Public Report Cards for In-Hospital Cardiac Arrest:
Empowering the Public With Location-Specific Data

Running title: Merchant; Public report cards for IHCA

Raina M. Merchant, MD, MSHP

1Dept of Emergency Medicine, University of Pennsylvania, Philadelphia, PA; 2Penn Medicine Social Media and Health Innovation Lab, University of Pennsylvania, Philadelphia, PA

Address for Correspondence:
Raina Merchant, MD, MSHP
University of Pennsylvania
423 Guardian Drive
Philadelphia, PA 19104
Tel: 215-847-9500
Fax: 215-573-2742
E-mail: Raina.merchant@uphs.upenn.edu

Journal Subject Codes: Ethics and policy:[100] Health policy and outcome research, Etiology:[8] Epidemiology

Key words: cardiopulmonary resuscitation, geography, Editorial, cardiac arrest, public policy
Each year, there are approximately 200,000 cardiac arrests in hospitalized patients in the United States (US)\(^1\) and survival rates remain very poor.

In this issue of *Circulation*, Fonarow et al. present new findings about regional variability in resuscitation rates and outcomes across the US.\(^2\) The authors reviewed records of over 800,000 in-hospital cardiac arrest (IHCA) events from 2003-2011, and identified that cardiac arrest in hospitalized patients was common with an incidence of 2.85/1000 admissions. Most notably they reported significant variability in IHCA across states with a nearly 6-fold difference in incidence and 2-fold difference in outcomes. With this substantial variance across states, it is likely that the differences within states are even greater. These findings are disturbing and clearly signal that where you live and where you arrest matter. As with any good study, this work raises more questions than it answers. Namely, what are the factors driving this variability and how can we narrow the gap between which hospitalized patients live and which die? Ultimately, this information is critically important to patients for making informed decisions about the locations where they receive healthcare.

First this variability could be driven by differences in hospital capabilities. Clearly hospitals vary in the services they provide, areas of excellence, and approach to the management of critically ill patients. Differences across hospitals could relate to structural variables (e.g. size, staffing ratios, teaching status) and/or process variables (e.g. targeted temperature management, emergency cardiopulmonary bypass). Comprehensive strategies for cardiac arrest management at resuscitation-specific centers may also apply bundles of care that could collectively rather than individually impact outcomes.\(^3\) This is important, as there are a multitude of factors along the clinical pathway between the antecedents of IHCA, post-arrest care, and hospital discharge.

Second, this variability could reflect a disturbing safety issue. As many IHCA are both
predictable and preventable, hospitals may differ in how they monitor and track admitted patients. Some hospitals may apply different approaches to telemetry monitoring, early ICU placement, use of rapid response teams and other methods of early detection of critical illness. Once an IHCA occurs, prior work also reflects differences in resuscitation practices like delays in defibrillation, and variability in code duration—which may also reflect safety issues associated with the quality of care that patients receive.\(^4\),\(^5\)

Third, hospitals may differ in which patients even receive resuscitation attempts. A particularly important hospital-level variable relates to the proportion of patients that have resuscitation interventions withheld because of advanced directives and do not resuscitate (DNR) status. For example, even hospitals with clinically similar patient populations may vary in which of those patients are resuscitated in the event of IHCA (i.e. DNR intensity).\(^6\) A hospital that resuscitates few of its patients in the setting of arrest reveals that it is applying additional selection decisions to those patients. It is likely that some of those decisions reflect relevant but unobserved patient differences and so hospitals with high DNR use could have better outcomes among those resuscitated even after adjusting for otherwise observable patient characteristics. The hospital characteristic of DNR intensity may be an appropriate adjustor in understanding IHCA incidence and survival rates.\(^7\)

Similarly, IHCA practices may be impacted by out-of-hospital cardiac arrest practices. In this regard, hospitals situated in communities with exemplary pre-hospital care (e.g. high bystander response rates, high CPR quality rates, early defibrillation) may apply similar system level approaches to in-hospital patients as a result of exposure to good outcomes for patients with early community interventions.

Fourth, regional IHCA variability may reflect differences in how IHCA is reported across
hospitals and strategies for risk-adjustment.8-11 To date, US databases with IHCA information vary in size, inclusion/exclusion criteria, definitions of events, and other features. The study by Fonarow et al, reports on data from the National Inpatient Sample (NIS), the largest all-payer nationwide database of care for hospitalized patients. Sponsored by the Agency for Healthcare Research and Quality, the NIS includes data from a stratified sample of approximately 1000 hospitals representing most (>95%) of the US population. This comprehensive data extracted from state mandated hospital discharge reports allows for estimation of the denominator of hospitalizations which is useful for estimating incidence. One potential limitation of NIS is that in the absence of an ICD-9 code for IHCA, the procedure code of CPR is used as a surrogate. This may lead to an underestimation of IHCA events, skewing the true estimate of incidence. The NIS also does not collect data about patients’ functional neurologic status at discharge. This is a critical delineation as survival post arrest can represent a range of functional outcomes from near baseline to severe debilitation. By contrast, many prior reports of IHCA are from the American Heart Association Get With the Guidelines-Resuscitation Registry, a database of resuscitation events extracted from medical records at select hospitals.8 Detailed information is collected about each arrest event and neurologic status at discharge, but participation in the registry is voluntary and the hospitals and patients do not represent a nationwide sample. The work by Fonarow et al, is important for exploring the opportunities and trade-offs associated with analyzing the NIS for surveilling IHCA.

Clearly there are a multitude of drivers of IHCA variability and many of these are likely interconnected. To begin to address these will require an understanding of the specific factors which are measurable and modifiable. Ultimately, improving arrest care is dependent on the ability to quantify and change it. A mandatory standardized system for reporting and surveillance
could be an important first step. Current efforts to make OHCA a reportable condition are underway and similar approaches could be taken for IHCA. Arguably, this data repository would be of great value for patients as they regularly make decisions about where to receive healthcare and have clear expectations for the quality and outcomes that they expect. At present, if a patient wanted to better understand their risk for IHCA it’s unclear where they would find this information. They could look at publicly available sites like Hospital Compare for Hospital Consumer Assessment of Healthcare Providers and Systems (HCAPS) data about hospital quality and 30-day mortality for select conditions, an online provider rating website (e.g. Health Grades), or an online business rating site (e.g. Yelp) for patient-generated comments about hospital experiences. If other aspects of care were equivalent across facilities, would anyone want to receive care at a hospital with a high incidence of cardiac arrest and a low incidence of survival? In its current format, it would be challenging for patients to use this information when reported at the state level to make an informed decision about a planned hospitalization. If the state level information presented by Fonarow et al also existed at the hospital level in a readily accessible, easily interpretable report card it may be more likely to be used by patients for making choices about where to receive care and by other stakeholders (e.g. providers, researchers, policymakers) seeking to track and improve care. As there is a movement towards increased transparency about quality, safety, and outcomes this represents essential information that it is important to collect, report, and make available.

Consistent with evolving changes in healthcare of networked electronic medical records, big data analytics, and a push towards data access, there are opportunities to aim for comprehensive and timely data about IHCA in US hospitals. Our charge is to identify the drivers of IHCA variability, and track progress in a standardized comprehensive national database over
time. This should occur in a manner that is accessible to patients and others so that IHCA becomes a rare event. The work by Fonarow et al lays the groundwork for moving us there.

Conflict of Interest Disclosures: Dr. Merchant reports grant/research support from NIH, K23, Grant 10714038, Pilot funding from Physio-Control, Seattle, WA; Zoll Medical, Boston, MA; Cardiac Science, Bothell, WA; Philips Medical Seattle, WA.

References:


2003;58:297-308.


Public Report Cards for In-Hospital Cardiac Arrest: Empowering the Public With Location-Specific Data
Raina M. Merchant

Circulation. published online March 19, 2015;

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/early/2015/03/19/CIRCULATIONAHA.115.016023