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EDITORIAL COMMENT

ASCERTing the Value of Coronary Artery Bypass Graft in Stable Angina Patients

The Challenges and Potential of Observational Research to Improve Care*

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In this issue of the *Journal*, Zhang et al. and the ASCERT (American College of Cardiology Foundation-The Society of Thoracic Surgeons Collaboration on the Comparative Effectiveness of Revascularization Strategies) investigators (1) have extended their comparative effectiveness research of percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) to examine costs.

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This work leverages an important collaboration between the American College of Cardiology and the Society of Thoracic Surgeons to combine their procedural PCI and CABG registries, which have previously been used to describe the survival advantages of the 2 procedures in stable ischemic heart disease patients with 2- or 3-vessel coronary disease (2). In this new study, the data are linked to Medicare spending from 2004 through 2008 to describe the differences in costs of those ages >65 years and to estimate the utilities (a coarse distillation of quality of life on the basis of published data-supported, rather than prospectively collected, estimates), lifetime costs, and cost utility of these 2 treatment strategies. They found that CABG costs more than PCI does, but CABG remains a reasonable value by commonly accepted standards. These economic analyses are largely congruent with, and driven by, the clinical results.

Zhang et al. (1) are to be commended for this statistical tour de force. Trying to estimate the benefits of 1 treatment versus another using observational data is always challenging, especially when substantial selection biases related to the choice of therapy exist. In this study, the lack of randomization ensures unmeasured confounding in their estimates, which was noted in previous critiques of their original publication (3,4). State-of-the-art techniques helped minimize measured confounding, but the inability to adjust for those unmeasured elements (e.g., lesion amenability to PCI, patient preference) is an inherent problem when using registries to compare treatment outcomes.

Even with propensity scoring and careful patient selection to balance a myriad of measured patient characteristics, factors left unmeasured can bias the results. For example, in an important analysis of potential selection biases when deciding to choose PCI or CABG, McNulty et al. (5) noted that refusal by surgeons to perform revascularization increased mortality risk by more than 5-fold, yet these details are not captured in the American College of Cardiology or Society of Thoracic Surgeons registries. In fact, the extreme divergence in propensity scores noted in the original ASCERT publication (2) underscores how truly different the patient populations undergoing PCI and CABG are. As the investigators worked to achieve balance in measured characteristics, they excluded more than 90% of potential participants, substantially limiting their findings' generalizability. These issues have led many to be skeptical of the ASCERT clinical findings, even if the results are

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correct. In this study, even more assumptions are needed, not only for lifetime cost and survival estimates, but particularly because the study did not directly measure utilities. Nevertheless, these are probably the best possible approximations that can be obtained for the comparative cost effectiveness of CABG versus PCI in routine practice, and Zhang et al. (1) should be commended for their hard work.

Given the overall results that CABG is more expensive but probably a reasonable value, what are clinicians and policy makers to do with this information? In practice, the choice of revascularization strategy should ultimately be decided by the patient, in consultation with their heart care team (6,7). The choice should factor in many variables, but most importantly there should be estimates of survival and health status (patient symptoms, function, and quality of life) outcomes and the periprocedural risks that patients are willing to accept to achieve these outcomes. Not surprisingly, patients and providers are much more concerned about survival and health status than the costs paid by Medicare. Thus, this study likely does not have direct relevance to clinical decision making, although the original ASCERT publication does help, despite its limitations, by providing likely survival advantages with more patients alive at 30 days after PCI, no difference at 1 year, and more CABG patients surviving at 4 years.

Critical gaps in knowledge remain, with little real-world data comparing the health status advantages of 1 treatment strategy over the other (8), although 2 recent clinical trials document slightly better 1-year symptom relief, function, and quality of life with CABG (9,10). We urgently need more information to better assist patients in making treatment decisions and the American College of Cardiology and Society of Thoracic Surgeons have a remarkable opportunity to expand their PCI and CABG registries to include patient-reported health status data, as they have with their joint transcatheter valve therapy registry (11). Were they to take the bold step of including health status outcomes, then a much richer evidence base would be available to help clinicians and patients make difficult treatment decisions.

Another gap in knowledge relates to the lack of data enabling personalized outcomes estimates. There is a well-recognized heterogeneity of treatment benefit for most procedures, with some patients deriving great benefit, others modest benefit, and others being harmed by treatment (12). Zhang et al. (1) examined cost-effectiveness in several distinct subgroups (by age, diabetes status, number of diseased vessels, and presence of heart failure), but what if patients have multiple conditions? Currently, no method exists to extrapolate these data to the complex patients typically seen in routine clinical practice. What is needed is to more formally model outcomes and to test the interaction and main effects of treatment alternatives across the range of risks for survival and health status outcomes. A recent example from the TRITON-TIMI 38 (Trial to Assess Improvement in Therapeutic Outcomes by Optimizing Platelet Inhibition With Prasugrel–Thrombolysis in Myocardial Infarction 38) study shows how simple the outcomes of alternative treatments can be compared, even when multiple risk factors need to be considered (13). Yet, building these models requires that registries collect those outcomes most important to patients, including health status at the time of treatment and over time, so that the research enterprise can build appropriate tools to help support clinical care. Ideally, such assessments would include those patients who do not undergo revascularization at all but, to date, only the Canadian APPROACH (Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease) registry has extended data collection to include medically treated patients' health status outcomes (14).

From my perspective, the ASCERT registry takes an important first step in assessing the comparative effectiveness of alternative revascularization techniques, but it also highlights important gaps in existing data and the challenge of assessing therapeutic effectiveness from observational data. The use of registry data to support shared medical decision making is tantalizingly close, but requires a strong commitment by clinicians and researchers to collect data and build tools that patients can use to help make decisions that are aligned with their personal goals and values.

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