

## In-Hospital Cardiac Arrest: Disparities in Survival Outcomes for Blacks

Chan PS, Nichol G, Krumholz HM, et al. Racial differences in survival after in-hospital cardiac arrest. *JAMA* 2009;302:1195–201.

### Study Overview

**Objective.** To determine racial differences in survival for patients with cardiac arrest due to ventricular arrhythmia and to estimate the relative role of sociodemographic and clinical factors and admitting hospital in explaining these differences.

**Design.** Retrospective cohort study.

**Setting and participants.** Data from the National Registry of Cardiopulmonary Resuscitation (NRCPR) was obtained for 10,011 patients with cardiac arrest due to ventricular fibrillation or pulseless ventricular tachycardia enrolled between 1 Jan 2000 and 29 Feb 2008 at 274 acute care hospitals located throughout the United States.

**Main outcome measures.** Survival to hospital discharge after an in-hospital cardiac arrest (primary outcome); successful resuscitation from initial cardiac arrest (return of spontaneous circulation [ROSC] for at least 20 minutes during the acute resuscitation), and post-resuscitation survival among these patients (secondary outcome measures). Cardiac arrest was defined as the absence of palpable central pulse, apnea, and unresponsiveness. Cases were identified by multiple methods, including collection of cardiac arrest flow sheets, review of hospital paging systems logs, and routine checks of code carts, pharmacy tracer drug records, and hospital billing charges for use of resuscitation medications.

For each of the study outcomes, multivariable models were used to examine the association between patient factors, hospital factors, and racial differences in survival. In addition to race, other patient factors included age, gender, initial cardiac rhythm, and comorbidities or medical condition present prior to cardiac arrest. Hospital factors included the hospital's geographic region, licensed bed volume (< 250, 250–499, ≥ 500 inpatient beds), academic training program status (no training program, residency program only, residency and fellowship programs), and hospital process variables for handling cardiac arrest patients.

**Main results.** The study included 1883 black patients (18.8%) and 8128 white patients (81.2%). Survival to discharge rates

were significantly lower for black patients (25.2%) versus white patients (37.4%) (unadjusted relative risk [RR], 0.73 [95% confidence interval {CI}, 0.67–0.79]). After adjustments for patient characteristics, racial differences narrowed (adjusted RR, 0.81 [95% CI, 0.75–0.88];  $P < 0.001$ ). Additional adjustment for the hospital in which the patient was admitted further attenuated the racial differences in survival to discharge (adjusted RR, 0.89 [95% CI, 0.82–0.96];  $P = 0.002$ ). Rates of ROSC were lower among black patients than among white patients (55.8% vs. 67.4%), and were further attenuated after adjusting for patient factors (adjusted RR, 0.88 [95% CI, 0.84–0.92]) and the hospital to which the patient was admitted (adjusted RR, 0.92; 95% CI, 0.88–0.96). Adjusting for the hospital site where patients received care explained a significant portion of racial difference in resuscitation (adjusted RR, 0.92 [95% CI, 0.88–0.96];  $P < 0.001$ ) and eliminates the racial differences in post-resuscitation survival (adjusted RR, 0.99 [95% CI, 0.92–1.06];  $P = 0.68$ ). Lower resuscitation and post-resuscitation survival was found in hospitals with high concentrations of black cardiac arrest patients.

**Conclusion.** Many factors contribute to whether or not a patient survives an in-hospital cardiac arrest; however, lower resuscitation and post-resuscitation rates in hospitals with a high concentration of black patients substantially explained the racial differences in survival. Improvements in the delivery of resuscitation and the quality of post-resuscitation in hospitals where black patients are more likely to seek care are vital in order to eliminate these racial disparities.

### Commentary

In the United States, rates of survival to discharge for black adults who suffer in-hospital cardiac arrest are considerably lower than those for whites. Until this study, it was difficult to disaggregate effects of race from confounding factors. Prospective data collected in the National Registry of Cardiopulmonary Resuscitation allowed careful examination of this issue. The hospital center in which a patient received care played a substantial role in the differences in outcomes, with low survival rates seen in hospitals with a large concentration of black cardiac arrest patients. Furthermore, rates of

delayed defibrillation were higher for black patients than for white patients, resulting in lower ROSC rates. While several confounding factors such as socioeconomic status (eg, income, employment status, educational level, health behaviors, or psychosocial factors) may intensify this association and warrant close examination [1], other factors responsible for hospital-level disparities (eg, quality of CPR, training of staff) could not be examined and require further study. For example, inadequately low chest compression rates and shallow compression depth, as well as high ventilation rates (ie, not adhering to American Heart Association and international CPR guidelines) are factors not captured in this study [2,3]. Audiovisual feedback and debriefing methods have been shown to improve quality of resuscitation [4,5].

### **Applications for Clinical Practice**

Thorough understanding of the underlying sociodemographic, clinical, and hospital factors causing significant disparities in survival after in-hospital cardiac arrest among blacks is crucial to increasing survival rates. Because hospital differences contributed greatly to the disparities observed, it is important to evaluate the quality of current training in resuscitation afforded to physicians and hospital staff and the determinants of physician decision-making regarding resuscitation [1,6]. Unlike many other racial disparities in

health care, we might be able to bridge the gap for differences in survival after in-hospital resuscitation.

—Review by *Joyce Gyanfi, MS (NYU Langone Medical Center, New York, NY), and Nirav R. Shah, MD, MPH*

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