquisition, and processing techniques for cardiac SPECT, PET, and hybrid imaging. *J Nucl Cardiol* 2013;**20**:891–807.
137. Smith-Bindman R, Lipson J, Marcus R, Kim KP, Mahesh M, Gould R, Berrington de González A, Miglioretti DL. Radiation dose associated with common computed tomography examinations and the associated lifetime attributable risk of cancer. *Arch Intern Med* 2009;**169**:2078–2086.
138. Senni M, Parrella P, De Maria R, Cottini C, Böhm M, Ponikowski P, Filippatos G, Tribouilloy C, Di Lenarda A, Oliva F, Pulignano G, Ciccoira M, Nodari S, Porcu M, Cioffi G, Gabrielli D, Parodi O, Ferrazzi P, Gavazzi A. Predicting heart failure outcome from cardiac and comorbid conditions: the 3C-HF score. *Int J Cardiol* 2013;**163**:206–211.
139. Sionis A, Ruiz-Nodar JM, Fernández-Ortiz A, Marín F, Abu-Assi E, Díaz-Castro O, Nuñez-Gil IJ, Lidón RM. Update on ischemic heart disease and intensive cardiac care. *Rev Esp Cardiol (Engl Ed)* 2015;**68**:234–241.
140. Bashore TM, Balter S, Barac A, Byrne JG, Cavendish JJ, Chambers CE, Hermiller JB Jr, Kinlay S, Landzberg JS, Laskey WK, McKay CR, Miller JM, Moliterno DJ, Moore JW, Oliver-McNeil SM, Popma JJ, Tommaso CL. 2012 American College of Cardiology Foundation/Society for Cardiovascular Angiography and Interventions Expert Consensus Document on Cardiac Catheterization Laboratory Standards Update. *J Am Coll Cardiol* 2012;**59**:2221–2305.
141. Patel N, De Maria GL, Kassimis G, Rahimi K, Bennett D, Ludman P, Banning AP, Outcomes After Emergency Percutaneous Coronary Intervention in Patients With Unprotected Left Main Stem Occlusion. The BCIS National Audit of Percutaneous Coronary Intervention 6-Year Experience. *J Am Coll Cardiol Intv* 2014;**7**:969–980.
142. Dehmer GJ, Blankenship JC, Cilingiroglu M, Dwyer J, Feldman D, Gardner T, Gardner CL, Singh M. SCAI/ACC/AHA expert consensus document: 2014 update on percutaneous coronary intervention without on-site surgical backup. *Circulation* 2014;**129**:2610–2626.
143. Sanborn TA, Tcheng JE, Anderson HV, Chambers CE, Cheatham SL, DeCaro MV, Durack JC, Everett AD, Gordon JB, Hammond WE, Hijazi ZM, Kashyap VS, Knudtsen M, Landzberg MJ, Martinez-Rios MA, Riggs LA, Hian Sim K, Slotwiner DJ, Solomon H, Szeto WY, Weiner BH, Weintraub WS, Windle JR. ACC/AHA/SCAI 2014 health policy statement on structured reporting for the cardiac catheterization laboratory a report of the American College of Cardiology Clinical Quality Committee. *Circulation* 2014;**129**:2578–2609.
144. Miller DL, Balter S, Dixon RG, Nikolich B, Bartal G, Cardella JF, for the Society of Interventional Radiology Standards of Practice Committee. Quality improvement guidelines for recording patient radiation dose in the medical record for fluoroscopically guided procedures. *J Vasc Interv Radiol* 2012;**23**:11–18.
145. Jolly SS, Yusuf S, Cairns J, Niemelä K, Xavier D, Widimsky P, Budaj A, Niemelä M, Valentin V, Lewis BS, Avezum A, Steg PG, Rao SV, Gao P, Afzal R, Joyner CD, Chrolavicius S, Mehta SR, RIVAL trial group. Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial. *Lancet* 2011;**377**:1409–1420.
146. Vahanian A, Alfieri O, Andreotti F, Antunes MJ, Barón-Esquivias G, Baumgartner H, Borger MA, Carrel TP, De Bonis M, Evangelista A, Falk V, Jung B, Lancellotti P, Pierard L, Price S, Schäfers HJ, Schuler G, Stepinska J, Swedberg K, Takkenberg J, Von Oppell UO, Windecker S, Zamorano JL, Zembala M. Guidelines on the management of valvular heart disease. *Eur Heart J* 2012;**33**:2451–2496.
147. Aggarwal A, Dai D, Rumsfeld JS, Klein LW, Roe MT. American College of Cardiology National Cardiovascular Data Registry. Incidence and predictors of stroke associated with percutaneous coronary intervention. *Am J Cardiol* 2009;**104**:349–353.
148. Steg PG, Fox KA, Eagle KA, Furman M, Van de Werf F, Montalescot G, Goodman SG, Avezum A, Huang W, Gore JM, Global Registry of Acute Coronary Events (GRACE) Investigators. Mortality following placement of drug-eluting and

- bare-metal stents for ST-segment elevation acute myocardial infarction in the Global Registry of Acute Coronary Events. *Eur Heart J* 2009;**30**:321–329.
149. Windecker S, Kolh P, Alfonso F, Collet JF, Cremer J, Falk W, Filippatos G, Hamm C, Head SJ, Juni P, Pieter Kappetein P, Kastrati A, Knuuti J, Landmesser U, Laufer G, Neumann FJ, Richter D, Schauerte P, Sousa Uva M, Stefanini S, Taggart DP, Torracca L, Valgimigli M, Wijns W, Witkowski A. 2014 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J* 2014;**35**: 2541–2619.
  150. Calkins H, Brugada J, Packer DL, Cappato R, Chen SA, Crijns HJ, Damiano RJ Jr, Davies DW, Haines DE, Haissaguerre M, Ilesaka Y, Jackman W, Jais P, Kottkamp H, Kuck KH, Lindsay BD, Marchlinski FE, McCarthy PM, Mont JL, Morady F, Nademanee K, Natale A, Pappone C, Prystowsky E, Raviele A, Ruskin JN, Shemin RJ. HRS/EHRA/ECAS expert Consensus Statement on catheter and surgical ablation of atrial fibrillation: recommendations for personnel, policy, procedures and follow-up. A report of the Heart Rhythm Society (HRS) Task Force on catheter and surgical ablation of atrial fibrillation. *Heart Rhythm* 2007;**4**:816–861.
  151. Wann LS, Curtis AB, January CT, Ellenbogen KA, Lowe JE, Estes NA 3rd, Page RL, Ezekowitz MD, Slotwiner DJ, Jackman WM, Stevenson WG, Tracy CM; 2011 Writing Group Members, Fuster V, Rydén LE, Cannom DS, Le Heuzey JY, Crijns HJ, Lowe JE, Curtis AB, Olsson S, Ellenbogen KA, Prystowsky EN, Halperin JL, Tamargo JL, Kay GN, Wann L, 2006 Writing Committee Members, Jacobs AK, Anderson JL, Albert N, Hochman JS, Buller CE, Kushner FG, Creager MA, Ohman EM, Ettinger SM, Stevenson WG, Guyton RA, Tarkington LG, Halperin JL, Yancy CW, ACCF/AHA Task Force Members. 2011 ACCF/AHA/HRS Focused update on the management of patients with atrial fibrillation (Updating the 2006 Guideline): A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation* 2011;**123**:104–123.
  152. Deshmukh A, Patel NJ, Pant S, Shah N, Chothani A, Mehta K, Grover P, Singh V, Vallurupalli S, Savani GT, Badheka A, Tuliani T, Dabhadkar K, Dibu G, Reddy YM, Sewani A, Kowalski M, Mitrani R, Paydak H, Viles-Gonzalez JF. In-hospital complications associated with catheter ablation of atrial fibrillation in the United States between 2000 and 2010. Analysis of 93,801 procedures. *Circulation* 2013;**128**: 2104–2112.
  153. Ferrero de Loma-Osorio A, Díaz-Infante E, Macías Gallego A. Registro Español de Ablación con Catéter. XII informe oficial de la Sección de Electrofisiología y Arritmias de la Sociedad Española de Cardiología. *Rev Esp Cardiol* 2013;**66**:983–992.
  154. Kuck KH, Wissner E, Metzner A. How to Establish an Arrhythmia Unit in the 21st Century. *Rev Esp Cardiol* 2012;**65**:92–96.
  155. Brugada J, Alzueta FJ, Asso A, Farré J, Olalla JJ, Tercedor L. Guías de práctica clínica de la Sociedad Española de Cardiología sobre requerimientos y equipamiento en electrofisiología. *Rev Esp Cardiol* 2001;**54**:887–891.
  156. Merino JL, Arribas F, Botto GL, Huikuri H, Kraemer LI, Linde C, Morgan JM, Schalij M, Simantirakis E, Wolpert C, Villard MC, Poirey J, Karaim-Fanchon S, Deront K; 2005–2007 Accreditation Committee of the European Heart Rhythm Association. Core curriculum for the heart rhythm specialist. *Europace* 2009;**11**:iii 1–26.
  157. Merino JL, Arribas F, Lopez Gil M, Viñolas X. La arritmología como una especialidad dentro de la Cardiología: Sistema de acreditación en electrofisiología cardiaca intervencionista de la Sección de Electrofisiología y Arritmias de la Sociedad Española de Cardiología. *Rev Esp Cardiol* 2010;**10**:5A–20A.
  158. ISO 9000 - Quality management. [http://www.iso.org/iso/home/standards/management-standards/iso\\_9000.htm](http://www.iso.org/iso/home/standards/management-standards/iso_9000.htm) (6 February 2015).
  159. January CT, Wann LS, Alpert JS, Calkins H, Cigarroa JE, Cleveland Jr JC, Conti JB, Ellorin PT, Ezekowitz MD, Field ME, Murray KT, Sacco RL, Stevenson WG, Tchou PJ, Tracy CM, Yancy CW; ACC/AHA Task Force Members. 2014 AHA/ACC/HRS Guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society. *Circulation* 2014;**130**:2071–2104.
  160. Russo AM, Stainback RF, Bailey SR, Epstein AE, Heidenreich PA, Jessup M, Kapa S, Kremers MS, Lindsay BD, Stevenson LW. ACCF/HRS/AHA/ASE/HFSA/SCAI/SCCT/SCMR. 2013 appropriate use criteria for implanted cardioverter-defibrillator and cardiac resynchronization therapy. *J Am Coll Cardiol* 2013;**61**: 1318–1368.
  161. Holmes DR, Rich JB, Zoghbi WA, Mack MJ. The Heart Team of cardiovascular care. *J Am Coll Cardiol* 2013;**61**:903–907.
  162. Albert NM, Barnason S, Deswal A, Hernandez Kociol R, Lee E, Paul S, Ryan CJ, White-Williams, on behalf of the American Heart Association Complex Cardiovascular Patient and Family Care Committee of the Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Quality of Care and Outcomes Research. Transitions of care in heart failure. A scientific statement from the American Heart Association. *Circ Heart Fail* 2015;**8**:384–409.
  163. Francis GS, Greenberg BH, Hsu DT, Jaski BE, Jessup M, LeWinter MM, Pagani FD, Piña IL, Semigran MJ, Walsh MN, Wiener DH, Yancy J, Clyde W. ACCF/AHA/ACP/HFSA/ISHLT 2010 clinical competence statement on management of patients with advanced heart failure and cardiac transplant. A report of the ACCF/AHA/ACP task force on clinical competence and training. *J Am Coll Cardiol* 2010;**56**:424–453.
  164. Allen LA, Stevenson LW, Grady KL, Goldstein NE, Matlock DD, Arnold RM, Cook NR, Felker GM, Francis GS, Hauptman PJ, Havranek EP, Krumholz HM, Mancini D, Riegel B, Spertus JA. Decision making in advanced heart failure: a scientific statement from the American Heart Association. *Circulation* 2012;**125**: 1928–1952.
  165. Campbell SM, Ludt S, Van Lieshout J, Boffin N, Wensing M, Petek D, Grol R, Roland MO. Quality indicators for the prevention and management of cardiovascular disease in primary care in nine European countries. *Eur J Cardiovasc Prev Rehabil* 2008;**15**:509–515.
  166. Perk J, de Backer BG, Gohlke H, Graham I, Reiner Z, Verschuren M, Albus C, Benlian P, Boysen G, Cifkova R, Deaton C, Ebrahim S, Fisher M, Germano G, Hobbs R, Hoes A, Karadeniz S, Mezzani A, Prescott E, Ryden L, Scherer M, Syvanne M, Scholte op Reimer WJ, Vrints C, Wood D, Zamorano JL, Zannad F. European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). *Eur Heart J* 2012;**33**:1635–1701.
  167. Falces C, Andrea R, Heras M, Vehí C, Sorribes M, Sanchis L, Cevallos J, Menacho I, Porcar S, Font D, Sabaté M, Brugada J. Integración entre cardiología y atención primaria: impacto sobre la práctica clínica. *Rev Esp Cardiol* 2011;**64**:564–571.
  168. Wood DA, Kotseva K, Connolly S, Jennings C, Mead A, Jones J, Holden A, De Bacquer D, Collier T, De Backer G, Faergeman O, EUROACTION Study Group, on behalf of EUROACTION Study Group. Nurse-coordinated multidisciplinary, family-based cardiovascular disease prevention programme (EUROACTION) for patients with coronary heart disease and asymptomatic individuals at high risk of cardiovascular disease: a paired, cluster-randomized controlled trial. *Lancet* 2008;**371**:1999–2012.
  169. Chow CK, Jolly S, Rao-Melacini P, Fox KA, Anand SS, Yusuf S. Association of diet, exercise, and smoking modification with risk of early cardiovascular events after acute coronary syndromes. *Circulation* 2010;**121**:750–758.
  170. Kumbhani DJ, Fonarow GC, Cannon CP, Hernandez AF, Peterson ED, Peacock WF, Laskey WK, Deedwania P, Grau-Sepulveda M, Schwamm LH, Bhatt DL, Get With the Guidelines Steering Committee and Investigators. Temporal trends for secondary prevention measures among patients hospitalized with coronary artery disease. Temporal trends for secondary prevention measures among patients hospitalized with coronary artery disease. *Am J Med* 2015;**128**: 426.e1–9.
  171. Piepoli MF, Corrà U, Adamopoulos S, Benzer W, Bjarnason-Wehrens B, Cupples M, Dendale P, Doherty P, Gaita D, Höfer S, McGee H, Mendes M, Niebauer J, Pogosova N, Garcia-Porrero E, Rauch B, Schmid JP, Giannuzzi P. Secondary prevention in the clinical management of patients with cardiovascular diseases. Core components, standards and outcome measures for referral and delivery: A Policy Statement from the Cardiac Rehabilitation Section of the European Association for Cardiovascular Prevention & Rehabilitation. Endorsed by the Committee for Practice Guidelines of the European Society of Cardiology. *Eur J Prev Cardiol* 2012;**21**:664–681.
  172. Authors/Task Force Members, Rydén L, Grant PJ, Anker SD, Berne C, Cosentino F, Danchin N, Deaton C, Escaned J, Hammes HP, Huikuri H, Marre M, Marx N, Mellbin L, Ostergren J, Patrono C, Seferovic P, Uva MS, Taskinen MR, Tendera M, Tuomilehto J, Valensi P, Zamorano JL; ESC Committee for Practice Guidelines (CPG), Zamorano JL, Achenbach S, Baumgartner H, Bajaj J, Bueno H, Dean V, Deaton C, Erol C, Fagard R, Ferrari R, Hasdai D, Hoes AW, Kirchhof P, Knuuti J, Kolh P, Lancellotti P, Linhart A, Nihoyannopoulos P, Piepoli MF, Ponikowski P, Sirnes PA, Tamargo JL, Tendera M, Torbicki A, Wijns W, Windecker S, Document Reviewers, De Backer G, Sirnes PA, Ezquerro EA, Avogaro A, Badimon L, Baranova E, Baumgartner H, Betteridge J, Ceriello A, Fagard R, Funck-Brentano C, Gulba DC, Hasdai D, Hoes AW, Kjekshus JK, Knuuti J, Kolh P, Lev E, Mueller C, Neyses L, Nilsson PM, Perk J, Ponikowski P, Reiner Z, Sattar N, Schächinger V, Scheen A, Schirmer H, Strömberg A, Sudzhaeva S, Tamargo JL, Viigimaa M, Vlachopoulos C, Xuereb RG. ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD: the Task Force on diabetes, pre-diabetes, and cardiovascular diseases of the European Society of Cardiology (ESC) and developed in collaboration with the European Association for the Study of Diabetes (EASD). *Eur Heart J* 2013;**34**:3035–3087.
  173. Estruch R, Ros E, Salas-Salvado J, Covas MI, Corella D, Arós F, Gómez-Gracia E, Ruiz-Gutiérrez V, Fiol M, Lapetra J, Lamuela-Raventos RM, Serra-Majem L, Pintó X, Basora J, Muñoz MA, Sorlí JV, Martínez JA, Martínez-González MA,

- PREDIMED Study Investigators. Primary prevention of cardiovascular disease with a Mediterranean diet. *N Engl J Med* 2013;**368**:1279–1290.
174. European Association for Cardiovascular Prevention & Rehabilitation, Reiner Z, Catapano AL, De Backer G, Graham I, Taskinen MR, Wiklund O, Agewall S, Alegria E, Chapman MJ, Durrington P, Erdine S, Halcox J, Hobbs R, Kjekshus J, Filardi PP, Riccardi G, Storey RF, Wood D, ESC Committee for Practice Guidelines (CPG) 2008–2010 and 2010–2012 Committees. ESC/EAS Guidelines for the management of dyslipidaemias: the Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS). *Eur Heart J* 2011;**32**:1769–1818.
  175. Kotseva K, Wood D, De Backer G, De Bacquer D, EUROASPIRE III Study Group. Use and effects of cardiac rehabilitation in patients with coronary heart disease: results from the EUROASPIRE III survey. *Eur J Prev Cardiol* 2013;**20**:817–826.
  176. Hamm LF, Sanderson BK, Ades PA, Berra K, Kaminsky LA, Roitman JL, Williams MA. Core competencies for cardiac rehabilitation/secondary prevention professionals: 2010 update: position statement of the American Association of Cardiovascular and Pulmonary Rehabilitation. *J Cardiopulm Rehabil Prev* 2011;**31**:2–10.
  177. Smith SC Jr, Benjamin EJ, Bonow RO, Braun LT, Creager MA, Franklin BA, Gibbons RJ, Grundy SM, Hiratzka LF, Jones DW, Lloyd-Jones DM, Minissian M, Mosca L, Peterson ED, Sacco RL, Spertus J, Stein JH, Taubert KA, World Heart Federation and the Preventive Cardiovascular Nurses Association. AHA/ACC secondary prevention and risk reduction therapy for patients with coronary and other atherosclerotic vascular disease: 2011 update: a guideline from the American Heart Association and American College of Cardiology Foundation. *Circulation* 2011;**124**:2458–2473.
  178. Kulik A, Ruel M, Jneid H, Ferguson B, Hiratzka LF, Ikonomidis JS, Lopez-Jimenez F, McNallan SM, Patel M, Roger V, Sellke FW, Sica D, Zimmerman L, on behalf of the American Heart Association Council on Cardiovascular Surgery and Anesthesia. Secondary prevention after coronary artery bypass graft surgery a scientific statement from the American Heart Association. *Circulation* 2015;**131**:927–964.
  179. Eckel RH, Jakicic JM, Ard JD, de Jesus JM, Houston Miller N, Hubbard VS, Lee IM, Lichtenstein AH, Loria CM, Millen BE, Nonas CA, Sacks FM, Smith SC Jr, Svetkey LP, Wadden TA, Yanovski SZ, Kendall KA, Morgan LC, Trisolini MG, Velasco G, Wnek J, Anderson JL, Halperin JL, Albert NM, Bozkurt B, Brindis RG, Curtis LH, DeMets D, Hochman JS, Kovacs RJ, Ohman EM, Pressler SJ, Sellke FW, Shen WK, Smith SC Jr, Tomaselli GF, American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation* 2014;**129**:S76–S99.
  180. Stone NJ, Robinson JG, Lichtenstein AH, Bairey Merz CN, Blum CB, Eckel RH, Goldberg AC, Gordon D, Levy D, Lloyd-Jones DM, McBride P, Schwartz JS, Shero ST, Smith SC Jr, Watson K, Wilson PW, Eddleman KM, Jarrett NM, LaBresh K, Nevo L, Wnek J, Anderson JL, Halperin JL, Albert NM, Bozkurt B, Brindis RG, Curtis LH, DeMets D, Hochman JS, Kovacs RJ, Ohman EM, Pressler SJ, Sellke FW, Shen WK, Smith SC Jr, Tomaselli GF, American College of Cardiology/American Heart Association Task Force on Practice Guidelines. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation* 2014;**129**(suppl 2):S1–S45.
  181. Shahian DM, O'Brien SM, Normand SL, Peterson ED, Edwards FH. Association of hospital coronary artery bypass volume with processes of care, mortality, morbidity, and the Society of Thoracic Surgeons composite quality score. *J Thorac Cardiovasc Surg* 2010;**139**:273–282.
  182. Society for Cardiothoracic Surgery In Great Britain And Ireland. Results of surgery in England as compare with other European countries. [www.scts.org/](http://www.scts.org/) (20 July 2015).
  183. European Adult cardiac surgery database. Individual country report. [www.e-dendrite.com/news/Milestone-European-cardiac-report-is-released-2010](http://www.e-dendrite.com/news/Milestone-European-cardiac-report-is-released-2010). [www.scts.org/documents](http://www.scts.org/documents) (20 July 2015).
  184. González-Vílchez F, Gómez-Bueno M, Almenar L, Crespo-Leiro MG, Arizón JM, Martínez-Sellés M, Delgado J, Roig E, Lage E, Manito N, on behalf of the Spanish Heart Transplant Teams for the Spanish Heart Transplantation Registry. 24th Official Report of the Spanish Society of Cardiology Working Group on Heart Failure and Heart Transplantation (1984–2012). *Rev Esp Cardiol* 2013;**66**:973–982.
  185. Ferreira-González I, Marsal JR, Mitjavila F, Parada A, Ribera A, Cascant P, Soriano N, Sánchez PL, Arós F, Heras M, Bueno H, Marrugat J, Cuñat J, Civeira E, Permanyer-Miralda G. Patient registries of acute coronary syndrome: assessing or biasing the clinical real world data? *Circ Cardiovasc Qual Outcomes* 2009;**2**:540–547.
  186. Bufalino V, Bauman MA, Shubrook JH, Balch AJ, Boone C, Vennum K, Bradley S, Wender RC, Minners R, Arnett D, on behalf of the American Cancer Society, American Diabetes Association, and American Heart Association. Evolution of 'The Guideline Advantage' lessons learned from the front lines of outpatient performance measurement. *Circ Cardiovasc Qual Outcomes* 2014;**7**:493–498.