



acute MI received thrombolysis in this large Quebec cohort. In a similar large European cohort, 36% of patients with acute MI received thrombolysis, although up to 55% met the criteria.<sup>1</sup> In another, smaller Canadian study, 48.9% of patients with acute MI met the criteria for, and received, thrombolysis.<sup>2</sup> These data suggest a 12% to 19% rate of underutilization of thrombolysis in the Quebec cohort.

Second, the authors found that the strongest factor in delay to thrombolysis was decision-making that involved a cardiologist: the 75th percentile time from hospital arrival to thrombolysis was 32 minutes longer for cardiologists than for emergency physicians. Thus, the emergency physicians gave thrombolytics to 75% of the patients they treated within 78 minutes, whereas cardiologists did so within only 110 minutes. The authors make a convincing argument that this delay might relate to the fact that cardiologists are asked to make decisions in more complex cases. Although this may often be the case, Table 2 shows that fully 46% of the cohort were treated by cardiologists. Could all, or even most, of these cases have been so complex? Furthermore, most of the complex cases would probably appear in the last quartile of the time range and are therefore unlikely to explain the difference in the median or 75th percentile times.

A simple explanation for the delay may be that cardiologists, unlike emergency physicians, are rarely in the emergency department when a patient arrives with acute chest pain. It is easy to imagine how a 32-minute delay could be created by having to wait for the cardiologist to arrive, repeat the examination and decide on therapy. Many studies have shown that thrombolysis is administered significantly more rapidly by emergency physicians, with high rates of appropriateness.<sup>2</sup> I echo the authors' call to

guard against delays associated with consultation. The answer may well be for hospitals, emergency physicians and cardiologists to develop policies jointly, encouraging routine emergency thrombolysis by emergency physicians.

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This study raises some interesting points. Of note were the delays in thrombolysis when cardiologists were involved and for women and older patients. The authors' suggestion that "the delay associated with a cardiologist decision-maker may be a marker for . . . more complex cases" may be true. Such cases might include elderly patients, among whom there is a higher prevalence of atypical history, other complicating illnesses and nonspecific ECG results,<sup>1</sup> all of which are directly related to the decision about thrombolysis. However, the study fails to address the significant delays in decision-making for women and older patients once diagnostic ECG had been done. Brophy and colleagues considered only patients who received thrombolytics, not all patients presenting with chest pain, so the question of atypical presentation, contraindications and nonspecific ECG results may not have been significant factors in the delays. Current clinical and ECG criteria for thrombolysis in MI are fairly straightforward,<sup>2</sup> and one would expect a rapid decision regarding

thrombolysis, irrespective of age and sex. Yet studies have shown that women and older patients with MI are managed less aggressively.<sup>3</sup> Even among patients eligible for thrombolysis, increasing age and female sex are independently associated with lower likelihood of receiving this treatment.<sup>4</sup> It is also known that once the patient reaches the hospital and a decision for thrombolysis has been made, older age and female sex are independent predictors of delayed in-hospital treatment.<sup>5,6</sup> These age-related effects apply more to women than to men, because women with MI are on average older than men with this condition.<sup>5,6</sup> In one study, for example, women experienced a considerable delay before undergoing ECG, and the interval from diagnostic ECG to treatment was 17 minutes longer for women than for men.<sup>6</sup>

In the treatment of MI, "time is muscle" and delay is the enemy of successful thrombolysis. Except in equivocal cases, the first physician encountering a patient with MI should be able to both determine the need for thrombolysis and direct its administration, regardless of the patient's age or sex. If we are to improve the outcome of patients with MI, efforts should be directed toward women and elderly patients with this condition.

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### [One of the authors responds:]

Our registry was undertaken to identify possible impediments to the prompt administration of thrombolysis. As stated in the article, individual and overall performance results — the specific data Dr. Socransky suggests — were supplied to the participating centres, in the hope of encouraging them to implement any necessary corrective measures. The questions asked by Socransky are precisely the type of questions we believe are important.

Dr. Schull raises the possibility of underutilization of thrombolysis in the study cohort. Also of concern may be overutilization in situations

where there are limited or no chances of improved survival but where the risks of thrombolysis remain. Unfortunately, our method does not permit comment on these important issues. Schull also notes the delay in treatment associated with a cardiology consultation. Although some of the delay was due to complexity of the cases, at the 75th percentile level an additional 12 minutes was required for diagnostic ECG in cases in which a cardiologist made the decision to administer thrombolytics. Dr. Schull appropriately cautions against needless delays caused by routine consultation. We share this opinion and support his proposed solution.

Dr. Yusuf suggests that there might have been an age or sex bias in our cohort of patients and states that criteria for thrombolysis are “fairly straightforward.” We do not agree. With respect to sex, Table 3 shows only a 5-minute in-hospital difference (at the 75th percentile level) between men and women to the time of thrombolysis, a difference that appears to be due to an increase in decision time. However, the women in this cohort were significantly older than the men, and in the multivariate analysis sex was not predictive of

greater delays. Furthermore, unpublished data from this registry failed to show a bias on the basis of sex in the use of the more expensive thrombolytic agent, tissue plasminogen activator. Neither the benefits nor the risks of thrombolysis are independent of age. The utility of thrombolysis requires an appreciation of the probability of benefit as a function of not only time from presentation but also size and infarct location as well as the risk of serious bleeding complications. The complexity of this decision process is obviously greater in elderly patients and, in our opinion, the additional delay of 8 minutes for patients over 65 years of age (75th percentile level) is more a reflection of appropriate clinical judgement than of hidden biases.

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