

Physician-leaders and hospital performance: Is there an association?

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Abstract

Although it has long been conjectured that having physicians in leadership positions is valuable for hospital performance, there is no published empirical work on the hypothesis. This cross-sectional study reports the first evidence. Data are collected on the top-100 U.S. hospitals in 2009, as identified by a widely-used media-generated ranking of quality, in three specialties: Cancer, Digestive Disorders, and Heart and Heart Surgery. The personal histories of the 300 chief executive officers of these hospitals are then traced by hand. The CEOs are classified into physicians and non-physician managers. The paper finds a strong positive association between the ranked quality of a hospital and whether the CEO is a physician ($p < 0.001$). This kind of cross-sectional evidence does not establish that physician-leaders outperform professional managers, but it is consistent with such claims and suggests that this area is now an important one for systematic future research.

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Introduction

In the past, hospitals were routinely led by doctors. That has changed. In the United Kingdom (UK) and the United States (US), most hospital chief executive officers (CEOs) are non-physician managers rather than physicians (Horton, 2008; Falcone and Satiani, 2008; Halligan, 2008; Darzi, 2009). Of the 6,500 hospitals in the US, only 235 are led by physicians (Gunderman and Kanter 2009). It has been suggested that placing physicians into leadership positions can result in improved hospital performance and patient care (Horton, 2008; Halligan, 2008; Falcone and Satiani, 2008; Darzi, 2009; Candace and Giordana, 2009; 2009; Stoller, 2009; Dwyer, 2010). The UK has recently established five Academic Health Science Centres (AHSCs). Their mission is to bring the practice of medicine closer to research -- in the hope that innovative science can more quickly be translated into clinical procedures (Smith, 2009). Physician leadership was also prioritized in the 2008 National Health Service (NHS) review (Darzi, A. 2008, 2009; Horton, 2008). Some outstanding American medical facilities -- for example the Cleveland and Mayo Clinics -- have explicitly introduced leadership training (e.g. Stoller, Berkowitz and Bailin, 2007), and management and leadership education is being incorporated into medical degrees (Fairchild, Benjamin, Gifford and Hout, 2004; Stern and Papadakis, 2006); this is supported by a new literature that focuses on the key competencies required to be an effective physician-leader (Chaudry, Jain, McKenzie, and Schwartz, 2008; Stoller, 2008).

Currently, however, there are no empirical studies that assess the physician-leadership hypothesis that hospitals perform better when they are led by doctors (see Dwyer, 2010 for a review of the literature on medical managers). To establish a clear relationship between leadership and organizational outcomes is challenging because many of the conditions required for an unambiguously causal analysis cannot be met. This paper provides an empirical inquiry. It looks at the leaders currently being hired by hospitals and examines the question: are CEOs in hospitals ranked higher typically physicians or non-medical managers?

The wealthiest and most prestigious hospitals arguably have the widest choice of leadership candidates. If it can be shown that hospitals positioned higher in a widely-

used media ranking are more likely to be led by medical experts rather than managers, this is one form of evidence that physician-leaders may make effective CEOs.

A related study, although not concerned explicitly with leadership, is Yasaitis, Fisher, Skinner and Chandra, 2009, which influenced this paper's choice of title.

Data and Methods

The paper identifies the CEOs in the top ranked hospitals in America – determining whether those hospitals situated higher in the league-table are more likely to be headed by physician-leaders or professional managers. To do this, one particular quality ranking is used, namely, the league tables produced by US News and World Report's "Best Hospitals" 2009.

The study constructs a dataset on CEOs in the top-100 hospitals in the three specialties of Cancer, Digestive Disorders, and Heart and Heart Surgery.

Data

The US News and World Report (USNWR) ranking is designed to inform consumers about where to seek treatments for serious or complex medical problems. Media-generated league tables cannot be viewed as entirely reliable measures of quality; nonetheless, using rating systems as heuristic devices to assess healthcare providers has become common in the US (Schneider and Epstein 1998) and it has been shown to influence consumers' behavior (Pope 2009).

This study uses the USNWR classification because it is one of the most established. Its Index of Hospital Quality (IHQ) incorporates a number of empirical measures and over the years serious attempts have been made at consistency. The underlying methodology for the ranking was developed by the National Opinion Research Center at the University of Chicago, which compiled the league tables from 1993 to 2004. In 2005, Research Triangle Institute (RTI) International started producing the ranking. RTI states that, despite some refinements and additions, the methodology is

approximately the same as in earlier years. (RTI's introduction to the 2009 rankings methodology can be found in Appendix A).

In the 2009 USNWR ranking, 4,861 medical facilities are assessed across 16 specialties. Of the sixteen, twelve of the specialties are rated using IHQ scores. These twelve include: Cancer, Diabetes and Endocrine Disorders, Digestive Disorders, Ear, Nose and Throat, Geriatric Care, Gynecology, Heart and Heart Surgery, Kidney Disorders, Neurology and Neurosurgery, Orthopedics, Respiratory Disorders, and Urology. For the remaining 4 -- Ophthalmology, Psychiatry, Rehabilitation, and Rheumatology -- only physicians' reputational score is used by USNWR. Only hospitals evaluated using IHQ scores are considered in this study.

The American Hospital Association (AHA) Annual Survey Database is the main source of information for each medical facility assessed by USNWR. To qualify for ranking in a given IHQ-driven specialty, every hospital is required to pass through two stages of eligibility. The first set of criteria oblige hospitals to either be a member of the Council of Teaching Hospitals (COTH), be affiliated with a medical school (American Medical Association or American Osteopathic Association), to have at least 200 hospital beds set up and staffed or, finally, to have available at least four of eight important key technologies (for example, a cardiac intensive care unit (ICU), or endoscopic ultrasound) and have at least 100 hospital beds set up and staffed. Stage 2 of the eligibility process requires hospitals to demonstrate that they can successfully treat and discharge a specified number of complex cases in a given specialty. Of the 4,861 medical facilities initially assessed by USNWR in 2009, 1,859 hospitals were deemed eligible for analysis in at least one of the IHQ-driven specialties.

Three areas of healthcare performance are reflected within the IHQ quality scores: structure, process, and outcomes. These are described in Table 1. 'Structure' is assigned 30% of the IHQ total score. It refers to the resourcing of patient care, such as, for example, the number of nurses, available technologies and patient services. 'Outcomes' is a measure of mortality rates 30 days after admission for the IHQ-driven specialty. The mortality rates are risk-adjusted to control for the severity of a patient's illness, their age and other factors. 'Process' is about the delivery of care; it incorporates diagnosis, treatment and prevention. The process component draws on survey data from board-

certified physicians who assign a reputation score in their field of medicine. Finally, a ‘patient-safety index’ is included. This measure incorporates factors such as safety and “freedom from accidental injury”, and the practice of up-to-date medical procedures. The Outcomes and Process measures each account for 35% of overall IHQ scores, which includes 5% weight allocated to patient-safety (distributed between outcomes and process).

No single general ranking exists in the USNWR tables. Instead, the top-50 hospitals are identified in each of the 16 specialist fields and published in U.S. News & World Report. In addition, there is an extra and more selective ranking of ‘Honor Roll’ hospitals – those that performed well in at least 6 of the 16 specialties. Twenty-one institutions made it on to this elite list in the 2009 Honor Roll.

The data in this paper cover the top-100 hospitals in the three specialist fields of Cancer, Digestive Disorders, and Heart and Heart Surgery. These three fields were chosen because they are assessed using IHQ scores and they represent ailments that are believed to be important and relatively common among the general population.

In this study the top-50 ranked hospitals in each of the three IHQ-driven specialties are taken from the 2009 USNWR ranking. To identify the second 50 (which creates the top-100 tables in this paper), this study ranked all the remaining hospitals by their IHQ scores, which were listed on the USNWR website. This generated a ranking of top-100 hospitals.

Next, data were collected on each hospital CEO. To do this, the study used hospitals’ websites, and on some occasions personal contact with institutions (in the form of a request for the name of the CEO). Each chief executive officer was classified into one of two categories -- physician-leaders, and leaders who are non-physician managers. To qualify as a physician-leader, by this study’s criterion, a CEO must have been trained in medicine (MD). Some information was available about the extent to which MD-trained leaders in the dataset had been career physicians. Most MD chief executive officers reported that they had clinical experience. Consistent information was not available on the level or number of years of clinical experience that each CEO had obtained. There were three nurses among the CEOs in the sample, and they were categorized as non-physicians.

The data used in this paper were acquired through public sources -- USNWR's website and from hospital websites -- so that for this study no further ethics approval was necessary.

Analysis

To establish whether hospitals higher in the USNWR rankings are more likely to be led by physicians, the study uses t-tests and regression equations. It does this for the top-100 hospitals in each of three medical fields; the statistical results are presented in the form of tables and a bar diagram.

Table 2 reveals how IHQ hospital-quality scores are distributed across the top-100 hospitals in each of the three fields in this study: Cancer, Digestive Disorders and Heart and Heart Surgery. For Cancer, for example, the mean of the IHQ scores in the sample is 28.0 (where, as for each of the three specialties, the maximum feasible score is normalized at 100) and the standard deviation is 12.6. There are 51 physician-leaders among this set of 100 CEOs. Thirty-three are in the top-50 hospitals, and 18 lead hospitals in the lower 50 group. Of the 100 leaders, 15 of the CEOs are female.

For the other two specialties, there are, respectively, 34 physician-leaders in the top-100 hospitals in Digestive Disorders, and 37 in Heart and Heart Surgery.

IHQ scores do not follow a normal distribution. With a sample of 100 observations, however, there can be expected, by the Central Limit Theorem, to be no major bias to later results.

Findings

Figure 1 depicts the mean hospital-quality scores -- for the separate fields of Cancer, Digestive Disorders, and Heart and Heart Surgery -- for physician-headed and manager-headed hospitals. In each of the three cases, the mean IHQ score of hospitals where the Chief Executive Officer is a physician is greater than the mean score of the hospitals where the CEO is a professional manager. For example, the mean IHQ hospital-quality score of the Cancer hospitals led by physicians is 31.63 (SD = 16.29)

while the mean quality score of Cancer hospitals led by non-physician managers is 23.61 (SD = 4.18).

Table 3 depicts the relationship more formally. The regression equations reveal that the presence of a physician-CEO is associated at the $p < 0.001$ level with an extra 8 to 9 hospital-quality points (as measured by an IHQ scale). In size, that is equivalent to approximately two-thirds of 1 standard deviation in IHQ hospital quality. The explanatory power of Table 3's equations is modest. For Cancer hospitals, for example, the R-squared is 0.09. A variable for the size of hospital, the number of beds, was checked as one possible confounding factor. The mean number of beds per hospital is 652 (SD = 361). This variable always entered with a coefficient insignificantly different from zero and did not alter the coefficient on the physician-leadership variable.

If the analysis is re-run with hospitals ranked in an ordinal way instead of being allocated an actual IHQ score, the statistical relationship continues to hold ($p < 0.001$). It might be feared that a handful of hospitals of all-round quality is what drives the study's result; however, if the sample is restricted to those hospitals that appear only once in any of the three rankings, and the ranked position of each hospital is correlated with whether the leader is a physician, the relationship still holds. Although this latter check is not ideal because it necessarily omits observations, it shows, encouragingly, that the pattern remains strong when the hospitals that perform the best across more than one category are removed (i.e. it is not just the best, or the same, hospitals driving the results in the three specialties).

Finally, it is of interest to study the USNWR so-called 'Honor Roll'. Within this selective group of the highest-ranking hospitals, the majority of CEOs -- 16 out of 21 -- are physicians. Among Honor Roll hospitals, USNWR quality scores are graded differently; they vary on a scale from a maximum score of 30 to a minimum score of 7. The mean hospital IHQ quality score for the Honor Roll sample is 17.0 (SD = 7.22). Among these hospitals run by physicians, the mean IHQ score is 18.38 (SD = 7.37); the mean score of Honor Roll hospitals led by managers is 12.60 (SD = 5.03).

Discussion

This study's results are cross-sectional associations and use one particular hospital-quality ranking. This means they have important limitations. The findings do not prove that doctors make more effective leaders than professional managers. Potentially, they may even reveal a form of the reverse -- assortative matching -- in that the top hospitals may be more likely to seek out MDs as leaders and vice versa. Arguably, however, the better hospitals will have a wider pool of CEO candidates from which to choose, because of the extra status and wealth that they attract. This makes the fact established in this paper an interesting one. The study's results show that hospitals positioned highest in the USNWR ranking have made judgments that differ from those hospitals lower down: on average they have chosen to hire physician-leaders as CEOs.

In the literature, vigilance about reliance on USNWR rankings is reported; some authors are more condemning (e.g. Halasyamani and Davis, 2007; McGaghie and Thompson, 2001) than others (e.g. Wang, Wang, Lichtman, Bradley, Normand and Krumholz, 2007; Souba, 2008; Philibert, 2009). Philibert suggests (citing Schneider and Epstein, 1998, and Hannan, Stone, Biddle and DeBuono, 1997) that 'the "America's Best Hospitals" rankings are valued by institutions and enjoy greater public recognition than more "scientific" sources of information on clinical quality available to patients and referring physicians' (2009, p. 178). Nevertheless, she points to Halasyamanti and Davis (2007), who contrast performance rankings based on adherence to clinical guidelines using Medicare program's 'Hospital Compare'. Medicare's 'Hospital Compare' is produced by the U.S. Department of Health and Human Services, and, like the USNWR ranking, it is designed to inform the public about the care offered to adult patients for a range of medical treatments in their local hospitals. Halasyamanti and Davis (2007) found an imperfect correlation for cardiac diagnoses and respiratory disorders between the highest-ranked hospitals in USNWR and those in 'Hospital Compare'. Philibert's (2009) main criticisms of the USNWR rating are that prestigious institutions stand to gain the most; high-profile hospitals can attract more qualified clinicians and this does not necessarily translate into a better learning environment; and in the USNWR ranking too

much emphasis is placed on specialized medical services instead of prevention and health maintenance (Philibert, 2009, p. 183).

Discrepancies between rankings and other hospital-quality measures highlight the difficulty for researchers. In the UK there are disagreements about the two most commonly used hospital-performance indicators: the NHS's Care Quality Commission and Dr. Foster Research (see Thompson, 2009).

Cross-sectional analyses can only be suggestive of causality. The results in this paper are consistent with complementary evidence on the role of 'expert leaders' that is emerging from other (non-medical) areas – summarized for example in Goodall (2006, 2009a,b, and Goodall, A.H., Kahn, L. M., & Oswald, A. J. (2011). Goodall argues that experts have the advantage that they have acquired a deep intuitive knowledge about the core business of their organizations and this may help with decision-making and institutional strategy. Falcone and Satiani (2008) suggest that a physician-leader who has spent years as a medical practitioner has acquired integrity that implies "walking the walk" (2008, p. 92) which, they argue, enhances a leader's credibility. Physician-leaders who have greater credibility may act as role models for medical staff and their presence may help hospitals to attract talented medical personnel. However, such explanations are merely suggestive; the mechanisms are not properly understood. The next, and vital, step for researchers is to design longitudinal inquiries into the possibility that physician-leaders improve the (later) performance of American hospitals. Other important variables, such as a CEO's tenure and the level and number of years of clinical experience that each CEO had obtained, could also be included. If it can be shown that physician-leaders improve hospital performance, then the ensuing empirical question to be addressed is why and how this happens -- by examining the transfer processes through which hospitals are influenced by their leaders' actions.

Conclusion

There has been much discussion in the USA, and increasingly in the UK, about the relative merits of having physicians and non-physician managers in leadership positions. Yet no evidence has been published one way or the other. Given the

difficulty of creating objective hospital performance measures, it is necessary to be cautious in empirical work. This paper does not establish that physicians make more effective leaders when compared with professional managers; but it starts the empirical process. It finds -- in each of three disciplinary fields -- that hospitals positioned higher in the US News and World Report's "Best Hospitals" ranking are led disproportionately by physicians.

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Table 1.**Construction of the Dependent Variable - Index of Hospital Quality (IHQ)***

Structure <i>30% Weight</i>	Outcomes <i>35% Weight</i>	Process <i>35% Weight</i>
✓ Availability of key technologies (15 technologies linked to specialty fields). ✓ Volume index (number of medical and surgical discharges). ✓ Nurse staffing – intensity of outpatient and inpatient, and level of excellence. ✓ Presence of a trauma centre. ✓ Patient services index (e.g. presence of an Alzheimer’s centre, fertility clinic, etc.). ✓ Have at least one specialist in critical-care medicine.	✓ Mortality rates 30 days after admission for all IHQ-driven specialties. It is calculated using a risk-adjusted method which includes: Volume of cases; Severity of illness; and a specialty-specific risk-adjusted mortality calculation. ✓ Patient-safety index includes: “freedom from accidental injury”, the practice of modern medical procedures and safety. This accounts for 5% of total score and is tied to both Outcomes and Process.	Reflects physicians’ decisions made in the hospital setting, such as: ✓ Choices about admission ✓ Diagnostic tests ✓ Course of treatment ✓ Choice of medication ✓ Length of stay. This information is acquired through a survey of randomly selected board-certified specialist physicians in each specialty field.

*The weights add to 100%. This information has come from “America’s Best Hospitals” 2009 methodology produced by Research Triangle Institute (RTI) International. IHQ scores are assigned to the 12 specialty fields that are data-driven: Cancer, Diabetes and Endocrine Disorders, Digestive Disorders, Ear, Nose and Throat, Geriatric Care, Gynecology, Heart and Heart Surgery, Kidney Disorders, Neurology and Neurosurgery, Orthopedics, Respiratory Disorders, and Urology. 1,859 US hospitals out of a total of 4,861 were assessed by UNSWR in at least one specialty and ranked.

Table 2.

Distribution of the Index of Hospital Quality (IHQ) Scores for the Top-100 Hospitals in the Specialties of Cancer, Digestive Disorders, and Heart and Heart Surgery*

	Cancer	Digestive Disorders	Heart and Heart Surgery
Maximum IHQ Score	100	100	100
Minimum IHQ Score	19.3	16.6	20.3
Mean IHQ Score	28.0	22.0	25.8
Standard Deviation	12.6	11.2	11.2

* The top-50 in each of the twelve IHQ driven specialties is published in USNWR. To identify the second 50 (which creates the top-100 data in this paper), this study ranked all the remaining hospitals by their IHQ scores, which are available on the USNWR website. This generated a ranking of top-100 hospitals.

Table 3.
Regression Equations for IHQ Hospital-Quality in the Fields of Cancer,
Digestive Disorders, and Heart and Heart Surgery¹

	1	2	3
	The Top 100 Hospitals in the Field of Cancer	The Top 100 Hospitals in the Field of Digestive Disorders	The Top 100 Hospitals in the Field of Heart and Heart Surgery
Hospital Led by a Physician ²	8.02*** (3.34)	9.19*** (4.21)	9.06*** (4.21)
Adjusted R ²	0.09	0.15	0.14
Constant	23.61	18.85	22.44
	<i>n=100</i>	<i>n=100</i>	<i>n=100</i>

The dependent variable is an IHQ hospital-quality score. The independent variable is a (1,0) dummy variable.

Coefficients are shown with t-statistics in parentheses; ***p < 0.001; **p < 0.01

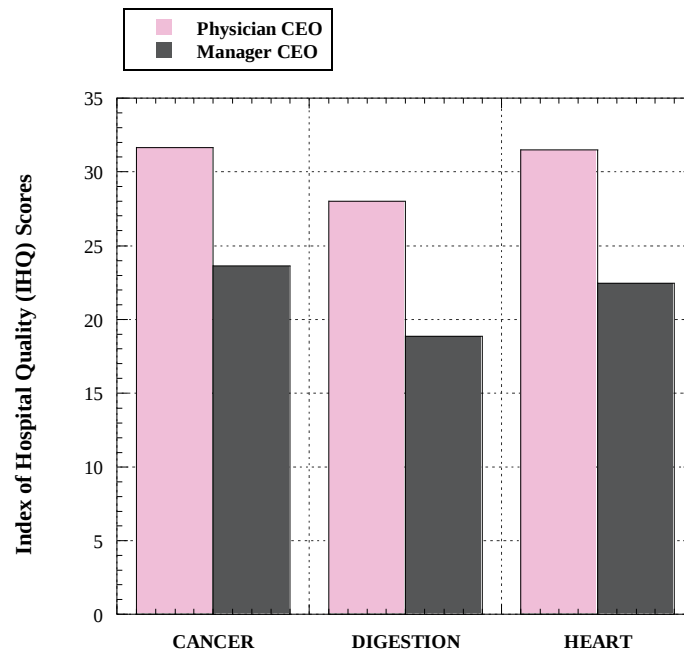
¹ Data from US News and World Report 'Best Hospitals' 2009.

² This is a variable where 1 = Physician leaders; 0 = Non-Physician leaders

These estimates are cross-section associations.

Figure 1.

Mean Index of Hospital Quality (IHQ) Score of Hospitals Led by Physician CEOs and Manager CEOs in Three Specialty Fields



Appendix A

Introduction to the “America’s Best Hospitals” 2009 Methodology

This introduction to the 2009 methodology has been extracted from the full report (available at: http://www.rti.org/pubs/abhmethmethod_2009.pdf) that was produced by Research Triangle Institute (RTI) International for US News and World Report.

I. Introduction (to 2009 methodology)

For families faced with a serious or complex medical problem, the choice of hospital can be critical. Yet they had few tools or resources beyond a doctor’s recommendation to inform their decision until 1990, when *U.S. News & World Report* introduced “America’s Best Hospitals.” Initially, the annual assessments took the form of alphabetized lists in 12 specialties, but in 1993 and thereafter, hospitals were ranked within each specialty. This year’s “America’s Best Hospitals” draws from a universe of 4,861 medical facilities.* In 12 of the 16 adult specialty rankings, hospitals receive a composite score that is based on data from multiple sources.

“America’s Best Children’s Hospitals,”† which ranks hospitals in 10 pediatric specialties, is a separate project.) The rankings and key portions of the accompanying data are published in a print edition; both ranked and unranked hospitals, with additional data, are published online at <http://health.usnews.com/sections/health/best-hospitals/index.html>.

It is important to understand that the rankings were developed and the specialties chosen explicitly to help consumers determine which hospitals provide the best care for the *most serious or complicated* medical conditions and procedures—pancreatic cancer or replacement of a heart valve in an elderly patient with comorbidities, for example. Medical centers that excel in relatively commonplace conditions and procedures, such as noninvasive breast cancer or uncomplicated knee replacement, are not the focus of Best Hospitals.

The underlying methodology for the Best Hospitals rankings was the work of the National Opinion Research Center (NORC) at the University of Chicago in the early

1990s. NORC collected the data and compiled the rankings from 1993 to 2004. In 2005, RTI International[‡] in Research Triangle Park, N.C., began producing the rankings. The methodology has been refined as opportunities appeared. Larger-scale enhancements are always under consideration. For 2009, a new measure related to patient safety was introduced, and the basic eligibility requirements were modified, potentially increasing the number of rankable hospitals.

The roster of specialties has been revised over the years. The AIDS specialty was dropped in 1998, for example, when it became clear that the majority of AIDS care had shifted to an outpatient setting. Pediatrics was moved out of the Best Hospitals universe in 2007 to establish separate pediatric rankings. No specialties were added or removed from the rankings in 2009.

For 2009, hospitals are ranked in 16 adult specialties:

- | | |
|----------------------------------|----------------------------|
| • Cancer | • Neurology & Neurosurgery |
| • Diabetes & Endocrine Disorders | • Ophthalmology |
| • Digestive Disorders | • Orthopedics |
| • Ear, Nose, & Throat | • Psychiatry |
| • Geriatric Care | • Rehabilitation |
| • Gynecology | • Respiratory Disorders |
| • Heart & Heart Surgery | • Rheumatology |
| • Kidney Disorders | • Urology |

A. Index of Hospital Quality

Twelve of the 16 specialty rankings are data driven; that is, rankings in these specialties are based largely on hard data. The other four rankings are based solely on reputation among relevant physicians, derived from a physician survey.

The data-driven rankings assign a score (the Index of Hospital Quality [IHQ]) to hospitals in the following 12 specialties: Cancer; Diabetes & Endocrine Disorders; Digestive Disorders; Ear, Nose, & Throat; Geriatric Care; Gynecology; Heart & Heart

Surgery; Kidney Disorders; Neurology & Neurosurgery; Orthopedics; Respiratory Disorders; and Urology.

The IHQ reflects performance in three interlocking dimensions of healthcare: structure, process, and outcomes. Their relationship was described by Avedis Donabedian in 1966 in a model that is widely accepted. In a hospital, *structure* refers to resources that relate directly to patient care. Examples factored into the Best Hospitals rankings include intensity of nurse staffing, availability of desirable technologies and patient services, and special status conferred by a recognized external organization (such as designation as a Nurse Magnet hospital by the American Nurse Credentialing Center [ANCC] or as a National Cancer Institute [NCI] cancer center).

Excellent healthcare also is shaped by the *process* by which care is delivered, encompassing diagnosis, treatment, prevention, and patient education. Structure and process are related to *outcomes*, the most obvious of which is whether patients live or die. Outcomes are typically measured by risk-adjusted mortality rates (i.e., the likelihood of mortality given the complexity of the case).

These and other factors do not necessarily sort neatly into one of the three dimensions. For example, complications of care are an outcome, but arguably they also reflect a flaw in the process of delivering care, and also may be affected by structural elements. Nonetheless, there is general agreement on the majority of measures. Many of the measures that make up the IHQ come from secondary data sources. The American Hospital Association (AHA) Annual Survey Database, for example, provides information regarding various structural hospital characteristics.

The three components of the IHQ rankings are described briefly below.

Structure

This score is based on data related to the structural characteristics of each medical specialty within a given hospital. These elements represent volume (i.e., discharges), technology, and other features that characterize the hospital environment. The source for many of these data elements in the 2009 rankings is the most recent AHA Annual Survey

Database from fiscal year (FY) 2007. Volume data are taken from the Medicare Provider Analysis and Review (MedPAR) database maintained by the Centers for Medicare & Medicaid Services (CMS). This database contains information on all Medicare beneficiaries who use hospital inpatient services.

Process

The process component of the IHQ score is represented by a hospital's reputation for developing and sustaining a system that delivers high-quality care. The hospital's reputation can be seen as a form of peer review. The reputational score is based on cumulative responses from the three most recent surveys of board-certified physicians conducted for the Best Hospitals rankings in 2007, 2008, and 2009. The surveyed physicians were asked to nominate the "best hospitals" in their specific field of care, irrespective of expense or location, for patients with serious or difficult conditions. Up to five hospitals could be listed. (For the physician questionnaires used in the 2009 rankings, see *Appendix A in the full methodology document at http://www.rti.org/pubs/abhmethod_2009.pdf*) In 2007, 2008, and again in 2009, a sample of 200 board-certified physicians was selected in each specialty. In 2007 and 2009, the sample was selected from the American Medical Association (AMA) Physician Masterfile, a database of more than 850,000 physicians.§ In 2008, the sample was selected from the American Board of Medical Specialties (ABMS) database.

The physician sample was stratified by census region (West, Northeast, South, and Midwest) and by specialty to ensure appropriate representation. The final, aggregated sample includes both federal and nonfederal medical and osteopathic physicians residing in all 50 states and the District of Columbia.

Outcomes

The outcomes score measures mortality 30 days after admission for all IHQ-driven specialties. Like the volume indicator, the outcomes measure is based on MedPAR data. For each hospital and specialty, the Healthcare Division of Thomson Reuters computed an adjusted mortality rate based on predicted and actual mortality rates using the All Patient Refined Diagnosis Related Group (APR-DRG) method created by 3M

Health Information Systems. APR-DRGs adjust the value for expected deaths by severity of illness using the patient's principal and secondary diagnoses. The method is applied to the 3 most recent years (2005, 2006, and 2007) of Medicare reimbursement claims made by hospitals to CMS.

B. Reputation-Only Rankings

The second ranking approach is used for the remaining four specialties—Ophthalmology, Psychiatry, Rehabilitation, and Rheumatology—and ranking scores reflect the results of the reputational survey alone. Many structural and outcomes measures are not applicable to these specialties because procedures are performed largely on an outpatient basis and pose a very small risk of death. For this report, these specialties are referred to as reputation-only specialties; the associated rankings are referred to as reputation-only rankings.