Hospital Quality Metrics: "America's Best Hospitals" and Outcomes After Ischemic Stroke

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Background: Developing quality metrics to assess hospital-level care and outcomes is increasingly popular in the United States. The *U.S. News & World Report* ranking of "America's Best Hospitals" is an existing, popular hospital-profiling system, but it is unknown whether top-ranked hospitals in their report have better outcomes according to other hospital quality metrics such as the Centers for Medicare and Medicaid Services (CMS) publicly reported 30-day stroke measures. *Methods*: The analysis was based on the 2015-2016 *U.S. News & World Report* ranking of the 50 top-rated hospitals for neurology and neurosurgery and 2012-2014 CMS Hospital Compare Data. We used mixed models adjusted for hospital characteristics and weighted by hospital volume to compare 30-day risk-standardized mortality and readmission between top-ranked and other hospitals. Among the 50 top-ranked hospitals, we determined whether ranking order was associated with the CMS outcomes. *Results*: Compared with 2737 other hospitals, the 50 top-ranked hospitals had lower 30-day mortality (14.8% versus 15.3%) but higher readmission (14.5% versus 13.3%). These patterns persisted in adjusted analyses with top-ranked hospitals having .72% (95% confidence interval [CI] −1.09%, −.34%) lower mortality and .41% (95% CI .16%, .67%) higher readmission. Among top-ranked hospitals, rank order was not associated with mortality (.05% decrease in mortality with each rank, 95% CI −.10%, .01%) or readmission (.02% increase; 95% CI −.03%, .06%). *Conclusion*: Admission to a top-ranked hospital for neurology or neurosurgery was associated with lower 30-day risk-standardized mortality but higher readmission after ischemic stroke. There was heterogeneity in outcomes among the 50 top-ranked hospitals.

Key Words: ischemic stroke—quality of health care—mortality—readmission—Medicare

Introduction

The assessment of quality of care and outcomes provided by hospitals has become increasingly important in the United States. The ranking of "America's Best Hospitals" by *U.S. News & World Report* (*USN&WR*) is among the most recognized, existing, and publicly available hospital-profiling systems. A *USN&WR* national ranking (ie, a top-50 hospital) is commonly cited in consumer advertising as a hospital quality indicator reflecting excellence in patient care.[1] The Centers for Medicare and Medicaid Services (CMS) publicly reports hospitals' 30-day all-cause, risk-standardized mortality and readmissions for ischemic stroke as quality of care indicators.[2] However, it is unknown how well these two ranking systems correlate. Accordingly, we assessed whether the *USN&WR* 50 top-ranked hospitals for

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Received June 25, 2018; revision received October 3, 2018; accepted October 13, 2018.

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1052-3057/$ - see front matter

https://doi.org/10.1016/j.jstrokecerebrovasdis.2018.10.022

Table 1. *Hospital characteristics*

	Top-ranked hospitals ($n = 50$)	Other hospitals ($n = 2737$)	P value
Bed size, median (IQR)	781.5 (271)	179 (208)	<.001
Large teaching, *n* (%)	49 (98.0)	213 (7.8)	<.001
Private, not for profit, *n* (%)	42 (84.0)	1827 (66.8)	.010
Joint Commission-certified, *n* (%)	49 (98.0)	2274 (83.1)	.005
Rural, *n* (%)	9 (18.0)	806 (29.4)	.078
Critical access hospital, *n* (%)	0 (0.0)	177 (6.5)	.073

Abbreviation: IQR, interquartile range.

neurology and neurosurgery have better hospital-level outcomes after stroke based on the CMS publicly reported metrics, and whether outcomes are comparable among the 50 top-ranked hospitals.

Methods

Hospital Rankings and Characteristics

We identified the 50 top-ranked hospitals for neurology and neurosurgery in the United States as reported in the 2015-2016 *USN&WR's* "Best Hospitals" issue.[3] The hospitals had been ranked based on Donabedian's model of structure, process, and outcomes for assessing healthcare quality.[1] All American Hospital Association hospitals were eligible for ranking by the *USN&WR* provided they met at least one of the following requirements: (1) teaching hospital, (2) medical school affiliation, (3) ≥200 beds, or (4) ≥100 beds and ≥4 of 8 medical technologies considered important for the patient population. For specialty ranking, hospitals must have met a specialty-dependent volume/discharge threshold or been nominated by ≥1% of physicians responding to the survey.

We supplemented the *USN&WR* "Best Hospitals" rankings with data from the American Hospital Association Annual Survey[4] to determine bed size and classify hospitals as teaching institutions, not-for-profit, Joint Commission-certified, rural, or critical access hospitals.

Hospital-Level Mortality and Readmissions

We obtained hospital-level 30-day risk-standardized all-cause mortality rates (death within 30 days of hospital admission) and risk-standardized all-cause readmission rates (readmission within 30 days of hospital discharge) for ischemic stroke from the CMS Hospital Compare database.[2] CMS reports these measures as quality indicators, and they were constructed using claims data and hierarchical regression models that adjusted for differences in case mix for hospitals with ≥25 stroke cases during the 2-year measurement period (June 30, 2012 to July 1, 2014).[5] Because these data are publicly available and contain no patient-identifying information, the study was exempt from ethics committee review.

Statistical Analysis

We compared characteristics of the 50 top-ranked hospitals and all other included American Hospital Association hospitals in bivariate analyses. We assessed differences in the CMS risk-standardized mortality and readmission measures for top-ranked hospitals versus the other hospitals in mixed models adjusted for hospital characteristics and weighted by hospital volume. We also compared the 50 top-ranked hospitals to other teaching hospitals. Among the 50 top-ranked hospitals, we fit similar mixed models to assess the relationship

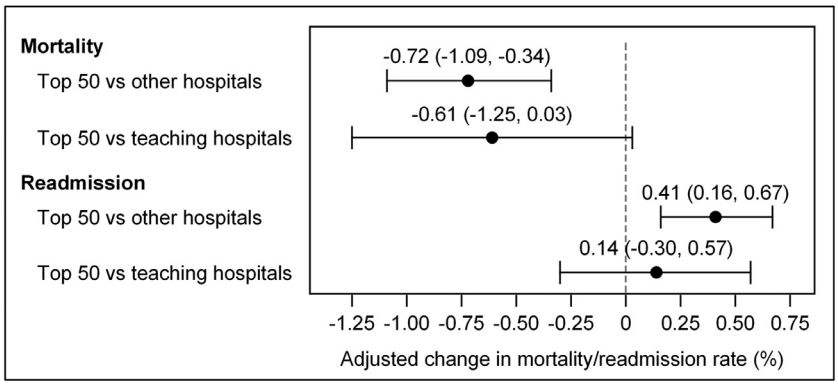

Figure 1. *Risk-standardized mortality and readmission rates for the 50 top-ranked hospitals versus other hospitals. Mixed models adjusted for hospital characteristics and weighted by hospital volume were used to assess differences in risk-standardized mortality and readmissions between top-ranked versus other hospitals. The forest plot summarizes the percentage point difference between the hospital groups and the corresponding 95% confidence intervals.*

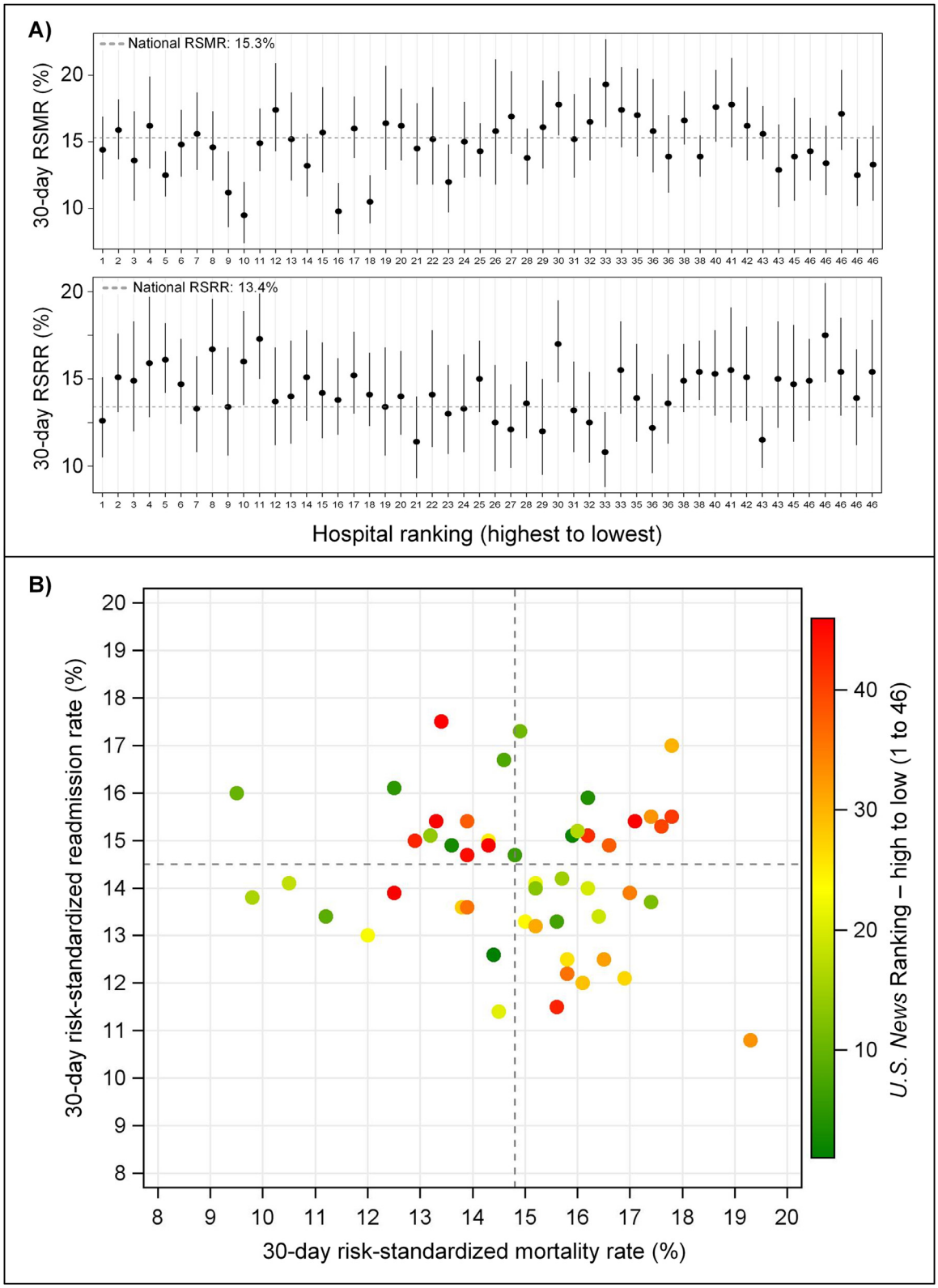

Figure 2. *Risk-standardized mortality and readmission rates among the 50 top-ranked hospitals. (A) The black circles indicate the mean 30-day risk-standardized outcome rates, with error bars defining the 95% confidence intervals. Abbreviations: RSMR, risk-standardized mortality rate; RSRR, risk-standardized readmission rate. (B) Each circle represents one of the 50 top-ranked hospitals by the U.S. News & World Report. The circles are shaded according to the hospital rank, ranging from 1 (green) to 46 (red); there were ties in rank for 33, 36, 38, 43, and 46. The downward sloping line reflects the slight negative relationship between the risk-standardized mortality and readmission rates; the lack of clear pattern in colors indicates that this relationship is unrelated to ranking. (Color version of figure is available online.)*

between hospital rank (ranging from 1 to 46 due to ties for ranks 33, 36, 38, 43, and 46) and the CMS risk-standardized measures. Because the CMS measures were calculated at the hospital level and adjusted for patient case mix in the risk-standardized models,[5] our models required no further adjustment for patient characteristics. Analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC). Statistical testing was two-sided with $\alpha = .05$.

Results

Among the 2787 hospitals with publicly reported ischemic stroke outcomes, the *USN&WR* 50 top-ranked hospitals had more beds and were more likely to be teaching institutions, not-for-profit, and Joint Commission-certified (Table 1). The 50 top-ranked hospitals had lower mean 30-day risk-standardized mortality rates compared with other hospitals (14.8% versus 15.3%) but higher 30-day risk-standardized readmission rates (14.5% versus 13.3%). In adjusted analyses, top-ranked hospitals had .72% lower mortality ($P < .001$) and .41% higher readmission rates ($P = .001$; Fig 1). There were no differences in mortality or readmissions after ischemic stroke for the 50 top-ranked hospitals versus other teaching hospitals.

Risk-standardized outcomes among the 50 top-ranked hospitals ranged from 9.5% to 19.3% for mortality and from 10.8% to 17.5% for readmissions. Risk-standardized mortality rates were lower than the national average for 14% of top-ranked hospitals whereas risk-standardized readmission rates were lower for only 2% and higher for 14% of the hospitals (Fig 2A). There was a modest negative relationship between risk-standardized mortality and readmissions among the 50 top-ranked hospitals, but this was not related to hospital ranking (Fig 2B). In analyses, further adjusted for hospital characteristics, rank order within the 50 top-ranked hospitals was not associated with either mortality (.05% decrease in mortality rate with each rank, 95% confidence interval −.10% to .01%) or readmissions (.02% increase in readmission rate, 95% confidence interval −.03% to .06%).

Discussion

The existing, currently reported *USN&WR* neurology and neurosurgery ranking identified a group of hospitals with lower 30-day risk-standardized mortality but higher readmission rates than other hospitals, with heterogeneity within the 50 top-ranked hospitals. Not all top-ranked hospitals performed better on the CMS stroke measures than the national average, and as a group, the top-ranked hospitals' outcomes were not different from those of other teaching hospitals.

The current *USN&WR* rankings provide a global assessment of the characteristics of hospitals' neurology and neurosurgery services, including the availability of technologies, reputation, and having a designated Alzheimer's Disease Center, Level IV Epilepsy Center, or Level I Trauma Center, among other metrics.[1] The rankings, however, do not specifically consider stroke center programs, such as Joint Commission Primary or Comprehensive Stroke Center certification, shown to be associated with 30-day stroke outcomes.[6-8] For example, patients treated at designated stroke centers in New York had modestly lower 30-day all-cause mortality as compared with those treated at non-certified hospitals.[8] A study of Medicare patients found that Joint Commission-certified Primary Stroke Centers had lower 30-day risk-standardized mortality for ischemic stroke than non-certified hospitals.[7] Certification generally identified better-performing hospitals for mortality, but there was heterogeneity in the distribution of risk-standardized outcomes within certification categories and considerable overlap between certified and non-certified hospitals. Our finding that the 50 top-ranked hospitals had outcomes consistent with other academic hospitals may reflect the fact that the majority of academic teaching hospitals have achieved stroke center certification or participate in quality improvement initiatives such as the American Heart Association Get with the Guidelines program, the Coverdell National Stroke Registry, or state-based approaches.

This study has several limitations. Although the *USN&WR* rankings consider a range of neurologic diagnoses and procedures, we focused on mortality and readmissions for patients with ischemic stroke given the current focus on performance measures linked to hospital reimbursement. Ranked hospitals may perform differently for other outcome measures, such as functional status, which are not currently assessed in CMS metrics. The CMS measures do not adjust for stroke severity, an important predictor of outcomes,[9-14] because it was not available in the administrative data. The final cohort included hospitals with publicly reported outcomes, and the findings might not generalize to hospitals that did not meet the CMS measure criteria.[5] Future quality metrics might be refined by the inclusion of clinical and structural characteristics, such as stroke severity and stroke center certification, which have been associated with patient outcomes. The outcome measures reflect Medicare patients aged ≥65 years; however, these Medicare patients represent the vast majority of patients admitted to hospitals with ischemic stroke.

Conclusion

Overall, the top 50 hospitals had better 30-day mortality outcomes than other hospitals but higher readmission rates after ischemic stroke. Although the *USN&WR* rankings provide guidance about the general quality of care provided to patients, we found that they may not fully align with CMS publicly reported 30-day performance measures for ischemic stroke.

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