

**Hospital Quality of Care:
Evaluation of Resulting Financial Risk for Disclosure in Annual Reports**

By:

James D. Byrd, Jr., PhD, CPA, CHFP
Collat School of Business
University of Alabama at Birmingham
Birmingham, Alabama

S. Robert Hernandez, DrPH
UAB School of Health Professions
Birmingham, AL

Greg L. Carlson, PhD
Saint Leo University
Saint Leo, FL

Larry R. Hearld, PhD
UAB School of Health Professions
Birmingham, AL

Richard A. Turpen, PhD
Auburn University at Montgomery
Montgomery, AL

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Abstract

Study Purpose: The Centers for Medicare and Medicaid Services (CMS) reduces its normal revenue payments to acute care hospitals for sub-standard quality of care. CMS uses a variety of measures for making these assessments. The measures used for the payment adjustments are being phased into the payment process beginning with cardiac patient readmissions in 2013. CMS announced in October, 2014, that 721 hospitals will have their Medicare payments reduced by one percent for high rates of hospital acquired infections and other injuries. This study analyzes whether such penalties will influence lenders' assessment of the financial risk of the penalized hospitals and increase interest rates. Net income and cash flow of hospitals with sub-standard quality could also be negatively affected if this information is used by consumers to change their healthcare purchasing decisions. This risk should be of interest to hospital CFOs and hospital auditors.

Methods: Acute care hospitals' average interest rates (cost of debt) for 2008, 2009 & 2010 were regressed on weighted average mortality scores (from Hospital Compare) using Stata 11 with robust clustering to account for repeated observations of hospitals across years. Separate regressions were used to test for differences between not-for-profit and for-profit hospitals, and whether the strength of the relationship between mortality rate and interest rate increased over time.

Results: The results indicated a negative correlation between mortality rates and interest rates (-.165, significant at .01 level). Accordingly, hospitals' mortality scores that were higher than the mean for the study population were correlated with a lower average cost of capital that was statistically significant. The results did not differ significantly between For Profit and Not-for-Profit hospitals, nor did they differ significantly from year-to-year within the study period.

Discussion: It is unlikely that lenders would view an increase in a hospital's mortality rate as reducing risk and lower their interest rate requirement on a loan. A more likely explanation is that hospitals were still receiving higher revenues from readmissions and the longer stays that result from problems with the quality of care.

Conclusion: The study results suggest that hospital quality scores may have a small correlation to cost of debt. While this study is an initial examination of the relevance of hospital quality reporting to financial statement users, the results suggest that users of hospital financial statements have not yet developed a high sensitivity to hospital quality scores. However, hospital CFO's and financial statement auditors should continue to monitor quality as a potential risk area that should be considered in assessing financial risk.

Keywords: Hospital quality, hospital profitability, cost of debt, Hospital Compare

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Introduction

In 2013, the Centers for Medicare and Medicaid Services (CMS) began reducing its revenue payments to acute care hospitals for sub-standard quality of care. Medicare Hospital Compare which was implemented in 2005, maintains and reports the quality scores that are used by Medicare for these payment adjustments. The Medicare Hospital Compare scores are also available on-line to individuals interested in using the data to compare hospitals when selecting a provider for health care services. CMS uses a variety of measures for making payment adjustments, which are being phased into the payment process beginning with cardiac patient readmissions in 2013. CMS announced in October 2014 that 721 hospitals will have their Medicare payments reduced by one percent for high rates of hospital acquired infections and other injuries. This penalty directly reduces the profitability of the affected hospitals. This study looks at whether such penalties influence lenders' assessment of the financial risk of the penalized hospitals and increase interest rates to the riskier hospitals. These hospitals could also be negatively affected if this information is used by consumers to change their healthcare purchasing decisions.

Previous studies have looked at the correlation between quality and financial performance^{1,2,3} without demonstrating a strong relationship between hospital profit and hospital quality improvement investments. However, little empirical work has been conducted regarding the association of hospital quality scores with hospitals' risk and cost of capital. This study analyzed the relationship between clinical quality scores of acute care hospitals and financial risk as reflected in hospitals' cost of debt. Lenders and rating agencies (such as Standard and Poor's and Moody's)^{4,5} consider both financial and non-financial information (such as a hospital's competitive environment) in deciding on a hospital's creditworthiness. Bond ratings indicate the creditworthiness of hospitals and other businesses, and accordingly have a direct influence on the rate of return demanded by investors⁶. Non-financial items, such as occupancy, payer mix, and case-mix index, are viewed as important considerations in the assessment of a hospital's financial risk because of the potential impact on revenues, expenses,

¹ Romano, P. S., & Zhou, H. (2004). Do well-publicized risk-adjusted outcomes reports affect hospital volume? *Medical Care*, 42(4), 367-377.

² Gillean, J., Shaha, S., Sampanes, E., Mullins, C., (2006). A search for the "Holy Grail" of health care: a correlation between quality and profitability, *Healthcare Financial Management*; Dec 2006; 60, 12, 114-121.

³ Bazzoli, G. J., Chen, H., Zhao, M., & Lindrooth, R. C., (2008). Hospital financial condition and the quality of patient care, *Health Economics*, 17: 977-995, (2008).

⁴ Standard & Poor's. (2011, February 16). General criteria: Principles of credit ratings. Retrieved from <http://standardandpoors.com>

⁵ Moody's, 2011 Moody's. (2011). Rating methodologies. Retrieved from <http://www.moody.com>

⁶ Gapenski, L. C. (2006). *Understanding healthcare financial management* (5th ed.). United States: Foundation of the American College of Healthcare Executives

and ability of a hospital to re-pay its debt.^{7,8,9} The financial risk environment of hospitals is becoming increasingly complex as a result of shifting from cost-based reimbursement to reimbursement models based on performance.

Increased transparency in healthcare relative to price and quality of care also contributes to the potential for increased or decreased financial risk inherent in operating a hospital because consumers can make more informed choices in selecting their healthcare providers. Consumers are expected to use the quality of care information to select providers providing better care, which will impact revenues of competing hospitals.¹⁰ Outside of healthcare, disclosure of non-financial information (e.g., environmental performance and corporate social responsibility) has been demonstrated to have a significant effect on both the cost of debt and the cost of equity capital.^{11,12,13} Hospitals' quality of care ratings are a relatively new non-financial disclosure in the healthcare industry. These ratings provide a public measure of the relative quality of care between competing hospitals. If consumers use this information, they may shift their choice of hospitals to the higher quality rated hospital which would increase the revenues of the better performing hospital. As such, these ratings may provide insight into a poorer performer's risk of losing revenues and causing financial distress.

The question addressed in this study is whether reported quality scores are associated with the degree of hospitals' financial risk as reflected in their cost of debt. Investors and lenders should be interested in the results that indicate a correlation between quality of care and cost of debt of hospitals. Since a correlation appears to exist, hospitals' quality of care can be an important factor of financial risk. Hospitals with poor quality scores are likely to experience higher costs per patient to treat issues caused by the hospital, higher costs from lawsuits, and potentially lower revenues as patients go to other hospitals for services. Investors and lenders should be concerned about these potential negative effects on a hospital's net income and demand a higher return to compensate for the risk. Financial statement auditors should also consider whether hospital quality scores are indicators of financial risk that should be considered during their annual risk assessment. A potential negative trend on earnings that could put loan repayment in jeopardy, should alert the auditors to a potential 'going concern' risk that should be disclosed in the financial statements.

⁷ Nelson, E. C., Rust, R. T., Zahorik, A., Rose, R. L., Batalden, P., & Siemanski, B. A. (1992). Do patient perceptions of quality relate to hospital financial performance. *Journal of Health Care Marketing*, (December), 6-13.

⁸ Oszustowicz, R. J. (1992). Quality of care emerges as a determinant of creditworthiness. *Healthcare Financial Management*, 46(3), 46-58.

⁹ Standard and Poor's, 2011

¹⁰ KPMG (2008). *Briefing for audit committee members of not-for-profit healthcare systems and hospitals*: Industry Insights.

¹¹ Dhaliwal, D., Li, O. Z., Tsang, A., & Yang, Y. G. (2010). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *Social Science Research Network*. Retrieved from <http://ssrn.com/abstract=1687115>

¹² Prumlee, Brown, Hayes & Marshall 2010

¹³ Sengupta, P. (1998). Corporate disclosure quality and the cost of debt. *The Accounting Review*, 73(4), 459-474

The Present Study

Purpose of Study

This study analyzed the association of hospitals' cost of debt with hospital quality scores. The quality scores can impact revenues in two ways. First, sub-par scores can directly cause revenue reductions due to the government's Hospital Value-Based Purchasing Program created by healthcare reform. This program established potential Medicare payment reductions that are driven by sub-par quality performance. Thus, beginning in 2012, hospital quality performance lapses would have a direct influence on hospitals' revenue beginning with payments during the fiscal year ended September 30, 2013.

Second, consumers can use the scores to select better performing hospitals for their healthcare needs. The indirect effects of a damaged reputation from poor quality of care (e.g., damaged reputation leads to reduced occupancy causing reduced revenues) which would negatively impact profits and increase financial risk.

The concern for hospital financial managers and external auditors that is addressed in this study is whether a hospital's cost of debt is associated with its quality scores to such an extent that auditors should consider hospital quality in their audit risk evaluation. Considering whether hospital quality scores are associated with hospitals financial risk will be a new step in the study of the benefits of improving hospital quality of care. Improved quality of care should improve hospital financial performance if health consumers are sufficiently knowledgeable and sophisticated to obtain and use publically available quality scores in making healthcare provider decisions. If consumers are not sophisticated, the sensitivity of the financial impacts caused by variances of clinical quality scores may be minimal. Results of this research may lead to a better understanding of the linkage between quality performance as reported by CMS in Hospital Compare, and financial risk of a hospital that is reflected in its cost of debt. Demonstrating this linkage may indicate that sufficient risk exists to warrant disclosure in the financial statement footnotes.

Background

The financial reporting literature has established the value of reporting non-financial data.^{14,15} Rating agencies like Moody's and Standard and Poor's consider a number of non-financial factors in rating bonds. For hospitals, these factors may include: occupancy, case-mix, payer-mix, admissions, discharges, competitive environment, and others. This study is concerned with the degree to which quality of care data should be considered a part of the analysis of non-financial factors as it is becoming more publicly available.

¹⁴ Hail, L. (2002). The impact of voluntary corporate disclosures on the ex-ante cost of capital for Swiss firms. *The European Accounting Review*, 11(4), 741-773.

¹⁵ Ittner, C. D., & Larker, D. F. (1998). Are nonfinancial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of Accounting Research*, 36, Supplement.

Sarbanes-Oxley¹⁶ increased the responsibility that hospitals have for ensuring that they minimize risk and comply with all rules, regulations, and reporting requirements. For hospitals, the potential cost of risk can be assessed in terms of the potential lost reimbursement, the risk of lawsuits and destroyed reputations, and increased debt financing costs.

Over the past 30 years, the hospital industry has been shifting from cost-based reimbursement to a model which places increased pressure on hospitals to generate revenues and control costs in order to remain profitable. At the same time, improved access by consumers and payers to quality and cost data from hospitals has increased risk by enabling consumers to shop for their healthcare provider on the basis of cost and quality. Hospitals can lose business to competitors if their quality of care is less than the other hospitals in the area. Hospitals also are becoming more at risk of losing customers to providers in other states, regions, and countries – a practice known as medical tourism. As agency theory would suggest, hospitals are responding to the increased scrutiny on quality of care and patient safety along with the risk of revenue loss from sub-par quality performance by implementing new quality control processes such as appointing quality officers and quality dashboards to ensure compliance with new rules and regulations. A number of hospitals have formed quality committees composed of hospital managers to be responsible for healthcare quality and patient safety. Other hospitals have created Quality Committees on their boards, and others have left quality oversight as a responsibility of the full board.¹⁷ Despite the increased attention by policymakers to patient safety and quality of care, governance of quality of care and patient safety still ranges from high priority to non-existent.¹⁸ Because of the potential impact of hospital quality of care issues on the hospital's overall Enterprise Risk Management¹⁹ and the potential for reimbursement losses for hospital-acquired conditions and sub-standard quality performance,²⁰ hospital Audit Committees and Internal Audit Departments should have an interest in healthcare quality.²¹

Risk and Cost of Capital

In general terms, risk is the chance that the actual outcome will differ from the expected outcome. For investments (e.g., bonds, stock, etc.), risk is the chance the return on investment will be less than the expected return. Returns include both periodic payment elements (interest or dividends) and changes in value of the security. When investors purchase a hospital bond or shares of stock in a hospital corporation, their required return will be affected by their assessment of the riskiness of the investment (Cleverly)²². The riskier the investment (i.e.,

¹⁶ The **Sarbanes–Oxley** Act of 2002 (Pub.L. 107–204, 116 Stat. 745, enacted July 30, 2002), also known as the "Public Company Accounting Reform and Investor Protection Act" (in the Senate) and "Corporate and Auditing Accountability and Responsibility Act" (in the House)

¹⁷ Jiang, J. H., Lockee, C., Bass, K., Fraser, I., & Keily, R. (2008). Board engagement in quality: Findings of a survey of hospital and system leaders. *Journal of Healthcare Management*.

¹⁸ Jha, A. K., & Epstein, A. M. (2009). Hospital governance and the quality of care. *Health Affairs-Web Exclusive*, 1-9. doi: 10.1377/hlthaff.2009.0297

¹⁹ Committee on Sponsoring Organizations of the Treadway Commission (COSO) (2004). *Enterprise risk management: Integrated framework*. American Institute of Certified Public Accountants.

²⁰ Final Rule – Inpatient Prospective Payment System (August 22, 2007)

²¹ KPMG, 2008 KPMG (2008). *Briefing for audit committee members of not-for-profit healthcare systems and hospitals: Industry Insights*.

²² Cleverly, W. O., & Nutt, P. C. (1984). The decision process used for hospital bond rating – and its implications. *Health Services Research*, 19(5), 615-637.

possibility that future cash flows will not be sufficient to make the debt services payments or to pay dividends and reinvest in the hospital plant and equipment), the greater the rate of return investors will require (Jones, 1998)²³.

The risk that is of concern to investors is comprised of multiple components. Financial risk can be divided into two categories: (1) systematic risk and (2) nonsystematic risk. Systematic risk refers to risk that is attributable to the entire market place and includes components such as default risk, interest rate risk, purchasing power risk, and marketability risk. Nonsystematic risk refers to risk that is related to a specific investment. Nonsystematic risk components include business risk, liquidity risk, capital structure (leverage), and profitability. All of these components can influence the variance of actual financial performance from expected financial performance. All of these financial risk factors, coupled with firm strategy, the ability of the management team, and unforeseen non-financial events, are of concern to investors as they analyze potential investments. The level of risk perceived by investors then drives the rate of return that they require (Gapenski, 2006²⁴; Jones, 1998²⁵).

Financial Risk Related to Quality of Care

Quality of care reporting provides consumers with information they can use to make healthcare purchasing decisions. As such, quality of care information can have a significant impact on a company's revenues, particularly if the decision maker can influence the choice of provider for a number of people, as in the case of employers selecting providers for employees for whom they provide healthcare benefits. For example, Lowe's, a large home improvement goods company, sends all of its employees who need heart surgery to the Cleveland Clinic. This selection not only impacts revenues of the Cleveland Clinic, it also impacts negatively the revenues of the providers formerly used by Lowe's employees. As employers and insurers increasingly select providers based on the value proposition offered (quality/cost), increased quality reporting has the potential to increase the financial risk of providers in the U.S.

Hospital quality management processes may be implemented to reduce the risk associated with medical errors and the adverse effects resulting from the errors. Quality processes are designed to reduce the possibility of occurrence of medical errors. In addition, processes may be implemented to identify errors when they occur and initiate corrective action as soon as possible in order to minimize adverse effects on patients. However, even when processes provide control over adverse events, inaccurate or inadequate reporting by the hospital may still cause negative effects on the cost of capital due to the risk that investors will receive incorrect information (information risk). Audit processes addressing clinical quality performance reporting can help to mitigate the information risk much the way financial internal control audits lower financial information risk. Management must balance the costs and benefits of these control costs (agency costs) to create a positive effect on financial performance.²⁶

²³Jones, C. P. (1998). *Investments: Analysis and management* (6th ed.). New York, NY: John Wiles & Sons.

²⁴Gapenski, L. C. (2006). *Understanding healthcare financial management* (5th ed.). United States: Foundation of the American College of Healthcare Executives.

²⁵Jones, C. P. (1998). *Investments: Analysis and management* (6th ed.). New York, NY: John Wiles & Sons.

²⁶Asbaugh-Skaife, H., Collins, D. W., Jr., Kinney, W. R., & Lafond, R. (2008). The effect of SOX internal control deficiencies on firm risk and cost of equity. *Journal of Accounting Research*, 47(1), 1-43.

Risk and Cost of Capital

The interest rate demanded by lenders on bonds and other borrowings is influenced by the assessed creditworthiness of a firm -- the perceived risk that the firm will be able to repay the debt. In this case, the relevant risk is corporate risk which is based on the effect on overall hospital risk of the project for which the debt is being issued. This rate is influenced by the perceived relative risk as compared to alternative lending options to the lender (Conrad, 1984²⁷; Gapenski, 1992²⁸). For this investigation, the researcher suggests that the degree of inherent risk for a hospital is increased by transparency of quality scores with hospitals having low quality scores (e.g. high risk adjusted mortality rates or high incidence rates for hospital acquired infections). Hospitals are negatively impacted financially when the increase in inherent risk translates into financial risk with the bond rating agencies and local lenders.

Quality Disclosure and Effect on Financial Risk

A study of 51 hospitals owned by Hospital Corporation of America (HCA) published in 1992 demonstrated that patient perceptions of hospital quality had a positive relationship to hospital financial performance.²⁹ At the time this study was conducted, the current definition of clinical quality had not been developed (a risk-adjusted mortality measure was used), but the conclusion that patient ‘perceptions’ of hospital quality is important to a hospital’s financial performance was significant. A study of surgeons and hospitals performing coronary artery bypass graft (CABG) surgeries in New York State from 1990 – 1993 found that hospitals with better outcomes had higher growth rates in both charges and market share.³⁰ Another study in the early 1990s demonstrated that increasing RN staffing improved quality without negatively impacting profit margins. These results support the notion that investments in quality of care can be expected to have positive financial results.³¹ Weech-Maldonado, Neff, and Mor (2003)³² studied the relationship of quality performance to financial performance for nursing homes following the Balanced Budget Act of 1997³³ that changed Medicare reimbursement to the prospective payment system (PPS) to increase financial incentives for more efficient and effective care. This study conclusively demonstrated the positive relationship between quality of care and financial performance.

After controlling for other factors that influence the cost of debt, Sengupta (1998)³⁴ noted that firms that provided more timely and more detailed financial disclosures had lower

²⁷Conrad, D. A. (1984). Returns on equity to not-for-profit hospitals: Theory and implementation. *Health Service Research, 19*(1), 41-63

²⁸Gapenski, L. C. (1992). Project risk definition and measurement in a not-for-profit setting. *Health Services Management Research, 5*(2), 216-224.

²⁹Nelson, E. C., Rust, R. T., Zahorik, A., Rose, R. L., Batalden, P., & Siemanski, B. A. (1992). Do patient perceptions of quality relate to hospital financial performance. *Journal of Health Care Marketing, (December)*, 6-13.

³⁰Mukamel, D. B., & Mushlin, A. I. (1998). Quality of care information makes a difference: An analysis of market share and price changes after publication. *Medical Care, 36*(7), 945-954.

³¹McCue, M., Mark, B. A., & Harless, D. W. (2003). Nurse staffing, quality, and financial performance. *Journal of Health Care Finance, 29*(4), 54-76.

³²Weech-Maldonado, R., Neff, G., & Mor, V. (2003). The relationship between quality of care and financial performance in nursing homes. *Journal of Health Care Finance, 29*(3), 48-60.

³³Balanced Budget Act of 1997 (Pub.L. 105–33, 111 Stat. 251, enacted August 5, 1997)

³⁴Sengupta, P. (1998). Corporate disclosure quality and the cost of debt. *The Accounting Review, 73*(4), 459-474.

costs of debt as a result of a lower perceived risk of default. Another study identified several non-financial variables (in particular, case-mix adjusted admissions and case-mix adjusted admission per bed) that affected the bond ratings and cost of debt of hospitals.³⁵ Voluntary disclosure of Corporate Social Responsibility (CSR) activities have been shown to have a positive effect on entities' costs of equity capital.³⁶ Since investment analysts use relevant non-financial data in their assessment of risk and voluntary disclosures of other non-financial information has been shown to affect cost of capital, disclosure of quality of care and patient safety data could have an effect on cost of capital. On the other hand, one research study conducted on healthcare, education, and financial service organizations concluded that only the highest rated sellers advertised their results from certifying or rating agencies.³⁷ These study results suggest that positive relationships between quality and financial performance may be skewed as a result.

Conceptual Framework

Alexander, Lee, Wang, and Margolin (2009)³⁸ used agency theory in their comparison of three Hospital Governance Surveys and suggested that the board should be considered as both a principal and an agent – a principal with respect to its governance of management activities, but also as an agent acting on behalf of the hospital's community. Agency theory suggests that a hospital board, representing the principals of the hospital, will provide governance in response to external pressures that create risk for the hospital. The conceptual framework of this study follows the agency theory analysis used by Alexander, et al.

With respect to quality of care, the board could be expected to implement compensation arrangements supported by performance evaluations of hospital executives that would incentivize the hospital management team to improve the hospital's clinical quality and patient care. Rating agencies and lenders use the bond rating to indicate their assessment of the likelihood of default on a hospital's debt based on both financial performance and other indicators of creditworthiness. The bond rating is manifested in the interest rate that a hospital must pay on its long-term debt. These relationships are depicted graphically below.

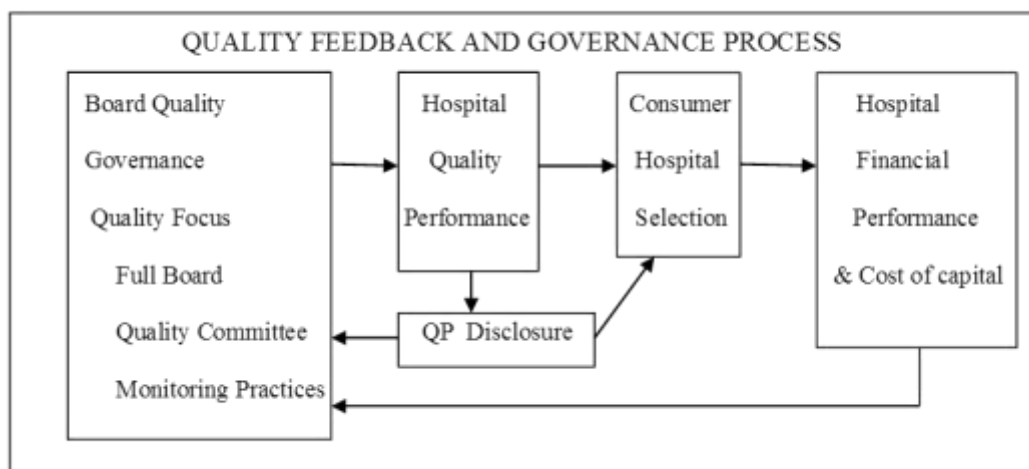
³⁵ Watkins, A. L. (2000). Hospital financial ratio classification patterns revisited: Upon considering nonfinancial information. *Journal of Accounting and Public Policy*, 19, 73-95.

³⁶ Dhaliwal, D., Li, O. Z., Tsang, A., & Yang, Y. G. (2010). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *Social Science Research Network*. Retrieved from <http://ssrn.com/abstract=1687115>

³⁷ Dranove, D., & Jin, G. Z. (2010). Quality disclosure and certification. *NBER Working Paper Series, No. 15644*.

³⁸ Alexander, J. A., Lee, S.-Y. D., Wang, V., & Margolin, F. S., (2009). Changes in the Monitoring and Oversight Practices of Not-for-Profit Hospital Governing Boards 1989-2005: Evidence from Three National Surveys. *Medical Care Research and Review*, 66(2): 181-196.

Figure 1. Graphic depiction of the quality feedback and governance process.



The figure illustrates the relationships between hospital board responses to quality of care risk that are expected to result in improved quality of care in the hospital and the effect of changes in the quality of care on the cost of capital to the hospital. A greater emphasis by the hospital board should result in improvements in quality of care. Since feedback is available to the board via the same performance statistics available to consumers, Hospital Compare, the board should be able to monitor the hospital’s performance and implement new policies and procedures that are necessary to achieve the desired quality scores subject to cost/benefit constraints. Since quality scores are available for use by healthcare consumers in selecting a hospital for their healthcare needs, quality scores could have a direct impact on hospital volumes assuming consumers are obtaining and using the information to help them make rational choices. By reporting quality scores through CMS and Hospital Compare, hospitals provide better information for consumers to make better choices.

Presumably, a hospital with better quality scores than its competitors will enjoy a competitive advantage by attracting a greater percentage of patients. In addition, a hospital with a higher number of preventable adverse events will incur greater costs per patient because of the longer stays and higher treatment intensity required to treat unanticipated adverse conditions. For patients with reimbursement plans that do not compensate the hospital for the extra treatment and length of stay, the hospital’s revenue per discharge will be reduced. The combination of reduced revenue and increased costs will have a negative effect on the hospital’s operating income and operating cash flow. Investors would translate the negative impact on financial performance as an increased risk and require a higher return on their investment in the hospital. In their agency roles, hospital boards should respond to the higher cost of capital by improving quality of care.

The primary effect under investigation is whether a relationship exists between reported hospital clinical quality scores and hospitals’ risk as measured by effective interest rates on long-term debt. Poor hospital quality performance can increase the risk that the hospital may default on its debt (or declare bankruptcy) by increasing costs (rework) and reducing revenues due to a decline in occupancy (patients going to other hospitals as a result of their knowledge about substandard care obtained through Hospital Compare or other methods).

Higher quality scores (lower mortality and readmission rates) should correspond with lower cost per case and yield a higher operating margin for the hospital. Investors generally associate better financial performance with better creditworthiness (i.e., lower risk) and require a lower return on investment. This lower return requirement corresponds with a lower cost of capital to the hospital. Therefore, the fundamental hypothesis of this study can be stated as follows:

Hypothesis: Hospital cost of capital is positively related to its reported mortality scores.

Methods

The hypothesis was tested using ordinary least squares (OLS) regressing the hospitals' average interest rates (cost of debt) on weighted average mortality scores. Stata 11 was used for the regression with the robust clustering function applied to account for repeated observations of hospitals across years. In addition to regressing average interest rates on current year cost of debt, a separate test was conducted with interaction terms between ownership type and mortality added to the main model to test whether the relationship between mortality scores and cost of capital would be the same for not-for-profit and for-profit hospitals. Finally, a third regression model that added interaction terms for year and mortality to the main model was used to evaluate whether the strength of the relationship between mortality rate and interest rate changed over time.

Data Sources

Data from three different sources were merged into a single database. Mortality scores (quality data) for acute care hospitals were obtained from Hospital Compare for the years 2008 through 2010. Using five or six years of data would have been preferred for testing the time effect on the relationship between quality reporting and cost of capital; however, 2008 was the first year for which mortality scores were available. Hospital characteristics were obtained from the American Hospital Association (AHA) annual survey and financial data were obtained from the Medicare Cost Reports. These three data sets were merged at the hospital level, separately for each year, to develop a pooled cross-sectional data set of all U.S. acute care hospitals for the years 2008-2010. Federal government hospitals, specialty hospitals (e.g., Children's hospitals, orthopedic hospitals, etc.) were removed from the study population, resulting in a total of 4,397, 4,290, and 4,416 hospitals for 2008, 2009, and 2010, respectively.

Since this study was intended to test the relationship between mortality scores and cost of debt, only hospitals that incurred interest expense were relevant. 3911 observations of hospitals with interest expense on the "Reclassification and Adjustment of Trial Balance Expenses" schedule in the Medicare Cost Reports (line A8800, column 2) were selected for the analysis. The interest on this schedule is associated with long-term debt. All other financial information including long-term debt was taken from the "Balance Sheet" and "Statement of Revenues and Expenses" included with the G series of schedules which are populated from the hospitals financial statements. The effective interest rate was derived by dividing the gross

interest (A880000, Column 2) by the average of the beginning and ending Mortgage and Bond debt (Balance Sheet lines 3700 and 3800 respectively). Hospitals with either a negative interest rate (n=33) or an interest rate greater than 25% (n=300) were then removed as either outliers or errors. Negative interest resulted from the calculation of the average interest rate when a hospital reported negative debt on the Balance Sheet that could not be resolved. An interest rate greater than 25% generally was similarly caused by errors in the data that could not be resolved. The resulting database consisted of 3,578 observations across all three years, with 1759 hospitals having observations for multiple years. 158 observations that did not have a weighted average mortality rate, the key independent variable, were then removed, leaving 3,420 total observations for the analysis.

Operationalizing the Variables

Dependent Variable – Average Cost of Debt

One ‘composite’ indicator of perceived creditworthiness/risk is a hospital’s bond rating. However, a bond rating is not available for all hospitals. Lenders use the same evaluation criteria to determine the interest rate for changes to existing debt or on a new bond issue. Therefore, the effective interest rate on long-term debt can be used as a surrogate measure for financial risk for tax-exempt entities. Tax-exempt entities’ cost of capital includes both a debt component and an equity component. The debt component is readily identifiable as the composite interest cost on long-term debt. The equity component must be derived, since the equity is a combination of contributions from donors and accumulated earnings from prior years. A number of methods can be used for estimating the cost of this component of capital, but the internal rate of return used for deciding to invest in a project appears to be the most common method used by not-for-profit organizations (Gapenski, 1992)³⁹. Arguments can be made for using the expected growth rate of hospital equity, the return required to maintain the hospital’s creditworthiness, the opportunity cost, or the cost of equity for similar for-profit businesses. While each of these alternatives has theoretical merit, each one also presents measurement issues (Bruner et al., 1998)⁴⁰. The internal rate of return avoids the measurement issues of the other methods by eliminating the forward looking estimations and need for information on other entities because it simply relies on the individual hospital’s cost of debt. The rate of return on any investment project must exceed the cost of the cost of capital used to finance a project to warrant moving forward with the project. Otherwise, the hospital’s resources will decline. For tax-exempt hospitals, projects generally are financed with debt. The cost of debt then represents the minimum required return on the project investment for the hospital to maintain its level of resources.

The other financial and non-financial factors that affect bond ratings and cost of capital are controlled for in the regression equation below, which is used to depict the hypothesized relationship:

$$WACD_{it} = HCQS_{it}\beta_1 + FRCV_{it}\beta_2 + HOCV_{it}\beta_3 + HECV_{it}\beta_4 e_{it}$$

³⁹ Gapenski, L. C. (1992). Project risk definition and measurement in a not-for-profit setting. *Health Services Management Research*, 5(2), 216-224.

⁴⁰ Bruner, R. F., Eades, K. M., Harris, R. S., & Higgins, R. C. (1998). Best practices in estimating the cost of capital: Survey and synthesis. *Financial Practice and Education*, Spring/Summer, 13-28.

Where:

WACD = average cost of debt;

HCQS = Hospital Compare Composite Quality Score;

HECV = hospital environment control variables for the preceding reporting period;

HOCV = hospital operating control variables;

FRCV = financial ratios control variables.

Independent Variable(s) – Composite Quality (Mortality) Scores from Hospital Compare

The quality score used in the study was a weighted average of mortality scores available in Hospital Compare similar to Haydar, Nicewander, et al⁴¹. The mortality measures are developed by CMS using complex statistical sampling models to provide hospital measures that allow consumers to compare hospitals. The methodology behind quality score development is available through the Hospital Compare website, specifically at http://qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTie_r4&cid=1163010421830. The three Risk Standardized Mortality Rates (RSMR) “Mortality Measures” from Hospital Compare were used to calculate the weighted average mortality rate. Even though the Risk Standardized Readmission Rates (RSRR) for AMI, Heart Failure, and Pneumonia components are included in the 2009 and 2010 CMS Mortality scoring, these three categories were not available for 2008, so only the three Risk Standardized Mortality Rates that were available in all three study years were included in the weighted average calculation to ensure consistent calculations of weighted average mortality across all years. The score for each of these three categories was weighted by the number of admissions reported to Medicare for each condition to obtain the composite Mortality Measure (Haydar et al., 2010)⁴². Since previous studies demonstrated a correlation between the process of care measures and the mortality measures (Jha et al., 2007⁴³; Ryan et al., 2009⁴⁴), a weighted average of mortality measures could be expected to provide an appropriate composite quality score measure for this study.

Hospital Compare also reports scores for process of care measures as well as mortality measures. Only the mortality scores were used in this study since researchers have demonstrated a correlation between process of care measures and mortality scores (Bradley et al., 2006⁴⁵; Fonarow et al., 2007⁴⁶).

Other Variables (financial and non-financial)

⁴¹Haydar, Z., Nicewander, D., Convery, P., Black, M., & Ballard, D. (2010). Clinical quality if independently associated with favorable bond ratings. *American Journal of Medical Quality*, 25(3), 181-185.

⁴² Ibid

⁴³Jha, A. K., Orav, E. J., Li, Z., & Epstein, A. M. (2007). The inverse relationship between mortality rates and performance in the hospital quality alliance measures. *Health Affairs*, 26(4), 1104-1110.

⁴⁴Ryan, A. M., Burgess, J. F., Jr., Tompkins, C. P., & Wallack, S. S. (2009). The relationship between Medicare’s process of care quality measures and mortality. *Inquiry*, 46, 274-290.

⁴⁵Bradley, E. H., Herrin, J., & Elbel, B. (2006). Hospital quality for acute myocardial infarction: Correlation among process measures and relationships with short-term mortality. *JAMA*, 296, 72-78.

⁴⁶Fonarow, G. C., Abraham, W. T., & Albert, N. M. (2007). Association between performance measures and clinical outcomes for patients hospitalized with heart failure. *JAMA*, 297, 61-70.

Indicators of financial performance that are used by rating agencies and investors in assessing risk and developing bond ratings and required returns are used as control variables. In addition, other key hospital non-financial indicators used by hospital boards and managers to assess performance were controlled for in the regression. The variables determined from the literature that have typically been used as control variables related to measuring hospital financial performance were used in this investigation (Haydar et al., 2010⁴⁷; McCue et al., 2003⁴⁸; Watkins, 2000⁴⁹, Pink, et al., 2007⁵⁰).

Pink and colleagues determined that CAH managers and boards found 13 of the most frequently used indicators and seven of the other indicators to be the most useful for managing hospitals (Pink, et al (2005).⁵¹ This study used these same 20 measures.

Other Control variables used in the analysis that were based on the typical non-financial hospital characteristics in studies included the following:

Hospital System Membership - System membership can create advantages and disadvantages.

Ownership – Hospitals categorized as non-federal governmental hospitals, not-for-profit hospitals, and for-profit hospitals by the AHA Annual Survey were included in the study to control for variations in interest rates associated with each type of hospital.

Payer-mix – Measures the relative degree to which a hospital's patient population has third party insurance, Medicare, Medicaid, private pay, and uncompensated care.

Staffed beds - Controls for the variations in quality and financial performance resulting from size variations. The number of staffed beds for each hospital was obtained from AHA Annual Survey data.

Occupancy percentage – *The average daily census divided by the average number of beds actually in use and generating revenue.*

Case-mix index – The diagnosis or treatment can be a factor in both the outcomes and the costs due to variations in intensity of care. Case-mix index influences revenue which is an important consideration in evaluating the inherent risk and financial risk.

Method of Analysis

Histograms were used to determine that the distributions of interest rates and mortality rates were sufficiently normal. The descriptive information for the hospitals included in the study data was compared to all acute care hospitals to assess whether the hospitals in the study reasonably represented all acute care hospitals.

⁴⁷Haydar, Z., Nicewander, D., Convery, P., Black, M., & Ballard, D. (2010). Clinical quality if independently associated with favorable bond ratings. *American Journal of Medical Quality*, 25(3), 181-185.

⁴⁸ McCue, M., Mark, B. A., & Harless, D. W. (2003). Nurse staffing, quality, and financial performance. *Journal of Health Care Finance*, 29(4), 54-76.

⁴⁹Watkins, A. L. (2000). Hospital financial ratio classification patterns revisited: Upon considering nonfinancial information. *Journal of Accounting and Public Policy*, 19, 73-95.

⁵⁰ Pink, G. H., Daniel, I., Hall, L. M., & McKillop, I. (2007). Selection of key financial indicators: A literature, panel and survey approach. *Longwoods Review*, 4(4), 87-96.

⁵¹ Pink, G. H., Holmas, G. M., D'Alpe, C. D., Strunk, L. A., McGee, P., & Slifkin, R. (2005). Financial indicators for critical access hospitals (Flex Monitoring Team Briefing Paper No. 7). *Flex Monitoring Team*.

Correlation analysis was used to understand the relationships between variables and to assess the possibility of multi-collinearity. Correlation analysis included the dependent variable, the independent variables, and the control variables concerning hospital characteristics and financial information selected based on the literature review. These same variables were used in regression analysis for hypothesis testing. Hospital characteristics that may impact creditworthiness include: occupancy, payer-mix, case-mix, size (number of beds), and geographic region. Financial risk factors representing financial viability, efficiency, liquidity, and capital structure were included in the regression as control variables. All variables are listed in the Correlation analysis results (Table 6) and in the regression model.

Analysis of Variance (ANOVA) was used to supplement descriptive information. ANOVA results showed differences in average values of interest rates and mortality scores between hospitals that are system members, and between ownership types.

Descriptive Statistics

Characteristics of hospitals that had an average annual interest rate within the relevant range of 0 – 25% are presented below in Table 1.

Table 1
Descriptive Characteristics

	2008		2009		2010	
Hospitals	1,547	100.0%	925	100.0%	948	100.0%
Member of hospital system	644	41.6	369	39.9	411	43.4
Ownership						
Not-for profit	1,023	66.1	615	66.5	649	68.5
Investor-owned	96	6.2	63	6.8	87	9.2
Governmental	428	27.7	247	26.7	212	22.4
Dependent variable						
Average interest rate		8.63%		5.91%		6.60%
Independent variable						
Weighted average mortality		12.11		12.18		12.14
Total beds (mean)		158.4		145.7		160.8
Occupancy % (mean)		57.0%		55.4%		54.7%
Payer Mix		.6997		.7084		.7142
Case mix index (mean)		.9492		.8736		.9387
Herfindahl index (mean)		.5955		.5867		.5657
Net Income		213,063		6,114,036		8,184,851
Current ratio		2.48		1.88		2.79
Invested debt capital to total capital ratio		.4396		.3067		.5089
Days Revenue in A/R		106.6		106.9		105.2
Operating Margin		-.0392		-.0371		-.0338
Total Asset Turnover		1.0971		.9407		1.1406
Revenue per admission		\$19,813		\$21,556		\$22,768

Hospitals with average interest rates within the reasonable range of 0 to 25% comprised approximately 35% (1,547) of total hospitals in 2008, 22% (925) in 2009, and 21% (948) in 2010. Almost all of the hospitals that were not included reported -0- interest expense. C The average of hospital interest rates declined from 8.61% in 2008 to 5.93% in 2009 then rose to 6.73% in 2010. The decrease in average interest rates between 2008 and 2009 occurred during the beginning of the economic downturn which saw a decline in the federal funds rate by 2.8% from the beginning to the end of 2008. The rapidly changing economic environment likely influenced hospitals to make changes in their debt by refinancing to reduce interest costs when presented the opportunity. Data from the Medicare Cost Reports only provide a snapshot of the debt and interest.

Weighted average mortality rates for the study hospitals remained almost constant throughout the study period (12.11 in 2008, 12.18 in 2009, and 12.14 in 2010), contrary to the researcher's expectation that mortality rates would decline as hospitals implemented better quality of care practices. Non-financial control variables (i.e., number of beds, number of employees, occupancy, Herfindahl index, etc.) remained relatively consistent over the study period. Since these factors were not expected to change significantly from year to year, this consistency matched expectations. Financial variables experienced greater fluctuation. The average current ratio declined from 2.48 in 2008 to 1.88 in 2009 which was consistent with economic events at the time, then rebounded to 2.79 in 2010. Hospitals' liquidity (measured by the current ratio in this case) could be expected to decline as the economy slowed and recovering as the economy stabilized. Average net income was positive even though average Operating Margin was negative because many hospitals received income from non-operating sources, such as contributions and foundations. Such income was included in net income for financial reporting even though it did not result from patient services. Operating Margin, on the other hand, was based exclusively on patient service revenue and costs, so the negative average margin indicated that average costs of service exceeded average net revenues on average for hospitals included in the study. Net revenues are equal to billed revenues minus contractual adjustments, allowances, and charity care. The low average net income of \$213,063 (SD = \$18.6 million) in 2008 v. \$6,114,036 (SD = \$20.5 million) and \$8,184,851 (\$23.2 million) in 2009 and 2010, respectively, was likely a function of the economic environment at the time with 41.8% of study hospitals in 2008 reporting a loss v. 27.7% and 27.0% in 2009 and 2010, respectively.

Table 2 below compares the characteristics of hospitals included in the study to the characteristics of acute care hospitals not included and to total acute care hospitals. Over the three year study period, hospitals in the study comprised approximately 27% of total acute care hospitals in the U.S. A smaller percentage of system hospitals were included in the study than in the total population (41.3% v. 55.8%). The difference likely resulted from the removal of hospitals with zero interest expense from the study population. Since many system-affiliated hospitals obtain necessary capital from their parent company and do not use external debt to finance expansions and other capital projects, higher percentage of system member than non-system member hospitals were removed from the study population. This scenario also provides a plausible explanation for the study population containing a smaller ratio of investor-owned hospitals than the total population of acute care hospitals in the U.S.

Table 2

Descriptive Characteristics – Comparison to all U.S. Acute Care Hospitals

	Three Year Average		
	Sample	Non-sample	Total
Hospitals(All Acute Care Hospitals)	1140	3128	4268
Member of hospital system (%)	41.6	61.3	55.8
Ownership (%)			
Not-for-profit	66.0	58.1	60.2
Investor-owned	8.1	20.7	17.3
Governmental	25.9	19.8	21.4
Region (%)			
New England	9.3	2.3	4.1
Mid-Atlantic	8.0	9.4	9.0
South Atlantic	14.6	15.2	14.9
East North Central	16.7	15.1	15.5
East South Central	7.0	9.5	8.8
West North Central	16.6	12.6	13.8
West South Central	11.2	15.3	14.3
Mountain	5.4	8.2	7.6
Pacific	9.8	11.5	11
U.S. Territories	1.4	0.9	1.1
CBSA Type (%)			
Division	11.5	16.1	14.9
Metro	38.6	46.9	44.7
Micro	21.5	17.3	18.3
Rural	28.4	19.8	22.1
Dependent variable			
Average interest rate	7.32	-0- (1)	
Independent variable			
Weighted average mortality rates	12.14	11.81	
Control variables			
Total beds (mean)	155.6	174.1	
Occupancy % (mean)	0.559	0.556	
Payer-Mix	0.706	0.682	
Case mix index (mean)	0.926	1.045	
Herfindahl index (mean)	0.585	0.532	
FTEs (mean)	890.0	982.3	

N=3,420

(1) Average Interest Rate for total hospitals because the number of hospitals with no cost of debt would distort an industry average.

The percentage of hospitals that were members of hospital systems was similar in all years ranging from a high in 2010 of 43.4% to 39.9% in 2009. Similarly, the percentage of not-for-profit hospitals was similar for all years with 66.1% in 2008, 66.5% in 2009, and 68.5% in 2010. The mix of hospitals in each region and in each CBSA also did not fluctuate dramatically from year to year. Distribution of hospitals between ownership types, regions, and CBSAs for the study population approximated the distribution for the total population of acute care hospitals.

Regression Analysis

The hypothesis was tested using ordinary least squares (OLS) regression analysis of pooled cross-sectional data. Because 1,759 hospitals occurred in the data in multiple years, the Stata 11 robust clustering function was used to adjust for repeated occurrences of hospitals across years. The regression model tested the relationship between mortality scores and average cost of debt rate using data for 2008, 2009, and 2010 (n=3,420) for hospitals that reported average interest rates on average debt capital between 0 and 25%. The regression provided a model with an adjusted R squared of .127 (F = 18.85, Sig. = .000), which indicates that the model (including control variables) explains 12.7% of the variance in average interest rates. The variable of interest (weighted average mortality rate) was significant, which indicates an inverse relationship with the dependent variable instead of the positive relationship as predicted. Specifically, the analysis found a negative correlation between mortality rates and interest rates (-.165, significant at .01 level), meaning that a hospital's weighted average cost of debt was 0.165 percent lower for every with a one point higher mortality rate correlate lower interest rates. Therefore, the analysis failed to support the hypothesis that reported mortality scores would be positively associated with interest rates. The regression model coefficients are presented in Table 3.

Table 3

Regression Results – Dependent Variable: Average Interest Rate on Average Debt

	Model 1 All Hospitals	Model 2 Ownership Int.	Model 3 Time Int.
Intercept	11.945 (1.060)	11.407 (1.136)	11.618 (1.507)
Weighted Average Mortality Rate	-.162 (.058) **	-.120 (.067)	-.134 (.107)
2009 Year	-2.735 (.146) ***	-2.739 (.146)***	-1.638 (1.397)***
2010 Year	-2.077 (.166) ***	-2.073 (.166)***	-2.245 (1.601)***
System Member	.168 (.183)	.178 (.183)	.165 (.183)
Ownership:			
Not-for-profit (referent)	Ref	Ref	Ref
For-Profit	2.700 (.514) ***	6.615 (3.703)	2.698 (.514)***
Non-federal government	-.039 (.226)	.774 (1.531)	-.039 (.226)
Operating and Financial Characteristics:			
Beds	-.001 (.001)	-.001 (.001)	-.001 (.001)
Occupancy %	-1.113 (.525) *	-1.086 (.525) *	-1.112 (.525) *
Inpatient Payer Mix	-1.066 (.685)	-1.043 (.686)	-1.106 (.685)
Case Mix Index	.146 (.217)	.144 (.217)	.143 (.218)
Herfindahl Index	-.284 (.289)	-.278 (.289)	-.281 (.289)
Current Ratio	-.004 (.008)	-.004 (.008)	-.004 (.008)
Debt Capital to Total Capital Ratio	-.090 (.021) ***	-.088 (.021)***	-.091 (.021)***
Net Income (Loss)	-1.56e-09 (.000)	-1.40e-09 (.000)	-1.58E-10 (.000)
Days Revenue in A/R	-.004 (.001) ***	-.004 (.001)***	-.004 (.001)***
Operating Margin	-.868 (.768)	-.883 (.764)	-.870 (.768)
Total Asset Turnover	.053 (.048)	.053 (.048)	.052 (.048)
Revenue per Admission	-.00001 (.000)	-.00001 (.000)	-.00001 (.000)
Interaction of Ownership and Mortality			
Not-for-profit		Ref	
Non-federal government		-.066 (.123)	
For-profit		-.326 (.300)	
Interaction of Time and Mortality			
2009 Mortality			-.090 (.134)
2010 Mortality			.014 (.131)

N = 3,420

*** p < .001

** p < .01

* p < .05

Ratio variables with significant effects on the average interest rates included occupancy % (-1.113, $p < .05$), the ratio of Debt Capital to Total Capital (-.090, $p < .001$), and Days Revenue in Accounting Receivable (-.004, $p < .001$). The Payer-Mix coefficient in the regression indicates an increase in the payer ratio would reduce the average interest rate for a hospital, as expected. Other significant financial ratios included Invested Capital to Total Invested Capital ($B = -.090$, $p < .001$) indicating that the larger the proportion of capital supplied by debt, the lower the interest rate and Days Revenue in Accounts Receivable ($B =$

-.004, $p < .001$) indicating that the larger the number of days of revenue included in accounts receivable the lower the interest rate.

Model 3 tested whether the relationship of mortality rates to average cost of debt strengthened over time. Using 2008 as the referent period, the results suggest that the negative relationship between mortality and interest rates changed only slightly between 2008 and 2009 ($B = -.090$, $p > .05$), and between 2008 and 2010 ($B = .014$, $p > .05$). The hypothesis was also analyzed by lagging the dependent variable for one year (e.g., 2008 mortality predictive of 2009 interest rates). The results are presented in Table 4. These results indicate that the relationship between mortality and cost of capital does not strengthen after mortality data have been available for one year. While the relationship between mortality scores and average cost of debt is still significant, the premise that the longer mortality information is available the more impact it has on cost of capital is not supported.

Table 4

Regression Results – Dependent Variable: Average Interest Rate on Average Debt – lagged 1year

	Model 1 All Hospitals	Model 2 NFP v. For-Profit	Model 3 Time Effect
Intercept	6.807 (1.105)	6.597 (1.139)	6.976 (.087)
Weighted Average Mortality Rate	-.138 (.065) *	-.122 (.075)	-.152 (.087)
2010 Year	.224 (.179)	-.227 (.122)	-.052 (1.165)
System Member	.010 (.186)	.006 (.186)	.012 (.186)
Ownership:			
Not-for-profit (referent)	Ref	Ref	Ref
For-Profit	1.389 (.606) *	.547 (5.420)	1.386 (.606) *
Non-federal government	-.040 (.220)	.866 (1.669)	-.039 (.220)
Operating and Financial Characteristics:			
Beds	-.002 (.001) *	-.002 (.001) *	-.002 (.000) *
Occupancy %	-1.013 (.537)	-1.006 (.536)	-1.011 (.537)
Inpatient Payer Mix	-.570 (.674)	-.569 (.673)	-.572 (.675)
Case Mix Index	-.001 (.232)	-.002 (.233)	-.000 (.233)
Herfindahl Index	-.083 (.273)	-.079 (.274)	-.081 (.273)
Current Ratio	-.074 (.039)	-.074 (.039)	-.074 (.039)
Debt Capital to Total Capital Ratio	-.073 (.031) *	-.072 (.031) *	-.072 (.031) *
Net Income (Loss)	-6.96e-09 (.000)	6.91e-09 (.000)	6.99e-09 (.000)
Days Revenue in A/R	-.000 (.001)	-.000 (.001)	-.000 (.001)
Operating Margin	-1.770 (1.014)	-1.754 (1.011)	-1.765 (1.017)
Total Asset Turnover	1.162 (.218) ***	1.163 (.219) ***	1.162 (.218) **
Revenue per Admission	-9.32e-06 (.000)	-9.53e-6 (.000)	-9.35e-6 (.000)
Interaction of Ownership and Mortality			
Not-for-profit		Ref	
Non-federal government		-.074 (.133)	
For profit		.073 (.452)	
Interaction of Time and Mortality			
2010 Mortality			.023 (.093)

N = 3,420

*** p < .001

** p < .01

* p < .05

Discussion of Results

Contrary to expectations, the results indicate a negative relationship between mortality rates and interest rates, meaning that higher mortality rates correlate with lower interest rates. It is unlikely that lenders would view an increase in a hospital's mortality rate as reducing risk and lower their interest rate requirement on a loan. A more likely explanation is that hospitals were still receiving higher revenues from readmissions and the longer stays that result from problems with the quality of care. The direct effect on Medicare payments had not taken effect during the study period.

This study anticipated that lower mortality scores would be observed by prospective patients who would move to the hospitals with the best quality scores, thereby increasing revenues to the high quality hospital and reducing revenues to the lower quality hospitals. In such cases, lenders would recognize an increased value proposition at high quality hospitals and lower their financial risk expectations and require lower interest rates. Similarly low quality hospitals would be penalized in their interest rates for increased risk. The results suggest that lenders neither reward nor penalize hospitals for their reported quality scores when lending to hospitals. Lenders and rating agencies apparently are not concerned with the potential contribution to hospital's value proposition that should result from superior quality of care. Nor are they concerned with the financial risk implications of substandard quality of care.

Two plausible explanations for the absence of the predicted relationship between quality of care and financial risk are:

1) Financial markets are not sensitive to mortality rates because lenders and rating agencies do not perceive a significant variance in quality scores across hospitals.

The simple explanation is that lenders and rating agencies were not concerned with the potential financial risk of inadequate quality of care during the study period because the quality of hospital care did not translate directly into revenues and costs. If lenders and rating agencies do not recognize the potential contribution to a hospital's value proposition derived from superior quality of care or appreciate the potential financial risks of substandard care, the independent variable of interest in this study (mortality scores) would not affect their risk assessments of hospitals seeking to borrow capital. Results suggest that lenders neither reward nor penalize hospitals for their reported quality scores when lending to hospitals. Instead the direct effect on revenues did have a small impact.

2) Consumers' selections of hospital are not influenced by quality scores.

The lack of financial impact of hospital quality information can be explained by applying the "consumer sophistication" construct (Titus & Bradford, 1996; Spiller & Zelner, 1997)⁵² to both potential hospital patients and to lenders and analysts. Study results by Ryan,

⁵²Titus, P. A., & Bradford, J. L. (1996). Reflections on consumer sophistication and its impact on ethical business practice. *The Journal of Consumer Affairs*, 30(1), 170-194.

Nallamothe, and Dimick published in the March 2012 issue of Health Affairs indicate that patient provider choice is not influenced by Hospital Compare data, and they conclude that patients' do not understand how this information can be used (Ryan, 2012)⁵³.

One of the current debates in accounting concerns the degree of effectiveness and usefulness of non-financial disclosures. The prevailing concern is that users (lenders and analysts in this case) may suffer from information overload if too much information is provided with the additional information actually being counterproductive. Analysts and lenders may have a limited capacity to absorb new non-financial information, especially when they do not have much experience with a subject. As a result, analysts and lenders may not incorporate risk factors such as quality score reporting in their investment risk evaluations.

Limitations and Next Steps

The study used the earliest Hospital Compare data that was available. At the time the study was conducted, the data were somewhat limited, therefore, study of this issue should continue as more data becomes available to see if trends emerge over time. A relationship between quality of care data and financial risk could slowly develop.

This study measured hospital quality using mortality outcomes data for a limited number of conditions. These conditions, however, reflect only a small portion of most hospitals' service activities. This study focused on mortality because they were the only outcomes data reported by Hospital Compare. Studies examining other service outcomes may yield different results. Mortality outcomes can be affected by a wide variety of factors, so despite risk adjusting the mortality scores, the results may not accurately reflect quality of care. For example, process of care measures reflect a broader spectrum of care (26 measures instead of 6 for mortality). The next stage of study is to test the relationship between quality of care and financial risk using process of care measures to measure quality.

Hospital Compare was created to improve patient understanding and help patients to find higher quality health care providers. Developing the information does have a significant cost, however. If consumers are not using it for that purpose, the question is whether or not public reporting is providing sufficient benefit to justify its cost.

People believe that improved transparency of hospital quality is important to consumers, but the level of detail, the medical terminology, and the complexity of hospital services may be beyond the comprehension of a large percentage of people trying to choose a hospital. A composite hospital quality score might be much more understandable. As Schwartz and Coehen (2011)⁵⁴ found, a composite score that communicates the level of overall quality and provides meaningful information for provider choice decisions is difficult to

⁵³Ryan, A. M., Nallamothe, B. K., & Dimick, J. B. (2012). Medicare's public reporting Initiative on hospital quality had modest or no impact on mortality from three key conditions. *Health Affairs*, 31(3), 585-592.

⁵⁴ Shwartz, M., Cohen, A. B., Resuccia, J. D., Ren, J. Z., Labonte, A., Theokary, C., . . .Horwitt, J. (2011). How well can we identify the high-performing hospital? *Medical Care Research and Review*, 68(3), 390-310.

develop. More research into establishing a “culture of quality” in a hospital may be a first step towards developing an effective composite quality score.

Conclusion

The FASB Concepts Statements indicate that a primary characteristic of accounting information is that it is relevant – that is, it is capable of making a difference in financial statement users’ decisions. The study results suggest that hospital quality scores may have a small correlation to cost of debt. However, since this study was conducted during the earliest years of hospital quality score reporting, study of the relationship between hospital quality score reporting and financial reporting should continue before attempting to reach conclusions about a relationship between hospital quality and hospital finances. While this study is an initial examination of the relevance of hospital quality reporting to financial statement users, the results suggest that users of hospital financial statements have not yet developed a high sensitivity to hospital quality scores. However, hospital CFO’s and financial statement auditors should continue to monitor quality as a potential risk area that should be considered in assessing financial risk.

Appendix A

FINANCIAL RATIOS

Dependent Variable

Weighted Average Cost of Capital – [(cost of debt*debt %) * (1 – effective income tax rate)] + (cost of equity capital * equity %)

Profitability Ratios

Operating margin	Net operating income/Operating revenues
Total margin	Net income/Total revenues
Cash flow margin	(Operating net income + depreciation + interest + change in working capital)/(Operating revenues + change in A/R)
Return on assets	Net income/Total assets
Return on equity	Net income/Total equity

Liquidity Ratios

Current ratio	Current assets/current liabilities
Quick ratio	(Current assets – inventories)/current liabilities
Days revenue in net A/R	Net patient accounts receivable/ (net patient service revenue/365)
Days cash on hand	(cash + marketable securities)/[(total expenses – depreciation)/365]
Average payment period	Accounts payable/(operating expenses/365)

Capital Structure

Long-term debt to Capitalization	L-T debt/(L-T debt + equity) capitalization (debt + equity)
Debt/Equity ratio	L-T debt/Equity
Debt service coverage	(Net income + depreciation + interest)/ Current portion of LTD + interest expense)
Cash flow to total debt	Net cash flow/Total debt
Equity financing	Equity (fund balance)/Total assets
Total debt/total assets	Total debt/Total assets

Activity

Total asset turnover	Total operating revenue/Total assets
Fixed asset turnover	Total operating revenue/Net fixed assets
Current asset turnover	Total operating revenue/Current assets

Other

Outpatient mix	Total outpatient days (inpatient equivalent)/ Total patient days
Average daily census	Average number of occupied beds each day
Occupancy rate	Average daily census/Number of staffed days
Inpatient payer-mix	Number of Medicare or Medicaid inpatients/Total patients
Outpatient payer-mix	Number of Medicare or Medicaid outpatients/Total patients

Medicare case-mix	Index indicating the complexity of cases
Average length of stay	Total number of inpatient days/Admissions
Expense per discharge	Total expenses/Adjusted discharges
Average age of plant	Accumulated depreciation/Depreciation expense
Medicare revenue/Medicare patient days	
Herfindahl index	Squared sum of acute care patient days/ Total acute care patient days for the county
Market share	Patient revenue/Total county patient revenue
Revenue per discharge	(net patient revenue – non-patient revenue)/ adjusted discharges
FTEs per bed	Total FTEs/Occupied beds
FTEs per adjusted day	(FTE/Adjusted average daily census)/ Medicare case-mix index
Definitions per CAH Financial Indicators report (Pink et al., 2005)	

Information about this article's co-authors:

James D. Byrd, Jr., PhD, CPA, CHFP
Collat School of Business
University of Alabama at Birmingham
Birmingham, Alabama 35294
jimbyrd@uab.edu
(205) 901-3748
Corresponding author

S. Robert Hernandez, DrPH
UAB School of Health Professions
Birmingham, AL 35294

Greg L. Carlson, PhD
Saint Leo University
Saint Leo, FL 33574

Larry R. Hearld, PhD
UAB School of Health Professions
Birmingham, AL 35294

Richard A. Turpen, PhD
Auburn University at Montgomery
Montgomery, AL 36117