

Editorial 

## Performance Deficiencies in the Treatment of ST-Elevation Myocardial Infarction in Québec: “Tis But a Part We See, and Not a Whole”

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*See article by Lambert et al., pages 1325.e11–1325.e18 of this issue.*

In his Essay on Man published between 1732 and 1734, Alexander Pope presented his views on the role of humans in the universe and their relation with God. Pope pointed out that with our limited mindset and limited intellectual capacities, we are only able to see a part, but not the whole. He concluded that humans have to rely on hope and faith, and accept many assumptions, because the universe functions in a rational way according to laws set by God.<sup>1</sup>

However, at least in science, Pope was not right; the part that we see might be different from the whole and belief must rely on evidence and not on faith. This is highlighted in this issue of the *Canadian Journal of Cardiology*, where Lambert and colleagues evaluated the outcome of 3731 patients with ST-elevation myocardial infarction (STEMI) admitted to > 80 acute care centres in the province of Québec over two 6-month periods.<sup>2</sup> Hospitals were classified into 4 types according to the method of reperfusion that was practiced: primary percutaneous coronary intervention (PPCI) centres were those where on-site PPCI was the exclusive reperfusion modality, fibrinolysis centres were those where fibrinolysis was the exclusive reperfusion treatment, transfer PPCI centres were those without on-site PPCI but where all patients were transferred to a PPCI facility, and mixed centres were those where STEMI patients were either treated with fibrinolysis or transferred to a PPCI centre.

The authors' objectives were to evaluate the performance of these hospitals in the management of STEMI. Although older studies have focused on examining the outcome of patients who received reperfusion therapy, the authors elected to evaluate the outcome of all STEMI patients, stratified according to the receiving centre. This is important to ascertain, because subgroup analysis might be misleading.<sup>3</sup> A look at the

“whole” is more likely to provide an objective assessment of the performance of the health care system. Several important findings of this article are worth discussing.

### Outcome in the “Part” and the “Whole”

When analysis was performed in patients who received reperfusion treatment, crude 30-day mortality did not differ across the 4 types of centres. This might lead to the erroneous conclusion that STEMI management is equivalent, irrespective of accessibility to PPCI and the type of reperfusion treatment. However, when all patients with STEMI were analyzed, outcome was significantly different, with an adjusted 30-day mortality being 58% higher in mixed centres compared with centres that provide PPCI. This was mainly driven by a higher mortality rate in patients who did not receive reperfusion therapy. Management of STEMI is thus, not similar across all facilities and the implications in terms of public health policy are different from those that could be derived from the first conclusion on the basis of subgroup analysis of patients who received reperfusion therapy.

The authors were right in stressing the “importance of examining all patients.” It is not uncommon in clinical studies to exclude some categories of patients leading to a sample that does not represent the true population, or to draw conclusions on the basis of subgroup analysis, which might not reflect the outcome in the whole population. A strong effort was recently made by the research community to correct these problems. The Consolidated Standards of Reporting Trials was developed to guide randomized clinical trials.<sup>4</sup> Similarly, the Strengthening the Reporting of Observational Studies in Epidemiology statement was recently published to guide the design and reporting of observational and case-control studies.<sup>5</sup> These guidelines put a particular emphasis on selection of the study population, and recommend a clear explanation on how the sample was chosen and the rationale for the inclusion criteria. They also stress the importance of analyzing all patients, explaining withdrawals, loss of follow-up, incomplete data, and evaluation of confounders.

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Adherence to these guidelines allows avoidance of erroneous conclusions as was shown by Lambert and colleagues in their current report.<sup>2</sup>

### The Problem of Untreated Patients

Despite the well-established benefit of early revascularization in patients with STEMI, 21.8% of patients did not receive a reperfusion treatment, with significant variability across centres, being highest in fibrinolysis centres and lowest in PPCI centres. Mortality among these patients was 3-4 times higher than for patients who received reperfusion treatment and accounted for the higher crude and adjusted mortality rates in the mixed centres. In an article published by the same authors,<sup>6</sup> the most important predictors of nontreatment were limited accessibility to PPCI, presence of left bundle branch block, or an ambiguous electrocardiogram (ECG). In addition, the study raises the possibility of a referral bias in mixed centres, where low-risk patients were referred for revascularization but high-risk patients, who theoretically should benefit the most from reperfusion therapy, were not. This hypothesis should be addressed in a separate study because of its important clinical implications.

### The Delay in Reperfusion Treatment

Reperfusion therapy was given outside the recommended time window in most cases when it was used. In PPCI centres only 35.4% of patients received it in a timely fashion, vs 11.9% in transfer centres and 1.2% in mixed centres. This is much lower than in other developed countries. In the Global Registry of Acute Coronary Events (GRACE) registry, 58% of the patients with STEMI had PPCI within 90 minutes.<sup>7</sup> Although the delay in transfer centres and mixed centres can be expected, this should not occur in centres with on-site PPCI capability. The causes of such delay should be investigated in future studies. Contrary to PPCI, thrombolytic therapy was given within the time window in 50% of patients in fibrinolysis and mixed centres. This could at least partially explain the good results of fibrinolysis centres despite the lower rate of reperfusion treatment compared with PPCI centres (70.2% vs 83.3%). The American College of Cardiology guidelines for STEMI recommend fibrinolysis in non-PPCI-capable hospitals when it is anticipated that PPCI cannot be performed within 120 minutes of first medical contact.<sup>8</sup> Median delay was 149 minutes in mixed centres, well above these guidelines.

### Limitations of the Current Study

The authors did not report on reinfarction, ejection fraction at discharge, new-onset congestive heart failure, and stroke rates. These factors are important to evaluate because they affect long-term outcome. Preservation of left ventricular function using early revascularization was associated with improved 1-year survival despite similar 30-day mortality.<sup>9</sup> Rates of reperfusion treatment and time to reperfusion were different across the 4 groups, which might affect the amount of myocardium being salvaged and consequently long-term survival. Although not statistically significant, adjusted mortalities were higher in fibrinolysis (odds-ratio, 1.5) and transfer centres (odds ratio, 1.3) compared with PPCI centres. It is

possible that a larger sample or a longer follow-up (more events) might have made these differences statistically significant.

### Public Health Implications

This study has important clinical and public health implications. As the authors mentioned, rather than increasing the number of facilities with on-site PPCI, the functioning of the health care system should be improved. Two major targets for intervention are the number of patients who receive reperfusion therapy and the delay of such therapy. Physicians working in remote facilities should be educated to better interpret ECGs and to refer patients with chest pain and ambiguous ECG or left bundle branch block for emergent coronary angiography. Transfer networks should be revised and improved to facilitate and accelerate transfers. Mixed centres where PPCI was almost always delayed and fibrinolysis was given promptly could be transformed into fibrinolysis centres. Because the authors hypothesized that patients who were transferred were at lower risk, transfer conditions should be studied to determine the safety of transfer of "higher-risk" patients who otherwise would not receive reperfusion therapy.

In conclusion, the current study shed important light on the functioning of the health care system in the province of Québec. Although several questions remain unanswered, the inclusion of more than 95% of STEMI patients and the analysis of all of them allowed the authors to approach more toward seeing the "whole." Contrary to Alexander Pope who concluded his Epistle II by "Whatever is, is right,"<sup>1</sup> Lambert et al. have shown that the management of STEMI (whatever is), is not perfect. Their findings will be very useful in improving the performance of the health care system.<sup>2</sup>

### Disclosures

The authors have no conflicts of interest to disclose.

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