

EDITORIAL COMMENT

Non-ST-Segment Elevation Myocardial Infarction Treated at Hospitals With and Without On-Site Cardiac Surgery

What Is the Important Point?*

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The title of the report by Pride et al. (1) in this issue of *JACC: Cardiovascular Interventions*, suggests this is another contribution to the debate about the safety of percutaneous coronary interventions (PCI) performed at hospitals without cardiac surgery on-site (No-OHS). That issue is addressed, but in reality this report relates more to the benefits of using evidence-based therapies in patients with non-ST-segment elevation myocardial infarction (NSTEMI).

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The debate about PCI at No-OHS facilities in the U.S. is not new. Based on the superior outcomes of PCI in patients with ST-segment elevation myocardial infarction (STEMI), some hospitals with diagnostic catheterization laboratories, but No-OHS, started PCI programs to provide this care to their local communities (2). Because it is difficult to sustain a PCI program solely on STEMI patients, these programs expanded to elective PCI (3). However, debate continued as the 2005 PCI guidelines recommended that elective PCI without surgery on-site not be performed (4). In 2007, an expert consensus document provided a comprehensive review of PCI without on-site surgery and contained survey data showing that elective PCI without on-site surgery was being performed in 28 states despite guideline recommendations (5). Recently, data from the NCDR (National Cardiovascular Data Registry) reaffirmed the safety of PCI without on-site surgery as did an update from the Mayo Clinic experience (6,7). Nevertheless, PCI

without on-site surgery remains a polarizing and emotional issue for many individuals.

The more important message of this study, however, derives from their data showing how the use of evidence-based therapies affects outcomes. Developing strategies to achieve the best outcomes, enhance patient safety, and improve the quality of care have moved to the forefront of many discussions about health care reform. Several studies show that improved adherence to guidelines results in better outcomes (8,9). Although debate has focused on whether PCI should be allowed at No-OHS facilities, a more meaningful approach would focus on the goal of providing the best care possible to patients regardless of the setting.

The report by Pride et al. (1) provides indirect support that adherence to guideline recommendations improves outcomes. The authors identified approximately 100,000 patients from the NRMI (National Registry of Myocardial Infarction) database who presented with NSTEMI. Patients at hospitals with open heart surgery (OHS) were compared with patients who presented to No-OHS hospitals. Three separate analyses were performed with the end points of in-hospital mortality: recurrent myocardial infarction (MI); the composite of death and MI; and the composite of death, MI, congestive heart failure, and cardiogenic shock.

In the first analysis, the entire cohort was compared. Although the numerical differences were small, patients at OHS hospitals were more likely to receive aspirin, beta-blockers, and statins within the first 24 h and were more likely to undergo coronary angiography and PCI than their counterparts at No-OHS hospitals. In-hospital mortality and the 2 composite end points were lower while the use of guideline-recommended medications at discharge was higher at OHS hospitals.

In the second comparison, patients at No-OHS hospitals were propensity-matched to patients at OHS hospitals using 15 clinical factors. The numerical differences in medication use between the groups during the first 24 h were smaller, but still favored a higher use of guideline-recommended drugs at OHS hospitals. Patients at OHS hospitals were more likely to receive angiography and PCI and also were less likely to be transferred to a different hospital (2.7% vs. 35.4%). This is an important caveat as transferred out patients were subsequently excluded from the outcome analyses. In this analysis, patients presenting to OHS facilities had lower in-hospital mortality and a lower incidence of the composite of death and MI compared with those at No-OHS hospitals, but the other end points were not different. Patients discharged from OHS hospitals remained more likely to go home with aspirin, beta-blockers, and statins. However, when this cohort was further matched for hospital characteristics and annual MI volume, the mortality advantage at OHS hospitals was smaller and borderline significant ($p = 0.05$).

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It is important to emphasize the limitations of these conclusions, some of which are acknowledged by the authors. NRMI data are unaudited, thus the accuracy of data entry could vary between small and larger centers. Hospitals participating in the NRMI may not be representative of all facilities involved in acute MI care, and follow-up beyond discharge was not available. However, the major weakness of the study relates to the issue of patients transferred into and out of facilities. Patients transferred into a facility were considered in the analysis. OHS hospitals had a transfer-in rate of 34.8% versus only 5.8% for No-OHS hospitals. This likely reflects physician bias in decisions about whether to transfer the patient at all, or if transferred what type of facility to be the recipient. Patients transferred from a non-PCI- to a PCI-capable hospital were likely considered good candidates for angiography and possible revascularization whereas those felt to be poor candidates would likely not be transferred. A more serious bias relates to patients transferred out from No-OHS hospitals as they were excluded from the analysis. About 35% of the roughly 6,000 patients admitted to No-OHS hospitals were transferred to another facility, but the reasons for transfer were never disclosed. Since only hospitals with PCI capability were included in this part of the analysis, it could be assumed that patients transferred out from a No-OHS facility were judged "too sick" to undergo angiography at that hospital or after angiography were felt too "high risk" for PCI at a No-OHS facility. This further clouds the interpretation of these data.

In the final analysis, the propensity-matched cohort was further restricted to the 1,282 patients in each group who underwent PCI. Based on a comparison of clinical factors, patients undergoing PCI were a lower risk group than the entire study cohort. In contrast to the other analyses, patients at No-OHS hospitals were either more or equally likely to receive guideline-recommended drug therapies within the first 24 h. In-hospital mortality, the 2 composite end points, and the administration of guideline-recommended discharge medications were now similar among hospitals, but recurrent MI was higher at OHS hospitals.

From this, the authors developed 2 main conclusions. First, patients with NSTEMI who present to No-OHS hospitals have higher in-hospital mortality even after adjusting for differences in baseline characteristics. However, when adjusting for the use of guideline-recommended medications within the first 24 h, mortality was reduced (hazard ratio: 0.70 to 0.81, $p < 0.001$). Although indirect, the message is better adherence to guideline-recommended medications is associated with reduced mortality. Believing that better adherence to guideline recommendations improves outcomes seems intuitive, but recently the guideline development process has come under scrutiny (10). Although improving how guidelines are developed is appro-

prate, there is evidence that existing guidelines enhance patient outcomes (8,9,11,12). A recent study examining coronary artery bypass surgery concluded that maximizing adherence to 6 quality measures improved overall mortality rates and equalized mortality rates even for surgeons and facilities in the lowest quartile of case volumes (13).

Second, there was no difference in mortality among the matched NSTEMI patients who underwent PCI at hospitals with and without OHS. This will bolster the argument that performing PCI without on-site surgery is safe, but it is important to remember the many statistical adjustments used in this study and their limitations. It is the responsibility of physicians performing PCI at facilities with No-OHS to follow strict screening criteria to ensure only lower risk elective cases are performed at such facilities (5). In this study, patients undergoing PCI at OHS hospitals had a higher incidence of recurrent MI. Since the NRMI only included in-hospital outcomes, the recurrent MIs were likely procedure-related thus suggesting the transfer of higher-risk PCIs from No-OHS to OHS hospitals had occurred.

In addition to providing information on safety at hospitals without surgery on-site, the more compelling message from this report relates to the importance of guideline adherence and promoting quality in the management of patients with NSTEMI. Healthcare reform is on everyone's mind, and how this will be accomplished is still unknown. However, it is apparent that there will be a strong emphasis on improving quality, and it is likely that payments will be, in some fashion, linked to meeting performance measures and quality metrics. All effective, evidence-based therapies, regardless of where a patient is treated and irrespective of whether the treatment is revascularization or medical therapy alone, should be implemented and monitored to ensure optimal outcomes for all patients with NSTEMI.

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