The Need to Improve the Appropriate Use of Coronary Revascularization

Challenges and Opportunities*

John Spertus, MD, MPH, Paul Chan, MD, MSc

Kansas City, Missouri

We stand at the precipice of extraordinary changes in medicine. Prior generations of physicians sought to apply any and all treatments available to preserve the health and functioning of patients, despite incomplete knowledge of disease processes and the evidence base to know the efficacy of alternative treatment strategies. Over the past 4 decades, an explosion of technology and treatments, with varying degrees of clinical evidence to support or refute their value, have been introduced. Congruent with these changes has emerged an unsustainable explosion in the costs of care, such that the economic future of the entire nation seems to be held hostage to “bending the cost curve” and creating a more sustainable model of lowering costs and maximizing the value of healthcare. Professional leadership in defining how best to direct therapy to those who most benefit, while withholding it in those with little to benefit (or are harmed), is the most promising way to maximize the value of healthcare—preserving the benefits of medical progress while limiting costs (1,2). Toward that end, the recently updated Manual of Medical Ethics by the American College of Physicians explicitly states that “physicians have a responsibility to practice effective and efficient health care and to use health care resources responsibly...to help ensure that resources are equitably available” (3).

Against this backdrop, the American College of Cardiology (ACC) tackled a challenge confronting the entire house of medicine by investing in a formal, critical evaluation of the appropriateness of its procedures (4). In contrast to the guidelines (5)—which synthesize the published data to suggest what we “can do” in caring for patients—or performance measures (6,7)—which distill the guidelines into a set of discrete actions that we “must do” for our patients—the appropriate use criteria (AUC) integrate the guidelines, clinical trial evidence, and clinician experience to quantify what we “should do.” By systematically evaluating common clinical scenarios, the AUC define the strength of the indications for a procedure, weighing both its benefits and harms. In so doing, the ACC exhibited phenomenal professional leadership in laying a foundation for evidence-based, clinically informed assessments of procedural appropriateness so that any financial rationing of treatments could be restricted to those with the least potential to benefit, as opposed to draconian administrative decisions or rationing through the time-consuming logistical hassles of navigating radiology benefits management companies. Raising fears of the latter option, the Centers for Medicare and Medicaid Services has recently announced a plan to pre-review the appropriateness of percutaneous coronary intervention (PCI), before payment, without explicitly articulating the methodology with which it will make such determinations (8).

In 2009, the ACC released the AUC for coronary revascularization (9), and in 2011, it reported current rates of appropriateness in the National Cardiovascular Disease Registry (10). Although, overall, the rates of inappropriate PCI were only 4.1%, virtually all patients undergoing PCI in the setting of an acute coronary syndrome were appropriate. By contrast, 11.6% of non-acute, elective PCIs were classified as inappropriate by the AUC, with wide variation in the rates of inappropriate non-acute PCI across hospitals (0% to >50%). In this issue of the Journal, Hannan et al. (11) leveraged a detailed procedural database of all New York hospitals doing PCI or coronary artery bypass grafting and found similar results, although they extended the previous report to note that very few inappropriate coronary artery bypass grafting procedures were performed. Collectively, these studies clarify that the vast majority of revascularization procedures are performed in patients who have a likelihood of benefiting from the procedure. However, as a profession that continually strives to improve, we must recognize that there are opportunities to further improve patient selection for PCI. How we respond to this information will define our field and can potentially enable us to serve as a role model for the rest of medicine.

Before changing our pattern of patient selection, however, there needs to be general acceptance of a common foundation with which to judge procedural appropriateness. Informally, we have heard numerous complaints about the AUC, which are summarized in Table 1. Although the first

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From the Saint Luke’s Mid America Heart Institute and the University of Missouri, Kansas City, Missouri. Dr. Spertus reports copyright ownership of the Seattle Angina Questionnaire, an equity position in Health Outcomes Sciences, which offers a web-based tool to prospectively assign the Appropriate Use Criteria to patients and a contract from the American College of Cardiology Foundation to analyze National Cardiovascular Disease Registry data; and has relationships with Lilly, the NHLBI, and the AHA Outcomes Center. Dr. Chan is supported by a Career Development Grant Award (K23HL102224) from the National Heart, Lung, and Blood Institute to examine the appropriateness of percutaneous coronary intervention in the United States.
version of the AUC for coronary revascularization will certainly improve, as new evidence and experience with their use evolves, we contend that these critiques pale when weighed against the benefits of systematically examining the decision to perform coronary revascularization. More detailed perspectives on some of these concerns include:

1. A large number of cases cannot be classified by the AUC, because either a stress test was not available in the medical record (50% of unclassifiable cases, 8.5% of all PCIs in the National Cardiovascular Data Registry) or the magnitude of ischemic risk was not communicated (42% of unclassifiable cases, 7.2% overall). This is a problem that transcends the AUC and mandates a reformation in the way that clinicians report and exchange information so that the interventional cardiologist has access to all relevant information when selecting the optimal therapy for patients. Furthermore, improving the completeness of stress test reports—including clear definitions of minimal, moderate, and severe ischemic risk—has been identified as an important opportunity to improve care and quality (12).

2. Concerns that a small pool (n = 17) of individuals rated the clinical indications for appropriateness in the AUC. As a specific example, some have complained that the rating of “inappropriate” for a patient with Canadian Cardiovascular Society Classification II angina and low-risk ischemia is unwarranted, although there have been no studies to show that patients live longer after revascularization than a trial of medical therapy, suggesting little harm in waiting to see whether medications alone can eliminate patient angina (13,14). Moreover, a survey of an additional 85 practicing cardiologists from 10 institutions found strong concordance (84%) between these practitioners with the AUC expert panel, even though the practicing clinicians, unlike the technical panel of the AUC, did not have the opportunity to discuss and re-rate indications with discrepant scores; a process that would have further improved agreement (15). Importantly, there was marked variability across practitioners, highlighting the need for the AUC to create a benchmark against which individual doctors can calibrate their perceptions about the benefits of revascularization.

3. Severity of angina has a huge impact on the strength of the appropriateness of a procedure. We recognize that the Canadian Cardiovascular Society Classification has poor inter-rater reliability (16) because it assesses symptoms from the perspectives of clinicians rather than those of patients and can be manipulated to improve the AUC rating of a patient. Therefore, we propose that patient-reported questionnaires, such as the Seattle Angina Questionnaire (17,18) (which is not only reproducible and sensitive to clinical change but also the strongest predictor of quality of life benefits from PCI) (19), be considered in the future to eliminate this concern.

4. Confusion with regard to the interpretation of uncertain and inappropriate categories. To reiterate the original document (9), a rating of “uncertain” reflects that there is limited evidence to clearly define whether or not coronary revascularization provides benefit in excess of risks and that coronary revascularization might still confer clinical benefit. In contrast, an inappropriate rating suggests that, in most circumstances, there is no clear benefit with coronary revascularization and that alterna-

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<th>Problem</th>
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<td>Miscoding of data in NCDR</td>
<td>Poor documentation</td>
<td>Improved documentation</td>
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<td>Perception that a small group of “experts” defined the AUC and disagreement on the ratings of some scenarios</td>
<td>Impracticality of having all cardiologists devote the time and participate in the process</td>
<td>None needed. The evidence supporting the benefits of revascularization should be transparent to all. Moreover, strong concordance was observed between practicing cardiologists and the Expert Panel.</td>
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<td>“Gaming” of angina severity</td>
<td>Inter-rater reliability for the CCSC is poor and interpreted by clinicians rather than patients</td>
<td>Use of patient-reported outcomes measures, such as the Seattle Angina Questionnaire</td>
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<td>Patient preferences not represented</td>
<td>Not reliably documented or quantifiable</td>
<td>Physicians can document these to support doing PCIs in patients rated as inappropriate</td>
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<td>Stress test results not done</td>
<td>Physician judgment</td>
<td>Intraprocedural documentation of ischemia (FFR)</td>
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<td>Stress test results not interpretable</td>
<td>Variable interpretation of findings and risk</td>
<td>Develop clear institutional procedures for reproducibly classifying magnitude of ischemia and risk</td>
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<td>Stress test results not known</td>
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<td>Confusion on interpretation of AUC categories</td>
<td>Uncertain sounds bad</td>
<td>Communication, education, and clarification of the categories, including that all sites are likely to have some inappropriate procedures due to limitations in clinical scenarios</td>
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<td>Resentment by clinicians of being “judged”</td>
<td>Need to ensure value in healthcare and documented cases of inexplicable excess of treatment demeans the profession</td>
<td>As a profession, we need to reframe our conceptualization of the AUC from that of a “judgment” to an opportunity to improve</td>
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AUC = Appropriate Use Criteria; CCSC = Canadian Cardiovascular Society Classification; FFR = fractional flow reserve; NCDR = National Cardiovascular Data Registry; PCI = percutaneous coronary intervention.
tive treatment strategies (such as medical therapy alone) can result in similar long-term outcomes without the upfront procedural risks (20,21) and costs. Due to the limited criteria used to create patient scenarios, there are certain to be patients rated as inappropriate for which almost all competent cardiologists would recommend intervention. In these cases, the operator should very clearly document the extenuating circumstances that warranted revascularization. Nevertheless, it is unlikely that the proportion of inappropriate cases justified by “extenuating circumstances” would vary so substantially across hospitals as to explain the observed hospital variability in rates of inappropriate non-acute PCIs. Thus, the presence of inappropriate revascularization cases suggests that there is room for improvement in clinical decision-making for coronary revascularization.

Despite the potential limitations of the AUC, we believe that what will define our professionalism is how we react to the AUC. Although some might advocate for their retirement, this presumes that clinicians are already perfect in their judgment and do not have an opportunity to improve. This is not a reasonable argument, particularly given the extraordinary variability observed in clinical practice (22). Rather, we should implement strategies to proactively use the AUC to improve practice. For example, several groups have developed strategies to prospectively map patients to the AUC after angiography and before revascularization. Doing so can support decision-making. Moreover, policies can be implemented to obtain “second opinions” before performing revascularization in a patient rated as inappropriate, so that a colleague can attest to the extenuating circumstances warranting treatment in that individual. Other strategies, such as weekly “cath conferences” that address appropriateness, is another promising strategy to increase consistency within a practice and decrease inter-operator variation.

If we can implement and improve the AUC among those undergoing revascularization, we will support better decision-making and decrease overuse of this procedure. Once done, we will then need to develop strategies to address underuse (23). There is evidence of substantial variability in symptom control of patients among outpatients not referred for PCI. For example, a recent study of primary care practices throughout Australia documented extraordinary variability in the proportion of patients at the primary care practices throughout Australia documented extraordinary variability observed in clinical practice (22). Instead of substituting criteria for coronary revascularization: a report of the American College of Cardiology Foundation Appropriateness Criteria Task Force, Society for Cardiovascular Angiography and Interventions, Society of Thoracic Surgeons, American Association for Thoracic Surgery, American Heart Association, and the American Society of Nuclear Cardiology. J Am Coll Cardiol 2009;53:530–53.


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Reprint requests and correspondence: Dr. John Spertus, Mid America Heart Institute, 4401 Wornall Road, 5th Floor, Kansas City, Missouri 64111. E-mail: spertusj@umkc.edu.

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