this study cohort overall. This is reflected in the reported unfavorable long-term survival after CABG of 80% and 48% at 5 and 10 years, respectively. The authors also demonstrate that having more, compared with fewer, of the 4 risk factors is associated with an increased risk of myocardial infarction and readmission for congestive heart failure over time. This emphasizes a critical although indirect take-away from this study: CABG is not a treatment for atherosclerosis and a somewhat meaningless intervention in absence of aggressive lifestyle risk modification, guideline-directed medical treatment, and patient compliance. These aspects are critical to ensure high-quality outcomes early and late after CABG, and therefore part of the Society of Thoracic Surgeons Star Rating and other quality metrics. They are also key to ensure the well-documented survival benefit of CABG over percutaneous coronary intervention,⁶ and although both revascularization strategies are associated with poor guideline-directed medical therapy compliance, guideline-directed medical therapy after CABG is in particular need of improvement.⁷

The authors bring our attention to an important aspect of cardiac surgery, and we commend them on their study of the

complex interaction between highly prevalent risk factors of atherosclerosis and CABG in a vulnerable population.

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Commentary: Has revascularization MET its match?

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Metabolic syndrome (MET), or Syndrome X, encompasses a group of patients with comorbidities (obesity, insulin resistance, dyslipidemia, hypertension) who are at

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CENTRAL MESSAGE

Innovative therapies need to be developed for patients with metabolic syndrome (MET) after revascularization procedures (PCI or CABG), as long-term outcomes have not improved.

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increased risk of developing cardiovascular disease. The incidence of MET has risen in the US population from 28% in 2005 to 32.5% by 2012¹ and is now reaching epidemic proportions. MET causes inflammation secondary to steady oxidative stress and is strongly associated with the development of atherosclerosis and coronary artery disease. Current revascularization strategies for patients with MET are coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI). PCI, compared with CABG, is associated with inferior clinical outcomes, mainly due to greater postprocedural risk of myocardial infarction and repeat revascularization.²

In this issue of the *Journal*, Deo and colleagues³ report long-term outcomes of 9600 patients with MET who underwent CABG at 41 Veterans Affairs centers. At 10-year follow-up, mortality was similar between patients with MET and without MET. The authors note that patients with MET were younger, were mostly male, and had more peripheral vascular disease and multivessel coronary artery disease. Furthermore, patients with MET had a greater incidence of myocardial infarction and hospital admissions for congestive heart failure. There was no increased mortality or stroke. Deo and colleagues' findings contrast with a previous report from Angeloni and coworkers,⁴ who assessed intermediate results (75 months) of patients with MET and without MET after revascularization procedures. This study showed that patients with MET had greater early and late mortality after CABG.

It is important to note that, despite advancements in interventional procedures and CABG surgery, outcomes in patients with MET undergoing revascularization (CABG or PCI) have not improved in the past decade.⁵ This implies that revascularization procedures may have reached their limits in the treatment and outcomes of patients with MET, suggesting that efforts should now be focused on development of newer and innovative treatments. Previous experiments in animal models with diabetes and MET showed that coronary collateral growth after coronary artery occlusion was severely impaired.⁶ Furthermore, patients with MET are reportedly prone to recurrence of angiographically significant coronary artery

lesions after CABG, either from graft failure or formation of new lesions.⁷ This may explain the reason for Deo and colleagues'³ findings of greater rates of myocardial infarction and heart failure in patients with MET.

Early identification and aggressive personalized treatment to patients with MET are needed if we are ever going to improve long-term outcomes with CABG or PCI beyond what has been achieved so far. Patients with MET need guideline-directed medical therapy before and after surgery and intensive follow-up after discharge from hospital. Deo and colleagues' study opens the door for further research that will increase our ability to predict which combinations of MET diagnostic criteria may be associated with specific outcomes. For example, will individuals with low high-density lipoprotein, hypertension, and diabetes who also have obesity have greater mortality after CABG than similar patients without obesity? Will patients without diabetes or obesity have better graft patency? All this means that we need to continue to search for newer and innovative therapies for MET in conjunction with revascularization, if we are ever going to improve outcomes.

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