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# Impact of Quality Performance on Financial Risk and Cost of Capital in Hospitals

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IMPACT OF QUALITY PERFORMANCE ON FINANCIAL RISK AND

COST OF CAPITAL IN HOSPITALS

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DISSERTATION

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IMPACT OF QUALITY PERFORMANCE ON FINANCIAL RISK AND COST
OF CAPITAL IN HOSPITALS

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ADMMINISTRATION – HEALTH SERVICES

ABSTRACT

This study evaluated the relationship of hospital quality of care as measured by
mortality scores to hospital cost of capital as represented by average cost of debt.  A
composite mortality score (weighted average of Hospital Compare's risk adjusted
mortality rate for each hospital) was regressed against the hospitals' average cost of debt
using OLS and the Stata 11 robust clustering function to adjust for repeated occurrences
of hospitals across years. The data base consisted of acute care hospitals with interest
expense observed over the three year period 2008 – 2010 (n=3420). Control variables
included a number of hospital characteristic (e.g., number of beds, occupancy percentage,
etc.) and financial variables (e.g. developed from the literature).  The results suggest that
lenders and rating agencies neither reward nor penalize hospitals for their reported quality
scores.  The result was not different between not-for-profit hospitals and for-profit
hospitals, nor did the result vary significantly with time.

DEDICATION

This dissertation is dedicated to my wife, Rebecca R. Byrd, MD., for without her love, encouragement, and emotional support I could not have completed this project. As my life partner she has been my champion at all times, provided wise counsel in critical matters, motivated me when necessary, and been a comforting companion. As an Internal Medicine doctor she heals the sick, comforts the dying and leads others in her practice to do good for the benefit of her patients and their families. Despite the intense demands of her career, she has always had time to be an incredible mother to our two sons, William and Matthew. William and Matthew are my pride and joy. They are fine young men thanks to integrity, compassion, and guidance provided by their mother, my wife Becky. I admire and appreciate her.

This project is also dedicated to my parents, James D. Byrd, Sr. and Rosie M. Byrd. They have always provided special inspiration to me with their hard work and grounding in the teachings of the Bible. They both rose from poor farm families in the depression to both career and academic success. My interest in science comes from my father, a rocket scientist with NASA and the defense industry. My interest in teaching comes from my mother, a lifelong teacher who has inspired many young people. My parents' strength and direction gave me the platform from which to be successful.

I would also like to dedicate this to God who has guided my life and blessed me with a wonderful family.

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LIST OF ABBREVIATIONS

AHA – American Hospital Association

AHRQ – Agency for Healthcare Research and Quality

AMI – Acute Myocardial Infarction

ANOVA – Analysis of Variance

A/R – Accounts Receivable

CABG – Cardiac Artery Bypass Graph

CBSA – Core Based Statistical Area

CHF – Congestive Heart Failure

CMS – Centers for Medicare and Medicaid Services

COSO – Committee of Sponsoring Organizations – Organization that provided an

internal control framework for the accounting and auditing profession. The framework

has provided the foundation for developing and improving internal controls in the U.S.

COSO also developed the Integrated Framework for Enterprise Risk Management.

DRA -- Deficit Reduction Act

FTEs – Full Time Equivalents

HCAPHS -- Hospital Consumer Assessment of Healthcare Providers and Systems

HQA – Hospital Quality Alliance

HQI -- Hospital Quality Initiative

OLS – Ordinary Least Squares

OMB – U.S. Office of Management and Budget

OSHPD – Office of Statewide Health Planning and Development (California)

RSMR – Risk Standardized Mortality Rate

RSRR – Risk Standardized Readmission Rate

RHQDAPU -- Reporting Hospital Quality Data for Annual Payment Update program

SOX – 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' (Senate version) and 'Corporate and Auditing Accountability and Responsibility Act' (House version) which set new standards for public company boards, management and public accounting firms.

WACC – Weighted Average Cost of Capital

GLOSSARY OF TERMS


Preventable Adverse Events – Injury and death resulting from medical errors

Chargemaster – A list maintained by each hospital of all of the prices of all services, goods, and procedures for which a separate charge exists. The chargemaster is used to generate a patient's bill.

Core Measures – Quality measures promulgated by the Joint Commission for accreditation

Enterprise Risk Management– Business processes that enable management to effectively deal with uncertainty and associated risk and opportunity, enhancing the capacity to build value (COSO – Integrated Framework).

Medical Errors – Failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim.

Medical Malpractice – a subset of preventable adverse events.  In general, it is medical practice below standard.  It may be negligence which is not doing something that should have been done due to carelessness or other reason.  Or, it may be malpractice with malicious intent

Quality – the degree to which products or services conform to design specifications

Risk – the chance that the actual outcome from an investment will differ from the expected outcome

Weighted Average Cost of Capital (WACC) – a measure of the cost of debt and equity capital to a corporation that is a composite of the cost of each weighted according to each component's relative contribution to the capital structure.

CHAPTER 1

INTRODUCTION

This study analyzed the relationship between clinical quality scores of acute care hospitals and financial risk as reflected in hospitals' weighted average cost of capital (WACC). Lenders and rating agencies (such as Standard and Poor's and Moody's) consider both financial and non-financial information (such as a hospital's competitive environment) in deciding on a hospital's creditworthiness (Moody's, 2011; Standard and Poor's, 2011). Bond ratings indicate the creditworthiness of hospitals and other businesses, and accordingly have a direct influence on the rate of return demanded by investors (Gapenski, 2006). 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, and ability of a hospital to re-pay its debt (Nelson et al., 1992; Oszustowicz, 1992; Standard and Poor's, 2011). The financial risk environment of hospitals is becoming increasingly complex as a result of shifting reimbursement methods from cost-based rate-of-return reimbursement to a reimbursement model based on performance. Increased transparency in healthcare relative to price and quality of care 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. Increased risk is reflected in higher cost of capital for hospitals with poorer quality of care ratings. Consumers are expected to use the quality of care information to select providers providing better care which will impact revenues of competing hospitals (KPMG, 2008). In this study, the

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researcher analyzed whether the quality of care information publicly-reported through Hospital Compare has a relationship to hospital cost of capital stemming from the increased risk of reporting poor quality performance.

*To Err is Human: Building a Safer Health System,* published in 1999 by the Institute of Medicine (IOM), increased attention to the variability in the quality of healthcare in the United States.  The report pointed out the frequency of medical errors, the national cost of avoidable adverse events (estimated between $17 billion and $27 billion), and deaths resulting from these errors (estimated between 44,000 and 98,000). These errors have resulted in higher average costs per hospital and a loss of trust by patients (Committee on Quality of Health Care in America, 1999).  A second report from the Institute of Medicine (IOM), *Crossing the Quality Chasm: A New Health System for the 21st Century,* published in 2001 offered a strategic direction for improving healthcare delivery in the United States (Committee on Quality of Health Care in America, 2001). Greater transparency of hospital quality performance was one of the key recommendations from the IOM.  In response, the Agency for Health Research and Quality (AHRQ) and Centers for Medicare and Medicaid Services (CMS) have implemented new quality reporting requirements which are beginning to provide greater transparency of individual hospital quality performance (Agency for Healthcare Research and Quality, 2011; Centers for Medicare & Medicaid Services, 2011; Chassin, 2011).

The performance of healthcare organizations in insuring patient safety and quality outcomes is becoming of increased importance to patients and payers.  For example, a major funder of healthcare services in the U.S., CMS has adopted plans to reduce reimbursement for inadequate quality performance (Dewberry & Rose, 2010).

Reimbursement adjustments will be based on hospital performance relative to specific

quality standards. Quality performance data that will be used for the reimbursement

adjustments are being made publicly available for consumers to use for their healthcare

purchasing decisions (Hospital Compare CMS). In addition, treatment errors and poor

care could possibly increase cost to a hospital by increasing the days in the hospital for a

given condition, additional utilization of supplies, durable medical goods, physician

services, and subject hospitals and other providers to costly lawsuits. The unnecessary

costs due to medical errors may not be reimbursed in some reimbursement scenarios and

would cause financial loss to hospitals. Improved quality of care by hospitals is believed

to reduce hospitals' average cost per discharge by reducing errors and the associated cost.

However, process changes and technology improvements that are typically implemented

to improve a hospital's clinical quality require certain financial investments by the

hospital. Hospital boards faced with investing in clinical quality improvements with

limited resources must evaluate the cost/benefit of their quality initiatives. Studies of

other industries have demonstrated a positive effect of improving quality on financial

performance (Capon, Farley, & Hoenig, 1990; Hendricks & Singhal, 2000; Waddock &

Graves, 1997). However, others who have studied quality award winning companies

have concluded that the linkage between quality and financial performance may not be as

apparent as scholars expect (Harry, 2000).

CMS provides quality scores through its Hospital Compare service, and a number

of other quality ratings are readily available (e.g., HealthGrades). Studies have

demonstrated that hospital boards are improving their oversight of clinical quality in their

hospitals by implementing  improvements and by increasing board quality awareness

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through board education and giving quality of care greater scrutiny in board meetings (Jha & Epstein, 2009a; J. Jiang, Lockee, Bass, & Fraser, 2009) resulting in improved quality scores (H. J. Jiang, Lockee, & Fraser, 2011). Multiple states are requiring hospitals to make their charge masters and average charges for selected services publicly available (California - OSHPD, Georgia - GA Hospital Price Check, and Maryland – The Maryland Hospital Pricing Guide, for example). As the public becomes better educated about the differences in quality and cost of care from one facility to another, by using services such as Hospital Compare and HealthGrades, the question becomes whether consumers will use the information to change their healthcare purchasing decisions. The potential for influencing patients' choice of hospital and the resulting effect on hospitals' market share, revenue, and ultimately its viability as a healthcare provider, all important factors to investors and lenders, makes disclosures of hospital quality scores important to the assessment of each hospital's enterprise risk (KPMG, 2008).

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 (Dhaliwal, Li, Tsang, & Yang, 2010; Prumlee, Brown, Hayes & Marshall 2010; Sengupta, 1998). Hospitals' quality of care ratings are a relatively new non-financial disclosure in the healthcare industry. As such, these ratings may provide insight into a hospital's associated degree of risk to investors and financial analysts. The question addressed in this study is whether reported quality scores have are associated with the degree of hospitals' financial risk as reflected in their weighted average cost of capital.

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Quality of Care – Measurement and Reporting

The Joint Commission began developing standards for quality and safety for healthcare services providers in 1951. The Joint Commission has established (and continues to update) core measures and other standards of care that are measured to determine if the health facility meets accreditation and/or certification requirements (Chassin, 2011). Although the Joint Commission is an independent body (not government affiliated), accreditation by the Joint Commission is widely considered to be a legitimizing status for hospitals. In response to the IOM reports, the Hospital Quality Alliance (HQA) began a national program to collect data on key measures of hospital performance on three medical conditions: acute myocardial infarction (AMI), congestive heart failure (CHF), and pneumonia in 2003 (HospitalQualityAlliance, 2011). CMS collects and maintains data on these conditions and related process of care measures. Starting in 2006, CMS provides patient satisfaction information under the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAPHS) program (AHRQ). These data are available to the public through Hospital Compare, a CMS program.

The intent of providing quality data on hospitals to the public is to raise awareness of the differences in quality of care, provide information to people to help them select a provider for needed medical procedures, and apply pressure for all facilities to raise their quality of care. Other hospital quality scores available on-line are provided by HealthGrades (www.healthgrades.com), Leapfrog Group (www.leapfroggroup.org), US News & World Report (www.health.usnews.com › Hospitals), and other sources. These services do not all report on the same conditions and processes, nor do they use the same

methodology.  Accordingly, results reported from each of the sources are not necessarily consistent, and one study concluded that the reports do not seem to impact consumer selection of healthcare options (Rothberg, Morsl, Benjamin, Pekow, & Lindenauer, 2008).  If consumers are not using the quality disclosure information in making provider choices, quality disclosures should have no impact on hospital financial performance or financial risk.

Quality of Care – An Element of Hospital Risk

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. The national debate on cost of healthcare as a proportion of GDP and its contribution to the national deficit illustrates the concern of politicians with rising healthcare costs.

The healthcare industry is subject to increased risk as a result of many issues; however, this study is focused only on the increased risk from increasing public reporting of hospital quality of care and its impact on the financial risk of hospitals as measured by hospitals' cost of capital.  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 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 (H. J. Jiang, Lockee, Bass, Fraser, & Kiely, 2008).  Despite the increased attention by policymakers to patient safety and quality of care in  hospitals and other healthcare enterprises, governance of quality of care, and patient safety still ranges from high priority to non-existent (Jha & Epstein, 2009b).  Because of the potential impact of hospital quality of care issues on the hospital's overall Enterprise Risk Management (COSO, 2004) and the potential for reimbursement losses for hospital-acquired conditions and sub-standard quality performance (Final Rule – Inpatient Prospective Payment System (August 22, 2007), board Audit Committees and hospital Internal Audit Department should have an interest in healthcare quality (KPMG, 2008).

Risk management, as an element of board/management control, is an agency cost under agency theory.  Costs typically include process changes, salaries for quality measurement and monitoring personal, and hospital IT which is required to implement quality improvements.  The measures endorsed by the National Quality Forum (NQF) and reported in Hospital Compare were developed with the goal of improving quality of life for healthcare patients.  Managers are faced with balancing the cost of achieving better quality of care with the financial return on investment needed to achieve quality improvements.  Managers must evaluate whether the value of the risk reduction achieved

by investments in improving clinical quality in their hospital exceeds the cost of these investments. From a financial standpoint, investments in quality improvements must be evaluated in the same manner as other projects requiring capital investment. Hospital boards must decide whether to finance these projects using internal funds, new debt, or new equity, and assess the benefit of the project against the cost of capital.

Financial Risk and Impact on Cost of Capital

The central premise of finance theory is that the opportunity cost for any capital investment is the lost earnings from alternative investments of equal risk (Gapenski, 2006). Cost of capital provides the mechanism for investors to evaluate potential investments (Bruner, Eades, Harris, & Higgins, 1998). For a company seeking capital, its cost is determined by the return required by investors and the risk presented by the company is an important element of the investor's analysis. Several risk characteristics are considered: (1) financial risk (leverage, liquidity, profit and cash flow, etc. of the hospital); (2) industry risk or business risk (relative profitability of hospitals to alternative investments in other industries); and (3) non-financial risk (environmental risk and competitive environment) and for hospitals (size, occupancy, and payer mix). Both debt and equity investors demand a rate of return to compensate them for the use of capital plus a risk premium – an incremental return commensurate with the risk of the investment (Jones, 1998). Investors assess risk by evaluating all available information. The higher the assessed risk, the greater the rate of return demanded by the investors and the higher the cost of capital to the hospital. Both financial and non-financial information are relevant for this risk assessment.

Non-financial Disclosure and Influence on Financial Risk Assessment

The financial reporting literature has established the value of reporting non-financial data (Hail, 2002; Ittner & Larker, 1998). 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 is becoming a part of the analysis of non-financial factors as it is becoming more publicly available.

Sarbanes-Oxley 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.

The Present Study

*Purpose of Study*

This study analyzed the extent to which hospital quality scores were associated with hospitals' cost of capital, which may influence a hospital's ability to access capital markets. Healthcare reform established potential reimbursement reductions by Medicare that will be driven by sub-par quality performance. In addition, the potential exists under these new rules for incentive payments based on exceptional quality of care performance. Thus, beginning in 2014, quality scores generated through the Hospital Compare process

will have a direct influence on hospitals' revenue. In addition, the indirect effects of a damaged reputation from poor quality of care (e.g., damaged reputation leads to reduced occupancy which could also lead to negative financial effects) would negatively impact revenues and profits and increase financial risk. Agency theory suggests that management, as a steward for the organization, will take action to reduce risk and improve performance. Governance by the Board of Directors (or Trustees) would oversee managers' performance and establish appropriate incentives for managers to act in the best interests of the organization. Applying agency theory to quality performance as well as financial performance, managers and boards could be expected to implement necessary processes and procedures to improve their hospitals' quality of care in response to the new quality score disclosure requirements. Boards may provide incentives to managers by adjusting compensation packages to include a quality score component to be balanced with financial performance incentives. Since the processes needed to improve quality management and oversight are costly and time consuming, these quality control improvements (agency costs) would not be made unless financial benefits exceed costs. In fact, COSO defined internal control in its Integrated Framework to cover effectiveness and efficiency as well financial reporting and indicated that the cost of internal control should not exceed its benefits (COSO, 1992). This line of reasoning suggests that improved quality of care should contribute to improved financial performance and/or reduced financial risk while meeting the cost/benefit test.

In this study, the researcher did not test the extent to which quality governance structures have been put into place. Instead, the researcher relied on previous research that has demonstrated the linkage between board quality emphasis and improved quality

and assumed that hospital boards and management teams were implementing governance processes focused on improving quality of care (Jha & Epstein, 2009a).  Boards can be expected to act in order to preserve the hospital for the benefit of its constituencies by reducing risks, including risks caused by poor quality of care.  Poor quality of care increases risk and negatively affects financial performance through increased cost of capital.  However, little empirical work has been conducted regarding whether reported hospital quality scores are associated with hospitals' risk and cost of capital and  cause a hospital's board and management team to improve quality for financial reasons. One study testing the effect of published hospital quality performance scorecards in California and New York found that the impact of quality score disclosures on revenue produced inconclusive results (Romano & Zhou, 2004).  Romano and Zhou conducted a study to determine if hospitals in California and New York with exceptionally higher or lower than normal published quality scores for certain procedures experienced changes in patient volumes after publication of scores.  Data revealed no effect in California. Hospitals in New York, however, did experience volume changes shortly after publication of mortality scores.  If quality score disclosures affect revenue or cost of capital, a board could be expected to improve quality performance to fiscally preserve the hospital for its constituencies.

*Research Questions*

        The research questions addressed in this study included the following:

1) Are hospital quality scores associated with a hospital's risk as represented by its cost of capital?

2) Are hospital quality scores associated with a hospital's risk differently for tax exempt versus for-profit hospitals?

3) Does the relationship of hospital quality scores to financial risk change over time as the level of public awareness increases?

*Contribution of the Study*

        Measuring the effect of reported quality ratings on financial risk will be a new step in the study of benefits of hospital quality management. 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 establish a direct linkage between quality performance, as reported by CMS in Hospital Compare, and its influence on financial risk of a hospital as reflected in its cost of debt and equity. Demonstrating this linkage may help hospital boards and managers appreciate the financial value of improving the quality of care. The results could demonstrate the importance of clinical quality to the financial viability of a hospital and should be of interest to hospital managers and boards

as well as policymakers. Conversely, if the study does not demonstrate a linkage an

argument could be made that the financial value of quality reporting is indeterminable.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

External reporting of non-financial information has steadily increased as the

Financial Accounting Standards Board (FASB), the U.S. Securities and Exchange

Commission (SEC), and other regulators have demanded additional representationally

faithful information from businesses that is relevant to users of financial information

(FASB Concepts Statement 8, 2010).  Since 1973, FASB has issued 168 accounting

standards, 48 Interpretations, and numerous Interpretations, Staff Bulletins, and

Emerging Issues Task Force Abstracts addressing perceived weaknesses in the

presentation and disclosure of financial information relevant to users

(http://www.fasb.org).  Annual and quarterly reporting and significant event disclosures

by the SEC (10-K including Management Discussion & Analysis, 10-Q, Proxy

Statements, S-8 requirements) have also increased the amount of information deemed to

be relevant to users' interpretation of financial data presented by reporting companies.

Currently, there are no requirements that hospitals report quality of care and

patient safety information with financial statements or other disclosures of financial

information.  However, quality of care performance information must be submitted to

Medicare.  These data are then made available to help consumers select a provider (e.g.,

hospital or physician) for their healthcare needs.  The consumer's decision has the

potential to impact the revenues of providers since a rational consumer could be expected

to choose providers with higher quality scores over those with lower reported quality scores. However, the extent to which this published information actually influences purchasing decisions is not known. Dranove and Jin (2010) provide a literature review analysis of the effect of third party disclosure on consumer choice and found mixed results, noting that studies by Scanlon et al (1998), Jin and Sorensoen (2006), and Dafny and Dranove (2008) found that market share increased for the higher ranked health plans in their studies, but quality disclosures had no effect in studies by Dranove and Sfekas (2008), and Romano and Zhou (2004). Additionally, the extent to which creditors and investors use scores as predictors of financial performance and creditworthiness of hospitals is also not known (Romano & Zhou, 2004). If reported quality scores do not influence consumer decision making, quality scores would have no relevance to investors and creditors until they cause insurers to adjust reimbursement rates. However, if scores do have a significant impact on provider selection, financial performance should be affected.

Quality of Care

Quality of care is a broad term that refers to the correctness and effectiveness of medical care provided. More specifically, in *Crossing the Quality Chasm: A New Health System for the 21st Century*, the IOM defined quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (p. 232). Thus, healthcare quality can be defined both as an individual concept and as a systematic or

industry-wide concept.  This research study was limited hospital provision of care to

individuals.  Within this scope, quality refers to outcomes of appropriate practices and

techniques applied that are consistent with current empirical evidence.  Healthcare

providers cannot guarantee desirable outcomes but can be expected to strive to prevent or

minimize errors and adverse events resulting from those errors.  Errors may include, but

are not limited to, missed diagnoses, improper medication, and care not conforming to

clinical guidelines.


*Hospital Quality Measurement, Public Reporting, and Disclosure*

The initial publication of the Committee on Quality of Health Care in America

(CQHCA), *To Err is Human: Building a Safer Health System,* defined healthcare quality

in terms of patient safety ("freedom from accidental injury").  Accidental injury or

'errors' were further defined as "failure of a planned action to be completed as intended

or the use of a wrong plan to achieve an aim" (Committee on Quality of Health Care in

America, 1999, p. 4).  In its following publication, *Crossing the Quality Chasm,* the

Committee proposed six areas for improvement in the healthcare system recommending

that U.S. health system goals should be to make healthcare: safe, effective, patient-

centered, timely, efficient, and equitable. The Committee highlighted other key terms

pertinent to this discussion, including adverse events and preventable adverse events.

Adverse events are injuries to patients resulting from medical care, but not necessarily

"errors."  Adverse events that result from errors are referred to as preventable adverse

events.  The example given in the CQHCA report to demonstrate the distinction was a

surgery patient who contracts pneumonia after the surgery.  Pneumonia is an adverse

event, but if the surgery and care was properly conducted the adverse event would not be an "error". On the other hand, if the patient contracted pneumonia as a result of poor sterilization in the operating room, the injury would be a preventable adverse event (Committee on Quality of Health Care in America, 1999).

The work of the CQHCA served as the genesis of efforts to measure and report hospital quality. One of the primary objectives of measuring and reporting hospital quality information is to provide healthcare consumers with information to improve decisions concerning choice of hospitals and/or physicians for healthcare needs. The absence of a set of measures that provides consistent, comparable, and reliable data creates the risk of disseminating misinformation concerning individual hospital clinical quality which could cause patients to make poor decisions about their choice of providers. Standardized quality measures based on scientific evidence are necessary to provide information helpful in making decisions (Pronovost, Miller, & Wachter, 2007). Efforts by the Joint Commission, CMS, AHRQ, and HQA have produced standardized quality measurement processes that are continuing to evolve. However, hospital quality measurement and reporting information continues to be promulgated by multiple, unrelated organizations in differing formats (Pronovost et al., 2007).

A brief summary of the predominant sources of quality data is provided below. Each of these services report on certain procedures and/or specialties, but none provide composite quality scores for a hospital.

1) Hospital Compare from CMS provides scores for six mortality indicators, 17 process of care measures related to the six mortality conditions, other specific

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measures as listed in Appendix A, plus  patient satisfaction measures based on

MedPar data collected by Medicare.

2) Health Grades provides hospital rankings on various services.  Health Grades is

an independent, proprietary measurement reporting services that also uses MedPar

data collected by Medicare.

3) US News & World Report annually publishes hospital rankings on various

services using proprietary data and methods.

4) Agency for Healthcare Research and Quality (AHRQ) provides Quality Indicators

that are based on measures readily available from hospital administrative data.

5) The Joint Commission provides accreditation of hospitals and certification of

hospital services based on Core Measures and 85% compliance with

Accountability Measures.

Reporting usually has three parts:

Outcomes (mortality, etc.) – Hospital Compare tracks and reports mortality

measures for six categories: (1) Acute myocardial infarction (AMI - heart attack); (2)

readmission from  AMI; (3) congestive heart failure (CHF); (4) readmission from CHF;

(5) pneumonia; and (6) readmission from pneumonia.

Patient Safety (HQA, AHRQ, and Joint Commission process measures) –

Hospital Compare provides 17 process measures related to conditions for which mortality

data are reported.  These are listed in Appendix A.

Patient Satisfaction (HCAPHS - includes communication with patients, pain

management, etc. – some of the measurements do not impact outcomes or patient safety).

Researchers have published inconsistent findings on correlation of mortality

scores and process of care measures. A 2007 study, using data for the 12 month period

ending March 31, 2005, demonstrated a relationship between Hospital Quality Alliance

(HQA) indicators at a hospital for AMI, CHF, and pneumonia and related mortality of

Medicare patients with these three conditions (Jha, Orav, Li, & Epstein, 2007).

However, a more recent study established that while a correlation between Hospital

Compare process of care quality data and the risk adjusted 30-day mortality rates for

heart attack, heart failure, and pneumonia existed, when unobserved heterogeneity was

considered, no causal relationship could be inferred (Ryan, Burgess, Tompkins, &

Wallack, 2009).  Bradley et al. (2006) found a correlation between process measures and

mortality for patients with AMI, and Fonarow (2007) found a correlation between

process measures and mortality for patients with heart failure ).

Measures are continually being refined and new measures are added as new knowledge is

obtained.

Assessing the overall quality of care of a hospital is further complicated by the

fact that no "composite" measure of quality has been published.  Hospital Compare,

AHRQ, and Health Grades all publish statistics and performance information for a varied

list of practices and procedures.  AHRQ developed a composite measure that will be

reported beginning in 2011.  However, these ratings address only specific practices or

procedures.  Rating entities on their specific services and providing useful information to

patients and potential patients for the selection of healthcare providers and to hospital

managers for improving healthcare in their facility accomplishes one goal, but individuals

are not admitted to a hospital to intentionally sample a smorgasbord of available

procedures and services in the same way a restaurant patron may try a variety of items to make an overall assessment of the quality of a restaurant.  No composite measure of a hospital's quality of care is provided because it would not be meaningful for these purposes.

Shwartz et al. (2011) theorized that a hospital that had "achieved a culture of excellence" (p. 292) should be rated relatively high in quality across most measures.  The authors discovered hospitals that performed well on composite measures developed for the study typically did not perform in the top quintile on most individual measures.  Empirical evidence supports calculating a composite quality score by a weighted average of mortality scores for the three conditions for which mortality is reported by Hospital Compare – AMI, CHF, and pneumonia.

*Concern of Regulators and Hospital Boards*

New quality reporting requirements are beginning to provide greater transparency of individual hospital quality performance.  The Deficit Reduction Act of 2005 introduced new Medicare rules that require more extensive reporting of healthcare quality data and compelled hospital boards to assume more active and attentive roles in the governance of quality and patient safety (Joshi & Hines, 2006).  Section 5001(a) of the Deficit Reduction Act (DRA) established new requirements for quality data reporting with the Reporting Hospital Quality Data for Annual Payment Update (RHQDAPU) program. RHQDAPU builds on the ongoing voluntary Hospital Quality Initiative (HQI) which strives to improve quality of care in hospitals on a national level.  These efforts have been successful in instituting requirements for hospitals to report consistent quality measures concerning hospital quality processes, structures, and outcomes through CMS's

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Hospital Compare web site. This increased regulatory scrutiny creates additional performance risk to the hospital (AON, 2008).

The increase in regulatory scrutiny concerning quality of care has also started to gain the attention of hospital boards. A 2006 study conducted by The Governance Institute disclosed the nature and types of hospital quality governance processes (H. J. Jiang et al., 2008). Governance processes include quality monitoring and reporting at board meetings, establishing a quality committee on the board or assigning quality oversight to another board committee, quality performance as a component of the performance evaluation of management, and management compensation incentives related to quality of care. However, a survey conducted in 2007 and published in 2009 reported that less than half of the 1,000 nonprofit, acute care hospital board chairs rated quality as one their top priorities (Jha & Epstein, 2009a). In 2007, the Institute for Healthcare Improvement began a program to educate and emphasize to hospital boards the importance of clinical quality in their hospitals. In turn, hospital boards are responding by adding quality of care to their governance processes (H. J. Jiang et al., 2011).

A board composed of community leaders and managers of other businesses would be concerned with maintaining a financially viable hospital as a resource for the community. Regulatory agencies and other third parties with an interest in quality of care are acting as surrogate 'principals' raising the level of attention and level of risk to hospital boards for less than adequate healthcare quality. With greater transparency comes greater consumer sophistication which further increases the level of risk from inadequate clinical quality in a hospital. Consumer sophistication, a construct that has

received little attention from researchers, has been defined as the ability of consumers to be informed and discerning enough to make sophisticated purchasing decisions (Titus & Bradford, 1996). As regulators require greater disclosure of hospital quality performance, consumers and their paying agents, the insurance companies, are placing greater scrutiny and pressure on hospital quality of care and patient safety performance. For example, Blue Cross Blue Shield of Alabama (BCBS) has entered into a joint effort with the AHA and the Alabama Quality Assurance Foundation to reduce hospital acquired infections in Alabama. Additionally, BCBS encourages hospitals to use MedMined automated surveillance process to help analyze hospital infection data to identify potential issues (Jackson, 2009). The risk of financial repercussions from CMS and other third-party payers is creating financial risk to hospitals that should be recognized by hospital boards.

Launched in 1983, Medicare's Prospective Payment System (PPS) introduced the need for greater fiscal responsibility by hospitals over the "cost-plus" reimbursement system that existed prior to that time. PPS provided standardized reimbursement based on procedures performed and/or diagnoses which were driven by Diagnostic Related Groups (DRGs). Under this program, reimbursement provided a fixed amount for the procedure or diagnosis instead of the cost consumed by the hospital in treating the patient (Berger, 2008). This change placed greater responsibility for managing costs on hospitals because reimbursement was limited. Due to the increased complexity in managing a hospital, along with greater financial risk in the reimbursement process, hospital boards began creating standing audit committees to oversee and mitigate some of the financial risk emerging in this new environment (Urbancic & Hauser, 1991).

Hospital managers cannot achieve quality solely for the sake of improved patient care. Many quality improvements require an investment of time and resources. These costs are relatively easy to quantify, while financial return on these investments generally cannot be measured in a way that allows managers to qualitatively evaluate the financial benefit of the investment.

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. The riskier the investment (i.e., 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).

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, 2006; Jones, 1998).

*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.

*Effect of Financial Risk on Financial Performance*

Financial management literature has analyzed financial strategy and its relationship to creating shareholder value. Modigliani and Miller (1958) demonstrated the value of a firm using three fundamental financial strategy decisions: the financing decision, the investment decision, and the dividend decision. Myers (1990) theorized that firms would develop their capital structure using lowest cost capital first (internal earnings) and adding capital from progressively more expensive sources (debt, equity, etc.) to meet their capital needs. A more recent study demonstrated how firms coordinate these elements into a financial strategy that aids both financial performance and operating performance (Slater & Zwirlein, 1996). Inherent in these models of firm value is the element of risk that creates uncertainty in the expected cash flows from investments in individual firms.

Some risk can be reduced through effective management control systems. Financial reporting risk can be minimized by effective internal management controls over the activities and transactions that create risk. The financial reporting risk that has the potential to impact cost of capital has three parts: (1) that unanticipated undesirable events may occur and the frequency with which they may occur; (2) the risk that these events will not be detected; and (3) the risk that they will not be accurately disclosed. Firms with strong internal controls have been shown to have lower cost of equity (Ashbaugh-Skaife, Collins, Jr., & Lafond, 2008).

Similarly, hospital quality management processes may be implemented to reduce the risk associated with medical errors and the adverse effects resulting from the errors.

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Quality processes generally 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 (Ashbaugh-Skaife et al., 2008).

*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, 1984; Gapenski, 1992). 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. Hospitals are negatively impacted financially when the increase in inherent risk translates into financial risk with the bond rating agencies and local lenders.

*Assessment of Risk by Bond Rating Agencies*

The degree of risk for a hospital, as assessed by potential investors, directly influences its cost of debt. Default risk is the key concern of bond rating agencies. Ratings are based on rating agencies' assessments of default risk and influenced by a number of factors, including: financial condition; institutional factors (size, occupancy, competition); and contextual factors (Cleverly & Nutt, 1984). Other factors influencing cost of debt include case mix acuity, location in a certificate-of-need-state (McCue & Kim, 2007), membership in a multi-hospital system, bond insurance, occupancy rate (Carpenter, McCue, & Hossack, 2001), and ratio of cash to debt service payments (McCue, Renn, & Pillari, 1990). A comprehensive list of financial analysis factors and their definitions is included in *Flex Monitoring Team Briefing Paper No. 7* (Pink et al., 2005).

*Standard & Poors' (S&P) methodology.* S&Ps' analysis of creditworthiness of a corporation or other entity is reflected in the firm's cost of debt – lenders charge a higher interest rate on debt when the S&P bond rating is lower. S&Ps' analysis studies the business' underlying risk and includes consideration of financial and non-financial information that analysts deem relevant to the firm's risk of default on its long-term debt obligations. Non-financial risk categories considered in the evaluation include the firm's business risk, environmental risk, industry factors, competitive environment, and the hospital's performance relative to other comparable hospitals. Performance measures considered in this part of the evaluation include: size, payer ratio, case index, etc. The

measures used in each analysis are somewhat subjective.  An excerpt from the S&P

methodology states:

> Key industry operating statistics: Our health care facilities analysts look at admissions trends by several measures. These include inpatient admissions, outpatient visits, average lengths of stay, number of surgeries, revenue per visit, the payer mix of patient revenue (Medicare, Medicaid, private, or other), occupancy levels, **and other categories.**  (Per S&P 2008 – emphasis added)

 Further, their published methodology indicates that a wide variety of non-

financial information is used by analysts to develop a bond rating.  The methodology

identified no precise formula for determining bond ratings, but a number of factors

including the competitive environment, degree of competition, etc. are judgmentally

applied in the analyses (Peknay, Pelanne, & Kaplan, 2009; Standard and Poor's, 2011).

Evaluation of financial risk is focused on governance, risk tolerance, financial

policies, cash flow, capital structure, and liquidity.  Ratio analysis is a key component of

the financial analysis and includes such measures as cash flow ratios, debt payback ratios,

debt service ratios, and financial flexibility ratios.  While definitions of ratios are

consistent, interpretation relies on an analyst's judgment (Standard and Poor's, 2011).

A key factor in an S&P analyst's assessment of creditworthiness is the long term

consistency and sustainability of a firm's competitive position.  Analysts look closely at

cost leadership and product differentiation along with product quality, pricing, market

share, customer relationships, and brand reputation (Standard and Poor's, 2011).

*Moodys' methodology.*  Moody's, like Standard and Poor's, promotes an

assessment of a firm's creditworthiness using a well-defined rating system that is widely

understood.  Moody's follows a similar multifaceted approach that considers non-

financial as well as financial factors in their evaluation. Financial ratio analysis that

emphasizes sustainable cash flow, liquidity, capital structure, and debt coverage provides

the basic tools for assessing the creditworthiness of a firm. However, other factors also

play a critical role in analysts' evaluations. Factors such as competitive environment,

business risk, industry factors, and a hospital's performance relative to other comparable

hospitals in terms of quality of care, efficiency, market share, case-mix, and payer-mix

are also key considerations. The credit rating provides an indication of Moody's

appraisal of the long-term risks of the hospital. Investors and lenders use these ratings in

setting the interest rates on debt of the hospital (http://www.moodys.com/ratings-

process/Ratings-Definitions/002002, accessed June, 2011).

Pink and a team of researchers performed a literature review of the financial

indicators most frequently used for financial evaluation of hospitals. The researchers

identified 37 financial and non-financial indicators spread across five dimensions were

most commonly used. Indicators included six financial viability indicators (including

operating margin, return on assets, equity and investment, etc.); seven liquidity ratios

(including current ratio, days revenue in accounts receivable, days cash on hand, etc.);

eight capital indicators (including equity financing, debt service coverage, debt/equity

ratio, etc.); three efficiency ratios (total asset turnover, fixed asset turnover, and current

asset turnover); and 12 hospital specific indicators (including payer mix, occupancy,

expense per discharge, Herfindahl index, etc.) (Pink, Daniel, Hall, & McKillop, 2007).

Pink's 2007 investigation expanded upon an earlier work published in 2005

concerning the financial performance indicators for critical access hospitals (CAHs). The

2005 study analyzed the same performance indicators from the literature review, but

examined the indicators' usefulness to CAH managers and boards for financial

management. In addition to the 37 most frequently used indicators, the authors

considered 77 other indicators in this study. 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. The variables used in this

study were selected from these 20 measures. The 37 most frequently used indicators and

their descriptions from the Pink study are presented at Appendix B.


Quality Disclosure and Effect on Financial Risk

Performance is frequently assessed using analysis of financial data. Firms that

were perceived to be high "quality" firms in *Fortune* magazine's annual survey of

corporate reputations consistently delivered better financial performance (McGuire,

Scheeweis, & Branch, 1990). While this survey confirmed the relationship between

perception of a firm's quality and its financial performance, the results also indicated that

reputation appeared to impact performance, and financial performance influenced a

firm's reputation. Non-financial performance had a significant impact on the perception

of a firm's creditworthiness, as indicated by S&P's and Moody's concern with non-

financial issues in their ratings analyses. Corporate social performance has been shown

to have an effect on financial performance (Waddock & Graves, 1997), as has customer

satisfaction (Ittner & Larker, 1998). Building on research that demonstrated the strategic

value of good corporate reputations, Roberts and Dowling (2002) tested the relationship

between good corporate reputations and superior financial performance. The authors'

research demonstrated that good reputation was a valuable intangible asset that enhanced

financial performance and contributed to sustaining superior financial performance since reputation provided a relatively stable long-term competitive advantage.

Published in 1992, a study of 51 hospitals owned by Hospital Corporation of America (HCA), demonstrated that patient perceptions of hospital quality had a positive relationship to hospital financial performance (Nelson et al., 1992). 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 (Mukamel & Mushlin, 1998). 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 (McCue, Mark, & Harless, 2003). Weech-Maldonado, Neff, and Mor (2003) studied the relationship of quality performance to financial performance for nursing homes following the Balanced Budget Act of 1997 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.

In a separate study, better hospital clinical quality was associated with favorable bond ratings by comparing a composite quality measure to Moody's Bond ratings of 236 hospitals (Haydar, Nicewander, Convery, Black, & Ballard, 2010). Using 2007 Hospital

Compare data, the authors developed composite quality scores based on an average of performance on core process measures for heart attack (AMI), heart failure (CHF), pneumonia, and from the Surgical Care Improvement Project. Outcomes and patient satisfaction (HCAPHS) measures were not used in the composite score for hospitals. The dependent variable was hospitals' interest rate, which corresponded to the bond rating (the credit spread on 20-year bonds at the end of 2007), with operating margin percentage, debt-to-capitalization ratio, return on assets percentage, and debt-to-cash-flow ratio as control variables. Other bond rating drivers used by Moody's in setting bond ratings, in particular the non-financial factors, such as hospital size and system membership, case-mix, payer-mix, and competition, were not used.

The quality of financial disclosures has been demonstrated to affect the cost of debt. After controlling for other factors that influence the cost of debt, Sengupta (1998) noted that firms that provided higher quality financial disclosures (more timely and detailed) had lower 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 (Watkins, 2000). Voluntary disclosure of Corporate Social Responsibility (CSR) activities have been shown to have a positive effect on entities' costs of equity capital (Dhaliwal et al., 2010). 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 can be expected to 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 (Dranove & Jin, 2010). These study results suggest that positive relationships between quality and financial performance may be skewed as a result.

Hospital Board Quality Risk Management and Firm Performance

Researchers have demonstrated a linkage between boards' internal processes and behavioral dynamics and financial performance, indicating that boards actively focused on key issues and related governance processes are more effective (Kane, Clark, & Rivenson, 2009). With more active hospital boards emerging, researchers have examined board effectiveness with respect to strategy as well as operational processes and characteristics of these "new" hospital boards (Kane et al., 2009; Lee, Alexander, Wang, Margolin, & Combes, 2008; McDonagh, 2005). Agency theory offers an explanation for the emergence of more active hospital boards in response to the increasing risk associated with greater scrutiny of hospital quality of care which has emerged in the last decade.

Applied from a management control system perspective, agency theory suggests that firms will respond to environmental changes (such as legal and regulatory changes) that create risks by implementing new governance processes to enable the board to satisfy its stewardship responsibilities to its stakeholders (Eisenhardt, 1989). The fundamental concern of agency theory is the principal/agent relationship. In its simplest form, the principal (owner) hires an agent (manager) to perform work on the principal's behalf. In more complex relationships, a contract governs the relationship and defines the desired activities of the agent, and incentives are provided to encourage the agent to perform the

contracted services in the best interests of the principal. The fiduciary relationship is legally governed by the law of agency and described by the *Restatement (Second) of Agency (Title 17, U.S. Code),* an authoritative summary of the law of agency (Miller & Jentz, 2007). In a corporation, the shareholders (owners) are the principals and management of the corporation performs the agent function. In large corporations, the Board of Directors represents the shareholders in incentivizing and overseeing the performance of management. Fama and Jensen (1983) described this relationship from a business management perspective, noting the problem created by the separation of decision management and control from residual risk bearing, and identifying agency costs which arise from the need of the principal to control and monitor activities of the agent.

Miller-Millesen (2003) reviewed literature on nonprofit boards and discovered that agency theory, resource-dependence theory, and institutional theory were the predominate theories used by researchers in empirical analyses of board governance. The author concluded that while all three theories provided contributions, agency theory appeared to provide the strongest theoretical support for explaining nonprofit board behavior. Agency theory was selected for the current investigation because it addresses the board's oversight and control role (governance) and has been discussed in relation to risk in the literature more than other theories. The principal's need to monitor the agent's activity is essential because of the agent's tendency to self-satisfice instead of maximizing firm value. Based on agency theory, the agent would have a tendency to make decisions that are better for him or her personally but less than optimize the principal's interest. For example, a hospital manager may not invest in new quality processes that would be in the best interest of the hospital if the expenditure would

reduce hospital net income and, in turn, the manager's performance bonus. The costs of

contracting, monitoring, and the potential loss from the agent's lack of conformance to

the agreement (residual loss) are considered "agency costs." Jensen and Meckling (1976)

integrated elements of property rights and finance theory with agency theory to introduce

external financing from both debt and equity to the agency equation. Using economic

analysis, the authors suggested that the costs to control and monitor activities of the agent

result in an increase in the residual value of the firm by "limit(ing) divergences of the

manager from value maximization" (p. 34). This analysis provides the theoretical

support for the value of effective governance. Eisenhardt (1989) identified problems in

the principal/agent relationship as requiring the principal to provide 'governance' over

the agent's behavior in order to control and mitigate the agent's self-serving behavior.

The governance processes required to suppress potential negative effects on hospital

performance that could result from the incongruent goals require additional costs

(transaction costs or agency costs) to monitor the relationship.

Jha and Epstein (2009) did not specifically refer to a theory in their evaluation of

"Hospital Governance and the Quality of Care"; however, they were clearly focused on

the governance aspects of board activity related to quality of care. Similarly, Jiang, Bass,

and Fraser (2009) studied board governance processes related to hospital quality without

specifically identifying a theory. The authors concluded that board oversight and

monitoring of quality did contribute to improved quality. Another 'agency theory'

process – measuring executive quality performance and linking compensation to quality –

was also demonstrated to have a positive relationship on quality results (H. J. Jiang et al.,

2008).

Accordingly, an active and involved board with highly structured operational processes and governance mechanisms as the "new" hospital boards mentioned above (Kane et al., 2009; Lee et al., 2008; McDonagh, 2005) are especially important for effectively performing the 'principal' function overseeing agents (managers) in non-profit hospitals.  This study assumed that hospitals reporting better quality scores had better quality governance that directly influenced improvements in quality of care.

Conceptual Framework

Alexander, Lee, Wang, and Mangolin (2009) 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. 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. Monitoring practices should also be implemented to provide additional governance of clinical quality.  These practices could be expected to include periodic board reporting of quality performance and more in-depth oversight by a quality committee or audit committee of the board.  In fact, consultants are just now beginning to recommend such practices and procedures (KPMG, 2008).  The higher the level of

quality governance exhibited by the board, the better the quality performance of the hospital should be expected.

Agency theory suggests that effective governance has a positive impact on a firm's financial performance. Building on the linkage demonstrated by previous authors, the board's governance of hospital quality should contribute to improved hospital financial performance. Since active board governance of quality has been demonstrated to have a positive effect on hospital quality, agency theory proposes that this action by the board would have a positive effect on overall financial performance of the hospital since the board should only invest in quality improvement initiatives when the cost/benefit test is met. The positive impact on financial performance would result when cost reductions and revenue increases combine to more than offset the cost of increased governance of clinical quality. 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.

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┌─────────────────────────────────────────────────────────────────────────┐
│                QUALITY FEEDBACK AND GOVERNANCE PROCESS                     │
│  ┌─────────────────┐   ┌────────────┐   ┌────────────┐   ┌────────────┐   │
│  │ Board Quality   │   │ Hospital   │   │ Consumer   │   │ Hospital   │   │
│  │ Governance      │──▶│ Quality    │──▶│ Hospital   │──▶│ Financial  │   │
│  │ Quality Focus   │   │ Performance│   │ Selection  │   │ Performance│   │
│  │   Full Board    │   └────────────┘   └────────────┘   │ & Cost of  │   │
│  │   Quality Committee ◀── ┌──────────────┐              │  capital   │   │
│  │   Monitoring Practices  │ QP Disclosure│              └────────────┘   │
│  │                         └──────────────┘                               │
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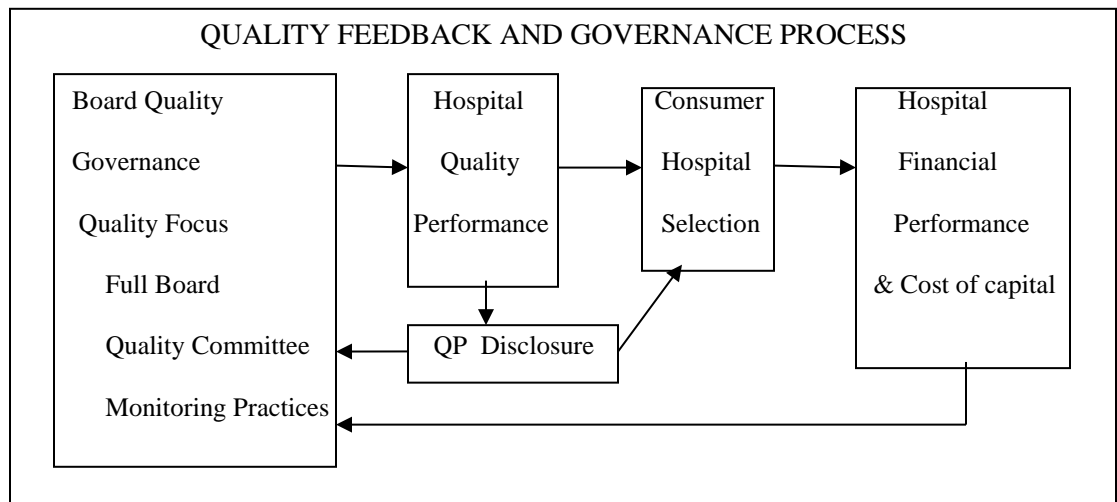
*Figure 1*. Graphic depiction of quality feedback and governance process.

The graph 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.

Ultimately, financial performance improvements should be realized to pay for the cost of improving quality of care. Measuring the association between quality scores and cost of capital provides a measurement of the risk reduction benefit of investments in hospital quality of care. Hospital boards and management should be sensitive to the risk created by sub-standard quality care. Since cost of capital is a reflection of the riskiness of a business, hospital boards should be concerned with the degree to which investments in quality are effective in reducing financial risk and contributing to improvements in cost of capital. 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.

CHAPTER 3

RESEARCH METHODS

Introduction

This chapter outlines the research methods used to empirically test the research questions presented in Chapter 1.  The research questions are restated in the form of testable hypotheses.  Following the three hypotheses, data used for the analysis and its sources are discussed.  The variables are then defined and operationalized for use in the analysis.  The final section of this chapter describes the methods used to test the hypotheses.

Hypotheses

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 and returns on equity (weighted average cost of capital or WACC).  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).

Hospital boards and management teams invest in new equipment and processes with the expectation that the benefit of these investments will exceed the cost.  The

financial benefits from these investments should be derived from reducing costs related to medical errors and from reducing the risk of revenue reductions caused by patients choosing competing hospitals for their care. Clinical quality improvements should reduce the number of readmissions due to preventable adverse events, such as substandard care or infection prevention. Readmissions result in increased patient days and increased costs, but do not generate additional revenue for the hospital since Medicare only pays once for each procedure under current reimbursement policies (Berger, 2008). Consequently, 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 1: Hospital cost of capital is positively related to its reported
                    mortality scores.

    *For-profit v. Not-for-profit hospitals* - Hospitals in the United States operate under various organizational forms, including: government owned and operated, shareholder-owned for-profit corporations, and tax-exempt organizations with no equity owners. A number of studies (Horwitz, 2005; Needleman, 1999; Norton & Staiger, 1994; Schlesinger, Mitchell, & Gray, 2009; Schneider, 2009; Young, Desai, & Lukas, 1997) have concluded that organizational form has little impact on the amount of

uncompensated care provided by the hospital to the community, the quality of care provided by the hospital, or the financial stability of the organization.  Given the absence of differences indicated by other studies between hospitals of different ownership types for other areas of performance, no difference in quality and cost of capital between for-profit and tax-exempt hospitals is expected.   However, the sensitivity of quality of care risk on financial risk should not be assumed to be the same between investor-owned hospitals and tax-exempt hospitals.  Therefore, Hypothesis 2 is stated as follows:

> Hypothesis 2: The relationship between hospital cost of capital and reported
> mortality rates are not different for tax-exempt hospitals and for-
> profit hospitals.

*Consumer sophistication,* Consumer sophistication is significant to the healthcare industry due to the complexity of healthcare services.  Consumer sophistication implies a degree of cognitive capability, knowledge, and experience (Titus & Bradford, 1996). Spiller and Zelner defined consumer sophistication in a specific product context as "the actual level of . . . training or experience that a product user has in relation to the products in question" (Spiller & Zelner, 1997, p. 6).  Training and experience necessary to competently use complex products is gained over timer.  As healthcare consumers become more knowledgeable, they can be expected to demand higher quality and competitive prices by using quality and price as decision variables in their selection of providers.  Efforts to increase the transparency of pricing and quality in the industry are

aimed at increasing the ability of healthcare consumers to make informed and efficient decisions concerning their care.

The longer quality score information is available, the greater the number of people who will become aware of the information. Cognitive learning theories, such as constructivism and connectivism, explain that learning is a building process. Individuals begin to understand new concepts and ideas by building upon their existing knowledge (Constructivism). In addition, learning is becoming increasingly dependent on individual's ability to construct networks to find information that they can use (Connectivism). New information concerning hospital quality of care is available and complex, so a degree of consumer sophistication must be developed before consumers are able to use it effectively to choose a hospital. As more people become aware of the information and better understand how to use it in making provider selection decisions, the impact of quality data may begin to influence consumer choice of hospital. Consumers can be expected to use information to compare the value of services between providers and choose hospitals with higher quality for their healthcare services. As consumers choose high quality over lower quality hospitals, higher revenues and greater financial performance should accrue to the higher quality hospitals because of the increased use of quality data in provider selection. Therefore, Hypothesis 3 is stated as follows:


Hypothesis 3: The relationship between hospitals' reported mortality rates and

their cost of capital will increase over time as consumers are

exposed to quality of care reports and how to use them in making decisions.

Data Sources

Data from three different sources were merged into a single database with multiple years' data. Initially, all acute care hospitals in the U.S. for which data was obtainable for 2008, 2009, and 2010 were used to develop a pooled cross-sectional data set for this study. Mortality scores (quality data) for acute care hospitals were obtained from Hospital Compare for the years 2008 through 2010. Although 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, 2008 was the first year for which numerical 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.

Acute care hospitals in the U.S. were used as the study population, a total of 4,397; 4,290; and 4,416 hospitals for 2008, 2009, and 2010, respectively. Federal government hospitals, specialty hospitals (e.g., Children's hospitals, orthopedic hospitals, etc.) were removed from the study population. 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

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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

observations in the regression.

The quality score used in the study was a weighted average of mortality scores

(Haydar et al., 2010) available in Hospital Compare. 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 current CMS Mortality scoring, these three categories were not available

for 2008 so only the three Risk Standardized Mortality Rates were included in the

weighted average calculation in order to have consistent calculations of weighted average

mortality across all years. The score for each of the three included categories was

weighted by the number of admissions reported to Medicare for each condition to obtain the composite Mortality Measure (Haydar et al., 2010). Since previous studies demonstrated a correlation between the process of care measures and the mortality measures (Jha et al., 2007; Ryan et al., 2009), a weighted average of mortality measures could be expected to provide an appropriate composite quality score measure for this study.

Operationalizing the Variables

*Dependent Variable – Weighted Average Cost of Capital (WACC)*

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 to 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). 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). The internal rate of return avoids the measurement issues of the other methods by eliminating the forward looking estimations and need 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. Therefore, the average cost of debt can be used as a surrogate measure for the equity component. Since both the equity component and the debt component are equal, the WACC for the tax-exempt hospitals is equal to its effective cost of debt.

For-profit companies are typically capitalized by a combination of debt and equity; therefore, a composite measure of a hospital's perceived risk should include the cost of both debt and equity capital. The weighted average cost of capital is equal to the effective interest rate on long-term debt (tax effected) multiplied by the ratio of debt capital to total capital plus the effective cost of equity multiplied by the ratio of equity capital to total capital (Gapenski, 2006). Cost of equity for each individual hospital presents a measurement issue for calculating a true WACC for hospitals that are members of a system. Hospitals that are members of a system are likely to have the capital managed at a consolidated level so that the cost of capital for individual hospitals in that system is not available. Because of the resulting cost of equity measurement problem, the average interest rate on debt for these hospitals is also used. While less than ideal,

this approach does result in a consistent measurement approach being used for both for-profit and not-for-profit hospitals.

The change in the federal funds rate published by the U.S. Treasury Department was considered as a control variable to account market effects on the average cost of debt. This variable was excluded from the final model since the time variables explain the effects of market rate changes. 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:

$$WACC_{it} = HCQS_{it}\beta_1 + FRCV_{it}\beta_2 + HOCV_{it}\beta_3 + HECV\,\beta_4\,e_{it}$$

Where:

$WACC$ = weighted average cost of capital;

$HCQS$ = Hospital 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*

A composite quality score for each hospital was developed by taking a weighted average of risk adjusted mortality scores for the three measures for which Hospital Compare published mortality data for 2008, 2009, and 2010, AMI, Heart Failure, and pneumonia. The mortality measures are developed 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%2FQnetTier4&cid=1163010421830. The weighted average of the three risk adjusted mortality measures for each hospital was calculated by adding the three scores after being weighted by their relative volumes for each annual period (Shwartz et al., 2011).

Researchers have incorporated a component into the composite measure for the Hospital Compare scores for process of care measures. Only the mortality scores were used in this study since several researchers have demonstrated a correlation between process of care measures and mortality scores (Bradley et al., 2006; Fonarow et al., 2007).

*Other Variables (financial and non-financial)*

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

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and managers to assess performance were controlled for in the regression. The variables

determined from the literature review that have typically been used as control variables

related to measuring hospital financial performance were used in this investigation

(Haydar et al., 2010; McCue et al., 2003; Watkins, 2000) (See Appendix B).


Control variables included the following:

*Member of a system* - System membership can create advantages and

disadvantages. For example, hospitals that are members of successful systems usually

have access to greater financial resources as part of a larger entity and may be able to

borrow at a lower cost. A dichotomous variable indicating membership in a multihospital

system (1 = member of a system; 0 = not a member of a system) was created to control

for these differences.

*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.

A dichotomous variable was used for each hospital type in the data set.

*Time* – Dichotomous variables were also used to identify data to the year 2008,

2009, and 2010 to control for differences in interest rates between years.

*Payer-mix* – Measures the relative degree to which a hospital's patient population

has third party insurance, Medicare, Medicaid, private pay, and uncompensated care.

Each of these types of payers pays a different percentage of total charges, so the payer-

mix has a significant effect on cash flow. For this study, payer-mix was calculated by

dividing the total of Medicare and Medicaid inpatient days by total inpatient days from

AHA data.

*Staffed beds* - to control 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 number of beds actually in use and generating revenue.  Occupancy percentage was calculated by dividing the total inpatient patient days by the total bed days available (number of beds multiplied by 365).  Inpatient patient days were obtained from AHA Annual Survey data.

*Herfindahl Index* – to control for the competitiveness of the market in which the hospital operates.  Markets for this study were defined as counties.  The Herfindahl Index was computed by first calculating the percentage of a hospital's inpatient patient days of the total inpatient patient days in the county in which it operates, then squaring the result.  The sum of squares of all hospitals in a county was the index for that county.  The lower the index, the more competitive was the market.  Data for the calculation were obtained from AHA Annual Survey data.

*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.  A case-mix affects a number of financial indicators that could affect interest costs, including revenue per admission, margins, debt service coverage, etc. (McCue & Kim, 2007).  The case-mix index is calculated by Medicare based on the diagnosis-related group system used for Medicare reimbursement.  The higher the case-mix index the more complex the services provided by a hospitals.  A hospital with a higher case-mix should generate greater revenues and costs per admission than a hospital with a lower case-mix

index.  The annual case mix index was downloaded from CMS.gov,

(www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/).

*Geographic differences* – Two variables were used to control for differences in

patient demographics that could affect mortality scores that is not reflected in the case-

mix index, and to control for interest rate differences between locations, AHA region

code and the Core Based Statistical Area (CBSA).  The AHA assigns each hospital in its

annual study to one of nine regions in the United States based on state, plus one for U.S.

territories (Guam, Puerto Rico, etc.)  CBSAs are defined by the U.S. Office of

Management and Budget (OMB) as urban areas with populations of at least 10,000.

Micropolitan areas contain between 10,000 and 50,000 people and Metropolitan

statistical areas are contiguous geographic areas that contain more than 50,000 people.

Metropolitan areas with a population greater than 2.5 million may be divided into

Divisions.  The AHA assigns CBSA designation of each hospital through its Annual

Survey database.  Hospitals in areas that are not included in one of the three OMB

defined categories are designated as Rural in the AHA Annual Survey database.  The

New England region and the Rural CBSA were used as the referent variables for each

type of category, respectively.


Method of Analysis

Histograms were used to determine that the distribution of interest rates and

mortality rates was sufficiently normal.  Counts of categorical variables and arithmetic

means of linear variables are presented in the Descriptives section of Chapter 4.  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.

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, between ownership types, between

regions, and between CBSAs. Bonferoni adjustments from each of these tests are

presented to aid the readers' understanding of hospitals' interest rates and mortality

differences between subsets of data.

The three hypotheses were tested using ordinary least squares (OLS). Stata 11

was used for the regression, and the robust clustering function was used to account for

repeated observations of hospitals across years. Hypothesis 1 was tested by regressing

the hospitals' average interest rates (cost of debt) on  weighted average mortality scores.

In addition to regressing the variables against current year cost of debt, a separate test

was conducted using a one year lagged cost of debt. A regression model was developed by adding interaction terms for ownership type and mortality to the main model to test Hypothesis 2 – that the relationship between mortality scores and cost of capital would be the same between not-for-profit and for-profit hospitals. A third regression model that added interaction terms for year and mortality to the main model was used to test Hypothesis 3 – whether the strength of the relationship between mortality rate and interest rate increased over time.

CHAPTER 4

Introduction

This chapter reports the results of data analyses.  This section is organized as follows:

1) Descriptive information is provided for all non-federal acute care hospitals after
   reducing the data set to hospitals having an average interest rate between 0 and
   25%.

2) Means Analysis.  Means analysis was performed to compare whether average
   interest rates and mortality rates differed between hospitals of different ownership
   types (Not-for-profit, investor-owned, and non-federal governmental), between
   hospitals of the 10 regions designated in the AHA Annual Survey data and
   between hospitals of the four CBSA types.

3) Correlation analysis results are presented.

4) Regression analysis results.  The regression model tested the relationship between
   reported mortality scores and cost of debt.  The average interest rate (surrogate for
   weighted average cost of capital and financial risk) was the dependent variable.
   The primary independent variable of interest was represented by a composite
   mortality variable developed by calculating the weighted average mortality rates
   of the three mortality measures published by Hospital Compare (CMS).  Controls
   included hospital characteristic variables from the AHA Annual Survey and
   financial variables developed from Medicare Cost Report data.

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* |
| Region | | | | | | |
| New England | 112 | *7.2* | 107 | *11.6* | 98 | *10.3* |
| Mid-Atlantic | 126 | *8.1* | 67 | *7.2* | 80 | *8.4* |
| South Atlantic | 213 | *13.8* | 141 | *15.2* | 145 | *15.2* |
| East North Central | 257 | *16.6* | 152 | *16.4* | 163 | *17.2* |
| East South Central | 104 | *6.7* | 81 | *8.8* | 55 | *5.8* |
| West North Central | 288 | *18.6* | 142 | *15.4* | 139 | *14.7* |
| West South Central | 168 | *10.9* | 95 | *10.3* | 120 | *12.7* |
| Mountain | 97 | *6.3* | 46 | *5.0* | 42 | *4.4* |
| Pacific | 161 | *10.4* | 82 | *8.9* | 91 | *9.6* |
| Associated Areas | 21 | *1.4* | 12 | *1.3* | 15 | *1.5* |
| CBSA Type | | | | | | |
| Division | 164 | *10.6* | 107 | *11.6* | 123 | *13.0* |
| Metro | 609 | *39.4* | 344 | *37.2* | 368 | *38.8* |
| Micro | 331 | *21.4* | 192 | *20.8* | 213 | *22.5* |
| Rural | 443 | *28.6* | 282 | *30.5* | 244 | *25.7* |
| 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% | |

Table 1

*Descriptive Characteristics*

|  | 2008 | 2009 | 2010 |
|---|---|---|---|
| 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.  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, so intra-year changes could have

resulted in interest rate calculations yielding results outside of the reasonable range.  For

example, the denominator of the calculation is based on a simple average of long-term

debt at the beginning and the end of the year, and the interest expense may have been

incurred for a longer or shorter period and would not match-up with an average debt

balance. During a period of rapid change, more hospitals' interest rates would likely fall

outside of the reasonable range and be removed from the study.

Hospital characteristics in the study varied slightly from year to year but did not change significantly. Not-for-profit hospitals comprised approximately two-thirds of hospitals in the study for all of the years, with non-federal government hospitals comprising between 22% and 27% and investor-owned hospitals ranging from 6.2% of the study hospitals in 2008 to 9.2% in 2010.

AHA divides hospitals into 10 different regional groups, as presented in Appendix C. Associated Areas (U.S. Territories) was the smallest regional group representing less than 2% of the total study population. South Atlantic, East North Central, West North Central, and West South Central each encompassed more than 10% of the study population. Approximately 40% of hospitals operated in metropolitan statistical areas (50,000 to 2.5 million people). Approximately 10% of the hospitals operated in the larger Division areas with the remaining 50% of the hospitals divided approximately equally between metropolitan and rural areas.

The average of hospital interest rates declined from 8.61% in 2008 to 5.93% in 2009 then rose to 6.73% in 2010. 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. Weighted average mortality rates for all acute care hospitals (See Table 2) had actually risen from 11.41 in 2008 to 12.29 in 2010.

Non-financial control variables remained relatively consistent over the study period. Since these factors (i.e., number of beds, number of employees, occupancy,

Herfindahl index, etc.) 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 costs

of service exceeded 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 ($213,063 in 2008) indicated that a large

number of hospitals reported a net loss for the period.

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 | |
|     Current ratio | (2) | | |
|     Invested debt capital to total capital ratio | (2) | | |
|     Net Income | (2) | | |
|     Days Revenue in A/R | (2) | | |
|     Operating Margin | (2) | | |
|     Total Asset Turnover | (2) | | |
|     Revenue per admission | (2) | | |

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

(2)   Averages for the ratios are not reported because many hospitals reported abnormal or non-existent data

The number of hospitals included in the study declined by 40% between 2008 and 2009. The only variable that limited the number of hospitals included in the study was interest rate; therefore, individual hospital interest rates that fell outside of the defined reasonable range were dropped for 2009 and 2010 (see previous discussion). The percentage of hospitals that are members of hospital systems (41.6%) is low compared to the total population of acute care organizations (from 55.8%). Frequently, all debt in consolidated groups is held at the parent company level with no debt held by the subsidiary. Assuming that this is the case for hospitals as well, many of the hospitals that were members of a hospital system would have been removed from the study population since they had no interest expense, leaving a smaller percentage of system hospitals than exist in the total hospital population.

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.

## Means Analysis

ANOVA was used to test whether a significant difference existed between means for the weighted average mortality rate and the average interest rate between years, between hospitals that were members of systems and those that were not, between

ownership types, between regions, and between CBSAs.  AVOVA results indicated

significant differences between the tested groups, as discussed below.

Average interest rates were significantly different between years, ownership

types, and regions. Neither the mortality rate nor the average interest rate was

significantly different between hospitals that were members of system and those that

were not.  Bonferoni adjustments indicated that the significant difference for interest rates

between years was due to a mean for the year 2008 that was significantly larger than in

years 2009 and 2010.  For-profit hospital interest rates were also significantly higher than

non-federal governmental hospitals and not-for-profit hospitals.

Table 3

*Means Analysis Results-Year, System, and Ownership*

|  | Average Interest Rate | Sig. | Mortality Rate | Sig. |
|---|---|---|---|---|
| Year |  |  |  |  |
| 2008 | 8.63%  (1) |  | 12.107 |  |
| 2009 | 5.91%  (1) |  | 12.177 |  |
| 2010 | 6.60%  (1) |  | 12.137 |  |
| F-Test | 135.134 | .000 | .879 | .415 |
| df | 3417 |  | 3417 |  |
| Member of a Hospital System |  |  |  |  |
| System | 7.42% |  | 12.129 |  |
| Independent | 7.25% |  | 12.140 |  |
| F-Test | 1.162 | .281 | .062 | .804 |
| df | 3418 |  | 3418 |  |
| Ownership |  |  |  |  |
| Not-for-profit | 7.07% |  | 12.150 |  |
| Investor-owned | 9.96% (2) |  | 12.024 |  |
| Non-federal governmental | 7.21% |  | 12.129 |  |
| F-Test | 47.161 | .000 | 1.015 | .362 |
| df | 3417 |  | 3417 |  |

(1) Interest rates were significantly different between all years
(2) Significantly higher than Not-for-profit and Non-federal governmental hospitals

Between regions, the mean differences were only significant at the 0.05 level between West North Central, West South Central, and Mountain regions versus the all other regions.  In general, the Mountain region exhibited the lowest mean mortality scores, followed by West North Central and West South Central regions, respectively. However, the East North Central mean difference as compared to the West South Central region was not significantly different.  The states included in each of the regions are listed on the AHA Annual Survey chart (Appendix C). Average interest rates were highest in the Associated Areas (i.e., U.S. Territories); average interest rates were lowest for the West South Central and East North Central regions, respectively.

Table 4

*Means Analysis Results-Region*

|  | Average Interest Rate | Sig. | Mortality Rate | Sig. |
|---|---|---|---|---|
| Region |  |  |  |  |
| New England | 6.53% (1) |  | 11.973 (2) |  |
| Mid-Atlantic | 7.92% (3) |  | 11.991 (2) |  |
| South Atlantic | 7.19% |  | 12.222 (4) |  |
| East North Central | 6.81% (5) |  | 12.101 (2) |  |
| East South Central | 7.77% |  | 12.180 (6) |  |
| West North Central | 7.26% |  | 12.000 (2) |  |
| West South Central | 8.13% (7) |  | 12.124 (6) |  |
| Mountain | 7.12% |  | 11.856 (8) |  |
| Pacific | 7.33% |  | 12.427 (9) |  |
| Associated Areas | 9.07% (10) |  | 14.094 (11) |  |
| F-Test | 5.025 | .000 | 16.959 | .000 |
| df | 3410 |  | 3410 |  |

Significant at p < .05
> (1) lower than Mid-Atlantic, West South Central, and Associated Areas
> (2) lower than Pacific and Associated Areas
> (3) higher than New England and East North Central
>
> (4) lower than Mountain, and higher than Associated Areas
> (5) lower than Mid-Atlantic, West South Central, and Associated Areas
> (6) lower than Associated Areas
> (7) higher than New England, and East North Central
> (8) lower than South Atlantic, Pacific, and Associated Areas
> (9) higher than New England, Mid-Atlantic, East North Central,
>     West North Central, Mountain, and lower than Associated
>     Areas
> (10) higher than New England and East North Central
> (11) higher than all other regions

For CBSAs, the mortality rate mean difference between divisional areas and metro and micro areas was significant at the 0.05 level.  Mortality rate means were also significantly different between hospitals in rural areas and hospitals in metro and micro areas.  Mean differences between the remaining categories were not significant.

Table 5

*Means Analysis Results-CBSA*

|  | Average Interest Rate | Sig. | Mortality Rate | Sig. |
|---|---|---|---|---|
| CBSA |  |  |  |  |
| Division | 7.41% |  | 11.602 (1) |  |
| Metro | 7.53% |  | 12.296 (2) |  |
| Micro | 7.17% |  | 12.307 (2) |  |
| Rural | 7.10% |  | 12.003 (3) |  |
| F-Test | 2.113 | .096 | 36.154 | .000 |
| df | 3416 |  | 3416 |  |

Significant at p < .05
>  (1) lower than all other CBSA types
>  (2) higher than Division and Rural
>  (3) higher than Division and lower than Metro and Micro

## Correlation Analysis

Initial assessment suggested that there was a significant negative correlation

between the dependent variable (Average Interest Rate) and the independent variable of

interest (Weighted Average Mortality Rate), r = -.048, which was significant at the 0.005

level for n = 3,420 across all years.  See Table 6 below for the correlation matrix.   The

correlation matrix presented here includes only those variables that were used in the

regression.  The variables FTEs and Total Assets that are typically used by lenders and

analysts were highly correlated with Beds, and so they were removed from the

regression.  All three variables were indicators or size, so only one was used in the final

analysis.  Similarly Expense per Admission was highly correlated with Revenue per

Admission, so Expense per Admission was removed and Revenue per Admission was

retained.  While correlations between some other variables were statistically significant,

but they were not removed since the Variance Inflation Index (VIF) was less than 3 and

the variable contributed to the explanatory value of the model.  Case Mix Index is

significantly correlated with Beds and Occupancy but was retained since it did not measure the same characteristics of a hospital. Case Mix is used as an indicator of the type of complexity of required patient care which is associated with higher revenues. The correlation with Beds occurs because patients with more complex medical conditions are generally treated in larger hospitals or medical centers that support a larger number of specialty and sub-specialty physicians that are needed for the complex cases. The Correlation between Beds and Occupancy is consistent with hospitals managing the number of beds needed to meet the demand over time. The correlation with of Case-Mix Index with Revenue per Admission was statistically significant, but was deemed to be small enough to be retained in the regression analysis. Herfindahl Index was significantly correlated with Beds, Occupancy %, and Case Mix Index, but was retained in the regression model because the correlation was deemed to be insufficient to warrant removal. Net Income was correlated with Beds, but was retained because it was a measurement of profitability rather than size. Net Income was also correlated with Operating Margin, but both variables were retained. Operating Margin related exclusively to profitability with respect to patient services, but Net Income encompasses additional relevant information such as gains and losses on asset sales, contributions, and interest expense. While the two variables are correlated, they provide different insights into the reasons for profitability (or lack of profitability).

Table 6

*Correlation Matrix*

| | Average Interest Rate | Weighted Average Mortality Rate | Beds | Occupancy % | Inpatient Payer Mix | Case Mix Index | Herfindahl Index | Current Ratio | Invested Debt Capital to Total Invested Capital | Net Income (loss) | Days Revenue in A/R | Operating Margin | Total Asset Turnover | Revenue per Admission |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Interest Rate | 1 | -.048** | -.027 | -.036* | -.041* | .033 | -.017 | -.005 | -.030 | -.073** | -.034* | -.031 | .051** | -.071** |
| Weighted Average Mortality Rate | -.048** | 1 | -.013 | .012 | -.011 | .065** | .050** | .009 | -.069** | .012 | .028 | .037* | -.030 | -.058** |
| Beds | -.027 | -.013 | 1 | .436** | -.133** | .583** | -.294** | -.006 | .008 | .340** | -.019 | .098** | -.014 | -.145** |
| Occupancy % | -.036* | .012 | .436** | 1 | -.091** | .336** | -.266** | -.027 | .018 | .104** | -.049** | .162** | -.004 | -.084** |
| Inpatient Payer Mix | -.041* | -.011 | -.133** | -.091** | 1 | -.085** | .081** | -.012 | -.012 | -.076** | -.035* | .001 | .011 | -.031 |
| Case Mix Index | .033 | .065** | .583** | .336** | -.085** | 1 | -.238** | -.028 | .021 | .171** | .082** | .122** | -.023 | -.297** |
| Herfindahl Index | -.017 | .050** | -.294** | -.266** | .081** | -.238** | 1 | .029 | -.035* | -.099** | -.021 | -.094** | -.010 | -.073** |
| Current Ratio | -.005 | .009 | -.006 | -.027 | -.012 | -.028 | .029 | 1 | -.008 | .004 | -.005 | -.002 | -.004 | .006 |
| Invested Debt Capital to Total Invested Capital | -.030 | -.069** | .008 | .018 | -.012 | .021 | -.035* | -.008 | 1 | -.008 | .001 | -.006 | .035* | -.016 |
| Net Income (loss) | -.073** | .012 | .340** | .104** | -.076** | .171** | -.099** | .004 | -.008 | 1 | .004 | .262** | -.001 | .059** |
| Days Revenue in A/R | -.034* | .028 | -.019 | -.049** | -.035* | .082** | -.021 | -.005 | .001 | .004 | 1 | -.081** | -.008 | -.148** |
| Operating Margin | -.031 | .037* | .098** | .162** | .001 | .122** | -.094** | -.002 | -.006 | .262** | -.081** | 1 | .039* | .091** |
| Total Asset Turnover | .051** | -.030 | -.014 | -.004 | .011 | -.023 | -.010 | -.004 | .035* | -.001 | -.008 | .039* | 1 | .005 |
| Revenue per Admission | -.071** | -.058** | -.145** | -.084** | -.031 | -.297** | -.073** | .006 | -.016 | .059** | -.148** | .091** | .005 | 1 |

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

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The correlation analysis suggests that an inverse relationship exists between weighted average mortality rate and the average interest rate, which is contrary to expectations as hypothesized.

Regression Analysis

The hypotheses were 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. Therefore, the analysis failed to support Hypothesis 1 that reported mortality scores would be positively associated with interest rates. The regression model coefficients are presented in Table 7.

Table 7

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

|  | Model 1<br>All Hospitals | Model 2<br>NFP v. For-Profit | Model 3<br>Time Effect |
|---|---|---|---|
| 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) |
| Region: |  |  |  |
|   New England (referent) | Ref | Ref | Ref |
|   Mid-Atlantic | 1.237 (.404) ** | 1.231 (.403) ** | 1.240 (.404)** |
|   South Atlantic | .304 (.387) | .290 (.388) | .303 (.387) |
|   East North Central | -.016 (.319) | -.019 (.319) | -.016 (.319) |
|   East South Central | .762 (.546) | .759 (.547) | .762 (.546) |
|   West North Central | .332 (.358) | .326 (.359) | .333 (.358) |
|   West South Central | .838 (.396) * | .821 (.395) * | .839 (.395) * |
|   Mountain | .094 (.433) | .097 (.435) | .094 (.433) |
|   Pacific | .517 (.392) | .495 (.393) | .518 (.392) |
|   U.S. Territories | 1.304 (.788) | 1.500 (.769) | 1.307 (.790) |
| Core Based Statistical Area: |  |  |  |
|   Rural | Ref | Ref | Ref |
|   Division | .159 (.428) | .162 (.429) | .166 (.429) |
|   Metro | .328 (.290) | .332 (.291) | .331 (.290) |
|   Micro | .197 (.286) | .200 (.286) | .202 (.286) |
| 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) |

Table 7

*Regression Results – Dependent Variable: Average Interest Rate on Average Debt (continued)*

|  | Model 1 All Hospitals | Model 2 NFP v. For-Profit | Model 3 Time Effect |
|---|---|---|---|
| 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

The constant of 11.945 represents an average base interest rate for a hypothetical hospital with no employees, beds, occupancy %, etc. The weighted average mortality rate parameter indicates that one point higher mortality rate is associated with a 0.162% lower interest rate. Hypothesis 1 suggested that higher mortality rates would be associated with higher interest rates because investors and lenders would associate higher mortality rate with greater financial risk. Specifically, disclosure by the hospital of higher mortality through Medicare's Hospital Compare website would lead to patients selecting hospitals with lower mortality scores for healthcare services. It was suggested that as patients move to other hospitals, occupancy and revenue would decline leaving the hospital in worse financial condition and this would be perceived negatively by investors and lenders. Accordingly, investors and lenders would demand higher interest rates on loans to hospitals with higher mortality rates. Possible reasons for contradictory results are discussed in Chapter 5.

Additional variables displayed in Table 7 are the control variables that were

included in the model to isolate the effect of mortality on interest rates. The differences

in interest rates that are attributable to time period and hospital characteristics are

presented first followed by the representative financial variables that are used by

investors and lenders to assess financial risk and adjust required rates of return. As

compared to 2008, interest rates paid by acute care hospitals averaged 2.7% and 2.1%

higher in 2009 and 2010, respectively. For-profit hospitals averaged paying interest rates

that were 2.7% ($p < .001$), higher than not-for-profit hospitals, which reflects the higher

rates demanded by investors to cover income taxes that must be paid on interest paid by

for-profit hospitals. The interest paid by not-for-profit hospitals is not taxed to investors;

therefore, the difference in rates approximates the difference in taxes paid by investors of

these alternative investments. Lenders also understand that historically, not-for-profit

hospitals are somewhat protected from normal competitive market forces, which reduces

their financial risk enabling them to charge lower interest rates.


The next two sections in the regression model present the association of interest

rates with hospital location. On average, hospitals in the Mid-Atlantic region paid

interest rates that were 1.2% higher than those in the New England region ($p < .01$), and

hospitals in the West South Central Region on average paid .8% higher average rates than

hospitals in New England ($p < .05$). Hospitals in the U.S. Territories also paid higher

interest rates on average than those in the New England region by 84 basis points (.84 %).

The difference was significant at 90%, but was not significant at 95%. Average interest

rate differences between the other regions and New England were not significant (See

Table 4 – ANOVA – Regions in the Means Analysis section for additional discussion of differences between regions).  None of the Core Based Statistical Areas were significantly different from the Rural area, which served as the referent variable.

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, $p < .001$).    These variables are measured as decimals in the data which should be considered in their interpretation.  For example, the occupancy % for 2008 of 56.7% from Table 1 would be represented in the data as 0.567.  Accordingly, the occupancy % parameter of -1.113 indicates an inverse relationship with a hospital's average interest rate such that a hospital with 100% occupancy would be expected to have an average interest rate that was 1.113 points below the constant value assuming the hospital's other characteristics are average.  A hospital with 60% occupancy would have an average interest rate 0.4452 (1.113 * (1 - .60)) of a percent higher than a hospital with 100% occupancy. Similarly, the payer-mix ratio parameter indicates that a 1% increase in payer-mix (e.g., from 1.00 to 1.01) could be expected to coincide with a 1.066% reduction in its interest rate. 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 2 tested whether the relationship of mortality rates to average cost of debt was different between not-for-profit hospitals and for-profit hospitals (R-squared = .128). Using interaction of mortality and not-for-profit as the referent variable, the results suggest that the negative relationship between mortality and interest rates was .326% larger for for-profit hospitals relative to than not-for-profit hospitals (B=-.326, p>.05). However, the relationship variables were not statistically significant; therefore, the analysis failed to demonstrate a difference between not-for-profit and for-profit hospitals, supporting Hypothesis 2.

Model 3 tested whether the relationship of mortality rates to average cost of debt strengthened over time (R-squared = .127). 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). Therefore, Hypothesis 3, that the relationship between mortality and interest rates strengthens over time, is rejected (See Chapter 5 for a discussion of possible reasons that the hypothesized relationship could not be demonstrated).

The Hypotheses were also analyzed by lagging the dependent variable for one year (e.g., 2008 mortality v. 2009 interest rates). The results are presented in Table 8. 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 8

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

|  | Model 1<br>All Hospitals | Model 2<br>NFP v. For-Profit | Model 3<br>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) |
| Region: |  |  |  |
| New England (referent) | Ref | Ref | Ref |
| Mid-Atlantic | .291 (.426) | .285 (.426) | .290 (.426) |
| South Atlantic | .296 (.346) | .292 (.347) | .296 (.346) |
| East North Central | .448 (.288) | .452 (.288) | .449 (.288) |
| East South Central | .752 (.502) | .749 (.503) | .752 (.502) |
| West North Central | .271 (.332) | .264 (.334) | .272 (.333) |
| West South Central | .218 (.400) | .220 (.399) | .218 (.400) |
| Mountain | .322 (.381) | .312 (.383) | .321 (.381) |
| Pacific | -.353 (.361) | -.360 (.361) | -.354 (.361) |
| U.S. Territories | .268 (.811) | .190 (.829) | .263 (.812) |
| Core Based Statistical Area: |  |  |  |
| Rural | Ref | Ref | Ref |
| Division | .184 (.427) | .203 (.428) | .184 (.427) |
| Metro | .534 (.279) | .537 (.280) | .534 (.280) |
| Micro | .313 (.273) | .311 (.273) | .312 (.273) |
| 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) |

Table 8 (continued)

*Regression Results – Dependent Variable: Average Interest Rate on Average Debt – lagged 1year (continued)*

|  | Model 1 All Hospitals | Model 2 NFP v. For-Profit | Model 3 Time Effect |
|---|---|---|---|
| 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

Results Summary

Hypothesis 1 – Hospital cost of capital is positively related to its reported mortality scores.  Not supported.

Hypothesis 2 – The relationship between hospital cost of capital and reported mortality rates are not different for tax-exempt hospitals and for-profit hospitals.  Supported

Hypothesis 3 – The relationship between hospitals' reported mortality rates and their cost of capital will increase over time as consumers are exposed to quality of care reports and how to use them in making decisions.   Not supported.

CHAPTER 5

DISCUSSION

The purpose of this study was to examine the association of mortality reporting with hospitals' financial risk as measured by their average cost of debt. Agency theory suggests that hospital managers would implement quality improvements for the purpose of increasing their performance-based compensation tied to hospital financial performance. This approach assumes that managers of hospitals are compensated to some extent based on financial performance; therefore, investments to improve quality and mortality scores reported by hospitals would result in higher compensation based on improved financial performance linked to better quality of care. One component of financial performance, net income, is reduced by the interest expense incurred on debt instruments such as mortgages and bonds payable. Managers whose compensation is based, at least in part, on net income would have an incentive to minimize interest costs.

Quality scores were also expected to influence financial performance by affecting revenues. Hospitals with better quality scores should be expected to attract customers from competing hospitals that report lower quality scores if quality score information influences customers' choice of provider. Hospital's that offer a superior value proposition (quality X price) should attract customers and revenues away from hospitals with lower quality. Increasing revenues should increase net income, and in turn, also increase a manager's compensation.

This study anticipated that lower mortality scores would be related to lower interest rates. However, results did not demonstrate that relationship. The results further

suggest that lenders neither reward nor penalize hospitals for their reported quality scores. Lenders and rating agencies apparently do not recognize the potential contribution to a hospital's value proposition that should result from superior quality of care; nor do lenders recognize the financial risk implications of substandard quality of care. Three plausible explanations for this phenomenon, that could be the subject of future research, are suggested: (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; (2) Consumers' selection of hospitals is not influenced by quality scores; (3) Hospital decisions to invest in improving quality of care are not driven by expected financial benefits but rather by the need to meet regulations or other legitimacy concerns. Additionally, these decisions are only made once the hospital has sufficient resources to bear the cost. These three reasons are further discussed below.

## Discussion of Results

Interest rates in the U.S. dropped dramatically in 2008 as a result of the economic downturn and reflected the easing in credit policy by the Federal Reserve. Interest rates remained virtually the same over the next two years. The average long-term debt rate of all hospitals (the dependent variable) closely followed general market trends, experiencing a significant decline from 2008 to 2009 followed by a slight increase from 2009 to 2010.

Long-term debt for an enterprise does not typically fluctuate with small changes in market rates due to the cost of refinancing. Hospital interest average costs typically change as hospitals add to debt by financing building projects or pay off existing debt.

The dramatic rate changes that were experienced in 2008 disrupted the norm and provided an opportunity for borrowers to reduce their debt costs by a large enough amount to overcome the cost of refinancing thereby enabling hospitals to reduce interest costs as rates declined. The dramatic decrease in the federal funds rate freed up more capital and likely led to a higher than normal amount of debt refinancing to take advantage of reduced interest costs.

Other financial predictor variables (current ratio, net income, etc.) were correlated with the dependent variable, consistent with previous literature on the subject. The Debt Capital to Total Capital Ratio and Days Revenue in A/R were exceptions. The atypical economic environment during the study period could have contributed to these results. In general, a higher debt to total capital ratio would be an indicator of greater risk and correspond to higher interest rates on long-term debt. However, during the economic downturn companies that increased debt to take advantage of the lower interest rates may have been viewed as adopting a positive strategy which was received favorably by lenders and rating agencies. As a result, the higher debt to capital ratio was correlated with a lower interest rate after removing the effect of general market changes in rates.

One of the premises of the hypotheses on which this study was based was that mortality rates would experience a year-over-year improvement (decline in mortality scores); however, this was not the case. Weighted average mortality rates remained nearly constant from year to year suggesting that risk-adjusted mortality on an industry level have leveled off. If that is the case risk-adjusted mortality that can be impacted by quality of care improvements may already be at a minimum in many hospitals and further

improvements may be unattainable.  If this is the case, mortality rates should not affect financial performance absent changes in reimbursement.

The average interest rate with investor-owned hospitals was significantly larger than not-for-profit and governmental hospitals for all three years.  For-profit hospitals must pay a higher rate on debt because investors do not receive the same tax-free privilege on interest from for-profit hospitals that they receive on interest from not-for-profit hospitals (i.e., "tax-exempts").  For-profit hospitals must pay a rate that is higher by approximately the tax rate on average individual tax-payers.  The number of hospitals included in the results differed in each year since hospitals with interest rates outside of the reasonable range were removed in each year.

Contrary to expectations, the results indicated a negative relationship between mortality rates and 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 a confounding factor may have caused the negative association between mortality and interest rates.  This study used mortality scores rather than process of care indicators as the measure of quality because prior research had indicated that mortality scores were positively correlated with process of care measures (Bradley et al. 2006; Fonarow et al., 2007).   However, prior study results found that hospitals that performed well on a composite mortality measure did not necessarily perform well on other individual measures (Shwartz et al., 2011).  If process of care measures are better understood than mortality scores by consumers and have a greater impact on consumer choice of hospital, the negative relationship between mortality rates and interest rates found in this study may be spurious.  Future researchers

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are encouraged to address the effect of hospital quality on risk by using process of care measures instead of mortality scores.

Quality of care reporting is a relatively new process and may not yet be providing information that affects consumers' hospital choice decisions. "Risk adjusted mortality scores" and many of the other measures reported by Hospital Compare may not yet be understood well enough by the general populace for the information to influence consumers' hospital choice. Most people generally do not have a sufficient level of knowledge and experience with the quality of care information for it to impact their provider choice decisions. Learning theories such as cognitivism, constructivism, and connectivism could provide insight into the development of actionable knowledge. These theories suggest learning is more effective when based on previously held knowledge, so a minimum critical mass of knowledge concerning healthcare quality, the terminology, and the intent of the information is needed for people to understand how to use the information that is being provided.

*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 implication is that lenders and rating agencies are not concerned with the potential financial risk of inadequate quality of care at this time because the quality of hospital care does 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.

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. One implication of the current study results is that lenders and rating agencies may not know that this information exists. These data may not be used in assessing financial risk of hospitals because analysts and lenders do not understand how mortality scores could impact hospital financial performance. In other words, lenders and rating agencies may not be sophisticated when it comes to acquiring and using hospital quality of care information. Consequently, these users would not take into account the Hospital Compare information as part of their assessments of hospital financial risk. Instead, they would focus on the overall effect on revenues and profits resulting from provider choice decisions made by patients.

*Consumers' Selections Of Hospital Are Not Influenced By Quality Scores.*

Learning theories provide insights regarding the learning process and how individuals develop a critical mass of knowledge necessary to learn and use new

information. Consumer sophistication supplements the learning theories by explaining how learning and knowledge are needed for effective use of information for making consumer purchasing decisions.

*Lack of consumer sophistication with respect to quality of care information.* The lack of financial impact of hospital quality information can be explained by applying the "consumer sophistication" construct to both potential hospital patients and to lenders and analysts. As stated previously, consumer sophistication implies a degree of cognitive capability, knowledge, and experience (Titus & Bradford, 1996). Spiller and Zelner (1997) defined consumer sophistication in a specific product context as "the actual level of . . . training or experience that a product user has in relation to the products in question" (p. 6). If consumer sophistication is considered to be a moderating construct, an insufficient degree of knowledge and understanding of quality reporting provides one plausible explanation for the disconnect between reported quality scores and hospital financial performance. Study results by Ryan, Nallamothu, 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.

If consumers are not using the information to improve their provider choice decisions, the degree of financial risk associated with publication of quality information is not likely to be significant. Similarly, the impact on financial performance is not likely to be of concern until Medicare actually affects reimbursement rates of poorer quality hospitals.

*Quality reporting is an immature process.* The immaturity of the mortality

reporting process is evidenced by the lack of year-over-year consistency in data that is

available from CMS. CMS supplied only categorical data in 2007 that were divided into

three categories: (1) average of U.S. hospitals; (2) less than average; and (3) better than

average. In 2008, mortality rates were supplied for three categories, and in 2009

mortality rate reporting was expanded to include six categories. In 2010, the three

comparative categories of average, better than average, and less than average were

removed. While annual changes make year-over-year comparisons more difficult, which

could impact understanding and interpretation, perhaps more importantly they indicate

that the reporting process itself has not yet matured into a stable process that supplies

comparable and consistent information year-to-year.

Hospital Compare does not provide an assessment of the overall quality of

hospitals. Instead, Hospital Compare provides quality scores for a variety of measures

including mortality and readmission for three conditions, plus a quality score for 26

process of care measures. A number of other organizations also publishes hospital

quality information that may be useful to consumers (Health Grades, US News and

World Report, etc.). However, information is not comparable from one source to another

because they each seek to accomplish different goals. Health Grades provides relative

assessments of hospitals for a list of selected procedures but does not provide a composite

hospital rating. US News and World Reports ranks hospitals on a number of categories

without providing an overall ranking. Since each of these sources provides different

information, hospitals have focused their advertising on specific strengths. Accordingly,

consumers receive an incomplete picture of hospitals overall quality of care. Consumers must assimilate and interpret these various sources of information into a cohesive quality picture of hospitals. Schwartz et al. (2011) determined that hospitals with strong composite ratings did not necessarily perform well on individual procedures. This disparity demonstrates that available information does not always reflect the "culture of quality" of a hospital.  This lack of comparability may also contribute to the uncertainty by consumers in using hospital information thereby muting the information's effect on facility choice.  If consumers' provider choice is not affected, facilities would not gain or lose patients; and therefore, revenues and cash flows would remain unaffected from the perspective of lenders and rating agencies.

Medicare will soon implement its Value Based Purchasing (VBP) program which is expected to financially reward hospitals with higher quality and/or notable improvements in quality.  This program will affect hospitals' revenues because of financial incentives to Medicare reimbursement, which are expected to go into effect in 2014.  Even though a relationship between quality scores and cost of capital was not demonstrated through this study, the VBP reimbursement adjustments, based on inferior or superior quality performance, will directly affect hospitals' financial performance. When this occurs, lenders will need to re-evaluate interest rates as they assimilate the financial impact of quality scores into current financial models.

*Hospital decisions to invest in improving quality of care are not driven by expected financial benefits but are instead driven by the need to meet regulations or other legitimacy concerns.*

This study was designed based on the premise that hospitals invest in quality improvements expecting a financial return. If the impetus for improving quality is actually driven by other factors, future studies will need to be designed differently. Plausible alternatives to agency theory as an explanatory platform are organizational legitimacy theory and resource dependence theory. Rather than expecting a financial return, hospitals may invest in quality to meet regulatory requirements and/or to meet competitive minimums for quality performance consistent with organizational legitimacy theory. Joint Commission accreditation provides an example of the need for improving quality of care that is not driven by an expectation of near term financial return. Meeting Joint Commission standards is generally considered to be a minimum credential and-. Joint includes a thorough review of practices and procedures that are quality related.

The negative association between interest rates and mortality rates may be an indicator that investments in quality may follow rather than precede financial strength consistent with resource dependence theory. The cost of implementing new processes designed to improve clinical quality and reported quality scores may exceed the financial benefit. Accordingly, hospital managers must justify financial investment in quality improvements for reasons other than return on investment. If quality improvements are driven by qualitative rather than quantitative considerations, hospital managers will not be able to invest in quality improvements until additional financial resources are available. If qualitative factors are driving these decisions today, in all likelihood they will continue to drive these decisions in the future. If consumer behavior is not sufficiently affected by quality disclosure to affect financial results, regulators will need to continue to play a major role in driving continued healthcare quality improvement.

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Implications

This study suggests that that Hospital Compare information does not affect

lenders assessment of a hospital's financial risk that could be caused by the disclosure of

quality of care information. This finding is consistent with the findings of the study

conducted by Ryan et al. (2012), that suggested that Hospital Compare information does

not influence potential patients' choice of facility because consumers do not understand

how this information can be used. If consumer choice is not affected, revenues and other

financial measures would not be affected by the disclosure of the information. One of the

problems may be the presentation rather than the quantity of information being

disseminated. Medical terminology is not commonly used and understood in U.S.

society; therefore, information communicated using medical terminology should not be

expected to be commonly understood. For example, "risk adjusted mortality" is not a

generally understood term. In addition to the commonly cited causes for differences in

understanding (e.g., differences in education by age, culture, and location), different

understanding by age of users could be explored to develop terminology that is more

commonly understood. Hospital Compare was created to improve patient understanding

and help patients find higher quality healthcare providers. Developing useful information

does have to be costly. If consumers are not using these data, the question is raised as to

whether or not public reporting of information meets the cost/benefit test for hospitals.

There is no doubt that improved transparency of hospital quality is important to

consumers, but the level of detail; medical terminology; and complexity of hospital

services may be beyond the comprehension of a large percentage of individuals

attempting to choose a hospital. A composite hospital quality score would be much more understandable. As Schwartz and Cohen (2011) noted, a composite score that communicates the level of overall quality and provides useful information is difficult to develop. More research into establishing a "culture of quality" in hospitals may be the first step towards developing an effective composite quality score.

Hospital managers may be focusing on improving care in ways that are more easily understood, controlled, and measured by hospital employees. For example, whether or not a patient dies may be beyond the control of hospital caregivers. However, hospital employees can better understand, control, and measure 26 process of care measures.

Study Limitations

Mortality scores were used as the quality variable in this study to focus on the effect of "outcome" reporting. Previous research had demonstrated that mortality data were significantly correlated with process of care measures. The results from this investigation suggest that current efforts to provide hospital quality information to help consumers make provider selection decisions may not be effective, and therefore, may not be affecting financial performance of hospitals. However, consumers may be using the information, but the resulting impacts on financial performance are minimal and do not affect cost of debt.

The negative parameter for the mortality in the model suggesting the opposite effect of what was predicted could be an indicator of a data issue or a methodological issue. A literal interpretation of the negative mortality parameter might suggest that

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lenders view hospitals with higher mortality as having lower financial risk, but that interpretation is illogical. The negative relationship may, instead, be the result of the rapid drop in interest rates during the time period being measured along with the weakness in the relationship of quality to financial performance in general. There may be missing explanatory variables that were not included in the model and are causing the illogical results and are embedded in the model's error term. Using the fed funds rate as a control variable provided no additional explanatory value to the negative relationship between cost of debt and mortality scores, so the variable was excluded from the final model. There may be other unidentified effects.

One potential weakness in the study is the reliability of the data itself. Medicare data collected for quality reporting has few if any established standards or controls that guide reporting entities in preparing and submitting the data from which the mortality scores are developed (Pronovost, et al., 2007). This lack of reliability is not a systematic issue at the Medicare level, but occurs at the hospital level.

One limitation of this study is that only mortality scores were used to represent hospital quality. Mortality scores may not be the most appropriate indicator of hospital quality. Process of care information may provide a better indicator of the effectiveness of hospital practices and procedures on overall patient care and on reducing the number of medical errors, which can be tested with further research. For unsophisticated healthcare purchasers, notions that a hospital did the "right thing," such as provide an aspirin at admission, may be easier to understand than a risk adjusted mortality rate. Consumers and lenders use process of care measures rather than mortality scores. The next step in understanding consumers' ability to obtain and use healthcare quality information

effectively to make decisions would be to test whether a relationship exists between process of care and cost of capital.

Hospital Compare Mortality data for the three mortality conditions used in this study were only available for three years, 2008, 2009, and 2010. Readmission data were not introduced until 2009. Comparisons to U.S. hospital averages, while available in 2007, were eliminated for 2010. The inconsistent nature of available information provided less than optimal data for a multi-year study. Readmission data and comparison to U.S. averages could not be used since they were not available for all three years. As hospital quality measurement matures, increasingly more years of mortality data will be available. Further research could be conducted once this database has matured. Due to the limited availability of data at the time this study was conducted, future research will be necessary to adequately address the third research question.

The financial reporting information in the Medicare Cost Report data had some inherent limitations. Cost Reports were not intended to be used for assessment of financial risks and, as a result, many hospitals that were likely relevant to this study could not be included due to the inadequacy of their data. The pertinent information for this study was primarily available in the G000000 and G300000 reports. Instructions to these reports were minimal and indicated that hospitals should simply provide their financial statements.

The amount of interest a hospital incurs is oftentimes obscured in financial statements because of the requirement that construction period interest be capitalized as part of the cost of a new building. While a large building project is under construction, a large portion of interest cost is typically removed from "interest expense" and is

transferred to "construction in progress" where it loses its identity as a financing cost of the hospital. Accordingly, the relevant information of total interest cost was not consistently reported in Medicare cost data.  For example, the expense (including interest expense) had little required specificity; therefore, many hospitals posted interest expense data on the A000000 report interest expense.  However, not all hospitals reported interest on A000000.  Frequently, interest was reported on the G series schedules but was not identified specifically and only reported on unlabeled sub-lines which varied from hospital to hospital. If a hospital's interest expense could not be matched to its long-term debt, a relevant interest rate could not be developed. Consequently, the hospital was not included in the analysis.

Another limiting factor in the Cost Studies was the lateness of filing by a number of hospitals.  Even though 2010 data were extracted in 2012, a significant number of hospitals had yet not reported, so they could not be included in the study.  At the time the database was developed, approximately 40 hospitals had reported 2011 data; therefore, 2011 was excluded entirely from this study.  Reprocessing the analysis over the next several years should allow a full set of 2010, 2011, plus 2012 data to be included making the study more reliable.

Another possible gap in the financial data is hospitals that explored the debt market but decided not to go through with the borrowing because their rates would have been unacceptably high as a result of high mortality scores.  Lenders could have declined to loan money to a hospital with an unacceptably high mortality risk. There was no way to know if there were hospitals that pursued or explored on a preliminary basis going to the debt market, but due to unspecified reasons, did not follow through. If a significant

number of hospitals were denied due to their quality scores (which would support the premise of your dissertation) their omission from the data set could have led to inaccurate results.

Similarly, as data becomes available to consumers over time, experts should detect a greater relationship between mortality scores and hospital financial performance. Hypothesis 3 suggested that the relationship between quality data and financial results should strengthen over time as consumers develop a greater awareness that information exists and a better understanding of how to use the information to make healthcare provider decisions. A long-term longitudinal study is likely to provide better information on this phenomenon than a study based solely on three years of data.

Directions for Future Research

Research on the relationship between hospital quality of care and financial performance could utilize different study designs based an alternative theories. For example, if improvements in quality result from the availability of resources to invest in quality improvements, the resource-based view of the hospital may provide a better explanation. Regression results indicated that hospital size, system membership, and profitability had an inverse association with interest rates (although not significant at the .05 level). Additional studies on the effect of these same factors and other hospital characteristics could provide insight into the effect of a hospital's size and system membership (availability of resources) on its ability to improve its quality scores. More resources could be related to better quality. This might suggest to managers that better

quality of care would result from merging with a hospital system that could provide additional resources.

If quality improvements are implemented to conform to new regulations and/or to keep pace with competitors in the quality race, organizational legitimacy theory may offer a better theoretical basis for assessing whether implementation of quality of care improvements in hospitals leads to improved financial performance. Success of government regulation in improving overall healthcare quality could be examined to determine if specific regulations affect the quality of care.

An additional study might involve designing information that would be more effective based on the ability of the target audience to receive, understand and use quality of care information.  Currently, information appears to have been designed based on the level of understanding by information developers as well as the information that is available.  It may be that the reason there have not been shifts in the financial characteristics of hospitals, based on Hospital Compare information, is that the information was not developed with an understanding and appreciation for the consumer's ability to comprehend and use it.


Conclusion

As previously stated,  there is no "bottom line" for hospital quality of care – no single quality measure or combination of measures that can be cited as indicating a hospital's clinical quality of care is higher or lower than another, in the same way that the financial terms such as "net income" and "cost of capital" are generally understood by both the public and managers of all types of entities including hospitals (Pronovost et al.,

2007).  Commonly understood terminology for the information being reported may provide a vehicle to help people use the information more effectively.

At the beginning of this research, financial consulting firms such as KPMG believed that disclosure of quality of care data would have a dramatic financial impact on hospitals.  As of 2010, this does not appear to be the case.  Quality of care information is intended to improve transparency so that consumers can make more informed decisions when choosing a hospital.  While information is becoming more readily available, consumers have not yet taken advantage of it.

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**Appendix A**

Hospital Process of Care Measure Set -- List of Current Measures (from Hospital

Compare)

**<u>Heart Attack (Acute Myocardial Infarction or AMI) and Chest Pain</u>**

AMI 1                    Aspirin at Arrival (Is both an inpatient and outpatient measure.)

AMI 2                    Aspirin at Discharge

AMI 3                    Angiotensin Converting Enzyme (ACE) Inhibitor or Angiotensin

                             Receptor

                             Blocker (ARB) for Left Ventricular Systolic Dysfunction

AMI 4                    Smoking Cessation Advice/Counseling

AMI 5                    Beta Blocker at Discharge

AMI 7a                  Fibrinolytic Medication Within 30 Minutes Of Arrival (Is both an

                             inpatient and outpatient measure.)

AMI 8a                  Percutaneous Coronary Intervention (PCI) Received Within 90

                             Minutes of Hospital Arrival


**<u>Heart Failure</u>**

HF 1                      Discharge Instructions

HF 2                      Evaluation of Left Ventricular Systolic (LVS) Function

HF 3                      Angiotensin Converting Enzyme (ACE) Inhibitor or Angiotensin

                             Receptor Blocker (ARB) for Left Ventricular Systolic Dysfunction

HF 4                      Smoking Cessation Advice/Counseling

**Pneumonia**

PN 2          Pneumococcal Vaccination

PN 3b         Blood Culture Performed in the Emergency Department Prior to

Initial Antibiotic Received in Hospital

PN 4          Smoking Cessation Advice/Counseling

PN 5c         Initial Antibiotic Timing

PN 6          Appropriate Initial Antibiotic Selection

PN 7          Influenza Vaccination


**Surgical Care Improvement Project**

SCIP INF 1     Prophylactic Antibiotic Received Within 1 Hour Prior to Surgical

Incision (Is both an inpatient and outpatient measure.)

SCIP INF 2     Prophylactic Antibiotic Selection (Is both an inpatient and

outpatient measure.)

SCIP INF 3     Prophylactic Antibiotics Discontinued Within 24 Hours After

Surgery End Time

SCIP VTE 1     Surgery Patients with Recommended Venous Thromboembolism

Prophylaxis Ordered

SCIP VTE 2     Surgery Patients Who Received Appropriate Venous

Thromboembolism Prophylaxis Within 24 Hours Prior to Surgery

to 24 Hours After Surgery

| SCIP  INF 4 | Cardiac Surgery Patients With Controlled 6 A.M. Postoperative Blood Glucose |
| --- | --- |
| SCIP  INF 6 | Surgery Patients with Appropriate Hair Removal |
| SCIP CARD 2 | Surgery Patients on a Beta Blocker Prior to Arrival Who Received a Beta Blocker During the Perioperative Period |
| SCIP | Inpatients whose urinary catheters were removed within 2 days after surgery to reduce the risk of infection. |

## Children's Asthma Care

| CAC 1 | Children receiving reliever medication (like albuterol) while hospitalized for asthma |
| --- | --- |
| CAC 2 | Children receiving systemic corticosteroid medication (oral and IV medication that reduces inflammation and controls symptoms) while hospitalized for asthma |
| CAC 3 | Children and their caregivers receiving a Home Management Plan of Care Document While Hospitalized for Asthma |

## Outpatient

| OP 1 | Median Time to Fibrinolysis (This is only an outpatient measure) |
| --- | --- |
| OP 2 | Outpatients with chest pain or possible heart attack who got drugs to break up  blood clots within 30 minutes of arrival (higher numbers are better) |

| | |
|---|---|
| OP 3 | Median Time to Transfer to Another Facility for Acute Coronary Intervention    (This is only an outpatient measure.) |
| OP 4 | Outpatients with chest pain or possible heart attack who got aspirin within 24 hours of arrival (higher numbers are better) |
| OP 5 | Median Time to ECG (This is only an outpatient measure.) |
| OP 6 | Outpatients having surgery who got an antibiotic at the right time – within one hour before surgery (higher numbers are better) |
| OP 7 | Outpatients having surgery who got the right kind of antibiotic (higher numbers are better) |

**Appendix B**

**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           L-T debt/(L-T debt + equity) capitalization (debt + equity)

  Capitalization

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)

Appendix C

**AHA STATE CODES FOR STATES & ASSOCIATED TERRITORIES**

| **New England** | Maine | **West North Central** | Minnesota |
| | New Hampshire | | Iowa |
| | Vermont | | Missouri |
| | Massachusetts | | North Dakota |
| | Rhode Island | | South Dakota |
| | Connecticut | | Nebraska |
| | | | Kansas |
| **Mid Atlantic** | New York | | |
| | New Jersey | **West South Central** | Arkansas |
| | Pennsylvania | | Louisiana |
| | | | Oklahoma |
| **South Atlantic** | Delaware | | Texas |
| | Maryland | | |
| | District of Columbia | **Mountain** | Montana |
| | Virginia | | Idaho |
| | West Virginia | | Wyoming |
| | North Carolina | | Colorado |
| | South Carolina | | New Mexico |
| | Georgia | | Arizona |
| | Florida | | Utah |
| | | | Nevada |
| **East North Central** | Ohio | | |
| | Indiana | **Pacific** | Washington |
| | Illinois | | Oregon |
| | Michigan | | California |
| | Wisconsin | | Alaska |
| | | | Hawaii |
| **East South Central** | Kentucky | **Associated Areas** | |
| | Tennessee | **(U.S. Territories)** | Marshall Islands |
| | Alabama | | Puerto Rico |
| | Mississippi | | Virgin Islands |
| | | | Guam |
| | | | American Samoa |
| | | | Northern Mariana Islands |