Self-regulation in the Era of Big Data: Appropriate Use of Appropriate Use Criteria

At the core of the medical profession is the collaborative decision-making process between physician and patient, where clinical evidence and best practice guidelines are applied to optimize outcomes for the individual patient. This process has long been shielded from public view. Decisions on the use of cardiovascular procedures are of particular interest, in part because of wide practice variation (1). New information technologies, electronic health records, and large administrative databases now permit outside observation of clinical decision making. With observation comes the potential for regulation. Governments, payers, professional organizations, and patients all wish to influence the use of medical procedures, either to decrease costs or to increase quality. These stakeholders have increasing access to clinical information. Billing and clinical registry data are widely available. Patients can access their electronic health record online and post reviews of their physicians to social media. Use of “big data” to understand, quantify, and regulate clinical decision making is inevitable.

Appropriate use criteria (AUC) are tools intended to help interpret these data. Using a method initially developed by the RAND Corporation to address underuse in a rapidly changing health care system, the American College of Cardiology Foundation, in collaboration with other professional societies, established criteria to guide use of cardiovascular procedures, such as echocardiography, diagnostic catheterization, and revascularization (2, 3). In the case of diagnostic catheterization, a panel rated 166 scenarios as appropriate, uncertain, or inappropriate on the basis of clinical trial evidence and expert clinical opinion (4). These criteria are intended to frame an individual decision between a physician and a patient but can play a key role in evaluating practice when applied to larger populations.

In this issue, Mohareb and colleagues (5) applied the 2012 AUC for diagnostic catheterization to a cohort of patients referred for angiography without a known history of coronary artery disease (CAD), with data collected from a registry encompassing 19 hospitals in Ontario, Canada. Overall, 58.2% of angiographic studies were rated appropriate, 31% were rated uncertain, and 10.8% were rated inappropriate, with substantial variation among hospitals in the percentage of studies rated appropriate. A stepwise decrease in diagnostic yield was noted for procedures rated appropriate (52.9%), uncertain (36.7%), or inappropriate (30.9%). Of note, studies rated inappropriate resulted in diagnosis of left main or triple-vessel disease in 7.1% of patients.

This study demonstrates some of the opportunities and challenges of applying AUC to large data sets. It used a registry with standard data elements that achieved universal capture of angiographic studies in Ontario. This permitted meaningful comparisons among hospitals. However, the registry lacked elements required to confidently assess appropriateness, notably whether chest pain was typical or atypical and whether stress testing categorized patients as intermediate-risk. Although reasonable adjustments were made to fit the AUC to available data, some misclassification probably remained. Poor clinical documentation and missing data can distort AUC findings, but this study, like similar analyses from the New York State database and the CathPCI Registry of the National Cardiovascular Data Registry, demonstrates that careful application of AUC to large data sets can generate findings of great interest to clinicians and policymakers (6, 7).

The results of this study show that invasive angiography that is rated as appropriate is more likely to diagnose obstructive CAD. What about the 47% of procedures rated appropriate that did not find obstructive disease? It is important to recognize that not all indicated angiographic studies uncover CAD. Rather, the appropriateness rating indicates that the clinical scenario is one for which evidence supports a benefit of performing invasive angiography. A finding of no CAD in a patient with a high pretest probability, with resultant avoidance of unnecessary medications and further testing, is a valuable result. Similarly, the finding of obstructive disease among some patients with procedures rated inappropriate is expected. Performance of procedures rated inappropriate may be prompted by a unique clinical scenario not captured by the AUC or influenced by patient preference. Poor documentation or lack of cohesive medical systems providing upstream information could omit clinical data that would justify the procedure. These findings highlight the need for ongoing maintenance of AUC with an iterative process that incorporates new evidence from clinical trials and quality improvement initiatives.

Presently, AUC can affect care delivery in many ways. Individual clinicians should consider AUC when ordering a cardiovascular imaging test or catheterization. The American College of Cardiology Foundation and others are developing clinical decision support to help incorporate the AUC into practice. Hospitals should examine institutional and provider-level appropriateness to identify areas for improvement. The AUC could be integrated into electronic health records to prospectively identify potential areas of underuse and overuse.

However, further work is needed to take full advantage of big data to build a learning health care system in which AUC are seamlessly integrated into clinical care and policy. An example of such a system in development is the CathPCI Registry, which collects data el-
lements necessary to assess appropriateness and provides confidential quarterly feedback to hospitals and physicians (8). The logical next step—use of AUC as a quality measure for public reporting and financial incentives—is more problematic. Some variables not represented in the AUC (such as extremes of age, comorbid conditions, and patient preference) may influence decision making, and further work is needed to understand how to identify outliers. Professional societies, regulators, and payers will need to standardize definitions so that AUC and performance measures can be applied uniformly and fairly.

There is broad interest in systems that use big data to assess appropriateness in order to reduce cost. However, that is a 1-sided approach to AUC. An ideal system would be evidence-based, use uniform and comprehensive clinical data, provide point-of-care decision support, and aim to improve quality by reducing overuse and underuse. The AUC could be the backbone of such a system and, if trusted by all stakeholders, could provide a practice-level alternative to preauthorization requirements or indiscriminant reductions in reimbursement. Physicians must embrace the opportunity for self-regulation that AUC offer to ensure that we remain advocates for our patients and stewards of our health system.

Jacob A. Doll, MD
Manesh R. Patel, MD
Duke University Medical Center
Durham, North Carolina

Disclosures: Disclosures can be viewed at www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M15-0418.

Requests for Single Reprints: Manesh R. Patel, MD, Associate Professor of Medicine, Duke University Medical Center, 2301 Erwin Road, DN7432, Durham, NC 27710; e-mail, manesh.patel@duke.edu.

Current author addresses are available at www.annals.org.


References
Current Author Addresses: Dr. Doll: Duke University Medical Center, 2301 Erwin Road, DUMC 3845, Durham, NC 27710. Dr. Patel: Associate Professor of Medicine, Duke University Medical Center, 2301 Erwin Road, DN7432, Durham, NC 27710.