EDITORIAL COMMENT

Accurately Gauging Ischemic Time
Still an Important Measure

Mariem A. Sawan, MD,[a] Spencer B. King III, MD[b]

The study by Mills et al[1] in this issue of *JACC: Advances* highlights the critical importance of time in the treatment outcomes of ST-elevation myocardial infarction (STEMI). Specifically, the study emphasizes the significance of prompt intervention, showing a notable increase in adverse events when the system delay between a patient's distress call and percutaneous coronary intervention (PCI) exceeds 60 minutes. This revelation of a threshold effect at the 60-minute mark underscores the urgent need for timely medical intervention, as delays beyond this point correlate with markedly poorer outcomes, even within the recommended guideline time of 120 minutes for prehospital diagnosis to PCI.

These findings provide valuable insights into optimizing STEMI treatment protocols, emphasizing the importance of minimizing system delays to ensure timely access to PCI. Particularly noteworthy is the study's comparison with earlier data,[2-5] highlighting the continued need for advancements in prehospital care despite the advent of field electrocardiograms (ECGs), which have facilitated more rapid diagnosis and triage of STEMI patients.

Furthermore, the study prompts a reevaluation of current treatment protocols by challenging the traditional focus on door-to-balloon times. It distinguishes between patient delay and system delay, emphasizing the latter's potential for intervention and improvement. This nuanced understanding underscores the importance of optimizing health care systems to minimize delays in treatment initiation and maximize patient outcomes.

The study's sensitivity analysis for non-STEMI cases suggests a need for tailored treatment approaches based on specific characteristics of different cardiac events. Overall, these insights urge health care providers to prioritize minimizing system delays and optimizing time to treatment, ultimately enhancing patient outcomes, and mitigating the impact of myocardial infarction.

The undertaking of this study in Denmark, a country renowned for its advanced public health care infrastructure, underscores the challenges associated with replicating similar research endeavors in the United States. Despite the uniform emergency number (911) across the United States, responses to cardiac emergencies exhibit significant heterogeneity.[6] In Denmark, where the populace is well-informed about optimal pathways to access emergency cardiac care, call times likely serve as reliable proxies for ischemic time. Conversely, in the United States, the multiplicity of organizations involved in patient care and the various reimbursement schemes have resulted in a fragmented landscape for seeking emergency care.[7] This fragmentation poses a considerable obstacle to accurately gauging ischemic time, thus prompting the prevalent use of door-to-balloon time in STEMI studies. Moreover, the absence of a unified public health care system in the United States complicates the implementation of quality improvement initiatives.[8] While individual health care entities may strive to enhance their door-to-balloon times, they exert limited influence over patients' decisions to seek care or the functioning of emergency medical systems.

This study's focus on prehospital ECGs further underscores their role in facilitating early diagnosis and triage of STEMI patients. By enabling swift identification of STEMI in the field, prehospital ECGs expedite the initiation of appropriate treatment and

From the ᵃDivision of Cardiology, Emory University School of Medicine, Atlanta, Georgia, USA; and the ᵇEmory University Healthcare, Atlanta, Georgia, USA.

streamline patient pathways through the health care system.[9,10] Additionally, they contribute to seamless communication between emergency medical services personnel and receiving health care providers, optimizing the efficiency of STEMI care delivery.

Investment in prehospital ECG technology and population-focused medical response is deemed crucial to enhance the quality and efficiency of cardiac care, particularly for STEMI patients.[11] By reducing time to treatment and minimizing delays, population-based emergency medical services, public education, and prehospital ECGs play a pivotal role in improving patient outcomes and reducing health care costs associated with delayed intervention. Thus, they represent strategic imperatives in optimizing STEMI care pathways and ultimately saving lives.

ADDRESS FOR CORRESPONDENCE: Dr Spencer B. King III, Emory University School of Medicine, 1440 Clifton Road, NE, Suite 400, Atlanta, Georgia 30322, USA. E-mail: spencer.king@emoryhealthcare.org.

REFERENCES

1. Mills EHA, Møller AL, Engstrøm T, et al. Time from distress call to percutaneous coronary intervention and outcomes in myocardial infarction. *JACC Adv*. 2024;3:101005.

2. Scholz KH, Maier SKG, Maier LS, et al. Impact of treatment delay on mortality in ST-segment elevation myocardial infarction (STEMI) patients presenting with and without haemodynamic instability: results from the German prospective, multicentre FITT-STEMI trial. *Eur Heart J*. 2018;39(13):1065–1074. https://doi.org/10.1093/eurheartj/ehy004

3. Park J, Choi KH, Lee JM, et al. Prognostic implications of door-to-balloon time and onset-to-door time on mortality in patients with ST-segment-elevation myocardial infarction treated with primary percutaneous coronary intervention. *J Am Heart Assoc*. 2019;8(9):e012188. https://doi.org/10.1161/JAHA.119.012188

4. Roswell RO, Greet B, Parikh P, et al. From door-to-balloon time to contact-to-device time: predictors of achieving target times in patients with ST-elevation myocardial infarction. *Clin Cardiol*. 2014;37(7):389–394. https://doi.org/10.1002/clc.22278

5. De Luca G, Suryapranata H, Zijlstra F, et al. Symptom-onset-to-balloon time and mortality in patients with acute myocardial infarction treated by primary angioplasty. *J Am Coll Cardiol*. 2003;42(6):991–997. https://doi.org/10.1016/S0735109703009197

6. de Boer MJ, Zijlstra F. STEMI time delays: a clinical perspective: editorial comment on the article by Verweij et al. *Neth Heart J*. 2015;23(9):415–419. https://doi.org/10.1007/s12471-015-0728-z

7. Brooks SC, Schmicker RH, Cheskes S, et al. Variability in the initiation of resuscitation attempts by emergency medical services personnel during out-of-hospital cardiac arrest. *Resuscitation*. 2017;117:102–108. https://doi.org/10.1016/j.resuscitation.2017.06.009

8. Agha L, Frandsen B, Rebitzer JB. Fragmented division of labor and healthcare costs: evidence from moves across regions. *J Public Econ*. 2019;169:144–159.

9. Nakashima T, Hashiba K, Kikuchi M, et al. Impact of prehospital 12-lead electrocardiography and destination hospital notification on mortality in patients with chest pain - a systematic review. *Circ Rep*. 2022;4(5):187–193. https://doi.org/10.1253/circrep.CR-22-0003

10. Park K, Park JS, Cho YR, et al. Community-based pre-hospital electrocardiogram transmission program for reducing systemic time delay in acute ST-segment elevation myocardial infarction. *Korean Circ J*. 2020;50(8):709–719. https://doi.org/10.4070/kcj.2019.0337

11. Ting HH, Krumholz HM, Bradley EH, et al. Implementation and integration of prehospital ECGs into systems of care for acute coronary syndrome: a scientific statement from the American Heart Association Interdisciplinary Council on Quality of Care and Outcomes Research, Emergency Cardiovascular Care Committee, Council on Cardiovascular Nursing, and Council on Clinical Cardiology. *Circulation*. 2008;118(10):1066–1079. https://doi.org/10.1161/CIRCULATIONAHA.108.190402