

Observational methods in cardiovascular outcomes research

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Abstract: Compared to randomized trials, observational methods have several advantages for cardiovascular outcomes research, including lower cost, reduced risk to subjects, and improved generalizability. Here, I leverage recently-developed observational methodologies to address questions that would be difficult or impossible to conduct using randomized trials. Study 1 centers on patterns and predictors of stress test use after elective percutaneous coronary intervention (PCI). I find that: (1) stress testing is commonly performed after elective PCI in a pattern suggestive of routine testing; (2) risk factors thought to increase the potential value of such testing are paradoxically associated with lower use of testing, and (3) the rate of stress testing use varies strongly across the facilities participating in the national CathPCI Registry in a manner that is associated with higher rates of repeat revascularization procedures without reduction in death or myocardial infarction. Study 2 centers on the imaging modality (echocardiography versus nuclear imaging) chosen for patients receiving an exercise stress test after PCI. While many comparisons of test performance (i.e., sensitivity and specificity) have been made for echocardiography and nuclear imaging, little is known about the implications of test choice on clinical outcomes or resource use. I find that patients who receive echocardiography received fewer subsequent coronary catheterization or revascularization procedures, but more repeat stress tests, than do nuclear testing patients. No differences in rates of death or readmission for myocardial infarction were noted. Study 3 illustrates the use of newly-developed instrumental variables methodologies for outcomes research. While conventional instrumental variables techniques are only able to estimate a local average treatment effect, or the effect of a treatment on an unidentifiable "marginal" population of patients, newer methodologies allow for the estimation of more relevant estimands, such as the average treatment effect on those patients receiving the treatment in clinical practice. We evaluated the effectiveness of drug-eluting versus bare metal coronary stents using these new methods, finding evidence that drug-eluting stents are safe and effective.

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