



## Editorial

# Treatment and Outcomes of Non—ST-Segment-Elevation Myocardial Infarction by Type of Center: A Tale of Patient Pathways, Access, and Clinician Aversion

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*See article by Rashid et al., pages 868-877 of this issue.*

Information about patient characteristics, processes of care, and clinical outcomes are essential to optimize decision making for patients and clinicians, as well as for managers of the health care system. In England and Wales, such information for acute coronary events is available through the Myocardial Ischemia National Audit Project (MINAP) and covers the complete system of care, making it all the more valuable.

In this issue of the *Journal*, Rashid et al.<sup>1</sup> have used the MINAP data to determine if there are any associations between the use of invasive diagnostic or treatment strategies and outcomes in patients suffering a non—ST-segment-elevation myocardial infarction (NSTEMI). More specifically from a health systems perspective, they examined whether an interaction exists between in-hospital mortality and the type of cardiac centers (PCI-capable vs catheterization-capable vs neither) at which patients entered the health care system. Their investigation helps to fill an important gap in evidence. A recent systematic review published in this journal highlighted the paucity of data regarding the comparative effectiveness of different treatment strategies for NSTEMI in elderly patients.<sup>2</sup>

The acute management of patients with NSTEMI is far from being straightforward. The decision whether or not to proceed with invasive coronary angiography (CA) and percutaneous coronary intervention (PCI) is influenced by a myriad of factors.<sup>3,4</sup> In the real-world context, both patient-related factors and physician beliefs and preferences are likely to weigh heavily in the decision, as would ease of access to CA and PCI services.

Through MINAP, Rashid et al.<sup>1</sup> were able to examine 452,216 NSTEMI patients treated in 235 different hospitals

over a 9-year period (2007-2015). The analysis stratified patients into 3 groups according to the type of initial treating hospital: no catheterisation laboratory (“no-lab”), diagnostic catheterisation laboratory only (“diagnostic”), and PCI-capable. All-cause in-hospital death, cardiovascular death, and bleeding outcomes were examined with the use of a multilevel logistic regression approach in which the type of hospital was included as a random intercept. A prespecified analysis examined outcomes for high-risk NSTEMI (Grace score > 140) for which clinical guidelines favour an invasive coronary treatment strategy within 24 hours.

From a health systems perspective, the first important observation was that PCI-capable hospitals were the least likely to be the primary destination for high-risk NSTEMI patients (53.4% of patients), while hospitals with no on-site catheterisation laboratory were the most likely (59.6%). Although the mode of prehospital transport was not reported, current protocols for emergency medical services that guide the choice of destination for patients with suspected high-risk NSTEMI clearly merit further consideration.

The proportion of patients with NSTEMI who underwent diagnostic angiography was highest in PCI-capable hospitals (77.3%), but similar between diagnostic and no-lab centers (63.2% and 61.4%, respectively). The proportions of patients undergoing PCI were more discrepant. While 45.9% of patients admitted to a PCI-capable hospital underwent revascularization, only 28.3% of patients admitted to a no-lab hospital were revascularised. The lowest rates of revascularization were observed in diagnostic hospitals (22.4% of patients). This surprising association remained after multivariate adjustment (odds ratio [OR] 0.88 [95% confidence interval [CI] 0.86-0.90] for diagnostic vs no-lab hospitals).

In the diagnostic hospitals, high-risk patients not transferred for PCI were more likely to have chronic renal failure and asthma or chronic obstructive pulmonary disease, as well as a history of cerebrovascular accident and peripheral vascular disease, than those who were transferred for PCI. This apparent conservatism may suggest risk aversion by

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See page 806 for disclosure information.

clinicians or patients. Such aversion is not uncommon and can result in patients who perhaps are the most likely to benefit from a PCI being the least likely to have access to it.<sup>5,6</sup>

So what do these variations in processes of care mean for patient outcomes in England and Wales? Rashid et al.<sup>1</sup> report that for high-risk patients with NSTEMI, the adjusted odds of in-hospital death were higher if they presented, or were transported by ambulance, to a diagnostic hospital: Relative to high-risk patients who were initially treated at a no-lab hospital, the OR was 1.36 (95% CI 1.06-1.75). These results raise questions about the value (outcomes in relation to costs) of diagnostic hospitals and their role in the care of patients suffering acute coronary syndromes. However, patient preferences, physician beliefs, and other factors that cannot possibly be captured by health administrative data, might well explain a great deal of variability observed by type of hospital.

The authors appropriately draw attention to the limitations of these observational analyses, and the observed variations in care and outcomes certainly merit further investigation to better inform improvement initiatives.<sup>7</sup> Their analysis would have benefitted from a more in-depth analysis of the interaction terms among type of hospital vs access to revascularization vs outcomes, as well as from the inclusion of socioeconomic variables, such as deprivation index or income.

These results demonstrate the potential contribution of real-world data from disease-based registries to inform decision making concerning patient selection and processes of care, particularly when the data pertain to a complete system of care.<sup>7</sup> They also should serve as a call to action by various stakeholders at different levels within NSTEMI care networks in England and Wales and elsewhere. The value of programs that can diagnose NSTEMI but cannot provide the necessary PCI intervention warrants careful reconsideration. Perhaps the focus should be put on direct transport or early transfer of NSTEMI patients to high-volume centres with PCI expertise.

In Canada, diagnostic-only centres are rare. No practice guidelines exist to address the direct transport or early transfer of NSTEMI patients to PCI-capable hospitals.<sup>8</sup> Obviously, improved automated electrocardiogram interpretation, rapid point-of-care biomarkers, and enhanced prehospital services are solutions that will eventually improve the channelling of NSTEMI patients toward the appropriate hospitals. To monitor this effort, access to health administrative data remains an essential part. The work done by the Canadian Institute for Health Information (CIHI) and their respective provincial agencies remains primitive.

Furthermore, outcomes of STEMI and of all MI combined are currently reported in Canada but not outcomes for NSTEMI.<sup>9</sup> The results presented by Rashid et al.<sup>1</sup> suggest there is an opportunity for improvement of quality of care of high-risk NSTEMI patients through collaborative efforts between clinicians, hospitals, and health care managers.

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