Comparison of Delay Times from Symptom Onset to Medical Contact in Blacks Versus Whites With Acute Myocardial Infarction

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Clinical outcomes in acute myocardial infarction (AMI) worsen with increasing delay between symptom onset and clinical presentation. Previous studies have shown that black patients with AMI have longer presentation delays. The objective of this analysis is to explore the potential contribution of community factors to presentation delays in black patients with AMI. We linked clinical data for 346,499 consecutive patients with AMI from the Acute Coronary Treatment Intervention Outcomes Network Registry-Get With the Guidelines (ACTION Registry-GWTG) to socioeconomic and community information from the American Community Survey. Black patients with AMI had longer symptom onset to first medical contact times than white patients (114 vs 101 minutes, p <0.0001) regardless of ambulance versus self-transport. Compared with white patients, black patients were younger and more likely to have clinical co-morbidities such as hypertension, diabetes, previous heart failure, and stroke. They were also more likely to live in urban communities with lower socioeconomic status, lower rates of long-term residence, and higher proportion of single-person households than white patients. In sequential linear regression models adjusting for patient demographic and clinical characteristics, logistic barriers to prompt presentation, and community socioeconomic and composition factors, black patients had a persistent 9% greater time from symptom onset to presentation compared with white patients (95% CI 8% to 11%, p <0.0001). In conclusion, the longer delay in time to presentation in black patients with AMI compared with white patients persists after accounting for a number of both patient and community factors. © 2017 Elsevier Inc. All rights reserved. (Am J Cardiol 2017;119:1127–1134)

Mortality risk increases with greater treatment delays in patients with acute myocardial infarction (AMI). Current practice guidelines underscore the importance of prompt initiation of treatment. While current performance metrics (e.g., first medical contact-to-balloon time) focus on delays that can be ameliorated by provider-level interventions, patient-related delays in MI presentation are also significant and are potential targets of educational interventions. Evidence suggests that both patient demographic and clinical characteristics contribute to AMI presentation delays. Black race has been associated with longer delays, particularly when combined with other factors such as female gender, older age, and lower income level. Although we know that the incidence of coronary heart disease is higher and AMI survival rates are lower in subjects living in socioeconomically disadvantaged communities, little is known about the contribution of an individual’s community of residence to presentation delays in patients with AMI. Socioeconomic and physical features of a community could be barriers to prompt presentation (e.g., distance to hospital, social isolation) contributing to longer treatment delays for black patients. Using a novel linkage between data from the National Cardiovascular Data Registry (NCDR) and the American Community Survey, we evaluated differences in demographic and clinical characteristics, logistical factors, as well as community socioeconomic factors and resident composition between black and white patients presenting with AMI and iteratively adjusted for these characteristics to assess their contribution to the longer symptom onset to first medical contact delays observed in black versus white patients with AMI.

Methods

The NCDR Acute Coronary Treatment Intervention Outcomes Network Registry-Get With the Guidelines (ACTION Registry-GWTG) is an ongoing quality improvement registry of consecutive patients presenting to participating centers (n = 1,024) in the United States with ST-elevation MI (STEMI) and non–ST-elevation MI (NSTEMI). The registry collects detailed clinical
information, including symptom onset time, patient characteristics, and care processes, using standardized definitions (available at http://cvquality.acc.org/~media/QII/NCDR/DataCollectionForms/ACTIONv2CodersDictionary24.ashx). This registry was either approved by an institutional review board or considered quality assurance data and not subject to institutional review board approval based on individual hospital determinations.17

The American Community Survey is a continuous nationwide survey of a randomly selected subset of households in the United States, collecting more detailed information than the standard Census Bureau “Short Form” survey, which includes detailed queries regarding housing and population characteristics, enabling annual data summaries of social, housing, demographic, and economic data.18,19 For this analysis, we used the 5-year estimate for the 2007 to 2011 data set.20 Patient’s zip code of residence, captured in the ACTION Registry-GWTG data collection form, was used to link individual patients to community socioeconomic status data for each zip code tabulation area. A similar zip code–based approach has previously been used to examine the influence of race and socioeconomic status on life expectancy after acute MI.21 Data definitions for the survey are published online.22

This analysis started with 554,214 patients with NSTEMI or STEMI in ACTION Registry-GWTG between July 1, 2008, and March 31, 2014. Although the delay between symptom onset to first medical contact is more relevant to patients with STEMI, we included patients with NSTEMI in the analysis population as patients themselves cannot distinguish between the 2 before medical contact. We started the analysis population with patients whose race was identified as black or white and excluded patients missing key data points (Figure 1). Our final study population included a total of 346,499 patients from 744 hospitals, 146,168 of whom presented with STEMI. Given the large number of patients missing symptom onset time or zip code information, baseline characteristics of the patients missing these data were compared against the included study population (Appendix 1); the only notable differences was a higher proportion of patients with STEMI in the included study population (42% vs 31%).

The primary outcome was delay to first medical contact, calculated as the time from symptom onset to first medical contact. Symptom onset time was recorded from clinical records by trained data abstractors. Due to the possibility of racial differences in ambulance utilization, we elected to study time to first medical contact instead of time to hospital arrival. Time of first medical contact was defined as the time emergency medical services first arrived in the field or the time of first hospital arrival if the patient self-transported. Driving distance was calculated using Google Maps, which has demonstrated acceptable performance relative to documented transport times in a previous analysis.23

A p value of 0.05 was considered statistically significant for all tests. All tests of statistical significance were 2 tailed. Continuous and ordinal categorical variables were compared using Wilcoxon rank-sum tests. Nominal categorical variables were compared using chi-square tests. The data was right skewed, normalized by natural log transformation, providing parameters corresponding to multiplicative changes in delay from symptom onset to presentation. The linear regression model was fit using a generalized estimating equations method with exchangeable working correlation matrix to account for within-hospital clustering because patients treated at the same hospital were more likely to have correlated responses relative to patients treated at another hospital. Iterative linear regression models were performed, starting with an adjustment for patient demographic variables, then adding clinical covariates, and logistic barriers to prompt presentation. Then, subsequent models added community socioeconomic and composition characteristics with variable selection based on previous literature, as well as clinical intuition on what may influence the rapidity of medical attention seeking. Model 1 adjusted for age and gender. Model 2 added clinical covariates (body mass index, smoking status, hypertension, dyslipidemia, diabetes, previous MI, previous heart failure, previous percutaneous coronary intervention, previous coronary
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