HOSPITAL QUALITY OVERSIGHT BY THE JOINT COMMISSION ON THE ACCREDITATION OF HEALTHCARE ORGANIZATIONS

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INTRODUCTION

The Institute of Medicine (IOM) of the National Academy of Science (NAS) in1999 announced the findings of several studies that estimated that medical error results in 44,000 to 98,000 deaths per year. The report, *To Err Is Human: Building a Safer Health System*, focused considerable attention on oversight of hospital quality. Many of the responses to the IOM's report were to either develop a medical-error reporting system or to find better standards for hospitals and other health care facilities to uphold. There has been minimal attention paid to the mechanisms of hospital quality oversight that are currently in place. Accordingly this study will analyze the system of hospital quality regulation in the United States.

There are over 6,200 hospitals in the United States. In order to be eligible to receive payment from the Centers for Medicare & Medicaid Services (CMS – formerly HCFA), hospitals are required to meet a set of minimum requirements called Conditions of Participation (CoPs). A private hospital is not required to be eligible for Medicare and Medicaid in order to exist. It could choose to have every patient pay out-of-pocket or through private health insurance. However, since over one-third of U.S. health expenditures are distributed through CMS programs, nearly all hospitals in the U.S. comply voluntarily with the CoPs. If a hospital were determined to be sufficiently out of compliance it would not be eligible for Medicaid or Medicare funds and the facility would likely go out of business. If a hospital becomes bankrupt, the hospital may change ownership to a group that can meet the quality standards of the CMS. The state or local government may take ownership of the hospital.

The Social Security Act as amended in 1965 gave the JCAHO "deeming" power for Medicare quality requirements. State certification is needed for Medicaid eligibility. Currently, 48 states accept JCAHO accreditation as acceptable compliance with quality assurance requirements for state certification.[1] As a result, approximately 80

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percent of U.S. hospitals voluntarily use JCAHO's quality oversight program. Approximately 1,400 (20%) hospitals use state certification agencies to meet CoPs. State certification agencies and JCAHO are non-exclusive alternatives for a hospital to meet Medicare and Medicaid eligibility. A relatively new option for many critical access hospitals is to be accredited by the American Osteopathic Association (AOA).

Prior to the IOM report, in 1999 the Office of Inspector General (OIG) of the Department of Health and Human Services (HHS) berated the JCAHO's performance review system and CMS' oversight of JCAHO. The oversight program was criticized for being too "collegial" with hospitals, for using a survey process that was unlikely to identify poor patterns of care, and for generating survey results that do not distinguish high and low quality hospitals.[2] Because JCAHO is both the primary means of oversight of and advocacy for the medical industry, it came under heavy scrutiny. In response, the Commission increased regulatory activity and began unannounced reinspections of hospitals that had below-standard areas in the Full Survey.

The IOM defines quality as "the degree to which health service for individuals and populations increase the likelihood of desired outcomes and are consistent with current professional knowledge." [Lohr, 1990] The JCAHO inspection evaluates hospitals on adherence to a defined set of professional standards and health care practice guidelines. Historically, JCAHO did not look at health outcomes in the accreditation decision. Conceptually, suboptimal processes of care raise the probabilities of non-fatal complications, in-hospital mortality, premature post-discharge deaths and early re-admissions [Ashton and Wray, 1996]. The objective of this study is to test whether the information that JCAHO collects during on-site surveys correlates with the quality of care in hospitals as evidenced by patient outcomes.

There are several studies on the regulation of hospitals with respect to cost containment [Antel, Ohsfeldt, and Becker, 1995] and there have been recent investigations on the measurement of hospital quality [McClellan and Staiger, 1999; Geweke, Gowrisankaran, and Town, 2001]. The role of regulatory effort on hospital quality has only been minimally studied. One study found that, for acute myocardial infarction patients, hospitals inspected by JCAHO have higher rates of use for aspirin, beta-blockers, and reperfusion therapy and lower 30-day mortality than non-JCAHO accredited hospitals [Chen, Rathore, Radford, and Krumholz, 2003].

The paper proceeds as follows. Section 2 describes the structure of the current U. S. hospital regulation system. Section 3 presents the theory that motivates the study of hospital effort and section 4 outlines the specific study questions. The empirical methodology is developed in section 5 and section 6 describes the data that will be used to address the research questions. Section 7 discusses the findings of the study and concludes the article.

BACKGROUND: HOSPITAL OVERSIGHT

Historically, JCAHO reviews hospitals every three years on a scheduled basis. Every hospital is required to have the triennial inspection and each survey is seemingly comparable in intensity. Recently, a 5 percent sample of hospitals has been randomly inspected with a one-day inspection and the agency has announced that starting in 2006, all surveys will be unannounced. Random inspections will occur with the constraint that they must take place every three years.

A team consisting of, at least, a physician, a registered nurse, and a hospital administrator conducts a "Full Survey" of each participating medical facility. There are more than 500 performance standards that investigators use to evaluate compliance in order to determine the scores for 46 different performance areas. Because of the complexity of the inspection requirements, hospitals frequently hire consultants to prepare for the JCAHO Full Survey.

Each performance area receives a score of 1 to 5. A score of 1 indicates full compliance with the standards of that performance area. The minimum acceptable score for any performance area is a 2. A score of 3, 4, or 5 results in a future re-inspection of that area. Summaries of the JCAHO inspections are published on the Quality Check™ website (http://www.jcaho.org/qualitycheck/directry/directry.asp). Along with the performance area scores, a Full Survey score, an Updated Survey score, and an accreditation decision is awarded. The Full Survey is scored on a scale of 0 to 100, with 100 being the best. Almost every medical facility that JCAHO inspects is awarded accreditation, but a hospital can be awarded without recommendations (all performance areas 1 or 2), with recommendations, or conditional (significant need for improvement).

Participation in either JCAHO's or the AOA's accreditation programs is voluntary. A non-accredited hospital can be certified through state oversight or directly through CMS. Due to real and potential competition, if one program unilaterally tries to increase regulatory activity it could result in a shift to an agency that provides relatively easier compliance. The result is that neither JCAHO nor the AOA are likely to raise standards because neither wants to lose hospitals from its oversight programs.[3] Moreover, neither is likely to unilaterally shorten the time between inspections because that would also increase costs for hospitals. For changes to occur in the hospital oversight program, the change would need to be directed from the CMS. If the federal agency mandated tougher rules or stricter penalties for hospital quality, then the accreditation agencies would be able to enforce the new standards without losing product share to the other agency or the states.

A final consideration is the nature of the relationship between JCAHO and hospitals. In addition to inspections, JCAHO also acts as a consultant to medical facilities and as an advocate for the health care industry. The majority of the Joint Commission's executive board members are from the American Medical Association or the American Hospital Association. This is an advantage with respect to having knowledge of the hospital system and the ability to effectively inspect and evaluate hospital quality; however, it also creates a conflict of interest in JCAHO's quality inspections because there may be a tradeoff between higher profits and hospital quality.

The effectiveness of any strategy of quality regulation depends on whether it can create enough incentive for the agent to increase effort that improves quality, and thereby reduce the amounts or intensities of harm. A strategy can fail for several reasons. First, the standards may be poorly designed so that compliance with those standards does not improve quality. While this may have some benefit, compliance will not be realized in terms of lives saved. Second, the regulation may be poorly enforced. An enforcement problem can result either because the inspection strategy used by the principal fails to identify deficiencies or low effort, or because the penalty for low effort is not large enough to prompt a response from the agent. Either way, compliance with standards would promote quality, but compliance is not incentive-compatible.

THEORY

The theoretical model borrows heavily from the health demand literature [Grossman, 1972]. Health is a form of human capital. At any given time, a person has a stock of health capital and that stock is depreciating. Individuals invest in health capital through decisions on such things as diet, smoking, exercise, and medical care. In this view hospitals provide one input into the production of health capital. Illness is associated with lower health and death occurs when a person's stock is exhausted.

Patient outcome from a hospital stay is dependent on two sets of factors: health investments and initial health condition. Investments consist of actions undertaken by a medical care provider to increase the health stock of its patients. These investments include observable inputs into health production, such as bed space, nursing labor, and lab tests, and unobservable inputs, like quality. For the purposes of this study, it will be assumed that both the observable and unobservable inputs are the specific results of decisions made by the hospital.

Health conditions of incoming patients are unknown to a hospital prior to arrival at the hospital. The facility does, however, have information on the distribution of health conditions and related factors. Hospitals make planning and resource allocation decisions based on their expectations of the number of patients that demand care and the health conditions of that population. The quality of care by a hospital will be explained, in part, by how well the hospital anticipates and schedules for this demand. With respect to quality, if a hospital's forecast is low, then it will allocate too few resources relative to actual need, increasing the risk of poor outcomes. If the forecast is high then too many resources will be allocated than are actually needed, creating excess capacity. This would be good for quality but bad for efficiency since excess capacity is inefficient. Some excess capacity is required by hospitals, which entails medical personnel and equipment waiting and available in case of an emergent hospital admission.

Of special consideration to health outcomes is medical error. Medical error is a negative shock to a patient's health capital stock or a missed opportunity for an investment. Hospitals incur expenses to identify and prevent medical errors. The effectiveness of this effort is a facet of the hospital's quality. The cost of error reduction is high. Hospitals decide how much effort to expend based on the cost of additional improvements in error reduction and the benefits of fewer errors. A large benefit to health care providers is reduced insurance premiums for liability protection. Hospital effort to improve quality is not directly observable. Hospitals know their levels of effort, but patients do not. Because quality enhancing effort and excess capacity are both expensive, hospitals have an incentive to provide suboptimal levels of both.

The probability of an adverse medical event is a function of allocation decisions based on expected patient needs and the specific efforts that hospitals use to prevent errors. Identified unfortunate outcomes are the realization from the probability function.

The role of regulation is to provide incentives for higher levels of effort to produce quality. The federal government is the largest payer of health care. In order to receive payments from the federal government, hospitals must meet a list of specific effort requirements. These requirements include the minimum acceptable levels of excess capacity (or reserve margins) and the performance of certain types of initiatives. A broad set of requirements focus on systems that hospitals must have in place to identify, evaluate, and prevent medical error.

The effectiveness of the regulatory mechanism is determined by how well it motivates risk probability to the patient. A reduced risk will be realized with fewer unfavorable outcomes. The model of regulation is a two-player principal-agent game with asymmetric information. The agent (hospital) owns a means of production but needs the permission of the principal (CMS/JCAHO). Each player is only interested in his or her own payoff.

The principal's objective is observed as the minimization of a realizable loss associated with quality. For the agent to operate, it must agree to a contract with the principal. The contract will specify the duties and payoffs to both players. The principal is not able to costlessly verify that the agent is complying with the contract, so the principal commits to an inspection strategy to monitor agent effort. Monitoring is expensive so the principal wants to minimize that cost.

The principal wants the agent to accept the contract, so it has to be both individually rational and incentive-compatible. Individual rationality suggests that the requirements on the agent cannot be so intense that the agent would be better off not accepting the contract and shutting down. The contract is incentive-compatible if the agent can make itself better off by complying with the terms of the contract. Both individual rationality and incentive compatibility are constraints on the principal's objective function.

The strategy options for the principal are specified in the contract. The principal maintains control of (1) the standards and requirements that the agent must adhere to, (2) the probability of an inspection occurring, and (3) the payoff to the agent for both compliance and non-compliance. During an inspection, the principal collects information on how well the agent complies with the standards. This information should be valuable by two considerations: the information provides a signal of effort (and therefore quality) by the agent and it provides an incentive to increase effort to comply with the standards. A higher probability of inspection should correspond to a greater incentive to comply. The same is true for payoff: the higher the reward for compliance and penalty for non-compliance, the greater the incentive.

HYPOTHESES

A regulatory strategy may be ineffective for two reasons. The first is because agents do not comply with the standards defined in the contract. The standards would work to promote quality if they were followed, but the principal's strategy does not provide enough incentive to comply. The second reason is because performance standards are not correlated with their objective or that the correlation is too weak to have a recognizable effect. Compliance may be high in this case, but with no value.

There are numerous reasons why JCAHO's oversight strategy may be ineffective. The primary reason is the dual role of JCAHO as a regulator and advocate. Being comprised of the American Hospital Association, the American Medical Association, and the health care insurance industry leaves JCAHO with a conflict of interest. The CMS' maximization objective would evaluate the rationality constraint at the point of indifference between accepting and rejecting the contract. JCAHO would evaluate the constraint as an inequality (hospitals strictly preferring to accept). In other words, JCAHO is motivated by hospitals' success beyond just the quality of care provided.

While the CMS oversees JCAHO to assure that inspections are at least as rigorous as what CMS would perform, only the means of inspection are evaluated and not the ends. To the CMS, it is acceptable for the means of JCAHO inspections to be more demanding than a CMS inspection. Patient care specific performance areas that are as rigorous as CMS standards may be "good enough." JCAHO may have additional standards on managerial and administrative function directed at efficiency and/or profitability. These additional standards may diminish the effect of the patient care standards.

The first question to be asked is whether JCAHO inspections have any identifiable effect on patient outcomes. Specifically, do JCAHO inspection variables explain enough of the variation that they significantly improve the explanatory power of a model predicting in-hospital mortality?

HYPOTHESIS 1. *The JCAHO performance variables are jointly significant in explaining patient mortality.*

A specific area of interest is whether better performance scores signal better hospital quality. The JCAHO survey can act as a signal of process quality and/or a means to induce better processes of care. Either of these roles provides value. The number of deaths may fall as a hospital approaches an inspection due to an inducement effect. The impact of survey scores after controlling for time until inspection provides evidence of the value of the survey information on hospital quality.

HYPOTHESIS 2. *JCAHO performance scores are signals of hospital quality.*

JCAHO surveys are performed every three years. Hospitals have historically known approximately when the JCAHO inspection team was due to arrive. One to two months in advance, the hospital was informed as the inspection's start date. The probability of inspection therefore is 1 for the scheduled year and 0 for the other two years. Knowing that there will not be a potential penalty in the "off" years reduces the incentive to comply with the contract. Hospitals start preparing for an inspection up to a year in advance, updating equipment, training staff, and holding mock inspections. The amount of preparation may result in improved quality of the care by the hospital in the short-period leading up to an inspection. The same is true for the period shortly following an inspection, as quality benefits may have duration before they expire and because many hospitals have re-inspections. The value of survey information becomes less valuable the longer it is from an inspection.

HYPOTHESIS 3. *Part of the variation in hospital deaths is explained by the duration to or from the JCAHO inspection.*

Finally, because hospitals receive a Full Survey score on a scale of 0 to 100, there is a natural tendency to use a survey as a report card on hospitals. The use of the survey report as a consumer tool would increase the incentive to comply with performance standards.

HYPOTHESIS 4. *The JCAHO Survey report acts as a comparative report on hospitals.*

THE MODELING APPROACH

The econometric model evaluates the relationship between the count of occurrences for some event and a vector of covariates that includes inspection variables. Count models explain variation in the count of incidents by variation in the unit of observation and regulation variables. The Poisson distribution will be used to estimate the effects of the inspection variables on patient deaths. The mean count, l, is an intensity parameter that varies depending on a vector of independent, exogenous covariates (x_i).

The Poisson model is an effective and popular method to control for unobserved heterogeneity. The problem of temporal dependence will present as unobserved heterogeneity in cross-sectional data [Cameron and Trivedi, 1998]. In panel data, the heterogeneity associated with error that correlates across time can be captured using a random effects model.

The use of the random effects panel Poisson is similar to the Negative Binomial model in that it allows for over dispersion in the data. The differences are that the Poisson specification used here assumes that the source of heterogeneity is the hospital, this heterogeneity can be modeled through repeated observation, and the error is normally distributed. The source of the heterogeneity in the Negative Binomial model is unknown, but assumed to be distributed gamma.

DATA

Samples on the count of in-hospital deaths per calendar quarter were drawn from 453 hospitals between the years 1995 through 1997. The source for the data was the Healthcare Cost and Utilization Project's (HCUP) Nationwide Inpatient Sample (NIS) [AHRQ HCUP NIS]. The complete NIS sample is yearly observations on 6 to 7 million individual admissions in 900 to 1,000 hospitals that form a 20% percent sample of the inpatient stays in the U.S. A sample of 5,409 observations was extracted for patients who were classified under medical diagnosis category MDC 1, and 5,401 observations for MDC 4 patients.[4] These two MDCs were chosen because they both have mortality rates in excess of 5 percent of the total discharges in the MDC and both have more than 5 percent of the total discharges from all MDCs. Other MDCs have higher mortality rates but have lower prevalence of admission. A hospital was included in this sample if it appeared in the NIS in all three years. Patient characteristics were combined with hospital-specific variables from the NIS database. The regulation variables were extracted from JCAHO's Quality Check™ website. The NIS data was linked to the JCAHO data based on the name and address of hospitals.

The dependent variable used is the quarterly count of deaths that occurred for inpatient stays. Deaths in the two MDCs were assumed to be independent. For MDC 1, the mean number of deaths was 6.6. The maximum number of deaths that a hospital experienced in a single quarter was 71. The average number of discharges that this sample of hospitals experienced for MDC 1 patients was 132.3. For MDC 4, the mean number of deaths was 14.5. The maximum number of deaths was 105 and the mean discharges for the MDC was 216.3.

FIGURE 1
Count of Hospitals and Deaths per Quarter (MDC 1)

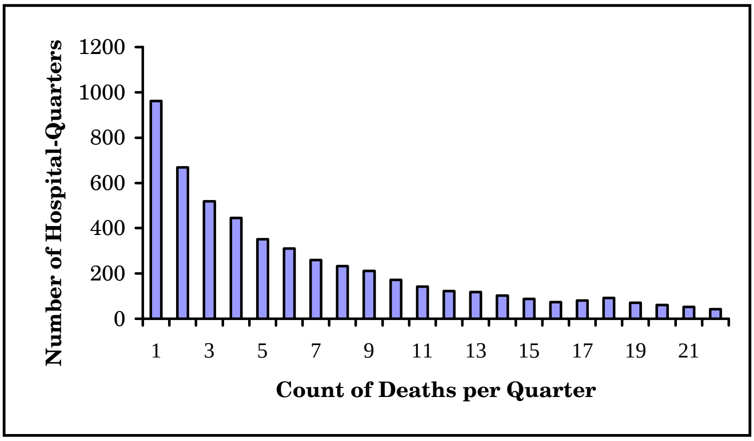

FIGURE 2
Count of Hospitals and Deaths per Quarter (MDC 4)

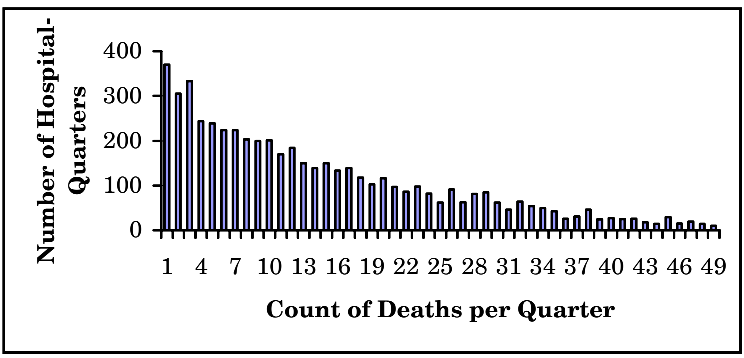

Table 1 contains definitions of all the explanatory variables and descriptive statistics. The independent variables in the model are grouped into three categories: patient-specific, hospital-level, and inspection variables.

TABLE 1
Data Description and Statistics for JCAHO Poisson/Negative Binomial Model

Variable	Description	Mean (S.D.) by MDC MDC 1	 MDC 4
Died	Count of the number of patients that were discharged dead per quarter per MDC	6.647 (7.797)	14.490 (13.504)
Ln(discharge)	Natural log of discharges in MDC	4.314 (1.211)	4.980 (1.017)
Age 0-15	Ratio of patients discharged aged 0 to 15.	0.049 (0.087)	0.116 (0.129)
Age 16-35	Ratio of patients discharged aged 16 to 35.	0.081 (0.069)	0.067 (0.049)
Age 36-50	Ratio of patients discharged aged 36 to 50.	0.111 (0.074)	0.100 (0.056)
Age 51-65	Ratio of patients discharged aged 51 to 65.	0.163 (0.077)	0.167 (0.060)
Age 66-80	Ratio of patients discharged aged 66 to 80.	0.363 (0.118)	0.343 (0.104)
Age 81+	Ratio of patients discharged aged 81+.	0.233 (0.126)	0.207 (0.097)
White	Ratio of patients discharged with race identified as "white".	0.810 (0.214)	0.807 (0.215)
Female	Ratio of female patients discharged.	0.530 (0.104)	0.521 (0.073)
Male	Ratio of male patients discharged.	0.470 (0.104)	0.479 (0.073)
Diagnoses	The natural log of the average number of diagnoses coded on patients' records.	1.863 (0.190)	1.850 (0.199)
Brain cancer	Percent of patients with principal classification code 35.	0.0102 (0.0231)	- -
Secondary malignancies	Percent of patients with principal classification code 42	.0.0163 (0.3120)	0.0174 (0.0242)
Acute cerebro-vascular disease	Percent of patients with principal classification code 109.	0.3120 (0.1805)	- -
Intracranial injury	Percent of patients with principal classification code 233.	0.0540 (0.0649)	- -
Respiratory failure	Percent of patients with principal classification code 131.	- -	0.0542 (0.0483)
Aspiration pneumonitis	Percent of patients with principal classification code 129.	- -	0.0475 (0.0420)
Lung Cancer	Percent of patients with principal classification code 19.	- -	0.0433 (0.0433)
Other Facility	Ratio of discharges that were admitted from another medical facility.	0.070 (0.145)	0.066 (0.141)
Income 0-25	Ratio of discharges where median income from zip code of residence is between $0 - $25,000.	0.346 (0.342)	0.356 (0.344)
Income 25-30	Ratio of discharges where median income from zip code of residence is between $25,001 - $30,000.	0.235 (0.242)	0.238 (0.241)
Income 30-35	Ratio of discharges where median income from zip code of residence is between $30,001 - $35,000.	0.156 (0.188)	0.153 (0.184)
Income 35+	Ratio of discharges where median income from zip code of residence is between $35,001 +	0.263 (0.311)	0.253 (0.310)
Specialize	Discharges in MDC divided by total discharges from the hospital.	0.062 (0.052)	0.116 (0.055)

TABLE 1 (cont.)
Data Description and Statistics for JCAHO Poisson/Negative Binomial Model

Variable	Description	Mean (S.D.) by MDC MDC 1	MDC 4
Surgical	Ratio of discharges that had a surgery or a surgical consult.	0.250 (0.313)	0.205 (0.264)
Government Owned	Dummy variable. 1 = ownership of the hospital is the government (non-federal).	0.131 (0.337)	0.131 (0.338)
Not-for-profit	Dummy variable. 1 = hospital designated as a not-for-profit corporation.	0.733 (0.442)	0.732 (0.443)
Investor Owned	Dummy variable. 1 = hospital designated as a not-for-profit corporation.	0.136 (0.343)	0.137 (0.344)
Rural	Dummy variable. 1 = rural hospital.	0.288 (0.453)	0.289 (0.453)
Urban	Dummy variable. 1 = urban hospital.	0.712 (0.453)	0.711 (0.453)
Teaching	Dummy variable. 1 = teaching hospital.	0.189 (0.392)	0.189 (0.392)
Time before/ after inspection	The natural log of the duration in years since the full survey listed.	1.073 (0.282)	1.073 (0.282)
(Time before/ after inspection)^2	Time squared.	1.230 (0.469)	1.231 (0.469)
Administration	Count of administration and planning violations (see Table 2) divided by 10	5.351 (3.407)	5.338 (3.402)
Management	Count of management violations (see Table 2) divided by 10.	2.383 (2.455)	2.379 (2.455)
Patient Care	Count of patient care violations (see Table 2) divided by 10.	7.256 (4.305)	7.257 (4.308)

The number of patients that arrive at each hospital and the health problems associated with those patients are the state of nature that reveals itself to the hospital. As a hospital treats more patients, it naturally experiences a greater count of deaths. Patients arrive with different stocks of health capital. While health capital is not directly observable, it may be correlated with identifiable characteristics such as age, race, gender, and income. Age is the most unambiguous variable correlated to health. Over time health capital depreciates. The rate of depreciation is likely to increase as age increases.

The patient characteristics were very similar for both of the MDCs. The single largest age group for patients in each of the MDCs was 66 to 80 years old. Patients identified as white, non-Hispanic constituted over 80 percent of the patients for each category. The proportion of female and male patients was evenly split. The income profiles are parallel. Two other characteristics that were recorded that explain the admission level of health for patients is the number of diagnoses recorded for the patient and whether the patient was admitted from another medical facility. The number of diagnoses indicates patient comorbidities that complicate the effectiveness of medical treatment. A patient from another medical facility has received some care prior to arrival at the hospital and would not likely have been transported to the observed hospital unless it increased the probability of saving the patient. The average number of diagnoses per patient was about 6.5 for each MDC. Approximately 7 percent of the admissions came from other medical facilities.

Hospital characteristics are used to control for potential patient selection problems in the data. The hospital characteristics that are used include the degree of specialization in the MDC, the proportion of patients that received a surgical consultation, the ownership of the hospital (government-owned, not-for-profit, or for-profit), whether the hospital is rural or urban, and whether it is a teaching hospital. A hospital that specializes in a limited number of diseases and disorders is expected to be better at treating its patients' conditions than a general hospital. This creates a potential selection problem regarding the hospital that a patient would choose. The most critical patients would likely be sent to the most specialized hospitals. The proportion of patients receiving a surgical consultation could be classified as a patient-level or a hospital-level variable. It is listed as hospital-level here because the algorithms of care that are adopted by individual hospitals heavily influence the proportion of consultations.

Investor-owned, for-profit hospitals have a strong adverse selection incentive. This ownership type may experience fewer deaths based on patient selection rather than quality of care. Rural hospitals have a slightly different function than urban hospitals. When a critically ill patient arrives at a rural hospital, often the goal of the hospital is to treat for life-threatening conditions and then prepare the patient to be transported to a larger urban hospital.

Teaching status of a hospital is important. A teaching hospital, while trying to improve the health of patients, is also trying to train doctors. Because of these dual objectives, the hospital is likely to actively pursue the most critical patients and may intensively treat patients that have little or no hope of improvement.

Deviation occurs in the hospital-level data. 'Specialize' is the number of discharges in the MDC divided by the total discharges from the hospital. The variable serves as an indicator of specialization by the hospital in the identified diseases and disorders. On average, there is a stronger specialization in circulatory problems such as cardiac care than respiratory problems (e.g., emphysema and COPD) and more in respiratory care than problems with the nervous system (e.g., brain surgery and neurology). Approximately one-fourth of the admissions in MDC 1 and about one-fifth of the patients in MDC 4 had some contact with a surgeon. 73 percent of the hospitals in this sample were private, not-for-profit hospitals. The remaining hospitals were split between government owned and for-profit hospitals. The NIS excludes federal hospitals, so the government hospitals include state and local government-owned hospitals. 71 percent of the hospitals were urban, and approximately 19 percent of the care centers were registered as teaching hospitals.

Table 2 presents the performance areas from the JCAHO Full Survey and the corresponding group that is analyzed in this study.

Each performance measure is the deviation in actual score from the best possible score. Each performance area is scored from 1 to 5, with 1 being the highest level of compliance to JCAHO standards. The measure is a sum of the actual scores minus one from each of the performance areas that comprise each of the performance

TABLE 2
The JCAHO Survey Variable Groups.

Performance Area	Performance Area Group
Accreditation Participation Requirements	Administration
Anesthesia Care	Patient Care
Assessing Staff Competence	Management
Assessment of Data	Administration
Availability of Patient-Specific Information	Administration
Continuity of Care	Patient Care
Credentialing	Administration
Data Collection and Analysis	Administration
Departmental Leadership	Management
Design of New Services	Administration
Design of the Environment	Administration
Governance	Management
Human Resources Planning	Administration
Implementation of Safety Plans	Patient Care
Improvement of Performance	Administration
Improvement Planning	Administration
Infection Control	Patient Care
Information Management Planning	Administration
Initial Assessment Procedures	Patient Care
Integrating and Coordinating Services	Management
Leaders' Role in Improving Performance	Management
Literature to Support Decision Making	Management
Management	Management
Managing Staff Requests	Management
Measurement of Processes and Outcomes	Management
Medication Use	Patient Care
Monitoring Safety Plans	Management
Needs Assessment for Specific Patient Populations	Patient Care
Nursing	Patient Care
Nutrition Care	Patient Care
Operative Procedures	Patient Care
Organization Ethics	Administration
Organization, Bylaws, Rules, and Regulations	Administration
Orienting, Training, and Educating Staff	Management
Pathology and Clinical Laboratory Services	Patient Care
Patient and Family Education	Patient Care
Patient Rights	Patient Care
Planning and Providing Care	Patient Care
Processes for Patient Care Decisions	Patient Care
Reassessment Procedures	Patient Care
Rehabilitation Care	Patient Care
Relevant Policies	Administration
Social Environment	Administration
Special Treatment Procedures	Patient Care
Strategic Planning	Administration
Use of Comparative Information	Administration

measures. Performance areas that are classified as management areas had the fewest number of deficiencies with a mean of 2.4. Surveys on average resulted in 5.3

administrative deficiencies, and 7.3 for patient care. The patient care group has the most deficiencies per performance area of the three categories. The average time since inspection is approximately 2 years at the patient level (discharge date to inspection date) and 18 months at the hospital level (inspection date to midpoint of calendar quarter).

RESULTS AND DISCUSSION

Table 3 reports the results of the random-effect panel Poisson model for diseases and disorders of the nervous system (MDC 1). Table 4 contains the results for diseases and disorders of the respiratory system (MDC 4). Model 1 is the full model with patient-level, hospital-level, and inspection variables all included. Model 2 contains the patient- and hospital-specific variables, but none of the inspection variables. Model 3 adds the Time variable into Model 2, but not the compliance indicators (Administration, Management, and Patient Care). Model 4 adds the indicators to Model 2, but not Time. Model 5 only contains the intercept, the compliance indicators and the random-effects parameter.

The primary use of the patient-level data is to control for the health expectations or state of nature in which hospitals operate. While there are many variables that are unobservable in the data, such as patient obesity or smoking propensity, the control function of the available data is quite good. The number of discharges in the

TABLE 3
Random-Effects, Panel Poisson Model for Diseases and Disorders of the Nervous System (MDC 1). Dependent variable is "Count of Deaths." (n = 5,409)[a]

Coefficient	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-2.769 ***	-2.963 ***	-2.485 ***	-2.318 ***	1.645 ***
	(-12.780)	(-13.855)	(-12.254)	(-11.114)	(20.487)
Ln(discharge)	1.079 ***	1.081 ***	1.082 ***	1.082 ***	-
	(167.887)	(166.662)	(165.714)	(167.658)	
Age 0-15	-0.346 *	0.191	-0.045	-0.003	-
	(-1.922)	(0.724)	(-0.300)	(-0.019)	
Age 16-35	0.655 ***	0.529 ***	0.308 *	0.418 *	-
	(2.409)	(2.039)	(1.231)	(1.691)	
Age 36-50	0.179	0.036	-0.023	0.095	-
	(0.754)	(0.109)	(-0.139)	(0.368)	
Age 66-80	0.582 ***	0.798 ***	0.637 ***	0.648 ***	-
	(3.491)	(4.661)	(4.458	(4.432)	
Age 81+	0.970 ***	1.097 ***	1.016 ***	0.956 ***	-
	(5.059)	(5.885)	(6.640)	(5.980)	
White	-0.206 ***	0.246 ***	0.098 **	0.088 *	-
	(-4.289)	(4.845)	(2.002)	(1.859)	
Female	-0.201 *	-0.286 **	-0.261 ***	-0.238 *	-
	(-1.850)	(-2.532)	(-2.323)	(-1.834)	
Diagnoses	0.195 ***	0.059	0.001	0.055	-
	(3.493)	(1.118)	(0.012)	(0.776)	
Brain cancer	-0.680	0.079	-0.161	-0.558	-
	(-1.326)	(0.120)	(-0.341)	(-0.969)	

TABLE 3 (cont.)

Random-Effects, Panel Poisson Model for Diseases and Disorders of the Nervous System (MDC 1). Dependent variable is "Count of Deaths." (n = 5,409)[a]

Coefficient	Model 1	Model 2	Model 3	Model 4	Model 5
Secondary malignancies	0.599 * (1.874)	0.728 *** (2.179)	0.564 (1.531)	0.644 * (1.818)	-
Acute cerebro-vascular disease	0.211 *** (3.059)	0.362 *** (5.566)	0.243 *** (3.456)	0.333 *** (4.797)	-
Intracranial injury	-0.059 (-0.395)	-0.114 (-0.777)	-0.216 (1.358)	-0.025 (-0.159)	-
Other Facility	0.095 (0.830)	-0.088 (-0.341)	-0.275 *** (-2.123)	0.221 (-1.305)	-
Income 0-25	0.092 (1.560)	-0.108 * (-1.784)	-0.060 (-1.463)	-0.118 *** (-2.222)	-
Income 25-30	-0.165 *** (-3.167)	-0.088 (-1.263)	-0.234 *** (-4.208)	-0.285 *** (-3.426)	-
Income 30-35	-0.087 (-1.588)	-0.069 (-1.113)	-0.094 (-1.347)	-0.080 (-0.970)	-
Specialize	-1.630 *** (-2.821)	-2.273 *** (-4.390)	-1.669 *** (-2.961)	-1.753 *** (-2.590)	-
Attendings	1.043 *** (49.255)	1.034 *** (50.012)	1.030 *** (59.299)	0.970 *** (42.615)	-
Surgical	-0.032 (-1.130)	-0.074 ** (2.019)	0.039 (1.142)	0.077 *** (2.607)	-
Government Owned	0.286 *** (4.772)	0.293 *** (5.393)	0.091 ** (2.022)	0.443 *** (7.002)	-
Not-for-profit	0.213 *** (3.854)	0.293 *** (6.389)	0.098 *** (2.362)	0.113 *** (2.065)	-
Rural	-0.083 * (-1.906)	-0.028 (-0.741)	0.001 (0.034)	-0.135 *** (-3.7287)	-
Teaching	0.163 *** (7.471)	0.092 *** (3.562)	0.105 *** (4.445)	0.111 *** (5.191)	-
Time before/ after inspection	-0.068 *** (-2.063)	-	-0.064 * (-1.879)	-	-0.074 (-1.476)
(Time before/ after inspection)^2	0.028 *** (4.237)	-	0.021 *** (3.087)	-	0.024 *** (2.169)
Administration	-0.023 *** (-7.729)	-	-	-0.043 *** (-9.447)	-0.114 *** (-14.850)
Management	-0.006 (-1.488)	-	-	0.017 *** (3.525)	-0.103 *** (-9.328)
Patient Care	0.004 * (1.891)	-	-	0.006 *** (2.210)	0.069 *** (11.076)
σ_u (random-effects parameter)	0.489 *** (35.471)	0.440 *** (33.606)	0.459 *** (43.369)	0.477 *** (25.339)	0.777 *** (38.985)
Log-likelihood	-11479.953	-11480.332	-11474.761	-11502.076	-12395.589
Maddala's R^2	0.317	0.317	0.318	0.311	0.041
Akaike's information criterion	23017.907	23018.664	23007.522	23062.152	24849.178

[a]Numbers in parentheses are t-statistics (based on heteroscedastic-consistent variance-covariance matrix); *, **, and *** denote significance at the 10, 5, and 1 percent levels respectively (based on a two-tailed test).

TABLE 4

Random-Effects, Panel Poisson Model for Diseases and Disorders of the Respiratory System(MDC 4). Dependent variable is "Count of Deaths." (n = 5,401)[a]

Coefficient	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-1.498 ***	-2.397 ***	-2.473	-2.101 ***	2.486 ***
	(-4.344)	(-12.581)	(-0.204)	(-10.756)	(51.197)
Ln(discharge)	1.097 ***	1.082 ***	1.091 ***	1.095 ***	
	(0.008)	(0.006)	(0.006)	(0.005)	
Age 0-15	0.113	-0.081	-0.035	-0.070	-
	(0.379)	(-0.460)	(-0.002)	(-0.454)	
Age 16-35	0.038	0.372	0.088 **	0.184	-
	(0.038)	(1.526)	(0.030)	(0.613)	
Age 36-50	-0.0.35	-0.205	-0.063	-0.148	-
	(-0.196)	(-0.909)	(-0.002)	(-0.639)	
Age 66-80	0.848 **	0.610 ***	0.725	0.649 ***	-
	(2.159)	(3.131)	(0.051)	(3.626)	
Age 81+	1.419 ***	1.036 ***	1.117	0.887 ***	-
	(3.676)	(5.674)	(0.097)	(5.283)	
White	-0.108 **	0.134 ***	-0.108	-0.078	-
	(-2.093)	(2.846)	(-0.245)	(-1.371)	
Female	-0.048	-0.138	-0.055	0.103	-
	(-0.294)	(-1.101)	(-0.033)	(0.846)	
Diagnoses	0.158 ***	0.357 ***	0.390 ***	0.239 ***	-
	(3.743)	(5.844)	(6.299)	(4.772)	
Respiratory failure	1.573 ***	0.773 ***	1.349	1.208 ***	-
	(9.199)	(2.651)	(0.933)	(7.536)	
Aspiration pneumonitis	0.953 ***	0.143	0.681	0.756 ***	-
	(3.935)	(0.681)	(0.193)	(4.200)	
Secondary malignancies	1.507 ***	0.978 ***	0.865	1.201 ***	-
	(5.916)	(3.234)	(0.289)	(3.587)	
Lung Cancer	1.034 ***	0.965 ***	0.815 ***	0.978 ***	-
	(3.724)	(4.087)	(0.166)	(4.631)	
Other Facility	-0.448 ***	-0.416 ***	-0.519	-0.428 ***	-
	(-5.098)	(-5.780)	(-0.949)	(-6.246)	
Income 0-25	-0.463 ***	0.174	0.004	-0.028	-
	(-11.663)	(3.564)	(0.004)	(-0.717)	
Income 25-30	-0.355 ***	-0.076	0.073	-0.169 ***	-
	(-7.771)	(-1.414)	(0.091)	(-3.450)	
Income 30-35	-0.266 ***	-0.017	-0.026	-0.189 ***	-
	(-5.412)	(-0.228)	(-0.025)	(-2.537)	
Specialize	4.148 ***	3.513 ***	3.839 ***	3.539 ***	-
	(18.221)	(14.774)	(17.860)	(15.852)	
Attendings	0.804 ***	0.882 ***	0.840 ***	0.860 ***	-
	(60.267)	(61.761)	(3.804)	(64.912)	
Surgical	-0.110 **	-0.029	-0.005 **	-0.031	-
	(-3.646)	(-1.109)	(-0.006)	(-1.084)	
Government Owned	0.061	-0.136 ***	0.099	0.164 ***	-
	(1.525)	(-3.599)	(0.428)	(4.372)	
Not-for-profit	0.032	0.055 ***	0.164	0.098 ***	-
	(1.378)	(2.471)	(0.739)	(3.250)	
Rural	-0.378 ***	-0.221 ***	-0.267	-0.383 ***	-
	(-9.706)	(-5.769)	(-0.895)	(-10.397)	
Teaching	0.021	0.232 ***	0.124 ***	0.092 ***	-
	(0.991)	(9.723)	(3.541)	(5.143)	

TABLE 4 (cont.)

Random-Effects, Panel Poisson Model for Diseases and Disorders of the Respiratory System(MDC 4). Dependent variable is "Count of Deaths." (n = 5,401)[a]

Coefficient	Model 1		Model 2		Model 3		Model 4		Model 5	
Time before/	-0.062	***	-		-0.066		-		-0.037	
after inspection	(-2.319)		-		(-0.262)		-		(-1.201)	
Time before/	0.022	***	-		0.025		-		0.010	
after inspection)^2	(3.823)				(0.572)				(1.532)	
Administration	-0.014	***	-		-		-0.013	***	-0.031	***
	(-4.188)		-		-		(-4.229)		(-5.159)	
Management	-0.015	***	-		-		0.011	***	-0.074	***
	(-2.986)		-		-		(3.157)		(-11.376)	
Patient Care	0.005	*	-		-		0.022	***	0.010	***
	(1.958)		-		-		(6.302)		(3.365)	
σ_u (random-effects	0.422	***	0.401	***	0.354	***	0.391	***	0.626	***
parameter)	(40.103)		(19.215)		(4.298)		(26.611)		(41.066)	
Log-likelihood	-14630.931		-14685.751		-14625.476		-14662.203		-16255.552	
Maddala's R^2	0.479		0.468		0.480		0.473		0.049	
Akaike's information criterion	29319.862		29419.502		29302.952		29378.405		3252.103	

[a]Numbers in parentheses are t-statistics (based on heteroscedastic-consistent variance-covariance matrix); *, **, and *** denote significance at the 10, 5, and 1 percent levels respectively (based on a two-tailed test).

MDC is a significant control for the number of deaths. Age is an important factor after the age of 65 for both nervous and respiratory system conditions. For nervous system problems, the presence of young patients is also an important consideration. Race is statistically significant for both diagnosis categories, but the direction of correlation is not consistent. To control for severity of patient illness, the proportion of patients admitted with the diagnoses with the highest associations with mortality are used as explanatory variables. The identification of these diagnoses is from the Clinical Classification System [HCUP CCS] codes of the primary diagnoses. For respiratory patients, these conditions are respiratory failure, aspiration pneumonitis, secondary malignancies, and lung cancer. For nervous system patient, the conditions are brain cancer, secondary malignancies, acute cerebrovascular disease, and intracranial injury. The number of diagnoses that a patient is admitted for is important and has an anticipated positive sign for both MDCs. This variable is used to control for the presence of comorbities that exist in the patient populations.

The variable Other Facility is an important control variable because a patient with a serious medical problem may originally have been admitted to a small rural hospital which did not have the equipment or specialty to treat the patient effectively. The rural hospital's role is to stabilize the patient and prepare him for transport to a larger urban hospital. The covariate in this case captures the experience of the urban hospital.

The variable Surgical acts as both a patient characteristic, given that some patients require a surgical and medical intervention, and a hospital characteristic, since it is a decision rule to provide surgical consultation to patients.

Both government-owned and not-for-profit hospitals have worse outcomes than investor-owned hospitals, which may reflect patient selection by the hospitals. Investor-owned hospitals treat fewer low-income patients. If we assume that higher income individuals can afford greater access to elective medical care, then this could result in investor-owned hospitals treating patients who have better admission levels of health and that investor-owned hospitals can plan better for patient needs because they know their population more thoroughly. Rural hospitals have fewer deaths because they have fewer patients and because they transport their sickest patients to urban hospitals. Teaching hospitals actively attract patients who are in poorer health than do non-teaching hospitals and may aggressively treat patients that have severe conditions where a non-teaching facility would advise non-treatment.

Table 5 contains a summary of hypotheses 1 through 3. Hypothesis 1 is tested by comparing model 1 to model 2. Mortality is better explained using the JCAHO variables for MDC 4. There is support for Hypothesis 1 that inspection activity has an effect on patient mortality. However, the direction of this effect is not necessarily evident. Comparing models 1 and 3 tests hypothesis 2. The JCAHO performance areas (patient care, management, and administration) jointly explain the quality related patient outcomes. Comparing models 1 and 4 tests hypothesis 3. The timing to the next inspection or since the last inspection has a significant effect on mortality for both MDC 1 and 4.

TABLE 5
Chi-Square Statistics for Hypothesis Tests Using Model 1 as the Unrestricted Model

Hypothesis	Null Restrictions	MDC 1 χ^2	MDC4 χ^2	Result
Hypothesis 1	Time, $(\text{Time})^2$, Administration, Management, Patient Care	0.8	109.6 **	Could not reject null for MDC 1. Null rejected for MDC 4.
Hypothesis 2	Administration, Management, Patient Care	10.4 *	10.9 *	Null rejected
Hypothesis 3 (	Time before/after inspection, Time before/after inspection)^2	44.2 **	62.5 **	Null rejected

*Significant at the 0.05 level; **significant at the 0.01 level.

Hypothesis 4 tests whether the JCAHO survey can be used as a comparative report on hospitals. The information from the Full Survey is modestly informative of the quality of care delivered by hospitals. The Full Survey score, however, has the problem that the overall score aggregates the results from all three performance area groups. This implies that basing a decision on the overall score could lead to poor decision-making. The score does not suggest the nature of the non-compliance.

Time before/after inspection captures the preparation by hospitals for the JCAHO inspection team. As an inspection is approaching, hospitals become more compliant with standards. There is a benefit to this compliance. The benefit begins to diminish after the survey is over. The Time variable can be used to evaluate the optimal timing of inspections to minimize patient demise.

An increase in the Administration, Management, or Patient Care indicator means that the hospital is less compliant with the associated performance standard. Patient

Care is statistically significant for both MDCs and the sign is positive. A better Patient Care score is correlated with better patient outcomes. Administration and Management indicators results are the opposite. Patients do not apparently benefit from an improvement in Administration or Management indicators with respect to mortality. This finding on the JCAHO inspection variables is robust across the two MDCs and strongly supports the idea that JCAHO's various roles result in conflicting quality incentives.

The standardized (beta) coefficients for Administration, Management, and Patient Care variables for MDC 1 are -0.015, -0.016, and 0.018 respectively; for MDC 4, the betas are -0.015, -0.019, and 0.026. This suggests that the Patient Care indicator has the greatest explanatory power for hospital deaths. A one standard deviation improvement in Patient Care performance area scores results in a 0.018 standard deviation improvement in patient deaths for nervous system diseases and disorders and a 0.026 standard deviation improvement for respiratory conditions.

In conclusion, JCAHO surveys do provide an incentive to hospitals to improve processes of care for the period leading up to an inspection and that incentive gets eliminated after the inspection occurs. JCAHO has announced a change from the scheduled survey to an unannounced strategy. The objective of this change is to provide an incentive to maintain a level of readiness. This may not occur if hospitals are motivated to minimize the overall cost of JCAHO compliance. Currently, hospitals are induced to prepare heavily for the Full Survey to minimize the cost of a follow-up inspection. It is likely that the change to the unannounced survey may reduce the preparedness of hospitals so that the expense is to fix performance areas that are identified by the full inspection.

The full survey scores do not identify whether hospitals are high or low quality largely because the different performance areas tend to counter each other. An improvement in performance areas that focus on patient care does work to improve patient outcomes across MDC 1 and MDC 4. Administrative and Management performance area improvements may actually result in worse patient outcomes. A policy opportunity is to change the focus of the Medicare compliance decision to rely only on quality indicators that relate to patient care. This change would separate JCAHO's quality assurance from its consulting activities. There is indication that society is better off with the JCAHO accreditation process than without it given that the patient care indicators have the largest effect on patient outcomes of the three areas identified.

NOTES

1 New Jersey and Oklahoma do not accept JCAHO hospital accreditation as compliance with state certification requirements for hospitals. It is interesting that all 50 states do recognize JCAHO's behavioral health accreditation program.

2 The OIG report (OEI-01-97-00053) did recognize that JCAHO inspections foster "attention to continuous quality improvement."

3 There are some hospitals that are surveyed by both JCAHO and AOA.

4 MDC 1 is nervous system diseases and disorders and MDC 4 is illness of the respiratory system.

REFERENCES

AHRQ HCUP NIS. Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project Nationwide Inpatient Sample, on-line at: http://www.hcup-us.ahrq.gov/

Antel, J. J., Ohsfeldt, R. L., Becker, E. State Regulation and Hospital Costs, *The Review of Economics and Statistics,* August 1995, 416—422.

Arminger, G. Specification and Estimation of Mean Structures: Regression Models. *Handbook of Statistical Modeling for the Social and Behavioral Sciences.* Plenum Pub. Corp., 1995, 77—183.

Ashton, C.M., Wray, N.P. A Conceptual Framework for the Study of Early Readmission as an Indicator of Quality of Care. *Social Science and Medicine,* December 1996, 1533-1541.

Cameron, A. C., Trivedi, P. K. *Regression Analysis of Count Data,* New York: Cambridge University Press, 1998

C**hen J., Rathore S.S., Radford M.J., and Krumholz H.M.** JCAHO Accreditation and Quality Care for Acute Myocardial Infarction. *Health Affairs*, March/April 2003, 243-254.

Geweke, J., Gowrisankaran, G., Town, R. J. Bayesian Inference for Hospital Quality in a Selection Model, 2001, NBER Working Paper 8497.

Grossman, M. On the Concept of Health Capital and the Demand for Health. *The Journal of Political Economy*, March/April 1972, 223—255.

HCUP CCS. Healthcare Cost and Utilization Project Clinical Classification Software, on-line at: http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp

Lohr, K.N. Ed. Medicare: A Strategy for Quality Assurance, 1990. Washington D.C.: National Academy Press.

McClellan, M., Staiger, D. The Quality of Health Care Providers, 1999, NBER Working Paper 7327.

Office of Inspector General, Department of Health and Human Services. The External Review of Hospital Quality Holding the Reviewers Accountable, 1999, OEI-01-97-00053.