Reducing time from symptom onset to reperfusion therapy decreases infarct size and improves survival in patients with ST-elevation myocardial infarction (STEMI). National quality improvement initiatives, including the Door-to-Balloon (D2B) Quality Alliance, have successfully disseminated evidence-based strategies to reduce door-to-balloon time.1,2 Many hospital systems have achieved the targeted door-to-balloon time <90 minutes for 75% of patients with STEMI presenting directly to a hospital with percutaneous coronary intervention capability.3 However, prehospital delay from time of symptom onset to hospital arrival remains the largest portion of the total delay time and has been refractory to interventions aimed at improving patient responsiveness.

For patients with STEMI, longer prehospital delay is associated with higher in-hospital mortality even after adjusting for patient-, hospital-, and system-level variables including door-to-balloon or door-to-needle time.4-5 In the past 15 years, 2 randomized controlled trials have tested whether educational interventions to improve patient knowledge about acute coronary syndrome (ACS) symptoms and to promote patient action to call 9-1-1 would reduce prehospital delay time. Luepker and colleagues randomized 20 US cities to serve as controls or to receive 18 months of education to reduce prehospital delay time. Luepker and colleagues randomized 20 US cities to serve as controls or to receive 18 months of education targeting mass media, community and professional organizations, and patients and clinicians in the Rapid Early Action for Coronary Treatment (REACT) trial.6 The median prehospital delay time was 2.3 hours at baseline and decreased slightly (4.7% per year) during the 18 months in the intervention group; however, this trend was not significantly different to that observed in the control group (P=0.54). The use of emergency medical services (EMS) increased modestly in the intervention group from a baseline rate of 33% to 39% (P<0.005) and did not change in the control group.

Since the disappointing findings from the REACT trial, there have been few insights or interventions to further our understanding of how to reduce prehospital delay. In this issue of Circulation: Cardiovascular Quality and Outcomes, Dracup et al7 randomized 3522 patients with documented coronary heart disease to receive an educational intervention or usual care in the Patient Response to Myocardial Infarction following a Teaching Intervention Offered by Nurses (PROMOTION) trial.7 The PROMOTION trial intervention consisted of a face-to-face encounter with a research nurse with cardiology expertise and telephone reinforcement at 1 month with the same nurse to improve patient knowledge about the symptoms and signs of heart attacks and to mitigate emotional and psychosocial reasons to delay. The primary outcomes, median prehospital delay time and use of EMS, were similar between intervention and control groups over 24 months follow-up (2.20 versus 2.25 hours, P=0.40, and 64% versus 67%, P=0.89, respectively).

Despite these negative findings, the study was well-designed and conducted and provides important insights about prehospital delay. First, the marked variation in use of EMS between U.S. hospitals (33.3%) as compared to Australian hospitals (66.7%) was intriguing and provocative. Although variations in prehospital delay time at the country level were not reported, the substantial variation in use of EMS between the United States and Australia suggests that factors such as insurance coverage, psychosocial factors, and cultural beliefs may be important in understanding the outcomes of interest. Would universal healthcare insurance that provided coverage for EMS transport influence patients’ decision to immediately seek medical care or call 9-1-1? Previous studies have documented that uninsured and underinsured patients are associated with reluctance to seek medical care and to comply with prescribed medications.8 Furthermore, any observed variability in impact of education on prehospital delay time and use of EMS at the hospital-level would be particularly informative of contextual requirements for education to be an effective intervention.

Second, subgroup analysis revealed that patients receiving the educational intervention were more likely than patients in the control group to use EMS if their ACS symptoms occurred within the first 6 months after the intervention, and, unlike other outcomes, this difference was statistically significant (P=0.036). Although it is not possible to draw conclusions from subgroup analyses because the variables affecting the outcomes of interest may not be balanced by

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randomization, this finding suggests that patient knowledge resulting from education may decay over time. The pattern of knowledge retention and the effectiveness of repeated educational interventions require additional investigation. The magnitude of effect in the higher use of EMS and any difference in prehospital delay time for patients within 6 months of the educational intervention were not reported.

There are several implications of the PROMOTION trial for future studies seeking to understand and reduce prehospital delay. First, educational interventions are unlikely to have a major impact on prehospital delay time or use of EMS in patients with ACS. For educational interventions to be effective, there must be evidence that a knowledge gap exists in the targeted group, accounts for the observed defect, and can be corrected and sustained with an educational intervention.9 REACT and PROMOTION suggest that educational interventions to improve patient knowledge of ACS symptoms and promote patient responsiveness to seek medical care have failed to reduce prehospital delay time. Although patient education and knowledge transfer are important and necessary domains of clinical care, they are not sufficient to reduce prehospital delay time or increase use of EMS. Moreover, an ideal system of care should strive to normalize education interventions to be delivered and reinforced by the entire clinical team (including physicians) as a part of routine usual care.10 For instance, at the time of hospital discharge, a patient is required to uptake instructions from the physician and clinical team about diet, exercise, prescribed medications, and smoking cessation; consequently, will the patient be receptive to education about prehospital delay delivered solely by a nurse? Opportunities and teachable moments to normalize educational interventions include the time of hospital discharge, reconciliation of outpatient medications, stress testing, or cardiac rehabilitation.

Second, researchers should seek causal factors for delay that may be amenable to intervention. Although previous studies have consistently shown that female gender, older age, and minority race are associated with longer prehospital delay, these variables are not modifiable with quality improvement interventions. However, a recent study exploring attachment theory has found that patients who had lower trustworthiness of others to provide needed care reported greater intention to delay to seek care for a heart attack.11 This low trustworthiness of others may be concentrated in patient sociodemographic characteristics associated with longer prehospital delay (ie, female gender, older age, minority race). Hence, although gender, age, and race may not be modifiable, the psychosocial and cultural beliefs of these vulnerable groups must be understood if we desire to effectively impact prehospital delay time. Furthermore, the patient’s ability to pay for healthcare costs, including the hospital admission and EMS transport, are structural factors likely associated with a patient’s decision to seek care. Differences in health insurance coverage and prehospital delay time would help illuminate the importance and magnitude of this variable.

The cornerstone of treatment in patients with STEMI is to minimize the time from symptom onset to reperfusion therapy. Although much has been learned and disseminated on improving access to primary percutaneous coronary intervention, timeliness of primary percutaneous coronary intervention, and in-hospital mortality, prehospital delay time remains the longest portion of the total delay time and much work remains to be undertaken to understand why patients delay, and what structural and psychosocial factors could be modified to reduce prehospital delay time. Educational interventions have not been successful to date, although studies regarding the timing, intensity, decay, and who delivers the education would be informative. Perhaps, this field needs more innovative and disruptive strategies such as those used by marketing firms to understand and influence customer behavior to change the inertia in patient responsiveness.

Disclosures

None.

References


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Patient Education to Reduce Prehospital Delay Time in Acute Coronary Syndrome: Necessary But Not Sufficient
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