complications and even of saving lives can certainly be estimated.¹ Indeed, the very cornerstone of the health economic discipline is to do exactly such estimations across the most common diseases to determine how limited health care resources can be used most effectively to benefit the most patients. Knowing the economic consequences of medical complications is a highly essential step in our efforts to identify cost-effective clinical interventions to address them. In health care systems with limited resources, policy makers, health insurers, hospital administrators, and practicing physicians need to consider carefully the cost-effectiveness of medical interventions, both in the daily practice of medicine and as part of long-term evaluation and planning of quality improvement initiatives.

As we describe in our article, medical interventions can either be cost saving (if the hospital's cost savings are greater than the cost of the intervention), cost-effective (when the incremental cost of a clinical intervention is reasonable with regard to the clinical benefits obtained), or cost enhancing (if the clinical intervention induces higher hospital costs without any clinical benefit). In the context of excessive hemorrhage in cardiac surgery, knowledge of the medical and economic consequences of this complication is the very first step in the identification of safe, effective, and cost-effective clinical interventions to address this complication. Additionally, awareness of the costs of excessive hemorrhage may compel health care professionals to apply preventive and therapeutic measures as early as possible. In our research we used simple and objective criteria for excessive postoperative hemorrhage to allow early identification of patients at risk for severe morbidity or even a fatal outcome. Early identification of bleeding facilitates early treatment and thereby improves outcome. This is the very basis for improvement in clinical care and applied quality improvement.

Of course, health care providers must primarily keep the individual patient's health in mind. In addition, however, we need to be aware of the costs of complications to provide the highest standard of care for all patients. This may be even more important in the future, when rationing of health care resources is likely to become an even more dominant part of our health care services.

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doi:10.1016/j.jtcvs.2010.02.009

DOES PREVIOUS PERCUTANEOUS CORONARY INTERVENTION INCREASE THE RISK OF GRAFT FAILURE IN SUBSEQUENT CORONARY SURGERY?

To the Editor:

We recently pointed out¹ that there is no evidence to support significantly better angiographic patency with radial artery conduit than with saphenous vein graft in coronary artery

bypass grafting in controlled, randomized trials reported to date. We do not, however, support inclusion of data extracted from the article by Gaudino and associates² in the recently published meta-analysis by Benedetto and colleagues³ of controlled, randomized trials comparing radial artery conduits and saphenous vein grafts with respect to angiographic patency.

The article by Gaudino and associates² reported 2 controlled, randomized trials including patients with previous percutaneous stent implantation (in any coronary vessel) with preoperative angiographic confirmation of a failed (I trial) or patent (II trial) intracoronary stent. In that report,² they focused on the results of arterial versus venous grafts directed to the first obtuse marginal artery. There were, however, no data on failed stent location. In a subsequent analysis⁴ of that initial report, Gaudino and coworkers⁴ focused on the complementary venous grafts to nonobtuse target coronary vessels (right coronary artery and circumflex artery other than the first obtuse marginal artery). They concluded that patients with development of in-stent restenosis face a higher risk of early venous graft failure (46 occluded of 84, patency rate 45.2% at 5 years after surgery). Even in that article, however, there were no precise data about the number of failed venous grafts that were distributed to targeted coronary arteries with in-stent restenosis. We were able to find out only that 25 of the failed stents were located on a circumflex artery other than the first obtuse marginal artery, 31 were located on the right coronary artery, and 7 were located on the left anterior descending coronary artery. Although 43 venous graft-targeted vessels were circumflex artery other than the first obtuse marginal artery and 41 were right coronary artery, we must face the possibility that the vast majority of venous grafts were placed on previously stented coronary arteries.

It has been argued by Gaudino and associates^{2,4} that in-stent restenosis is

seen in a subgroup of patients with aggressive coronary atherosclerosis. Conversely, the pathophysiologic response⁵ to the presence of an intravascular foreign body (stent) may also adversely affect the fate of the conduits used to graft stented coronary arteries. Stenting can cause prolonged endothelial dysfunction, as well as an acute and chronic inflammatory reaction, even during the late period, with involvement of the distal coronary artery and surrounding myocardium.⁵ This may adversely affect anastomosis sites in patients who subsequently undergo coronary artery bypass grafting.

A vexed question is whether the poor fate of venous conduits used to bypass coronary arteries with in-stent restenosis is due to aggressive atherosclerosis or to an inflammatory reaction involving downstream coronary artery beds. Although we do not know the distribution of occluded conduits with respect to stent locations, we cannot definitively point out the influences on graft patency. We therefore do not support inclusion of these data in meta-analyses.

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doi:10.1016/j.jtcvs.2010.01.041

Reply to the Editor:

We thank Nezic and colleagues for their interest in our recent article.¹ We regret to point out, however, that Nezic and colleagues misrepresent data reported by Gaudino and associates.² In fact, 2 different analyses were reported in that study. First, Gaudino and associates² reported an angiographic comparison of radial artery (RA) and saphenous vein graft (SVG) conduits randomly assigned to target obtuse marginal coronary arteries (OMs) with previous stenting (study group) versus OMs without previous (control group). The results of this comparison were shown in Gaudino and associates’ Table 3,² which compared 20 RA conduits versus 20 SVG conduits from the study group and 20 RA conduits versus 20 SVG conduits from the control group. In addition, they reported angiographic results of other conduits not randomly assigned to complete revascularization in both the study and control groups (see Gaudino and associates’ Table 2²).

For the purpose of our meta-analysis of randomized, controlled trials, we included only conduits randomly assigned to target OMs. Therefore, in our study the Gaudino I study included RA versus SVG conduits randomly grafted to previously stented OMs, and the Gaudino II study included RA versus SVG conduits grafted to unstented OMs. The risk that intrastent restenosis would influence the results was exactly the same for all RA and SVG conduits used in the first cohort of patients (Gaudino I). Nezic and colleagues picked up data referring to conduits not randomly assigned to complete revascularization (see Gaudino and associates’ Table 2), thus completely misrepresenting the inclusion criteria adopted in our meta-analysis of randomized, controlled trials.

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doi:10.1016/j.jtcvs.2010.02.010

META-ANALYSIS COVERS THE HORIZON WHEN THE LITERATURE SEARCH IS UNDERTAKEN THROUGH A KEYHOLE

To the Editor:

The meta-analytical review by Benedetto and colleagues¹ comparing failure rates of radial artery (RA) and saphenous vein (SV) conduits in coronary artery bypass grafting has several methodologic flaws that significantly limit its validity. Consequently, we strongly believe that both the data presented and the conclusion that “no definitive evidence supports the superiority of the RA over the SV in terms of graft failure rate”¹ cannot be accepted without challenge.

Benedetto and colleagues’ restrictive inclusion criteria¹ may have excluded data from several high-quality studies that considered different target lesions or used definitions of graft failure other than total graft occlusion or severe diffuse graft narrowing (string sign).¹ Angiographic stenosis of more than 50%, 70%, or 75%, for example, may cause symptomatic ischemia and may require repeated angiography. Finally, Benedetto and colleagues¹ appear to have excluded important studies in which assessment of angiographic patency was performed at a fixed interval as a secondary end point. These restrictive inclusion criteria compromise the