SCAI Core Curriculum for Adult and Pediatric Interventional Fellowship Training in Continuous Quality Assessment and Improvement

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Word count: 5528

This manuscript was prepared without external funding
Introduction

The practice of interventional cardiology has evolved and now includes intraprocedural lesion assessment, complex coronary revascularization procedures, structural heart disease procedures, congenital procedures, and peripheral interventions. Critical to interventional practice is continuous quality assessment (CQA) and continuous quality improvement (CQI) programs. Broadly defined, “quality” is a science that involves ensuring that appropriate structural and process elements are in place to achieve the best patient outcomes. Specific to the practice of medicine, “quality” at the patient level ensures providing the right procedure to the right patient at the right time in the right way. While didactic training and clinical rotations have evolved to meet this need, training requirements in CQA and CQI have not been explicitly defined [1]. Fellows-in-training (FIT) and practicing interventional cardiologists should receive training to participate and lead efforts to attain the triple aim of improving the patient experience of care, the health of a population, and reducing the per capita cost of health care [2, 3]. Each facet of the triple aim is dependent on successfully executing “quality” care. While professional societies have introduced clinical guidelines, expert consensus statements and appropriate use criteria, it is now essential to include recommendations regarding core curriculum for CQA/CQI training [4]. A consistent framework for quality management must be developed to couple the clinical and administrative team to effectively identify, prioritize, and implement effective quality strategies. This expert consensus statement outlines the key components of CQA/CQI training for FITs to be able to implement these skills after fellowship training. These components are applicable to both adult and pediatric interventional FITs.
Defining Quality

The Institute of Medicine has defined quality as “the degree to which health services for individuals and population increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”[5] One approach to measure quality is based on the Donabedian framework; a model for examining health services and evaluating quality of care. According to the model, information about quality of care can be drawn from three categories of measurement: structure, process and outcome.[6] Structure measures describe the context in which care is delivered, including the physical and organizational work setting. Examples pertinent to the catheterization laboratory include hospital and catheterization laboratory structure, registry participation, specialty certification and credentialing criteria. Process metrics are the set of activities which occur between practitioners and patients and are intended to assess the care provided. Examples include pre-hospital care algorithms for the management of ST segment elevation myocardial infarction (STEMI) and out of hospital cardiac arrest (OHCA), hospital based systems of care including STEMI and OHCA protocols, and inpatient systems to apply evidence-based care to patients. Simple process measures include aspirin use, statin therapy, beta blocker therapy, door-to-balloon times for STEMI, dual antiplatelet therapy post stent implantation, risk adjusted bleeding events and referral to cardiac rehabilitation. Outcome measures are changes in the patient’s health status due to the care delivered. These include risk adjusted mortality, morbidity, readmission rates, and functional status. In addition, outcome measures can also include patient satisfaction as well as cost.

FITs should receive CQA/CQI training in this framework and should review pertinent structure measures, process metrics, and outcomes measures (e.g., National Cardiovascular
Data Registry (NCDR) feedback reports). FITs should then identify and participate in a new or ongoing process improvement project in conjunction with a faculty mentor.

National Quality Programs Specific to Interventional Cardiology

A primary mission of the Society for Cardiovascular Angiography & Interventions (SCAI) is to provide interventionalists and their catheterization laboratory staff the tools for continuous learning to remain up-to-date with the evidence, ongoing assessment of actual performance and targeted efforts toward improvement. Since 1978, SCAI has emphasized standards and best practices for performance, quality control and peer review [7-9]. In 2011, SCAI published a series of two expert consensus statements specific to CQA/CQI standards as applied in the catheterization laboratory [10, 11].

Part I [11] outlines CQA/CQI standards and the responsibilities of the catheterization CQI committee. Responsibilities include peer review coupled with processes and methods of remediation for individual operators. Best practices include benchmarking, data collection, and review of procedural appropriateness, documentation of the CQI committee’s proceedings and deliberations, and methods of non-punitive reporting to individual operators. Part II [10] addresses public reporting and risk adjustment, calling attention to the limitations inherent in both. These consensus statements did not, however, specifically address the training requirements, tools, and requisite knowledge base for FITs to achieve competency in CQA/CQI.

The ACC Core Cardiology Training Symposium (COCATS) expert consensus statements published in 2008 [12] and updated in 2015[13] serve as the guide for training general and subspecialty FITs. The COCATS Task Force 3 addressed the training requirements in diagnostic and interventional cardiology which were consistent with the training requirements from the
American Board of Internal Medicine, requiring a certifying examination in interventional cardiology and formal training accreditation by the Residency Review Committee of the Accreditation Council for Graduate Medical Education. These entities recognize six core domains, of which two include CQA/CQI (i.e., Systems Based Approach, Practice Based Learning Improvement). A specific and detailed listing of the necessary knowledge base of available CQA/CQI tools and techniques is not delineated in the current guidelines. In addition, Maintenance of Certification (MOC) programs may require demonstration of ongoing CQA and CQI initiatives. Therefore, this expert consensus statement will assist not only fellowship training program directors to establish a strong curriculum for CQA/CQI, but also professional and credentialing organizations as they develop future recommendations for education in CQA/CQI and possibly in MOC activities.

FITs should be involved in the following aspects of the CQA/CQI process: peer review, morbidity and mortality (M&M) conference, and registries (local, regional, or national). In addition, FITs should become familiar with the concepts of benchmarking, performance measures, and process metrics and systems-based practice.

Peer Review:

Peer review, mandated by The Joint Commission (TJC) and recommended by interventional cardiology guidelines, is an important feature of CQA/CQI [1, 7, 14]. Components of peer review have been outlined previously [1, 7, 10, 11] and these reviews recognize the potential problems of conflict of interest in maintaining objectivity. This includes the potential for conflicts related to camaraderie/practice group affiliation. While peer review is essential for any case review as related to adverse outcomes, random case review is also essential to assure
quality. This is especially germane in the “open” cath lab environment at institutions with competing practice groups [15, 16]. Maintaining strict confidentiality and objectivity is crucial, and familiarity with statutes such as the Health Care Quality Improvement Act (HCQIA) of 1986 protecting those being scrutinized as well as peer reviewers is essential. FITs should become familiar with the requirements of the National Practitioner Data Bank (NPDB) for the reporting of certain categories of actions that may ensue from peer review actions. After completing fellowship, physicians will have increasing responsibilities in the peer review process during their careers that warrant broad-based familiarity with the topic [17, 18].

FITs should become active participants in peer review conferences, acquire skills including the determination of appropriateness of PCI based on published AUC guidelines and become familiar with the National Practitioner Data Bank requirements.

Morbidity and Mortality Conference:

Cases with unfavorable outcomes are reviewed in departmental or hospital-based Morbidity and Mortality Conferences (M&MC). These conferences are recommended or required in a variety of national guidelines [1, 11, 12]. The history of M&MC has been described previously [19].

Core principles for conducting M&MC are applicable to interventional cardiology [1, 19, 20]. The conference format should be non-judgmental, involve open discussion, and allow physicians and staff to identify and learn from mistakes. Case selection should include all cases with serious adverse patient outcomes. A moderator, usually a senior physician, should conduct the discussion in a supportive atmosphere. Any perceived conflicts of interest of the moderator
should be identified. Attendance of all team members should be encouraged. The discussion should be summarized with a set of conclusions coupled with potential opportunities to improve care or avoid similar errors in the future. Meeting minutes should be recorded to document the discussion and to be available for future review. Efforts must be made to protect patient privacy and confidentiality.

At times, M&MC may identify high-risk errors or system-based errors that require further evaluation. Such evaluation may include other CQA/CQI techniques such as a formal root cause analysis. [21] FITs should participate in these quality processes and techniques as a routine part of fellowship training. In particular, FITs should provide a formal written summary of their cases selected for review at M&MC, should present the case during the conference, and provide their perspective on aspects of the case, if any, that could have been done differently to obtain a better outcome.

Registries

Registry data are essential in understanding local and national variations in treatment and outcomes [22] and form the basis for ongoing performance analysis. The ACC-National Cardiovascular Data Registry (NCDR) is the most comprehensive outcomes-based quality improvement program in the US and includes a number of hospital-based registries with over 2,400 participating hospitals, and one outpatient registry [23]. Registries use standardized definitions, subject to rigorous data control actions [24], to collect baseline demographics, clinical and procedural variables, and outcomes for each procedure. These data elements are then used for calculation of performance measures, risk-adjustment algorithms, procedural
appropriateness, and in-hospital outcomes [11, 25] and are linked to current ACCF/AHA/SCAI clinical practice guidelines (Table 1).

NCDR provides both physician-level and hospital-level performance metrics that are critical to identifying and measuring performance. These analyses are fundamental in assessing quality of care, are a part of the American Taxpayer Relief Act of 2012 [26], and should be expressly taught during fellowship training.

The NCDR CathPCI Registry® includes patients undergoing diagnostic catheterization and/or PCI procedures. CathPCI Registry® participants receive quarterly and annual outcome reports, which display comparison of practice patterns and outcomes to national averages and volume-based peer comparison groups [27]. The CathPCI Registry® provides an executive summary, which includes four major sections:

I. PCI Performance Measures

II. Quality Metrics (diagnostic catheterization and PCI)

III. PCI Appropriate Use Criteria (AUC) Metrics

IV. PCI Process Comparison Metrics

Section I. Performance Measures are endorsed by the National Quality Forum and are considered appropriate for public reporting. Performance measures have specific characteristics [28] and must represent a meaningful measure to patients and society. In addition, they must be valid, reliable, and practical to measure, and have the ability to be risk-adjusted for patient variability. Most importantly, they should be modifiable through improvements in care processes. Examples include:
1) PCI in-hospital risk-adjusted mortality for all PCI patients,
2) Composite: discharge medications in eligible PCI patients
3) PCI in-hospital risk adjusted rate of bleeding in all patients

**Section II.** PCI Quality Metrics are divided into Process Metrics, Outcome Metrics, Utilization Metrics, and Data Quality Metrics. The essentials of the PCI Process Metrics section consist of:

1. Proportion of elective PCIs with prior positive stress or imaging study
2. Median time to immediate PCI for STEMI patients
3. Proportion of STEMI patients receiving immediate PCI within 90 minutes
4. Median time from ED arrival at STEMI transferring facility to ED arrival at STEMI receiving facility among transferred patients
5. Proportion of patients with aspirin prescribed at discharge
6. Proportion of patients with a P2Y12 inhibitor prescribed at discharge
7. Statins prescribed at discharge

**PCI Outcomes Metrics include:**

1. Emergency CABG post PCI
2. Proportion of PCI procedures with a post procedure MI
3. Proportion of PCI procedures with a post procedure stroke
4. PCI in-hospital risk adjusted mortality (patients with STEMI)
5. PCI in-hospital risk adjusted mortality (STEMI patients excluded)
6. Proportion of PCI procedures with transfusion of whole blood or RBCs
7. PCI in-hospital risk adjusted acute kidney injury

**Section III.** Appropriate Use Criteria (AUC) metrics are classified into proportion of procedures that are “appropriate,” “may be appropriate” or “rarely appropriate” and are stratified according
Section IV. PCI process metrics provide comparisons of a hospital with other US hospitals with regards to anticoagulant use, stent use, and assessment of intermediate lesions by intravascular ultrasound or fractional flow reserve testing.

The CathPCI Registry® recently introduced the ‘NCDR Physician Dashboard’, which allows individual physicians to confidentially evaluate certain individual metrics in detail, study longitudinal data trends, and compare metrics with other physicians using national benchmarking data. In addition to in-hospital outcomes, novel approaches with probabilistic matching of patient data have created linkages of CathPCI Registry® to claims data from payers, including the Centers for Medicare and Medicaid Services, and allowed measurement of longitudinal outcomes in the Medicare population [30].

The NCDR IMPACT Registry® is a pediatric interventional cardiology registry comprised of quality and technical performance outcomes. Pediatric Interventional FITs should be familiar with the definitions of quality as defined through this registry. Pediatric interventional FITs should be familiar with the NCDR IMPACT® registry-defined quality metrics and especially the metrics surrounding the six key interventional categories [[31].

Pediatric interventional FITs should be trained in the data elements and reporting of data into IMPACT® Registry. Quality and performance metrics of IMPACT® Registry (e.g. technical performance and radiation reduction) should be included during fellowship training.

FITs should be trained in the NCDR feedback report content including performance measures and quality metrics. FITs should understand data abstraction and the statistical
tools and methods used to present the data. FITs should participate in institutional
quarterly review of the data and, in conjunction with the physician and hospital
administrative staff, prioritize items for CQI. (Table 2) [32].

Measuring and Benchmarking

While measurement of performance measures is essential for CQA/CQI, it does not provide a
c context for performance relative to peers or to self over time. The process of comparing
performance measures across providers is called “benchmarking”, a complex process involving
measuring performance measures, risk adjusting using robust statistical modeling, and reporting
the aggregate result. Risk models for mortality [33], bleeding [34], and acute kidney injury [35]
have been developed and are frequently used for CQA/CQI.

The process of measuring and benchmarking has been simplified through the availability
of large regional or national registries, which include the Northern New England Registry, the
MassDAC registry, the New York State Department of Health PCI registry, the NCDR CathPCI
Registry® and the NCDR IMPACT Registry [24, 36, 37]. All registries collect data
electronically on process measures including use of specific antithrombotic agents, and outcomes
including mortality, bleeding, and acute kidney injury. Registries incorporate standardized
definitions for outcomes and provide risk-adjusted benchmarking to hospital participants.
Awareness of the challenges inherent to benchmarking is critical, such as insufficient or
incomplete data, lack of granular information on contraindications or special situations, and the
effects of procedural volume on the performance measures. Registries utilize auditing to ensure
completeness and fidelity with the medical record, but unlike clinical trial data, every data field is not “source document verified” [24, 27]. As such, the accuracy and completeness of some subjective data elements may be suboptimal. A related problem is the reliable capture of contraindications to specific therapies. Since process-related performance measures include the proportion of patients who receive evidence-based therapies, defining the denominator is essential to benchmarking. For example, the NCDR CathPCI Registry® data collection form includes a field for contraindications for each medication listed so that patients with contraindications are excluded from the denominator of the reported metric. Reported metrics are usually expressed as a percentage, and the low volume sites can appear to be either leading or lagging centers simply due to smaller numbers of patients (smaller denominator). The analytic process accounts for this by setting a requirement for the number of patients required per site for inclusion in the reporting of the performance measures. Benchmarking reports for sites that do not have the requisite number of patients without contraindications usually display “numbers not sufficient” for specific performance measures.

Team-Based Approach to Quality Improvement

To implement a quality improvement program, a multidisciplinary team including nurses, technologists, physicians, quality improvement specialists and a hospital administrator is essential. This team should be supported by the hospital leadership and continuously engage in quality improvement activities. It is essential to develop a list of projects and develop a consensus to prioritize the efforts. For the team to be successful there must be an advocate for the
vision, who works effectively within a team while assisting in developing the right priorities.

First, the team should identify the problem and agree on the definition and the magnitude of the problem. Next, the team should identify the key stakeholders and generate interest amongst the participants. All team members must agree on the methodology, measured metrics, timeframe to complete and respective roles.

Quality Improvement Techniques for Systems of Care and Organizations

Many quality improvement techniques developed and implemented in the non-healthcare industrial sector have distinct applicability to healthcare and contain essential tools for FITs to be successful. A brief descriptive listing is provided along with examples of applications specific to interventional cardiology and the catheterization laboratory environment.

FITs should have a basic understanding of these quality improvement techniques.

Plan-Do-Study-Act Cycles

W. Edwards Deming (1900-1993) advocated using reiterative Plan-Do-Check-Act cycles in modern industrial quality control using the principles of careful focus group selection/inclusion of stakeholders, brainstorming, affinity diagrams, flowcharts, and other tools to direct focused attention to a given problem [38]. Now referred to as Plan-Do-Study-Act cycles (PDSA cycles) this technique is often used to assess process measures and determine whether best practices have been followed. The group would plan, initiate/do a new process change, check/study the results, and act upon the results. Items amenable to PDSA cycles in the catheterization laboratory include patient safety measures including dual antiplatelet therapy, antithrombotic therapy, and
radiation exposure. In addition, resource utilization including inter-procedural turnover time, equipment utilization and patient readiness are also amenable to this technique.

**Root Cause Analysis**

Root Cause Analysis (RCA), developed by NASA initiatives in the 1950’s, is a retrospective quality tool required by TJC for all Sentinel Events[39]. This technique is often used to determine why there was variation in standard practice (identified by PDSA) and is predicated on the belief that problems are best dealt with by removing contributing causes and that systems need designed-in redundancy to prevent future problems [40]. RCA evaluates the causes of a failure in a reactive, ex post facto context after an untoward event has transpired, and makes frequent use of cause-and-effect diagrams (Ishikawa diagrams, “fishbone” diagrams) in which contributing factors in a few selected domains are listed and analyzed by the RCA focus group. Examples of the most frequently chosen domain headers for the “bones” of the “fish” would include the “4P’s” (Place, Procedure, People, Policies), the “4M’s” (Methods, Machines, Materials, Manpower), or the “4S’s” (Surroundings, Suppliers, Systems, Skills). Subsidiary factors are then gathered through group brainstorming. Examples of RCA application for FITs might include assessing verbal communication errors,[41] medications errors, and M&MC case analyses [42].

**Failure Modes and Effects Analysis**

Failure Modes and Effects Analysis (FMEA) attempt to identify possible system design inadequacies which may negatively impact patient safety [43-45]. In contrast to RCA however, FMEA is prospective and assesses where and how a process might fail as well as what might be the relative impact of the failure. This allows one to correct the process prior to the failure
occurring as well as to assess the impact of the system redesign prior to implementation. Both
RCA and FMEA may make use of cause-and-effect diagrams, brainstorming, flow-charting, and
other shared techniques for implementation. FMEA has the distinctive feature of forecasting
implications for events and control plans if encountered. A popularly used scoring scale
addresses the probabilities for future events in the realms of occurrence, detection and severity.
An example germane to FITs might be an FMEA analysis of the potential for contrast induced
nephropathy or severe radiation induced skin injury in the catheterization laboratory. Tools and
techniques for both RCA and FMEA are outlined in detailed guides available through TJC
Resources [43, 44]

Total Quality Management/TQM

Total Quality Management (TQM) incorporates an organizational orientation that embeds
awareness of the importance of quality in a system wide meta-process. TQM emphasizes the
importance of quality measurement, customer orientation, leadership, empowerment, elimination
of waste and continuous improvement. A relevant example might be the creation of cross-
functional teams including pharmacy, nursing, information technology, residents, FITs, and
attending cardiologists to assure discharge medication adherence to current guidelines for
optimal medical management for coronary artery disease after PCI, with adequate care
coordination with referring physicians, resulting in improved quality and patient satisfaction.

Lean Production

Initially utilized by Toyota in the 1970’s, the lean production model is highly relevant to
contemporary healthcare, with its emphasis not only on improving quality but also doing so at
reduced cost[38]. The cost/value equation is important in the current era of diminishing
healthcare reimbursement and has recently been refined[46]. Pertinent examples include the development of standards for vascular access, equipment selection, antithrombotic agents and post procedure recovery.

Six Sigma/DMIAC and DMADV

Six Sigma, developed by Motorola, is a management strategy which applies a set of practices to reduce or eliminate defects[47]. Projects follow two methodologies: DMAIC (define, measure, analyze, improve, control) for existing programs and DMADV (define, measure, analyze, design, verify) for new products or processes. There are multiple vendors of the education/certification process and more recently there has been a fusion with the lean methodology of Toyota, referred to as Lean Six Sigma, which is utilized with increasing frequency in the healthcare industry.

Organizational knowledge and leadership

The concept of systems-based practice and the four sub-competencies outlined previously serve as an outline to achieve organizational knowledge and leadership. A good leader understands the organizational structure in the immediate practice environment and promotes a culture that is patient-focused and which seeks continuous improvement. Communication with fellow colleagues in all phases of the institutional health care delivery team adds credibility to the CQI leader. CQI organizational structure should not be merely vertical but also horizontal to encompass all members of the team.

As part of the training program, FITS should serve on their institutional CQI committees. FITs should also develop organizational skills by joining organizations such as ACC and
SCAI. Opportunities exist for FITs to participate in committees of the ACC, NCDR, and SCAI organizations.

Recommendations for education of FITs in quality improvement programs (Table 4):

1) Participation in peer review conferences and morbidity and mortality conferences during fellowship. (Examples include acquisition of skills to evaluate the appropriateness of PCI cases based on specific NCDR registry criteria as well as angiographic and clinical criteria).

2) Training in reviewing and interpreting the NCDR-PCI or NCDR-IMPACT registry report. Each FIT should participate in the quarterly review of this report. In addition, each FIT should understand the definition, statistics and methodology for reporting on specific performance metrics, process metrics, and clinical outcomes.

3) Designing and implementing a quality improvement project during fellowship which incorporates a multidisciplinary team approach including nurses, technologists, physicians, quality improvement specialists and hospital administrators.

4) Participation on institutional Quality Improvement committees.

5) Program directors should be aware of the latest CQA/CQI recommendations from our national cardiology societies including SCAI, ACC and AHA.

Conclusion:

The education of FITs and graduates must evolve to include specific knowledge of registries as well as specific techniques and practices that promote the ability to effectively participate and lead local CQA/CQI initiatives. It is essential for all interventional cardiologists to develop the expertise required to be effective partners and leaders in efforts that promote the triple aim of improving the patient experience of care, the health of a population, and reducing the per capita
cost of health care [2, 3]. Each facet of the triple aim is dependent on successfully executing “quality” care. Medical societies must develop curricula focused on CQA/CQI that can be incorporated into interventional fellowship programs. These efforts, in turn, will lead to the successful partnership between clinicians, patients, and health system administrators in executing high quality and value-based care.

Acknowledgement: I would like to thank Dr Eric Stecker and Troy Schmitt for their assistance in reviewing this document.


<table>
<thead>
<tr>
<th>NCDR Registry</th>
<th>Partners/Collaborations</th>
<th>Patient Characteristics</th>
<th>Risk-adjusted measures/metrics</th>
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</thead>
</table>
| CathPCI Registry| American College of Cardiology Foundation  
The Society for Cardiovascular Angiography and Interventions | Diagnostic catheterizations and percutaneous coronary interventions                       | PCI In-Hospital Mortality (all PCI patients, STEMI patients, NSTEMI patients)  
                              |                                                                                        | PCI In-Hospital Bleeding  
                              | Acute Kidney Injury  
                              | New Need for Dialysis  
                              | PCI 30-Day Readmission |
| ACTION Registry-GWTG | American College of Cardiology Foundation  
American Heart Association  
American College of Emergency Physicians  
Society of Hospital Medicine  
Society of Cardiovascular Patient Care | Acute MI (STEMI/NSTEMI) patients                                                      | AMI In-Hospital Mortality  
                              | AMI Bleeding |
| ICD Registry    | American College of Cardiology Foundation  
Heart Rhythm Society                                                             | Implantable cardiac defibrillators and lead revisions                                   | ICD In-Hospital Risk Adjusted Complications                                                   |
| IMPACT Registry | American College of Cardiology Foundation  
The Society for Cardiovascular Angiography and Interventions  
American Academy of Pediatrics                                                        | Diagnostic catheterizations and catheter-based interventions in pediatric and adult congenital heart disease | In development 2015                                                                 |

Table 1. NCDR registry programs.
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<thead>
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<th>Registry</th>
<th>Organization</th>
<th>Procedures</th>
<th>Description</th>
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<tbody>
<tr>
<td>PVI Registry</td>
<td>American College of Cardiology Foundation</td>
<td>Lower extremity peripheral arterial catheter-based interventions, carotid artery stenting, carotid endarterectomy</td>
<td>Reported separately for CAS and CEA patients: Risk Adjusted Rate of Stroke or Mortality (RASM)</td>
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<td></td>
<td>The Society for Cardiovascular Angiography and Interventions</td>
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<td>STS/ACC TVT Registry</td>
<td>American College of Cardiology Foundation</td>
<td>TAVR procedures, mitral leaflet clip, mitral valve in valve procedures</td>
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<td>The Society of Thoracic Surgeons</td>
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<td>The Society for Cardiovascular Angiography and Interventions</td>
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<td></td>
<td>American Association for Thoracic Surgery</td>
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<td>PINNACLE Registry</td>
<td>American College of Cardiology Foundation</td>
<td>Ambulatory patients with CAD, hypertension, heart failure and atrial fibrillation</td>
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<td>Medical Informatics Engineering</td>
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<td>Table 2: CathPCI Registry Metrics</td>
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<td><strong>Performance Metrics</strong></td>
<td>PCI in-hospital risk adjusted mortality (all patients)</td>
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<td>PCI in-hospital risk adjusted rate of bleeding events (all patients)</td>
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<td>Discharge medications in eligible PCI patients</td>
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<td><strong>Process Metrics</strong></td>
<td>Proportion of elective PCIs with prior positive stress or imaging study</td>
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<td>Median time to immediate PCI for STEMI patients (in minutes)</td>
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<td>Proportion of STEMI patients receiving immediate PCI w/in 90 minutes</td>
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<td>Median time from ED arrival at STEMI transferring facility to immediate PCI at STEMI receiving facility among transferred patients</td>
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<td>Median fluoroscopy time</td>
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<td><strong>Outcomes Metrics</strong></td>
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<td>Proportion of PCI procedures with a post procedure MI</td>
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<td>Composite: Proportion of PCI patients with death, emergency CABG, stroke or repeat target vessel revascularization</td>
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<td>PCI in-hospital risk adjusted mortality (patients with STEMI)</td>
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<td>PCI in-hospital risk adjusted mortality (STEMI patients excluded)</td>
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<td>Proportion of PCI procedures with transfusion of whole blood or RBCs</td>
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<td>PCI in-hospital risk adjusted acute kidney injury (all patients)</td>
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<td><strong>Organization</strong></td>
<td><strong>Mission / Goals / Focus</strong></td>
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<td>Agency for Healthcare Research and Quality (AHRQ)</td>
<td>Lead Federal agency charged with improving the quality, safety, efficiency, and effectiveness of health care for all Americans</td>
<td><a href="http://www.ahrq.gov">www.ahrq.gov</a></td>
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<td>National Guideline Clearinghouse (NGC)</td>
<td>An initiative of AHRQ that is a public resource for evidence-based clinical practice guidelines</td>
<td><a href="http://www.guideline.gov">www.guideline.gov</a></td>
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<td>Department of Health and Human Services (DHHS)</td>
<td>Provides links to hundreds of sites on the Internet that contain reliable health care information and links to many government and nongovernment sources of information on healthcare quality</td>
<td><a href="http://www.healthfinder.gov">www.healthfinder.gov</a></td>
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<td>The Joint Commission</td>
<td>Provides accreditation to hospital and other health care facilities; provides quality care and hospital quality measures for public reporting through the ORYX reporting program</td>
<td><a href="http://www.jointcommission.org">www.jointcommission.org</a></td>
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<td>National Committee for Quality Assurance (NCQA)</td>
<td>A private, 501(c)(3) not-for-profit organization dedicated to improving health care quality. Operates the Healthcare Effectiveness Data and Information Set (HEDIS), a tool used by more than 90 percent of America’s health plans to measure performance on important dimensions of care and service</td>
<td><a href="http://www.ncqa.org">www.ncqa.org</a></td>
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<tr>
<td>The American Health Quality Association (AHQA)</td>
<td>An educational, not-for-profit national membership association dedicated to health care quality through community-based, independent quality evaluation and improvement programs</td>
<td><a href="http://www.ahqa.org">www.ahqa.org</a></td>
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<td>National Quality Forum (NQF)</td>
<td>Sets national priorities and goals for performance improvement and endorses national consensus standards for measuring and publicly reporting on performance</td>
<td><a href="http://www.qualityforum.org">www.qualityforum.org</a></td>
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<td>Physician Consortium for Performance Improvement (PCPI) of the American Medical Association (AMA)</td>
<td>Sponsored by the AMA, the Physician Consortium for Performance Improvement (PCPI) is committed to enhancing quality of care and patient safety by taking the lead in the development, testing, and maintenance of evidence-based clinical performance measures and measurement resources for physicians</td>
<td><a href="http://www.ama-assn.org/">www.ama-assn.org/</a></td>
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<tr>
<td><strong>Organization</strong></td>
<td><strong>Mission / Goals / Focus</strong></td>
<td><strong>Web Site</strong></td>
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<td>American College of Cardiology Foundation (ACCF)</td>
<td>In collaboration with other professional organizations develops clinical practice guidelines, expert consensus documents, and other quality programs including: Guidelines Applied in Practice (GAP) to provide assistance with guideline application in clinical practice and Hospital to Home (H2H), an effort to improve the transition from inpatient to outpatient status for individuals hospitalized with cardiovascular disease</td>
<td><a href="http://www.cardiosource.org">www.cardiosource.org</a></td>
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<tr>
<td>American Heart Association (AHA)</td>
<td>In collaboration with other professional organizations develops clinical practice guidelines, expert consensus documents, and other quality programs including: Get With The Guidelines, a hospital-based quality improvement program designed to ensure that every patient is consistently treated according to the most recent evidence-based guidelines and Mission: Lifeline, a national, community-based initiative to improve systems of care for patients with ST elevation myocardial infarction (STEMI)</td>
<td><a href="http://www.my.americanheart.org">www.my.americanheart.org</a></td>
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<tr>
<td>The Leapfrog Group</td>
<td>A voluntary program organized by large employers to promote big leaps in healthcare safety, quality, and customer value.</td>
<td><a href="http://www.leapfroggroup.org">www.leapfroggroup.org</a></td>
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### Table 4: Required Skills

<table>
<thead>
<tr>
<th>Mastery</th>
<th>NCDR Cath PCI Registry</th>
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<tr>
<td>Peer Review</td>
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<td>Morbidity and Mortality</td>
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<td>Systems Based Practice</td>
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<thead>
<tr>
<th>Competency</th>
<th>PDSA Cycles</th>
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<td>RCA, FMEA</td>
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<thead>
<tr>
<th>Familiarity</th>
<th>TQM</th>
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<tr>
<td>LEAN</td>
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<td>Six Sigma</td>
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