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EMPLOYMENT OF PHYSICIAN ADMINISTRATORS (CEOS) IN ACUTE CARE
HOSPITALS AND THEIR IMPACT ON HOSPITAL PERFORMANCE

by

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A DISSERTATION

Submitted to the graduate faculty of The University of Alabama at Birmingham,
in partial fulfillment of the requirements for the degree of
Doctor of Science in Administration - Health Services

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EMPLOYMENT OF PHYSICIAN ADMINISTRATORS (CEOS) IN ACUTE CARE
HOSPITALS AND THEIR IMPACT ON HOSPITAL PERFORMANCE

MUHAMMAD H. AL-MIDANI

DOCTOR OF SCIENCE IN ADMINISTRATION – HEALTH SERVICES

ABSTRACT

This study examines the performance of hospitals employing physician CEOs. It compares the performance of these hospitals to hospitals employing non-physician CEOs in the same regions.

The study evaluated clinical outcome variables including mortality and readmission rates in addition to patient safety index. The study also evaluated average expense per inpatient discharge as well as adjusted operation margin as measures for financial performance. The hospital scores on these measures were compared using an independent sample t-test to compare the means of the two groups of hospitals for significant differences in performance. Multiple regression analysis was conducted for this comparison controlling for: teaching status, bed size, tenure, and geographic region, which were treated as covariates. The results showed a statistically significant difference ($p < .05$) between physician and non-physician led hospitals in acute myocardial infarction (AMI), heart failure (HF), and pneumonia in the scores of the 30-day adjusted mortality rates, which was lower among hospitals with physician CEOs. Also, patient safety index (PSI) was favorable and lower among hospitals with physician CEOs and statistical significance at ($p < .05$). Even though the average expense per inpatient discharge was higher, which was unfavorable in hospitals with physician CEOs and

statistically significant at (p <.05), the operation profit margin was higher among physician led hospitals but not statistically significant.

This is the first quantitative study to compare clinical and financial outcomes performance between physician-led and non-physician-led hospitals. This research can guide hospital boards when they hire CEOs. The hospital which is financially sound but needs to improve in its quality regarding the reduction of mortalities and increase its safety may benefit from hiring a physician CEO.

Additional research is needed to: address the limitation of the study, test a larger pool of physician CEOs, and compare physician CEOs with non-physician CEOs who have effective CMOs and the leadership characteristics of effective CEOs in hospitals. This research must compare in more comprehensive detail the two groups. Schools of Health Professions can take the lead in such research and can fill the gap by educating and preparing leader physicians for their new role as CEOs.

DEDICATION

I dedicate this work to:

Everyone who seeks life-long learning and to those scholars who never stop searching to

improve human life.

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CHAPTER 1

INTRODUCTION

Statement of the Problem

In the early 20th century, hospitals began employing physicians as CEOs. However, the vast majority of hospitals today employ non-physicians who are educated and trained as administrators. In 1970, an editorial in Fortune magazine declared that the time has come for radical change because the management of medical care is extremely precious to leave to doctors who are, after all, not managers to begin with (Fortune,1970 January). A decade later, Starr (1982) expressed concern that in health care, CEOs, not physicians, make the decisions. He further contended that the purpose of CEOs is no longer better health, but rather "the rate of return on investments" (Starr, 1982, p. 420).

More recently, Falcone and Satiani (2012) re-asserted that the management of medical care is so complex that it should be left to doctors or at the least doctors should be involved. The authors stated, "As the pendulum swings away from a leader to clinician leader, there is a powerful and convenient opportunity for physicians to reinsert themselves into a leadership role" (Falcone & Satiani, 2008, p. 88).

To date, academic research has not provided support for one approach over the other. Thus, research is needed to determine whether hospitals that have a physician CEO perform better (regarding quality and financial performance) than hospitals with a non-physician CEO.

Since hospitals are both complex and socially beneficial organizations, the management of these organizations is a high stakes venture for all stakeholders.

At the same time, however, little is known about the employment of physician CEOs in these highly specialized operations and if the employment of physician CEOs is associated with statistically significantly improve hospital performance. Therefore, the main research question is: do hospitals led by physician CEOs perform better on measures of quality and finance when compared to hospitals led by non-physician CEOs? The answer to this question could help to answer other questions such as: Would the U.S. healthcare system improve by hiring more physician administrators? Could this improvement lead to a reduction in the variability of quality and cost of medical care between regions?

Significance of the Study

Because the 'performance of some hospitals' is poor in regard to quality and cost, it is necessary to determine the variables that are responsible for this poor performance. Evaluating all of the potential variables is beyond the scope of the study; however, one of the variables to consider is the employment of the CEO. Typically, this hiring decision is made after a lengthy search by the hospital board that is looking for someone who will improve the bottom-line through quality improvement and cost containment. One important characteristic of CEOs is their inherent knowledge and whether their background is medical or management. This variable has not been tested empirically among hospitals that are employing physician CEOs versus non-physician CEOs to see if there is an association between the CEO they choose to employ and hospital

performance. The significance of the study is to provide empirical evidence regarding hospitals led by physician and non-physician CEOs by measuring hospital performance.

Currently, the available research by Goodall (2011) has focused on the quality performance of clinician CEOs (the majority of whom were physicians). Goodall (2011) found that clinician CEOs were rated as 33% (two-thirds of a standard deviation) better than their non-clinician CEO peers in the areas of cancer, cardiac, and gastrointestinal diseases. The study did not address other aspects of acute hospital care, such as: mortality, readmission, safety, or financial performance.

A shift occurred in the eighties in the healthcare industry when hospitals were only interested in a candidate's financial expertise, often seeking CEOs with financial experience. The current shift towards value-based healthcare in the past 3 years has placed greater emphasis on a physician's skill set and experience. As stated by Abernathy (in interview by Gamble, 2012), "In clinical settings, physicians are so close to quality improvement initiatives, evidence-based medicine and pay-for-performance because they've been so close to the patient. There is a migration towards physician executives who have strong business backgrounds" (Gamble, 2012 March in Becker's Hospital Review). This empirical study may help both hospitals and physicians to make a more objective decision for this employer-employee relationship when hospitals are selecting clinicians over non-clinicians.

Hospital CEOs should have expertise in management and administration since they operate extremely complex care organizations. They should also have a solid knowledge on how to improve the overall quality of care and reduce medical errors. Therefore, hospital CEOs will need to have the skills to manage complex healthcare

systems both financially and clinically. In a healthcare system that is multifaceted, economically troubled, and marginally sustainable, the physician CEO may present a set of skills in clinical quality and safety that can add value to the business of medicine (Leatt, 1994, pp. 171-175). However, many potential physician CEOs may lack the necessary business and management knowledge and experience. These skills are essential in operating the dynamically changing and complex hospital industry. This later topic, however, is also large and beyond the scope of this current study. Therefore, the focus of this investigation was whether a hospital's performance was positively or negatively associated with the employment of physician CEOs versus non-physician CEOs specifically regarding clinical and financial performance.

Purpose of the Study

The purpose of this study was to compare the clinical and financial performance of acute care, not-for-profit hospitals employing physician CEOs to similar hospitals employing non-physician CEOs.

Research Question

The following research question guided this investigation: To what extent does hospital employment of a physician CEO result in higher clinical and financial performance as compared to hospital employment of a non-physician CEO?

The answer to the research question may be useful to hospital boards, policymakers, and management schools as they look for empirical evidence to support recruitment and curricular decisions.

CHAPTER 2

LITERATURE REVIEW

Of the 6,500 hospitals in the U.S., only 235 are led by physicians (Gunderman &

Kanter, 2009); therefore, this investigation focused on employing physician CEOs by few

hospitals (3.6% of the total number of hospitals in the U.S.). There is a paucity of data in

the literature about the performance of these hospitals compared to hospitals which are

led by non-clinician managers.

The most relevant topics identified in the existing literature include the following:

physician involvement in the management of healthcare organizations, the physician role

in quality improvement, and performance related to leadership characteristics that may

indirectly relate to physician CEOs. This review includes empirical studies performed on

quality and safety measures that are related indirectly to CEOs in hospitals and

appropriate theories related to improving CEO performance.

Literature Review for Medical Leadership

Physician involvement in the management of healthcare organizations is crucial to

designing the future healthcare system (Leatt, 1994). Leatt (1994) argued, "physicians

bring vital skills, values, clinical insights, and perspectives on patients' needs that are

critical for effective analysis, ethical determinations, and problem-solving; these are

qualities that non-physician CEOs may lack" (p. 176).

It is important to note that other researchers may have the opinion that this may

not be true of all physicians, perhaps only the distinguished leaders among a few. Also,

physician involvement in the management of healthcare organizations is not necessary solely for the CEO position. The physician leader could be involved in management through many other roles including: Chief Medical Officer (CMO), Chief Quality and Safety Officer (CQO), or Chief Medical Information Officer (CMIO).According to Alimo-Metcalfe, Alban-Metcalfe, Bradley, Mariathasan, and Samele (2008), the engaging leadership quality does offer positive correlation with performance, attitudes, and well-being at work.

The research evidence suggests that there is a link between involvement of physicians in leadership and quality improvement. Quality improvement programs that fail to engage physicians and that are not sensitive to their involvement in the process tend to have a minimal impact (McLaughlin, 2004). However, many factors affect the impact of quality improvement programs in addition to the engagement of physicians in medical leadership. Therefore, medical leadership is best seen as a necessary condition (but not the only condition) for quality improvement in healthcare (Dickinson & Ham, 2008).

There is a growing body of research that supports the assertion that effective clinical leadership is associated with better performance of healthcare organizations (Mountford, 2009). A recent study by McKinsey and the London School of Economics (Pedro, 2008) established that hospitals with the greatest clinician participation in management scored approximately 50% higher on key drivers of performance than hospitals with low levels of clinical leadership. This research involved interviews with more than 170 general managers and clinical heads of departments in the UK National Health Service. Responses covered the effectiveness of overall management and of

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performance management as well as the level and effectiveness of clinical leadership. Clinician participation in this study included physicians as clinical heads of departments.

In the United States and abroad, academic studies reveal that high-performing medical groups typically emphasize clinical quality, build strong relationships between clinicians and non-clinicians, and are able to learn new ways of working together (Shortell et al., 2005). A recent study by the UK National Health Service (NHS) noted that in 11 cases of attempted improvement in services, organizations with stronger clinical leadership (with the assumption that at least some of the clinicians were physicians) were more successful while another UK study determined that CEOs in the highest-performing organizations engaged clinicians in dialogue and in joint problem-solving efforts (Mountford & Webb, 2007, 2009).

The above studies identified medical leadership but not physician CEOs as the top leaders of the hospital. In this dissertation, I focused on the top leader (the CEO) of the hospital. I will explore first the CEOs involvement in quality and safety in general, regardless of their background education in management or in medicine.

Parand et al. (2013) showed that CEOs provided key participation that the authors and others considered to significantly contribute to the safer patient initiative (SPI). In this qualitative study where the data collection method was interviews, CEOs recognized the importance of their part in the SPI program and provided detailed accounts of the perceived value of their involvement at all stages of the process. In exploring the roles played by the CEOs, the following five dimensions were identified: (1) resource provision; (2) staff motivation and engagement; (3) commitment and support; (4) monitoring progress; and (5) embedding program elements. Staff reports confirmed these

dimensions; however, the weighting of the dimensions differed. The findings stressed the importance of particular actions of support and monitoring such as constant communication through leadership walk rounds and reviewing program progress. Parand et al. (2013) did not address the CEOs' background knowledge and expertise but provided an important link between the role of the CEO in quality and safety initiatives and motivating and engaging staff among them physicians.

So, what does the literature say about physician CEOs employment and their performance? To answer this question, literature was searched, yielding a cross-sectional study of America's best-performing hospitals by Goodall (2011). Goodall concluded, "America's best hospitals disproportionately have physicians, rather than managers, as CEO leaders. These patterns are statistically significant ($p<0.001$); they remain so after controlling for the potential confounder of bed size" (p. 1).

The above Goodall study shows an association between being among the best hospital in U.S. and having physician as CEO leader but does it answer the question about their performance? Goodall stated that these findings did not prove that physicians make more effective leaders than professional managers. However, in each of three disciplinary fields (cancer, digestive diseases, and cardiac care), the study reported that hospitals positioned higher in the Best Hospitals ranking in US News and World Report-were disproportionately led by physicians (Goodall, 2011). The current author summarizes the above literature with the following points:

(1) Clinical leadership is extremely important to enhance quality and safety improvement in hospitals.

(2) The CEOs' support of clinical leadership is important in order to achieve

better quality and even more safety improvements in hospitals, and this

includes communication with the clinicians involved in the improvement,

project directors, and product line managers.

(3) Involvement and support of the hospital CEO is essential to reach the desired

outcome for clinical and safety projects in particular. All of the above

literature, however, was not directly related to physician CEOs, and the

literature review failed to reveal any direct evidence to suggest that physician

CEOs would outperform non-physician CEOs, even in quality and safety

outcomes. There was no identified empirical study of physician administrators

(CEOs) with regard to their impact on clinical and financial outcome.

Theoretical Framework

This section includes an overview of available leadership theory with particular emphasis on: performance, specific CEO characteristics that are related to healthcare principles for effectiveness, and a theory that is compatible with physician CEOs' performance.

Leadership in Healthcare

Research funded by an Eastman Kodak grant was completed in 1992 as 400 hospital CEOs created a common healthcare vision for the future. These CEOs envisioned the following:

A new civilization in healthcare with greater emphasis on the continuum of care,

disease prevention, and the healing of communities as well as patients and a

resource-sensitive system transformed by science, technology and government

policy, with basic healthcare access to all. (Eastman-Kodak, 1992, p. 4)

The CEOs defined six competencies and values needed for leading the 21st century

healthcare organization. These competencies included: (1) mastering change, (2) systems

thinking, (3) shared vision, (4) continuous quality improvement, (5) redefining

healthcare, and (6) serving public and community (Eastman Kodak, 1992). As stated by

Pendleton and King (2002), "We will see care, expertise, insight, communication, and

extraordinary effort" (p. 1355).

In healthcare, executives must have management talent sophisticated enough to

match the increased complexity of the healthcare environment, and it is expected that

these individuals demonstrate measurable outcomes and effectiveness. Competencies

related to workplace effectiveness have shifted to evidence-based management (Stefl,

2008). This has led to numerous efforts to define the competencies most appropriate for

healthcare. The Healthcare Leadership Alliance (HLA), a consortium of six leading

professional membership organizations, used the research from and experience with their

individual credentialing processes to post five competency domains common among all

practicing healthcare managers:

1. Communication and relationship management.

2. Professionalism

3. Leadership

4. Knowledge of the healthcare system

5. Business skills and knowledge. (Stefl, 2008)

These five competencies were shared among all CEOs. Physicians spend a significant part of the time during their medical education learning about disease treatment and prevention. As with most skills, leadership skills and/or styles can be learned. Development of the necessary skills to lead healthcare organizations in the 21st century can contribute to the available pool of effective hospital executives.

While physicians may be stronger in medical care knowledge, non-physicians are more likely to be stronger in business skills. Having cited the HLA and other lists of competencies, several questions remain: Are physicians more likely to have these competencies than non-physicians? If not, what are the competencies physicians have or do not have? While it might be possible to identify certain performance outcomes, it would be difficult to generalize any result based on one or more outcome variables if the study were not able to test all suggested competencies.

As such, the evaluation for all competencies is significant beyond the scope of this investigation. There are many competencies which correlate with performance, and this study was not able to address how physician-CEOs obtained levels of performance. This is an important question that should be considered for future studies.

The Expert Leadership Theory

In a cross-sectional study using U.S. hospital data (Goodall & Fellow, 2010), CEOs were classified into two types: those who were medically trained (MDs) on one hand and CEOs who were professional managers on the other. The ranked position of each hospital was then correlated with the CEOs' characteristics. In the statistical analyses, the regression equations revealed that the presence of a physician-CEO was positively associated with an extra eight to nine hospital quality points on an 80-point

scale (p<0.001 level) with the baseline being manager CEOs. In short, hospital quality scores were approximately 25% higher in physician-led hospitals than in non-physician-run hospitals. This study used index hospital quality (IHQ) in three fields: cancer, digestive diseases, and cardiac care (including cardiac surgery). The dependent variable in IHQ was constructed from three components (structure, process, and outcome) using different weights: 30% on structure, 35% on process, and 35% on outcome. The coefficients were 8.02 for cancer, 9.19 for digestive diseases, and 9.09 in cardiac field with p<0.001. However, the explanatory power R-square was 0.09 for cancer, 0.15 for digestive diseases, and 0.15 for cardiac care.

This was the only empirical study conducted to present the expert leadership theory (TEL) (Goodall & Fellow, 2010). This theory proposed empirical support that leaders and followers should share technical expertise.

Other researchers described experts within the context of creativity, such as Mumford, Scott, Gaddis, and Strange (2002) who summarized these findings and reported that the evidence was clear: to lead creative individuals requires both "technical and creative problem-solving skills" (pp. 705-750).

Goodall reviewed the work of multiple authors then summarized their work (Basadur, Runco, & Vega 2000; McAuley, Duberley, & Cohen, 2000; Mumford, Marks, Connelly, Zaccaro, & Reiter-Palmon, 2000; Thamin & Gemmill, 1974):

1. The evaluation of creative people and their ideas can only be performed by individuals who share their competencies; in short, it takes one to know one (or to competently assess one).

2. Leaders can communicate more clearly and effectively to their followers who share the same creative and technical perspective and motivation.

3. As far as performance is concerned, leaders can better articulate the needs and goals of the organization (Packard, 2004).

The theoretical equation proposed by Goodall and Fellow (2010) is presented as $EL = f$ (IK, IE, and LC), so the Expert Leadership (EL) is a function of:

(1) Inherent knowledge (IK) which is acquired through technical knowledge of the core-business activity, attained through education and practice, and combined with high ability in the core-business activity.

(2) Industry experience (IE) which equates to time and practice in the core-business industry.

(3) Leadership capabilities (LC) which includes management and leadership experience and training, acquired during a leader's earlier career, and his or her innate characteristics (see Figure 2.1, p. 22).

According to expert theory in the hospital setting, organizational performance will be positively correlated with leaders' inherent medical knowledge (IMK) as well as their industry medical experience (IME) and leadership capabilities (LC), where, medicine (M) is the core business. Core workers are classified in this theory as the employees most relied upon to undertake core business functions which maintain and grow the organization; the core employees may be the practicing physicians and surgeons in a hospital. Managers are considered as peripheral workers in the business of medicine and nurses are considered as support personnel (Goodall, 2012. p. 11). The core workers in the theory are the essential workers where the business of medicine cannot be conducted

without them. As the core workers (physicians in the case of hospitals) are essential to initiate the process of medical care (treatment by medication, performing procedures, ordering radiological or blood tests, and performing surgeries) the final outcome is affected by them. Ancillary and support workers who execute orders written by physicians, no doubt have an impact on the outcome but not to the same degree the essential workers (physicians) have.

Inherent knowledge. Inherent knowledge, which is the main factor, is acquired through education and practice and is combined with high ability in the core-business activities. Inherent knowledge may also be described as a deep understanding that facilitates intuitive decision-making, akin to wisdom (Tichy & Bennis, 2007). Inherent knowledge combines explicit and tacit knowledge (Nonaka & Takeuchi, 1995).

A unique feature of this theory is that organizational performance is improved when a leader has an outstanding ability in the core business area. A successful expert knowledge base is referred to in the literature as domain knowledge; which has been acquired through education, training, and experience within a particular field. TEL extends these arguments and suggests that the most important decision-maker–the executive head (the CEO)–should not only have domain knowledge and experience, but also he or she should be among the best experts in the domain that represents the organization's core business. In TEL, however, professional managers are classified as peripheral workers because the core business in hospitals is the practice of medicine; thus the core workers are physicians. Arguably, other health workers might be classified as core workers as well, such as nurses, but Goodall viewed nurses as support personnel. In

Goodall's opinion, the definition of core workers is "those without whom an organization ceases to exist."

Industry experience. The second component in the TEL model is industry experience, which can be expressed as time spent in the core business industry. In the literature, extensive domain experience gives leaders greater intuitive knowledge and helps them make more effective decisions (Dane & Pratt, 2007; Klein, 2003) and ultimately results in enhanced performance (Ericsson, Krampe, & Tesch-Romer, 1993).

Leadership capabilities. The third constituent in TEL, and arguably the most self-evident, focuses on the individual's leadership capabilities. In particular, it considers his or her management and leadership skills and innate characteristics.

Central to TEL is the notion that leaders should primarily be specialists in their field (physician in hospitals) not generalists, with well-founded, specific experience and core-business knowledge and an expert knowledge in that area (of medicine in the case of healthcare organizations). Individuals' innate characteristics will influence leadership ability and style.
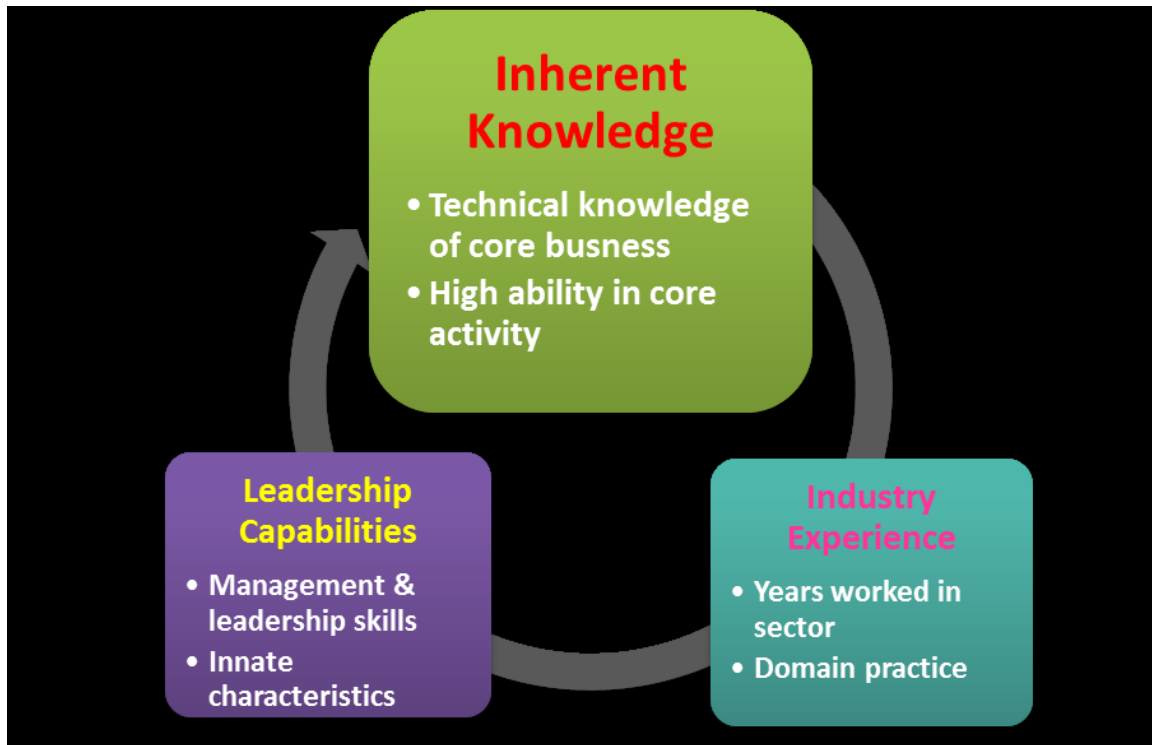
EL = f (IK, IE, LC)

Figure 2.1. Theory of Expert Leadership.

This figure is adapted with permission from the author of TEL (Goodall, 2012. p. 7).

Leaders' personal characteristics are not the focus in the empirical work that supports TEL; however, these characteristics might include factors such as cognitive capability, self-control, resilience, and confidence among others.

Expert leaders might affect organizational performance which occurs through a sequence of processes. There are five possible processes: inherent knowledge, credibility with core workers, knowledge base strategy, long-term view, and stakeholder focus (see Figure 2.2).
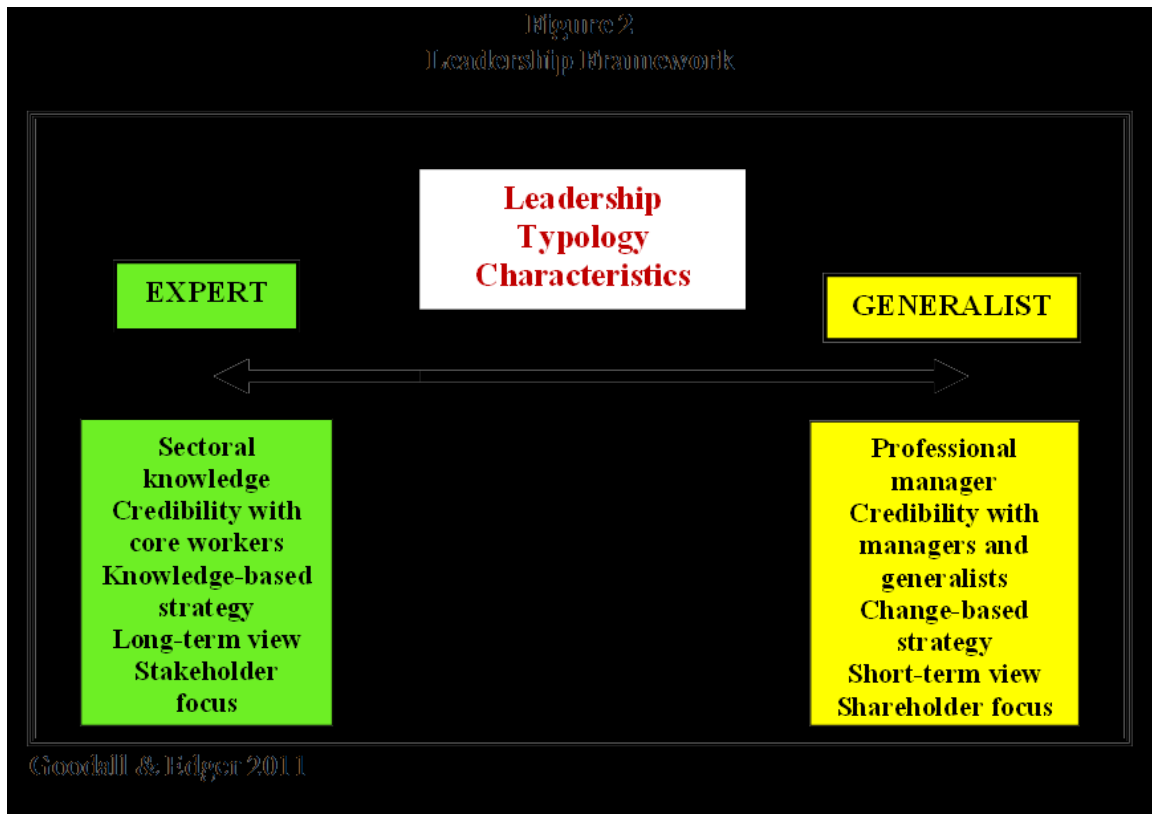
Figure 2.2. Leadership typology**.**

This figure is adapted with permission from the author of TEL (Goodall, 2012. p. 16).

Inherent knowledge produces preferences in decision-making which leads to strategic choices (see Figure 2.3). Therefore, inherent knowledge, together with strategic choices creates knowledge-based strategies.

Figure 2.3. Knowledge-based strategy-sequence formations.

This figure is adapted with permission from the author of TEL (Goodall, 2012. p. 17).

Knowledge-based strategy. A knowledge-based strategy combines a leader's inherent knowledge of the core business (in this case, medicine) with the strategic direction of his or her organization.

Expert leaders can be expected to improve organizational performance through medical knowledge-based strategy in three ways:

(1) By acting as a standard bearer, raising and enforcing quality expectations in the healthcare organization;

(2) By creating an intrinsically attractive environment for core workers (physicians); and

(3) By adopting the long-term view and thinking strategically.

In this study, the current author has propositions that can be tested for standard bearers: for the product or service that is the core business (high quality medical care in safe environment), output can be expected to be of a higher standard if the head (the CEO) is an expert leader-physician (Goodall, 2012. p. 18). In this investigation, standardized objective measures tested for clinical quality and safety measures and checked for a higher standard of medical care with CEOs who were physicians.

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The arguments behind this proposition suggest that if the hospital wants to be among the best in quality of medical care and safety, then the board should hire a leader who is already one of the best in that field.

TEL advocates for the level of fundamental knowledge held by a head to be commensurate with that of the most essential core basic workers in order to facilitate communication, guidance, and influence. For this study, the researcher made the assumption that physicians were the most essential basic workers.

The credibility effect. Central to TEL is the belief that expert leaders command more respect because of their proven track record in the core business activity. The idea that credibility legitimizes leaders' authority is well documented in the literature (Bass, 1985; Kouzes & Posner, 2003). This approach focuses on the interactions between the physician leaders and their physician followers in the hospital setting. TEL suggests that expert leaders are viewed as credible leaders because they have "walked-the-walk" with a high standard. Also, the credibility will trickle down to the support workers when they see the physician heads of department and every physician in the hospital are following the high standards set by the top physician leader (the CEO).

Expert leaders might be described as being the first among equals because they originated from the core workers. Having been 'one of them', expert leaders may be more likely to understand the culture and value system of core workers as well as internal incentives and motivations.

Creating the right conditions for core worker. TEL argues that expert leaders are more likely to create the right conditions for core workers compared to leaders who are non-experts (Goodall, 2012, pp. 21-23). One of the most reported conditions found in

the literature to enhance worker creativity is autonomy. Physicians are known to be independent and to prefer making their own decisions.

Intrinsic motivation and the long view. The education and on-the-job training required to become a medical expert or specialist is extensive (it currently takes 14 years beginning with undergraduate education to become a general cardiologist). Additionally, medical experts are frequently self-motivated and driven by intrinsically motivated curiosity (Amabile, 1993, 1995). Intrinsic motivation is defined as "the drive to do something for the sheer enjoyment, interest, and personal challenge of the task itself (rather than solely for some external goal like financial incentive)" (Hennessey & Amabile, 2010, p. 581).

Creative and professional individuals are also more likely to have their personal identity enmeshed with their work. Therefore, professional success and recognition is a powerful motivator (Harrell & Stahl, 1981; Rostan 1998). This is seen among high achieving physicians as they spend more hours at work when it demands their expertise. Also, creative people in general tend to value more recognition by their professional organizations than the appraisal of their employers (Bradway, 1971; Goulder, 1958; Organ & Green, 1981). This is often seen among creative physicians as they value the recognition within their profession (specialty associations, societies, or colleges) during presentations of their new research or new techniques. As their hospital recognizes them, they will eventually become known in their community for their innovative work.

TEL suggests that leaders who are intrinsically motivated by the core business services, who are experts in the core business activity (medical care), and have worked

intensively in the field for much of their lives may be more likely to adopt strategic choices that follow a strategic plan with regards to clinical quality and safety outcomes.

According to recent reports, the turnover rate for CEOs in hospitals is reaching 14%-18% per year (Healthcare Executive, 2003). The majority of these CEOs were non-physicians, since the number of physicians does not exceed 4% of the total number of all hospital CEOs. TEL proposes that due to the rapid turnover, generalists CEOs are more likely to follow a strategy of "short-termism" than expert clinical leaders. This short term strategy also includes short term cost containment and an operation profit margin. Table 2.1 shows the typology difference between physician CEOs (experts) and non-physician CEOs (professional managers). Short-termism and rapid turnover of CEOs may show cost savings and temporarily better profit margins, but in the long term it might affect quality by eliminating cutting edge technology and not sufficiently funding quality improvement initiatives, and that in turn affects the sustainability of vibrant medical quality care.

Table 2.1

Typology Difference between Physician CEOs and Non-physician CEOs

Expert Physician CEOs	Generalist Non-physician CEOs
Medical knowledge	Professional manager
Credibility with core worker (Physicians)	Credibility with non-physician service manager
Knowledge-based strategy (improve long term quality and safety)	Change-base strategy (improve margin and reduce cost this year)
Continuous quality improvement leads to sustainable business (Shareholder focus)	Bottom line this year (Shareholder focus)
Longer CEO tenure-low turnover	Shorter tenure-high turnover (14-18%) (Healthcare Executives, 2003)

Modified from (Goodall & Edger, 2011, p.16).

How Much of the Performance Can Be Explained by Expert Leaders?

Approximately 10% of organizational performance can be explained by a leader's inherent knowledge in the medical field, as shown in the comparative study of physician and manager CEOs using R-square (Goodall, 2011).

According to expert leadership theory, improved performance by physician CEOs is ultimately related to the adapted knowledge-based strategy, which is the combination of inherent medical knowledge and strategic choices made to improve quality and safety of patients. For example, physicians CEOs are the standard bearer of quality in their hospitals (Goodall, 2012, p. 18).

Physicians also create the intrinsic, stimulating environment for their core workers, namely physicians who enjoy autonomy in delivering quality care to their

patients. Physician CEOs can engage hospital physicians and encourage creativity among them.

Since a physician CEO's thinking is strategic and long term, he or she may enjoy a long tenure to achieve the long-term goals of continuous quality and safety improvement.

All of these factors, in addition to intrinsic motivation are outlined in Table 2.3 as typology of physician CEOs.

We can make the same case for non-physician CEOs with high input from physician leaders. This will require survey and or interview and is beyond the scope of this study.

Table 2.2

Schematic Employment Model Performance Using The Expert Theory-TEL

Purpose of CEO	Candidate	Outcomes	Financial Performance
To improve clinical quality & safety	Expert in quality medical care & safety (Physician)	Improved clinical quality & safety	Sustained profit margin

(Goodall, 2012)

Table 2.3

Typology of Physician CEOs

Knowledge–Based-Strategy (K-B-S)
Standard bearer-improve quality
Intrinsic environment for core worker (Autonomy)
Creativity
Intrinsic motivation
Long view (Strategic)
Low CEO Turnover

Modified from (Goodall, 2012)

This typology for physician CEOs can explain the clinical performance directly; however, the financial performance will be maintained indirectly. Short-term financial improvement based on cutting costs can occur if the short view is dictated by stakeholders. Financial inherent knowledge, which is more prevalent among professional managers especially those with backgrounds in finance, outperform physician CEOs who do not have that inherent knowledge and may not be savvy in financial management. However, if the knowledge base strategy is based on what is the best value and quality to offer patients in a sustainable way, then collaboration and team work should be implemented. This would involve utilizing the best experts in medicine aided by the best experts in finance (CFO) to support the long-term viability of the hospital.

An extreme example of a sector that has converted to manager-CEOs and away from technical experts is that of healthcare. In the past, qualified doctors led hospitals. In the United States today, only 4% of hospitals are led by medically trained doctors, most are instead administered by professional managers (Gunderman & Kanter, 2009).

Clinical and Financial Measures

A review of the available literature for physician CEOs as a main predictor variable for clinical and financial performance of these hospitals did not reveal significant empirical literature that showed any direct relationship between physician CEOs as a predictor variable in the performance of the hospitals employing them. Therefore, to address this research question empirically, the researcher used the expert leadership theory framework which suggests that clinical outcomes are predicted to be better for hospitals employing physician CEOs. The researcher used the term physician CEO to mean any physician, or a top physician, or a physician with management and leadership training. The researcher did not explore the specific definition of physician except that he or she carries the title of MD or DO. The specifics of additional degrees or titles would require further surveys and interviews which may restrict the number of hospitals to be compared and it was beyond the scope of the study.

Objective financial and clinical quality outcome measures were used as composite measures in this study to compare the performance of hospital CEOs based on their background knowledge of patient care versus general management and finance knowledge.

On the other hand, the financial outcome might be better for the short-term in hospitals employing professional manager CEOs. The selection of objective metrics to address clinical as well as financial performance outcomes was based on the use of composite measures which are well known in the healthcare industry. These standardized metrics are used for benchmarking when the performance of hospitals is compared. These metrics are also recognized by the government as the basis of reimbursement by the

Centers for Medicare & Medicaid Services (CMS) (e.g., CMS hospital compare). These measures included mortality and readmission rates in three clinical conditions of acute myocardial infarction, heart failure, and pneumonia. The financial measures included the expense per patient discharge and the operation margin.

To carry the theoretical framework to the selection of variables essential to test the hypotheses, the researcher applied the typology based on the Theory of Expert Leadership (TEL). Clinical performance can be schematically summarized as seen in Table 2.4. The researcher made the assumption that physicians were all experts in clinical quality and safety or refreshed as trainee in these two areas.

Table 2.4

Clinical Performance by Physician CEOs

CEO	IK	Expert	IE	Leadership Traits
Physician	Medicine	Clinical "Quality and Safety"	Long	Leadership essentials

Schematic clinical performance using The Expert Theory (TEL) (Goodall, 2012).

If the purpose of hospital employment is to have better clinical outcomes, then the best candidates would be physician CEOs. Therefore, employment of physician CEOs could lead to outperforming hospitals.

On the other hand, if the same expert leadership theory is applied to financial performance, hospitals with professional managers, who have inherent knowledge in management and finance, would outperform hospitals with physician CEOs. This outcome is particularly expected in short-term cycles and specifically in cost control since it is a tactical consideration and subject to frequent changes in the internal and external environment of conducting the business of delivering care. In addition to the cost

needed to improve the quality and safety in the hospitals, this may lead to fluctuations in profit margins for the short term.

However, in the long-term, the operation margin would not be affected as sustainability of good clinical performance would lead to stable financial performance (if not a better share in the market of serving the patient population) even though it is not the sole variable. Financial performance can be schematically summarized, as seen in Table 2.5. The researcher assumed that financial expertise was the only competency of the manager CEO. Although many managers have competency in understanding the general concepts of healthcare delivery, health, and illness, their depth of knowledge and length of education is much less relative to physicians.

Table 2.5

Financial Performance by Manager CEOs

CEO	IK	Expert	IE	Leadership Traits
Manager	Management	Reduces cost; Maintain or maximize profit	Short or long	Leadership essentials

Schematic financial performance: Modified from Goodall, 2012.

If the purpose of hospital employment is for better short-term financial outcomes, then the best candidates would be manager CEOs. Therefore, employment of manager CEOs could lead to outperforming hospitals.

In summary, the proposed theory regarding financial performance in the short-term is as follows: Employment of physician CEOs predicts hospitals will outperform in the clinical realm. Employment of physician CEOs predicts hospitals will underperform financially in short-term; however, in the long-term, employment of physician CEOs will

not lead hospitals to underperform financially as financial stability is due to the

continuous, renowned clinical services and the steady operation margin (even though the

costs might be higher).

The final theoretical framework looks like this mini-schematic and uses the

Theory of Expert Leadership (TEL): Outperforming hospitals in quality and safety

employ physician CEOs who are experts in medical care delivery with quality and safety

components. This framework was used in the selection of both clinical and financial

variables and when testing for hypotheses (see Table 2.6).

Table 2.6

Hospital Employment Model, Physician CEO Performance

Purpose of CEO	Candidate	Outcomes	Financial Performance
To improve clinical quality & safety	Expert in quality medical care & safety (Physician)	Improved clinical quality & safety	Sustained profit margin

Physician CEO Performance using The Expert Theory-TEL (Goodall, 2012)

Hypotheses and Their Relation to the Theory

Hospitals are predicted to enjoy better clinical quality and safety outcomes if

physicians CEOs are selected for clinical skills. The hypothesis for the clinical outcome

can be stated as: H1: Hospitals with a physician CEO will have better clinical outcomes

than hospitals with non-physician CEOs.

As non-physician CEOs are selected for financial skills, hospitals are predicted to

enjoy better financial outcomes in the short-term especially in cost control.

In the long-term, if better clinical outcomes in quality and safety are achieved,

then sustainability in delivering medical care is predicted to maintain the operating

margin, and hospitals with physician CEOs are predicted to enjoy a stable operating margin.

The general hypothesis for the financial outcome can be stated as: H2: Hospitals with physician CEOs will not have better financial outcomes than hospitals with non-physician CEOs in the short-term pertaining to expenses because of the incurred cost to improve quality and safety. In the long-term, physician CEOs who improve clinical outcomes will continue to have sustained operation margins.

More details regarding the clinical and financial hypotheses will be discussed in the methodology section since they are related to the selected variables that were tested. The selection, description, and value of the variables will also be discussed in the methodology chapter. Those variables along with the detailed hypotheses were the basis for data analysis.

CHAPTER 3

METHODOLOGY

Purpose

This study compared the clinical and financial performance of acute care, not-for-profit hospitals employing physician CEOs to acute care not-for-profit hospitals employing non-physician CEOs. The objective was to examine relationships between selected quality and financial outcome variables and the predictor variables of hospitals that employed physician CEOs versus non-physician CEOs. The main predictor variable was CEOs' inherent knowledge of medical care or management.

The study utilized a non-experimental design to examine cross-sectional, secondary data from hospitals in all U.S. regions. Data were collected for three and a half years during the physician and non-physician CEOs' tenure. Analyses described associations among variables and potential predictors of CEO effectiveness.

To achieve this objective, three types of statistical analyses were conducted: (1) descriptive statistics; (2) comparative statistics using an independent sample t-test; and (3) multiple regression analysis.

Data

First, hospitals were identified that employed physician CEOs (the study group) in all four regions of the United States (East, North Midwest, South Midwest, and West) for the periods of 2008, 2009, 2010, and 2011.

U.S. hospitals were divided into four regions, so the researcher used them as covariates due to regional variation of quality and financial benchmark scores. Hospitals were selected based on the following criteria: (1) not-for-profit hospitals, and (2) with more than 199 beds. Physician CEOs were identified as individuals who had obtained a medical degree (MD). This identification was carried through by finding the MD or DO title next to the name of the hospital CEO. This was done manually during the selection of hospitals that met the selection criteria listed above. Data were derived from Billian's Health Data (Blue Book, 2011).

The training of physicians in management and leadership, whether they are top physicians or actually practiced medicine, has not been addressed as it was beyond the scope of this study.

The researcher selected a group of hospitals which employed non-physician CEOs (the comparison group) and had comparable characteristics (same region, academic or non-academic status, bed size, and not-for-profit status). The selection was done by two staff assistants who assigned the groups that met the criteria mentioned above. If more than one hospital met the criteria, then the candidate hospital was selected randomly by the same assistants. Matching pair's model was not attempted since this would have been time consuming and may have significantly reduced the sample size. Additionally, as two-step regression analyses were planned to control for covariates in the predictor variables' side of the regression equation, the second step of regression eliminated the need for the matching pair's model. Data were compiled, prepared in Excel, and merged with data derived and provided by Truven Health Analytics (the custodian of Thomson Reuters Proprietary) Data Set for the 100 Top Hospitals for 2011.

Thomson Reuter's data identified the study group and the comparison group hospitals that were requested. The merged data was prepared by the third party, Truven Health Analytics, in Excel and forwarded to the researcher. From Excel, the data were imported into SPSS Statistics 17.0 and analyzed.

Thomson Reuters Proprietary data set used the following data sources:

(1) Medicare Provider Analysis and Review (MedPAR) which is the database maintained by the Centers for Medicare & Medicaid Services (CMS). This database contains information on all Medicare beneficiaries who use hospital inpatient services;

(2) CMS Hospital Compare Data Set; and

(3) Medicare Cost Report; which includes the following two sources of information:

     (a) Expense / Revenue Data;

     (b) Federal Hospital Cost Report (HCRIS).

Like the volume indicator, the outcomes measure was based on MedPAR data. For each hospital and specialty, the Healthcare Division of Thomson Reuters computed an adjusted mortality rate based on predicted and actual mortality rates using (All Patient Refined Diagnosis Related Group)−APR DRG−method.

The variables and the years of data selection:

30Day Rates (mortality and readmission): July1, 2008 - June 30, 2011

These variables are a combined three-year period (2008-2011) dataset from the CMS Hospital Compare data file 2012 Q3 release. This dataset was used in the 2011 study year.

Patient Safety Index

This variable represents a combination of two years of data for each study year:

2009 Study Year combines 2008 and 2009 MedPAR data

2010 Study Year combines 2009 and 2010 MedPAR data

2011 Study Year combines 2010 and 2011 MedPAR data

As the data overlap and is not discrete, it is not like the data for 30 day mortality or readmission rates, but the analysis was performed similarly on all hospitals.

The PSI data for these three years were processed using a different risk model than the previous dataset of 30Day Rates. These data were processed using AHRQ PSI 4.3 POA Unix model. Only MedPAR data that had POA (Present on Admission) coding were included in the record population, which accounted for only three years of data, 2009-2011. CMS did not start mandating POA coding until the 2009 discharge year.

Adjusted Inpatient Expense/Discharge

(Cost reports from the HCRIS 2012 Q3 dataset)

This variable represented one year of data for each study year: 2011 Study year is obtained from 2011 hospital cost report (or 2010 if 2011 unavailable); 2010 Study Year is obtained from 2010 hospital cost report (or 2009 if 2010 unavailable); and 2009 Study Year is obtained from 2009 hospital cost report (or 2008 if 2019 unavailable). The average of the 2009, 2010, and 2011 was calculated and analyzed.

Adjusted Operating Profit Margin *(used similar data as the previous variable)*

(Cost reports from the HCRIS 2012 Q3 dataset)

The researcher chose the same years for all variables to the extent that available data allowed. Mortality rates and readmission rates were chosen between July1, 2008 -

June 30, 2011. Only three years of data, 2009 - 2011 for patient safety index were chosen. Finally, the averages of the three years of data, 2009 - 2011 for patient expense/discharge and operating margin were chosen. This selection was intended to ensure that the years evaluated aligned as much as possible among the entire outcome variables studied.

Inclusion Criteria

Hospitals with physician CEOs and non-physician CEOs during the years of 2008, 2009, 2010, and 2011, were included in this investigation. Only not-for-profit hospitals in the same regions were analyzed. The not-for-profit category was selected since this was the largest number of hospitals in the United States (for-profit hospitals were excluded due to the small number and the influence of shareholders who may demand financial performance which compromises quality). The bed capacity in all of the hospitals was greater than 199 acute beds to run sufficient size hospitals and to be able to include teaching hospitals. The facilities were either teaching or non-teaching hospitals to compare differences and possible relationships. Teaching hospitals were defined as: hospitals with training for residents and fellows or being a member of the Council of Teaching Hospitals (COTH), being affiliated with a medical school (American Medical Association−AMA−or American Osteopathic Association−AOA−), and having at least 200 hospital beds set up and staffed or having at least four of eight important key technologies (for example, a cardiac intensive care unit [ICU], or endoscopic ultrasound).The tenure of hospital CEOs was three and a half years or more to ensure sufficient duration of the same CEO, which would reflect his or her performance.

Hospitals with less than 199 acute care beds were excluded from this investigation because the majority of them are rural and did not qualify for teaching hospital status

according to the criteria mentioned above. Hospitals in the same region were compared to reduce regional variation. Finally, hospitals with clinical CEOs who were not physicians were also excluded (e.g., nurses).

Procedures

Health Data (Blue Book) were used to identify hospitals with physician administrators (CEOs), specifically hospitals in the United States that maintained the same physician CEOs for the years 2008, 2009, 2010, and 2011. Not-for-profit hospitals were also identified with more than 199 beds. The total number of hospitals which employed physician CEOs was 61, while only including 56 hospitals for which scores were available.

Once the filter of hospitals with physician CEOs whose tenure was included at the beginning of 2008 and extended to the end of 2011, the comparison group of hospitals that employed non-physician CEOs in the same region of the United States were selected. The composition of these hospitals was comparable to the first group with 199 beds or more, not-for-profit status, and both academic and non-academic affiliations. Both groups included only acute care, non-specialty and non-psychiatric hospitals. The total number of hospitals was 129 (after excluding women and children hospitals and CEOs with tenure less than three and a half years).

Human Subject Protection

The Institutional Review Board of the University of Alabama at Birmingham reviewed and approved the research. This study employed the analysis of anonymous hospital selections; therefore, it did not involve risk to human participants.

Study Design

This investigation was guided by the following research question:

To what extent does hospital employment of a physician CEO result in higher clinical and financial performance as compared to hospital employment of a non-physician CEO?

Because physicians CEOs are selected for clinical background, they are predicted to enjoy better clinical quality and safety outcomes, according to the expert leadership theory. Based on this same theory, manager CEOs are predicted to enjoy better financial performance. The variables which addressed the clinical quality and safety outcomes as well as the financial outcomes are detailed as follows:

Variables

The main independent variable (IV) used in this study was type of hospital CEO while the dependent variables (DV) included the financial and clinical quality outcomes.

The clinical outcome variables selected for this study included a 30-day risk-adjusted rate of (AMI, HF, and Pneumonia) as standardized 30-Day mortality and readmission rates (RSMR and RSRRs). To reduce confounding with regional variations in Acute Myocardial Infarction (AMI), Heart Failure (HF), and Pneumonia outcomes, the study group and the comparison group were selected from the same region. To select a safety outcome variable, the Agency for Healthcare Research and Quality (AHRQ) considers Patient Safety Indicators (PSIs) as an important quality variable. As such, the Risk-Adjusted Patient Safety Index was included as a global safety variable.

The selected financial outcome variables were: Adjusted Operating Margins (AOPM), which showed performance related to operation, and Adjusted Inpatient

Expense per Discharge (AIEPD), which showed efficiency in cost control. Each of these financial indicators was analyzed separately and then summarized.

Variable Details

30Day Rates (mortality and readmission): These variables were constructed between July1, 2008 - June 30, 2011 and represent a combined three-year period (2008-2011) dataset from the CMS Hospital Compare data file 2012 Q3 release.

30-Day Risk-Adjusted Rates for Two Quality Areas: Readmission and Mortality

(1) 30-day risk-adjusted readmission rates for AMI, Heart Failure, and Pneumonia patients. Thirty-day readmission rates are a widely accepted measure of the effectiveness of hospital care. These data describe how the care provided in hospitals to patients with three particular conditions may have contributed to clinical outcomes related to their post-discharge, medical stability, and recovery. Because these measures are part of the Center for Medicare & Medicaid Services (CMS) value-based purchasing program, they are now being tracked by the healthcare industry. Additionally, tracking these measures may help hospitals identify patients at risk for post-discharge problems if discharged too soon as well as target improvements in discharge planning and in aftercare processes. Hospitals that scored well (i.e., lower) may be better prepared for a pay-for-performance structure.

Calculation

CMS calculates a 30-day readmission rate for each patient condition using three years' of MedPAR data. CMS does not calculate rates for hospitals in which the number of cases is too small (less than 25). A database for hospitals in this study was built by Thomson Reuter so that hospitals were ranked independently on each of the three

conditions (AMI, heart failure, and pneumonia) and compared. These data adjusted for patient-level risk factors.

Data from the CMS Hospital Compare dataset were drawn from July1, 2008 - June 30, 2011 and released in August of 2012. These were the only data compiled and offered by Truven's Analytics. This single rate covering the three years poses a limitation for the comparison with the other variables (safety index, expense per patient discharge, and operation margin) which were given for each year of 2009, 2010, and 2011. This non-alignment in timing also presents a limitation in the study. Additional details regarding this dataset can be found in Appendix A.

(2) 30-day risk-adjusted mortality rates for AMI, Heart Failure, and Pneumonia. Mortality rates were included for the same reasons as the readmission rates variables (for only AMI, HF, and Pneumonia). These were calculated in the same way as the calculation of the readmission rates, using mortality data.

Risk-Adjusted Patient Safety Index

Patient safety has become an increasingly prominent measure of hospital quality. Patient safety measures are reflective of both clinical quality and the effectiveness of systems within the hospital. The Agency for Healthcare Research and Quality (AHRQ), a public health service agency within the Department of Health and Human Services, has developed a set of patient safety indicators (PSIs). These indicators are widely used as a means for measuring hospital safety. Because PSIs use hospital administrative data and include surgical complications and other iatrogenic events, they provide an unbiased perspective on the quality of care inside hospital

Calculation

This variable represented a combination of two years of data for each study year:

2009 Study year is obtained from 2008 and 2009 MedPAR data

2010 Study year is obtained from 2009 and 2010 MedPAR data

2011 Study year is obtained from 2010 and 2011 MedPAR data

The PSI data for these three years were processed using a different risk model than the previous dataset of 30Day Rates. These data were processed using AHRQ PSI 4.3 POA Unix model. Only MedPAR data that had POA (Present on Admission) coding were included in the record population, which accounted for only three years of data, 2009 - 2011.

The reference value for this index was 1.00; a value of 1.15 indicates 15% more events than predicted, and a value of 0.85 indicates 15% fewer.

Scoring was based on the difference between the observed and expected number of patients with PSI events, for each of the eight selected PSIs, expressed in standard deviation units (z-score). Two years of MedPAR data (2008 and 2009) were used to reduce the influence of chance fluctuation. The AHRQ PSI risk models used POA coding in 2009 MedPAR data and imputed POA in 2008 MedPAR data. This was repeated for 2009 and 2010 as well as 2010 and 2011. Z-scores were normalized by hospital comparison group, and a mean normalized z-score was developed as an aggregate PSI score. Hospitals with fewer observed PSIs, relative to the number expected, accounting for binomial variability, received the most favorable scores. Hospitals with extreme outlier values in this measure were not eligible to be named benchmarks.

Financial Outcome Variables

      Case mix adjusted and wage-adjusted inpatient expense per discharge. This measure helps to determine how efficiently a hospital cares for its patients. Low values indicate lower costs and thus better efficiency.

Calculation

      The expense variable represents one year of data for each study year: 2011 Study year = 2011 hospital cost report (or 2010 if 2011 unavailable); 2010 Study year = 2010 hospital cost report (or 2009 if 2010 unavailable); and 2009 Study year is obtained from 2009 hospital cost report (or 2008 if 2019 unavailable). The average of the 2009 2010, and 2011 was calculated and analyzed (Truven's Health Analytics data provided each year separately).

      Adjusted inpatient expense per discharge measures the hospital's average cost of delivering inpatient care on a per-unit basis. Inpatient expense for each department is calculated from fully allocated cost using the ratio of inpatient charges to total charges. For inpatient nursing units, this will always be 100% of the fully allocated cost. For departments with inpatient and outpatient services, the ratio varies. Non-reimbursable and distinct purpose cost centers (e.g., patient education) were omitted as these had no charges for patient care. I assumed that hospitals are comparable in delivering same level of care for AMI-CABG, for example, as they are matched for size and teaching status and controlled for those covariates.

      The hospital CMS-assigned case mix index was used to account for differences in patient complexity while the CMS area wage index was used to account for geographic

differences in cost of living. Hospitals with extreme outlier values in this measure were not eligible to be named benchmarks (this was done by Thomason Reuter).

To calculate this measure, the total acute care inpatient expense was divided by total acute inpatient discharges and adjusted for both case mix and area wage indexes. Detailed calculations and the Medicare Cost Report locations (worksheet, line, and column) for each calculation element can be found in Appendix A.

Profitability (Adjusted Operating Profit Margin)

Operating profit margin is one of the measures of a hospital's financial health. It is a clear measure of a hospital's operating earnings as compared to its expenses (Top 100 hospitals Thomason Reuter 2001).

Calculation

The profit variable represents one year of data for each study year: 2011 Study year is obtained from 2011 hospital cost report (or 2010 if 2011is unavailable); 2010 Study year is obtained from 2010 hospital cost report (or 2009 if 2011is unavailable); 2009 Study year is obtained from 2009 hospital cost report (or 2008 if 2009 is unavailable). The average of the 2009, 2010, and 2011 was calculated and analyzed.

The adjusted operating profit margin is the difference between a hospital's total operating revenue and total operating expense. This is expressed as a percentage of its total operating revenue. Total operating revenue is the sum of net patient revenue plus other operating revenue. Operating expense is adjusted for related organizational expenses. See Appendix A for detailed calculations and the Medicare Cost Report locations (worksheet, line, and column) for each calculation element.

Operating expense includes adjustments for related organizational expenses. Extreme outlier values in this measure were not eligible to be named benchmarks. See

"Eliminating Outliers" below; this was done by Truven's Health Analytics. Hospitals were scored by ranking the adjusted operating profit margin. Higher values in this variable were considered favorable.

Independent Variables (IV)

To examine the relationship between outcome variables (DV) and predictor, or independent variables (IV), the following elements were used:

The study compared hospitals that employed physicians as CEOs (MDCEO=1) and hospitals that employed non-physician CEOs (non-MDCEO=0).

Control Variables (Covariates)

This study controlled for the following conditions: bed size, CEO tenure, academic versus non-academic hospital status, and geographic region.

Two of the characteristics were modified from the AHA categories. The AHA classifies bed size within eight categories:

1. 6-24 beds
2. 25-49 beds
3. 50-99 beds
4. 100-199 beds
5. 200-299 beds
6. 300-399 beds
7. 400-499 beds
8. 500 or more beds

For this study, the eight categories were collapsed into the following two categories:

1. 199-499 beds

2. 500 or more beds

For practical reasons, in this study, the researcher reduced the number of dummy covariates. In the case of hospital bed size, the number was collapsed to two categories after eliminating less than 199 beds. This reduction was important as the study sample size was not large. In general, the addition of covariates would lead to loss in degree of freedom and therefore loss of statistical power. Too many predictor variables would increase the standard error and increase Type II error and thereby fail to reject the null hypothesis when it was false.

Geographic region was also classified within eight categories by the AHA. The eight categories include:

1. Mid-Atlantic/New England

2. South Atlantic/Associated Territories

3. East North Central

4. East South Central

5. West North Central

6. West South Central

7. Mountain

8. Pacific/Associated Territories

These eight categories were collapsed into the following four categories for this study:

1. North East (NE)

2. Midwest (MW)

3. South

4. West

The states associated with each region are detailed in Appendix E. These eight categories were collapsed into four categories to reduce the number of covariates as this would also increase the standard error and lead to Type II error. The four location variables were recoded into three categorical dummy variables; North, Midwest, and South leaving West as the comparison location.

The CEO tenure variable was divided into two subgroups: those between four to eight years as short (0) and those with more than eight years as long (1) after recoding the variable into two categorical dummy variables. Hospitals' academic status variable was divided into two subgroups: teaching (1) and non-teaching (0) after recoding the variable into two categorical dummy variables. A teaching hospital was defined as the major teaching hospital that has academic affiliation with the medical school.

Dependent Variables (DV)

For this study, financial and clinical outcomes served as the dependent variables. These two items were defined by the following attributes:

Clinical Outcome Variable

1. RSRRs-rate: 30-day risk-standardized readmission measures (AMI, HF, and Pneumonia).

2. RSMRs-rate: 30-day risk-standardized mortality measures (AMI, HF, and Pneumonia)

3. RAPSI: Risk-Adjusted Patient Safety Index

Financial Outcome Variables

1. AIEPD: Adjusted inpatient expense per discharge

2. AOPM: Adjusted Operating margin

Table 3.1

Summary of Outcome and Predictors Variables

Outcomes Variables	Predictors Variables
Y8=AOPM	X1=Hospital CEOs
	Dummy MDCEOs=1 Non-MDCEOs=0
Y9=AIEPD	X2=Hospital bed size
	Dummy large (1) & small (0)
Y1=RSMRs MI	X3=CEO Tenure-years
Y2=RSMRs HF	Dummy long (1) & short (0)
Y3=RSMRs Pneumonia	
Y4=RSRRs MI	X4=Academic:
Y5=RSRRs HF	Dummy teaching (1) non-teaching (0)
Y6=RSRRs Pneumonia	
Y7=RAPSI	X5=Regions 1, 2, 3, & 4 (will have 3
	dummies) North, Midwest, and South.

The general equation is:

Y =Bo (constant) +B1 (physician CEOs) +B2 (teaching hospital) +B3 (large hospital) +

B4 (long CEO tenure) +B5 (North location) + B6 (Midwest location) +B7 (South

location)

Y is any one of the outcome dependent variables: AOPM, AIEPO, RSMRs AMI,

RSMRs HF, RSMRs Pneumonia, RSRRs AMI, RSRRs HF, RSRRs Pneumonia,

and RA PSI.

The following research question guided this investigation: To what extent does hospital employment of a physician CEO result in higher clinical and financial performance as compared to hospital employment of a non-physician CEO?

The Data from the Literature and the Hypotheses
(Hypotheses and Their Relation to the Theory)

As physician CEOs are selected for clinical background, they are predicted to enjoy better clinical quality and safety outcomes in the short and long term. The general hypothesis for clinical outcomes can be stated as:

H1: Hospitals with a physician CEO will have better clinical outcomes than hospitals with non-physician CEOs.

As non-physician CEOs are selected for financial skills, they might enjoy better financial outcomes in the short-term especially in cost control.

In the long-term, if better clinical outcomes in quality and safety are achieved, then sustainability in delivering medical care may maintain the operation margin, and physician CEOs might enjoy stable operation margins.

The general hypothesis for financial outcome can be stated as:

H2: Hospitals with a physician CEO will not have better financial outcomes than hospitals with non-physician CEOs in the short-term in the area of expenses because of the incurred cost to improve quality and safety. In the long-term, physician CEOs who improve clinical outcomes will continue to have sustained operation margins.

Hypotheses

Clinical Outcome Null Hypothesis

Since physician CEOs are selected for clinical skills, their hospitals are predicted to enjoy better clinical quality and safety outcomes. The general hypothesis for clinical outcomes can be stated as:

H1: Hospitals with a physician CEO will have better clinical outcomes than hospitals with non-physician CEOs. This general hypothesis can be detailed for each of the selected outcome clinical variables as follows:

Detailed clinical outcome hypotheses.

H1 -1: Hospitals with a physician CEO will have lower 30-Day Risk-Adjusted Readmission Rates for AMI than hospitals with non-physician CEOs.

H1 -2: Hospitals with a physician CEO will have lower 30-Day Risk-Adjusted Readmission Rates for HF than hospitals with non-physician CEOs.

H1 -3: Hospitals with a physician CEO will have lower 30-Day Risk-Adjusted Readmission Rates for Pneumonia than hospitals with non-physician CEOs.

H1 -4: Hospitals with a physician CEO will have lower 30-Day Mortality Rates for AMI Patients than hospitals with non-physician CEOs.

H1 -5: Hospitals with a physician CEO will have lower 30-Day Mortality Rates for HF Patients than hospitals with non-physician CEOs.

H1 -6: Hospitals with a physician CEO will have lower 30-Day Mortality Rates for Pneumonia Patients than hospitals with non-physician CEOs.

H1 -7: Hospitals with a physician CEO will have lower Risk-Adjusted Patient Safety Index than hospitals with non-physician CEOs.

Financial Outcome Hypothesis

Since non-physician CEOs are selected for financial skills, they might enjoy better financial outcomes in the short term, especially in cost control. Operation margin depends on three factors: sustained or increased volume, revenues, and cost control. Performing high quality work will increase volume and maintain revenues. Outperforming hospitals may increase cost but typically maintain profit. The general hypothesis for financial outcome can be stated as:

H2: Hospitals with a physician CEO will not have better financial outcomes than hospitals with non-physician CEOs especially in cost control for the short term.

Detailed financial outcome hypotheses.

H2 -8: Hospitals with a physician CEO will have higher Case Mix- and Wage-Adjusted Inpatient Expense per Discharge than hospitals with non-physician CEOs.

H2 -9: Hospitals with a physician CEO will not have lower Adjusted Operating Profit Margin than hospitals with non-physician CEOs if they outperform in quality.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) was employed for all quantitative data analysis.

Statistical Analysis

A descriptive summary was used to analyze the data distribution. Further, an independent sample t-test was used to compare the mean and median scores for the continuous variables, specifically the scores of physician CEOs versus non-physician CEOs. Both samples were drawn from a population within the same region to control for

variance. Additionally, samples reflected academic/non-academic status, CEO tenure, and number of beds.

Independent Sample t-test

The means of the outcome variables were reviewed individually, compared, and noted for differences between the two groups of hospitals that employed physician CEOs (the study group) and hospitals that employed non-physician CEOs (the comparison group). Using a Q-Q plot, the data suggested a range outside of the normal distribution in all outcome variables except AMI 30days mortality rate, Pneumonia 30days mortality rate, HF 30days readmission rate, and Pneumonia 30days readmission rate. Therefore, a transformation to normal distribution was done by exclusion of hospitals which were in the range of outlier or extreme values.

After matching hospitals for comparisons, descriptive and exploratory procedures were used to determine the distribution for each outcome variable (DV). Outlier and extreme values were removed to establish a normal distribution for each outcome variable with final Q-Q plot. Then, individual outcome variables were tested using an independent sample t-test, comparing means and testing for the null hypothesis. Each outcome variable was adjusted to become normal in distribution; therefore, the number of hospitals was decreased from the original one, depending on the number of extreme or outlier hospitals which were removed for each variable accordingly. The transformation of specific outcome variable to normal distribution will be explained in greater detail in the discussion of outcome variables.

Regression Analysis

Descriptive and exploratory procedures were used to determine the distribution for each outcome variable (DV) in general, and then extreme and outlier values were eliminated. Multiple regressions were performed on all outcome variables, including: RSMRs, RSRRs, and RAPSI, AIEPD, and AOPM to reach normal distribution using the P-P plot.

Since all outcome dependent variables were transformed to normal distribution only, parametric analyses were done. Two-step regressions were conducted first with the main predictor the CEO as a physician. In the second step, the researcher controlled for the covariates of hospital region, size, teaching status, and CEO tenure. The researcher used this technique to adjust for the covariates and to reduce their effects on the result of the main predictor of the study group "physician CEO." The P value of the second step of multiple regressions was used to show the association between the predictor "CEO" and the outcome variable as well as the degree of significance. Also, it showed if the other covariates influenced the outcome variables with significant association.

CHAPTER 4

RESULTS

Descriptive characteristics were computed and analyzed (Table 4.1).

Table 4.1

Descriptive Statistics for Hospital Characteristics and P value of Chi Square

Characteristic	Overall (129, %=100)	Hospitals with MD CEOs (n=56, %=43.4)	Hospitals with Non-MD CEOs (n=73, %=56.6)	P value
Bed size				
199-499	91 (70.5%)	36 (64.3%)	55 (75.3%)	0.17
500+	38 (29.5%)	20 (35.7%)	18 (24.7%)	
Teaching status				
Teaching	41 (31.8%)	16 (28.6%)	25 (34.2%)	0.49
Non-teaching	88 (68.2%)	40 (71.4%)	48 (65.8%)	
Geographic region				
North	42 (32.6%)	19 (33.9%)	23 (31.5%)	0.86
Midwest	33 (25.9%)	14 (25.0%)	19 (26.0%)	0.77
South	14 (11.6%)	5 (9.4%)	9 (13.2%)	0.85
West	40 (30.9%)	18 (32.7%)	15 (29.3%)	0.52
CEO tenure				
Long (+8 years)	54 (41.9%)	24 (42.9%)	30 (41.1%)	0.84
Short (4-7 years)	75 (58.1%)	32 (57.1%)	43 (58.9%)	

To ascertain differences in hospital characteristics (region, academic status, bed size, and CEO tenure) between hospitals that employed physicians and those that did not, a Chi-square test was conducted and was shown as P value in Table 4.1. Of the four characteristics, none were statistically significant using the Pearson chi- square.

To produce a normal distribution of the outcome variables, each dependent variable was separately explored, and then extreme and outlier values were identified by

box-plot. Box-plot results are shown as figures under the review of findings for each hypothesis as part the univariate analysis.

Table 4.2

Outcome Variables, Independent t-test; Mean Difference and P Value between Hospitals with Physician versus Non-physician CEOs

Outcome Variable	Mean Value for Hospitals with Non-MD CEO	Mean Value for Hospitals with MD CEO	Total Number of Hospitals	The Mean t-test Difference	P value
RSMRs MI	15.216	14.252	120	-.9637	P=.001
RSMRs HF	11.242	10.454	119	-.7880	P=.005
RSMRs Pneumonia	11.759	10.955	124	-.8044	P=.007
RSRRs MI	19.747	19.841	119	.0941	P=.760
RSRRs HF	24.914	24.788	124	-.1245	P=.755
RSRRs Pneumonia	18.700	18.989	123	.2887	P=.364
RAPSI	.98886	.94340	117	-.0368	P=.010
AIEPD	6292.2	6798.7	119	506.48	P=.028
AOPM	4.61	5.7188	109	1.09	P=.232

RSMRs MI: 30-Day Risk-Adjusted AMI Mortality Rates

RSMRs HF: 30-Day Risk-Adjusted Heart Failure Mortality Rates

RSMRs Pneumonia: 30-Day Risk-Adjusted Pneumonia Mortality Rates

RSRRs MI: 30-Day Risk-Adjusted AMI Readmission Rates:

RSRRs HF: 30-Day Risk-Adjusted Heart Failure Readmission Rates

RSRRs Pneumonia: 30-Day Risk-Adjusted Pneumonia Readmission Rates

RAPSI: Risk Adjusted Patient Safety Index (Average 2009 to 2011)

AIEPD Case mix adjusted and wage-adjusted inpatient expense per discharge (Average 2009 to 2011)

AOPM: Adjusted Operating Profit Margin (Average 2009 to 2011)

Review of Findings

General Overview of Findings

The theoretical framework which was finalized earlier at the end of the literature review is based on the Theory of Expert Leadership (TEL) and can be summarized as follows:

For hospitals that desire improvement in quality and safety may employ experts in medical care delivery with quality and safety components. Physician CEOs with their educational background and clinical experience, in addition to leadership capabilities that can be learned, can meet that demand. The clinical outperformance in quality and safety will lead to financial stability with sustainable quality advantage of medical care that maintains the business with sustained margin even though the cost of quality might be higher.

This framework was used in the selection of both clinical and financial variables, and when testing for hypotheses.

A general overview of the findings will first be offered, followed by a more detailed discussion of the study's findings.

The study sample was narrowed to 129 hospitals from 132 after excluding the Women and Children hospitals in addition to one hospital that employed a CEO with less than three and half years of tenure. This last criterion, number of years of tenure, provided CEOs with at least six months to allow them to form their new team, to review the internal environmental analysis, and to formulate the strategy. The findings from the adjusted multiple regression generally showed that hospitals employing physician CEOs

significantly outperformed hospitals employing non-physicians in the quality outcome

variables related to 30-day mortality rate as well as in safety PSI (Table 4.3).

On the other hand, hospitals employing non-physician CEOs outperformed

hospitals employing physician CEOs with respect to expense per patient discharge (Table

4.3).

Thirty day readmission rates for of AMI, HF, and Pneumonia were not

significantly different between hospitals that employed physician CEOs and non-

physician CEOs. Likewise operation margin was not statistically different between the

two types of hospitals.

Table 4.3

*Multivariate Adjusted Regression Results for Relationship between MD CEOs and
Outcome Variables*

	Total Number of Observations	B Coefficient	Sig.
AMI 30dmort Rate	120	-.712	.012
HF 30dmort Rate	119	-.901	.003
PNEU 30dmort Rate	124	-.787	.014
AMI Readmit Rate	119	.157	.515
PNEU Readmit Rate	123	.277	.380
PSI Average Rate	117	-.049	.009
Expense per Patient per discharge	119	$501.35	.025
Operation Profit Margin	109	.858	.372

Clinical Quality Hypotheses

Hypothesis 1

Relative to hospitals with non-MD CEOs, hospitals with MD CEOs were

associated with lower 30-day mortality rates for AMI (b= -0.712, p=0.012). The model

covariates explained 12.2% of the variance between the two group means (Table 4.4).

There were no other covariates that were significant (p<0.05) except large hospitals that were marginally significant (p=.057) with a B Coefficient of -.62.

Table 4.4

Multivariate: Mean and Standard Deviation (AMI 30-Day Risk-Adjusted Mortality) in MD and Non–MD CEOs

	B	SE	P Value
Unadjusted Results (Constant)	15.06	0.18	.000
CEOs	-0.76	0.28	.006
Adjusted Results (Constant)	15.40	.033	.000
CEOs	-0.71	0.28	.012
Teaching	-0.07	0.38	.835
North	-0.28	0.44	.446
Midwest	-0.35	0.48	.347
South	-0.11	0.53	.824
Long Tenure	0.06	0.33	.827
Large Size	-0.62	0.38	.057

R^2=.068 in step1, R^2=.122 in step 2 R^2 change =.055

Hypothesis 2

Relative to hospitals with non-MD CEOs, hospitals with MD CEOs were associated with lower 30-day mortality rates for HF (b= -0.788, p=0.007) Relative to smaller hospitals, larger hospitals were associated with lower 30-Day Risk-Adjusted Mortality Rates for Heart Failure (b=-0.79, p=0.015).

The model covariates explained 7.2% of the variance in 30-day heart failure mortality in the study of all hospitals (see Table 4.5) There were no other covariates that were significant (p<0.05) except large hospitals that were significant (p=.015) with a B Coefficient of -.79.

Table 4.5

Multivariate: Multiple Regression (HF30-Day Mortality Rate) Results for Relationship between MD and Non-MD CEOs

	B	SE	P Value
Unadjusted Results (Constant)	11.25	0.19	
CEOs	-0.84	0.29	.004
Adjusted Results (Constant)	11.83	0.33	
CEOs	-0.78	0.278	.007
Teaching	-0.52	0.35	.112
North	-0.55	0.41	.127
Midwest	-0.07	0.44	.857
South	-0.55	0.46	.491
Long Tenure	0.15	0.30	.589
Large Size	-0.79	0.30	.015

R^2 = .072 for step 1 .214 for step 2, change R^2=.142

Hypothesis 3

Multiple regressions confirmed the finding of statistical significance. There was a significant negative correlation between hospitals with physician CEOs and pneumonia mortality rate (r=-.262) at p=.002. Also, there was significant negative correlation between large hospitals and pneumonia mortality rate (r=-.210) at p=.012. The means difference was -.894 (B coefficient) which was lower in hospitals that employed physician CEOs but statistically significant with p=.005 (see Table 4.6). In the second step, B Coefficient was -.787 at p=0.014.

Relative to smaller hospitals, larger hospitals were associated with lower 30-Day Risk-Adjusted Mortality Rates for pneumonia (b=-787, p=0.014) (see Table 4.6).

The model covariates explained 6.8% of the variance in 30-day pneumonia mortality in the study of all hospitals (see Table 4.6).

Table 4.6

Multivariate: Regression Results for Relationship between MD CEO and Pneumonia 30-Day Risk-Adjusted Mortality Rates

	B	SE	P Value
Unadjusted Results (Constant)	11.794	.203	.000
CEOs	-.894	.309	.005
Adjusted Results (Constant)	11.887	.377	.000
CEOs	-.787	.313	.014
Teaching	.411	.367	.265
North	.062	.407	.880
Midwest	.007	.419	.986
South	.182	.538	.735
Long Tenure	-.206	.321	.523
Large Size	-.804	.364	.018

R2=.068 in step1, R2=.119 in step 2 R2 change =.051

Hypothesis 4

There was no significant correlation between the hospital CEO and reduction of AMI readmission within 30 days; however, the mean difference was .157 (B coefficient) greater in hospitals that employed physician CEOs. The only significant coefficient was with northeast location hospitals with 1.182 higher rates of readmission than other geographical location, p=.004 (see Table 4.7). The other characteristics accounted for an additional 11.2% of the variation, above and beyond the CEO characteristic.

R Square was .004 and .115 in the second step, and the R2 change was .112 which suggests that other characteristics accounted for an additional 11.2% of the variation, above and beyond the CEO characteristic.

There was significant positive correlation between hospitals in the northeast (r=.242) at p=.005 as well as large hospitals (r=.159) at p=.48. The remaining covariates and physician CEOs did not have any correlation with the outcome of AMI Readmit Rate (see Table 4.7).

Table 4.7

Multivariate: Regression Results for Relationship between MD CEO and AMI 30-Day Risk-Adjusted Readmission Rates

	B	SE	P Value
Unadjusted Results (Constant)	19.694	.203	.000
CEOs	.198	.308	.525
Adjusted Results (Constant)	18.781	.374	.000
CEOs	.157	.304	.608
Teaching	.179	.355	.616
North	1.182	.403	.004
Midwest	.699	.416	.096
South	.459	.523	.382
Long Tenure	.104	.310	.737
Large Size	.410	.354	.250

R2=.004 in step1, R2=.115 in step 2 R2 change =.112

Hypothesis 5

Two-step multiple regressions confirmed the finding of no statistical significance (p=.625). There was no significant correlation between hospitals with physician CEO and reduction of heart failure 30-days Readmission Rate. Relative to non-MD CEOs, MD CEOs were associated with lower 30-Day Risk-Adjusted Readmission Rates for Heart Failure (b= -0.198), but the relationship was not statistically significant (p=0.625). R Square change was .139 which suggests that other characteristics accounted for an additional 13.9% of the variation, above and beyond the CEO characteristic.

The only covariate that was significant was the northeast location (b=1.908. p=.0001). There was no other significant correlation between covariates and the outcome variable (HF Readmit Rate) including physician CEOs (see Table 4.8).

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Table 4.8

Multivariate: Regression Results for Relationship between MD CEO and HF30-Day Risk-Adjusted Readmission Rates

	B	SE	P Value
Unadjusted Results (Constant)	24.900	.271	.000
CEOs	-.018	.417	.965
Adjusted Results (Constant)	23.941	.474	.000
CEOs	-.198	.405	.625
Teaching	-.201	.472	.670
North	1.908	.518	.000
Midwest	.872	.536	.107
South	.185	.685	.788
Long Tenure	-.071	.410	.864
Large Size	.647	.473	.174

R2=.000 in step1, R2=.139 in step 2 R2 change =.139

Hypothesis 6

The two-step multiple regression showed the useful models to be covariate (Northern location) relative to other locations with a B coefficient of 1.118 for a higher rate with p=.007, and teaching hospitals with a B coefficient of .781 for a higher value with p=.035. However, the main predictor in the study (physician CEOs) was not statistically significant (b=0.277, p =.380) (see Table 4.9). However, there was no significant correlation between the outcome variable of pneumonia re-admittance and physician CEOs. On the other hand, other covariates had significant correlation to 30-day pneumonia re-admission. Those covariates are: North (r=.257) at p=.003, teaching (r=306) at p=.000 and large size hospital (r=255) at p=.003. All of these correlations showed higher rates which were not desired outcomes (see Table 4.9).

Table 4.9

Multivariate: Regression Results for Relationship between MD CEO and Pneumonia 30-Day Risk-Adjusted Readmission Rates

	B	SE	P Value
Unadjusted Results (Constant)	18.702	.218	.000
CEOs	.324	.332	.330
Adjusted Results (Constant)	17.678	.373	.000
CEOs	.277	.313	.380
Teaching	.781	.368	.036
North	1.118	.407	.007
Midwest	.518	.419	.215
South	.773	.535	.151
Long Tenure	.095	.320	.766
Large Size	.629	.363	.086

R2=.008 in step1, R2=.191 in step 2 R2 change =.182

Hypothesis 7

In the step one multiple regression analysis, hospitals with physician CEOs showed the B coefficient was -0.051, and R2 was .067 with a p value of .006 (see Table 4.10). When a step two regression analysis was conducted for covariates, the significant outcome variables (PSI in hospitals with physician CEOs) stayed statistically significant with a B Coefficient of -.050 with a p value equal to .009. R2 became .110 with an R square change of .044 (see Table 4.10).

There was a negative correlation between PSI and physician CEOs (r= -.259), which indicated that employment of physician CEOs correlated with lower safety events with a p value equal to .003. There was no correlation between PSI and covariates.

Table 4.10

Multivariate: Regression Results for Relationship between MD CEO and Patient Safety Index (PSI)

	B	SE	P Value
Unadjusted Results (Constant)	.990	.012	.000
CEOs	-.051	.018	.006
Adjusted Results (Constant)	.978	.023	.000
CEOs	-.050	.023	.009
Teaching	.026	.022	.250
North	.018	.024	.454
Midwest	-.018	.086	.457
South	.020	.035	.563
Long Tenure	-.002	.019	.930
Large Size	.001	.023	.966

R2=.067 in step1, R2=.110 in step 2 R2 change=.044

Financial Hypotheses

Hypothesis 8

A two-step multiple regression analysis confirmed the finding of statistical significance. There was a significant correlation between hospital physician CEOs and increased cost per patient discharge rate by (r=.208), and the B Coefficient in the second step was $522.83 more in hospitals that employed physician CEOs with a p value equal to .028.

R Square explained 4.34% of the variance of the cost per patient discharge related to hospitals employing physician CEOs (see Table 4.11). In step two, the means difference fell to $475.08 related to physician CEOs but remained statistically significant with a p value of .034, and the change R2 of .22.

Other covariates also explained this variance in changing costs. Specifically, teaching hospitals charged $746.79 more with a p value of .006, but Northeastern

locations showed significant cost reduction by $1,018.85, p = .001, and Midwest

($623.72 less) at p=.42 (see Table 4.11).

Table 4.11

Multivariate: Regression Results for Relationship between MD CEO Adjusted Inpatient Expense per Discharge

	B	SE	P Value
Unadjusted Results (Constant)	6258.633	156.448	.000
CEOs	522.829	234.150	.028
Adjusted Results (Constant)	6506.027	271.526	.000
CEOs	475.027	221.326	.034
Teaching	746.791	268.692	.006
North	-1018.847	296.712	.001
Midwest	-623.721	302.606	.042
South	-652.548	382.362	.563
Long Tenure	218.342	224.604	.333
Large Size	464.644	269.348	.087

R2=.043 in step1, R2=.224 in step 2 R2 change =.180

Hypothesis 9

Multiple regressions were modeled in two steps. In the first step, before and after

adjusting for the covariates, differences were not statistically different with p values of

.226 and .387. There was a significant negative correlation (r was -.173) between profit

margin and teaching hospitals with a p value of .045 making $2.219 million less in profits

(B Coefficient) (see Table 4.12). None of the other covariates, including physician CEOs,

had a statistically significant correlation with operation profit.

Table 4.12

Multivariate Regression Results for Relationship between MD CEO and Adjusted Operating Profit Margin Average 2009-2011

	B	SE	P Value
Unadjusted Results (Constant)	4.512	.615	.000
CEOs	1.129	.927	.226
Adjusted Results (Constant)	5.004	.927	.000
CEOs	.828	.952	.387
Teaching	-2.219	1.097	.045
North	-.565	1.220	.644
Midwest	.517	1.318	.696
South	-1.072	1.598	.504
Long Tenure	.341	.964	.387
Large Size	1.624	1.318	.142

R2=.015 in step1, R2=.080 in step 2 R2 change =.065 P=.365

Summary of Results

The purpose of this study was to compare the clinical and financial performance of acute care, not-for-profit hospitals employing physician CEOs with acute care, not-for-profit hospitals employing non-physician CEOs. To achieve this objective, the researcher examined relationships of selected standardized clinical quality and financial outcome variables with predictor variables of hospitals that employed physician CEOs and non-physician CEOs. The following is a result of the analysis. A summary of results can be found in Table 4.13.

1. 30-Day Risk-Adjusted Mortality Rates for AMI Patients were lower in hospitals employing physician CEOs. The statistical significance was $p<.05$.

2. 30-Day Risk-Adjusted Mortality Rates for Heart Failure Patients were lower in hospitals employing physician CEOs. The statistical significance was $p<.05$.

3. 30-Day Risk-Adjusted Mortality Rates for Pneumonia Patients were lower in hospitals employing physician CEOs. The statistical significance was $p < .05$.

4. 30-Day Risk-Adjusted Readmission Rates for AMI Patients were higher in hospitals employing physician CEOs and not statistically significant.

5. 30-Day Risk-Adjusted Readmission Rates for Heart Failure Patients were lower in hospitals employing physician CEOs and not statistically significant.

6. 30-Day Risk-Adjusted Readmission Rates for Pneumonia Patients were higher in hospitals employing physician CEOs and not statistically significant.

7. Risk-Adjusted Patient Safety Index was lower in hospitals employing physician CEOs. The statistical significance was $p < .05$.

8. Adjusted Inpatient Expense per Discharge provided higher cost per patient care in hospitals employing physician CEOs. The statistical significance was $p < .05$.

9. Profitability (Adjusted Operating Profit Margin) trended higher in hospitals employing physician CEOs but not statistically significant.

Table 4.13

Summary Graph Comparing Outcome Measures for Physician CEOs to Non-physician CEOs

Outcome Variable	Sig.	P Value	Mean Difference
AMI 30d mort rate	Lower Sig.	.001	-.9637
HF 30d mort rate	Lower Sig.	.005	-.7880
PNEU 30d mort rate	Lower Sig.	.014	-.787
AMI 30d readmission rate	Not Sig.	.608	.157
HF 30d readmission rate	Not Sig.	.625	-.198
PNEU 30d readmission rate	Not Sig.	.380	.277
PSI (Patient Safety Index)	Lower Sig.	.009	-.050
Avg. Expense per Patient Discharge	Higher Sig.	.034	$475.027
Adj. Operating Profit Margin	Not Sig.	.376	.828

CHAPTER 5

DISCUSSION

Assessment of Findings

This study found the quality indicators of mortality and safety, in addition to cost,

were different between the two groups. The three standardized outcome variables, acute

myocardial infarction (AMI), heart failure (HF), and pneumonia mortality rates were

favorably lower with statistically significant p values < .05 in the study group of hospitals

with physician CEOs relative to hospitals with non-physician CEOs. For safety, the study

group of hospitals with physician CEOs showed a favorable, lower index with fewer

events and was statistically significant at p<.05. On the other hand, the study group of

hospitals with physician CEOs showed higher expense per discharge and was statistically

significant at p<.05 relative to hospitals with non-physician CEOs which where

statistically low.

Finally, the operation profit margin was not statistically different between study

and comparison groups.

The higher expense per discharge could be explained by the increased cost related

to improving clinical outcomes. As stated by Bechel, Myers, and Smith (2000),

"Hospitals with higher scores on patient centered care were associated with better clinical

outcomes, at a higher cost per patient" (p. 1) Outperforming hospitals may achieve better

clinical outcomes, at a higher cost, but without negatively affecting the profit margins.

Somehow the physician-led hospitals must have collected more revenue to be more

profitable despite having higher costs per discharge. In this study, hospitals with physician CEOs had higher operation profit margins, but these data were not statistically significant with p=.376 (see Table 4.13).

The researcher can summarize the finding; outperforming hospitals with physician CEOs achieved better clinical mortality outcomes, at a higher cost, but without negatively affecting the profit margins based on this study.

There were no other covariates (in this study) in addition to the CEO that were significant (p<0.05) in the hospitals with physician CEOs which were associated with lower 30-day mortality rates in AMI. However, large hospitals relative to small hospitals were lower in 30-day mortality rates in HF and Pneumonia.

Northeast location was associated with higher readmission rates in AMI and HF and was statistically significant even though CEOs, regardless of their background, (physician or non-physician) were not associated with statistically significant higher or lower rates.

In the case of 30-day pneumonia readmission, multi-covariates were associated with statistically significantly higher rates and among those were Northeast location, teaching status, and large size hospitals. Again, the background of CEOs (physician or non-physician) was not associated with statistically significant higher or lower rates.

Since the researcher only found physician CEOs to be associated with statistically significantly lower rates in patient safety index (PSI) and no other covariates were associated with reduced rates in (PSI), this may place particular importance of physician CEO on safety.

Both physician CEOs and teaching hospitals were associated with statistically significantly higher cost per patient. However, Northeast and Midwest locations were associated with lower cost per patient discharge.

Teaching hospitals were the only covariate associated with statistically significantly lower profit margin and none of the other covariates were statistically significant at p<.05, including physician CEOs.

As previously noted, cardiac specialty hospitals were excluded to minimize a bias in selection (especially in comparing rates related to AMI and HF). The study used composite scores for performance measures since they were both objective and standardized.

Discussion

Hospitals constantly aspire to provide high quality, safe, and cost-effective care. The increasing interest in healthcare performance measures reflects the growing awareness that in order to improve, it is necessary to measure and monitor performance. The challenge faced by researchers, funders, and providers is to identify measures that are robust, accurately reflect the multi-dimensional construct of a healthcare service, and are responsive to change.

The CMS has identified several standardized measures that can be used to reimburse the reporting healthcare facility based on the values of the mortality and readmission rates. In this study, the researcher selected common mortality conditions used by CMS as quality indicators as well as selected patient safety index (PSI) as a safety indicator.

This selection of quality and safety variables was by no means inclusive of all essential diagnoses in acute care facilities; they were, however, representative of common diseases and frequently used to identify hospitals for pay for performance.

The financial variables in this investigation have also been used by many researchers (e.g., Thomason Reuters Top Performing Hospitals 2011) and included short-term, inpatient expense per discharge and operation margins. All of the variables used, including mortality and readmission quality, safety, and financial indicators, were adjusted for case mix index.

As related to AMI mortality, Curry and colleagues (2011) found a correlation between the organizational culture, led by the top management including the CEO. Curry et al. (2011) noted that a reduced mortality rate of acute myocardial infarction correlated with the hospital characteristic of CEO leadership involvement in quality improvement in addition to practice guidelines.

The result of this current study does not necessarily suggest that a non-physician CEO who leads a quality improvement effort in order to reduce mortality rates in acute myocardial infarction would be less effective than a physician CEO nor does it suggest that a physician CEO who leads the quality improvement effort in order to reduce mortality rates in acute myocardial infarction would be more effective than a non-physician CEO. Simply stated, the employment of physician CEOs explained 6.8% of the variation for lower rates in AMI mortality than employment of non-physician CEOs (and was statistically significant with a p value of .001). This is a small percentage of variance explained by this single characteristic. However, the overall percentage related to non-

clinical component could be related to other managerial, logistical, system affiliation, and other factors.

Additionally, this statistically significant result and the covariates of large hospital association with lower heart failure (HF) and pneumonia mortality rates, along with physician CEOs, is supported by previous research. For example, Gandjour et al. (2003) investigated an association between hospital volume and risk-adjusted mortality. In a systematic review, the authors found that volume related to activity levels of a hospital for a particular diagnosis or treatment (including 33 diagnoses and interventions of varying quality and a range of sample sizes) was associated with mortality. This systematic review concluded that there was a significant association between hospital volume and mortality. A decrease in mortality was found to be associated with higher hospital volume for 22 of 33 (67%) of the studies reviewed. The summary odds ratio for the most robust studies on hospital volume was 0.87 (with a 95% confidence interval: 0.85-0.89). This indicates that, in general, higher hospital volume is associated with higher rates of survival.

In this current investigation, the PSI was statistically significantly lower, p= .009 (after adding other covariates) in hospitals employing physician CEOs in comparison to non-physician CEOs. There was a negative correlation (r=-.295) between physician CEOs and PSI with fewer events reported in the study group.

In the relatively small sample of this study, teaching hospitals showed a higher score (with more adverse events) by .026, but it was not statistically significant. The Agency for Healthcare Research and Quality (2012) user comparative database report on patient safety culture showed nonteaching hospitals consistently rated patient safety

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culture composite items higher than teaching hospitals. This report used the patient safety

culture which is different than patient safety index (PSI) that was used in this current

study. Results of both instruments trended in the same direction despite the differences in

measurement.

Analysis for cost per patient discharge in this investigation favored non-physician

CEOs. Physician CEOs explained only 4.3% of the increased cost per patient discharge

related to physician CEOs. Other covariates in the study explained up to 22.4%, however,

teaching hospitals increased cost, and the p value was .006. On the other hand, locations

in Northeast reduced cost with a p value of.001 as well as in Midwest, which had a p

value of .042. This means that the South and West regions incurred more cost per patient

discharge.

A cross-sectional study which investigated an association between risk-adjusted

mortality rates and cost inefficiency does not support findings of this current study (Deily

& McKay, 2006). The study included urban, acute-care hospitals in Florida over a time

period of 1999-2001. Hospital cost inefficiency scores, average hospital costs, and risk-

adjusted mortality rates were calculated in order to examine an association between

hospital cost efficiency and quality of care. Hospitals with lower risk-adjusted mortality

were found to be associated with lower inefficiency ($p<0.01$). This equated to a one

percentage point decrease in inefficiency being associated with one fewer death per

10,000 discharges when all other variables were constant. The models explain 71% of the

observed variation (R^2). While this study supported an association between higher cost

efficiency and a reduction in mortality rates, the cross-sectional study design did not

allow for identification of a causal relationship. Therefore, even though this current study

established reduction in mortality rate, this did not translate to reduction in cost at hospitals led by physician CEOs.

The expenses incurred to establish high quality programs are related to many factors including physician CEOs, the variance of 4.3% was less with non-physician CEOs who have backgrounds in finance. But we have to consider the fact that high quality programs cost more than low quality programs because high quality programs purchase expensive technology programs and tools that add to quality or safety (e.g., computerized physician order entry−CPOE−systems and patient safety and financial performance) (Eslami et al., 2008; Wolfstadt et al., 2008). This does not to negate the fact that process improvement without adding staff improves safety and quality (e.g., Virginia Mason experience with Toyota process improvement).

In this study, there was a significant negative correlation (r= -.173) with a p value of .041 (for correlation) between profit and teaching hospitals, which reduced the profit by $1.072 million. No other covariates, including employed physician CEOs, showed a correlation with operation margin and a statistical significance.

The trended higher profit was not related to hospital physician CEOs employment but could be related to other factors. As the margin was not affected, even though the cost was higher, this support the fact that quality programs will not make the bottom line suffer.

The effect of physician CEOs on activities that directly impacted these outcomes was mediated by many other factors in the case of readmission. Thus, the relationship association did not show any statistical difference. This study identified only hospitals located in the Northeast to be associated with higher rates of readmission in all three

conditions of acute myocardial infarction (AMI), heart failure (HF), and pneumonia.

CEO background did not show any significant difference. Another factor was that

teaching hospitals were associated with higher readmission rates. Both of these factors

were not favorable since they were associated with higher readmission rates.

In addition to the high costs associated with preventable readmissions,

preventable readmissions rates are increasingly being used as a quality indicator which is

scrutinized by commercial payers and consumers alike. This can also affect a hospital's

bottom line. This is not relevant to this current study but can make the results more

difficult to explain.

The significance of reducing rates of readmission is obvious as the government

will enforce two programs in order to achieve this goal. The Hospital Readmissions

Reduction Program, which is part of CMS Inpatient Prospective Payment System, will

reduce Medicare reimbursements to hospitals with high levels of preventable, 30-day

readmissions for three high-volume conditions: acute myocardial infarction, heart failure,

and pneumonia. Additionally, the CMS Hospital Value-Based Purchasing Program

includes measures for readmissions, which will further penalize hospitals for high rates of

preventable readmissions. Both of these programs became effective in fiscal year 2013.

This is important as readmission reduction can be a strategy to increase revenue and

improve operation margin.

In this study, hospitals with physician CEOs were not different from those with

non-physician CEOs in terms of readmission rates. Strategic direction by top

management, including the CEO, with delegation of responsibility to nursing leadership

in the hospital will facilitate readmissions. This strategic direction will be extremely

important in the three hospital characteristics identified in this study: large size hospitals, northeast location, and teaching status. There are many reduction programs in addition to future evidence-based management practices. These programs and solutions are not impacted by either medical knowledge or management knowledge. Also, all of these programs are related to new experiences in the health industry. As such, being a physician or non-physician CEO would not have bearing on the readmission rates.

The pay-for-performance model, aligned with federal accountable care guidelines, is designed to give incentives to hospitals and physicians to collaborate in efforts to reduce hospital-acquired infections and readmissions and to follow evidence-based guidelines for surgical care and the treatment of heart attacks, heart failure, and pneumonia. There are numerous ways to reduce preventable hospital readmissions that are based on a combination of research and successful hospital initiatives, even though the readmission rate has been shown to be related to poor follow-up care and poor adherence to therapy.

There are a number of programs and initiatives that demonstrate factors that reduce readmission rates but do not fit in the domain of CEO education background or skills. They include innovative ways used by the hospital industry at large to reduce readmission.

Certain patient populations are at increased risk of hospital readmission. Research from the Healthcare Cost and Utilization Project (HCUP) suggests, for instance, that Medicaid patients and uninsured patients are at an increased risk for readmission. Specifically, research by HCUP showed maternal readmission rates were approximately 50% higher for the uninsured and Medicaid patients than for privately insured patients.

Therefore, hospitals that serve this high risk population will experience more readmission. Hence, adjustment must be made when evaluating readmission in these hospitals. Again, a CEO's educational background cannot impact this problem among this population.

Healthcare experts agree that patients with limited English proficiency are also at an increased risk of readmission. In fact, The Joint Commission recently established new requirements for hospitals delivering care to limited English proficiency patients (e.g., requiring interpreters and Sign Language for deaf and hard of hearing patients). Of course, this will increase the cost of providing care to this population of limited English proficiency patients, and proper reimbursement by payer must be considered to offset the cost. This is also unrelated to a CEO's educational background and may explain the finding of no difference between the two groups in readmission.

The Readmission Prevention-focused Collaborative, which is a year-long collaborative involving 50 hospitals championed by The New Jersey Hospital Association, partnered with nursing homes and home health agencies to reduce hospital readmissions for heart failure. This is a partnership supported by state hospital associations and nursing homes. Although 50 hospitals joined the Collaborative, it was outside of any particular hospital design and was not impacted directly via the CEO education background.

Medical studies have suggested that patients who followed-up with their physician within seven days of discharge were less likely to be readmitted to the hospital. This is out-of-the-hospital activity and neither the CEO nor the hospital can impact these behaviors.

Services by Avalere Health LLC, home healthcare for chronically ill patients, resulted in an estimated 20,426 fewer hospital readmissions than chronically ill patients receiving other post-acute services, such as long-term acute-care hospital services. In addition to home healthcare, transitional care has been shown to reduce hospital readmissions. One study conducted at Baylor Medical Center at Garland (Texas) found a nurse-led transitional program reduced adjusted 30-day readmission rates by 48%. This is also an out-of-hospital activity and was related to robust follow-up; however, if the hospital continuum of care includes home care and specialty hospital for long-term acute-care, both may reduce readmission to that hospital indirectly.

Researchers conducted a systematic review of literature and analyzed 21 randomized clinical trials of transitional care interventions involving chronically ill adults. These authors discovered nine common interventions that helped drastically lower readmissions 30 days post-discharge, many of which included some variation of nurse involvement. They concluded that hospitals should position nurses in leadership roles, such as clinical managers or in-person home visitors, for discharged patients. Another study showed that effective and proper nurse staffing, while patients are still in the hospital, can decrease preventable readmissions. This is a nursing leadership-related solution rather than one directly impacted by the CEO.

At the University of California in San Francisco (UCSF) Medical Center, a team of multidisciplinary heart failure experts monitored heart failure patients after discharge. These experts targeted preventable readmissions by educating patients about their diseases and utilizing the "Teach Back" method. UCSF Medical Center's multidisciplinary-expert approach helped reduce 30-day and 90-day readmissions for

heart failure patients 65 and older by 30%. Additionally, a Horizon Blue Cross Blue Shield pilot program in New Jersey is closely monitoring congestive heart failure patients in their own homes in an effort to drive down hospital readmissions. This is another example of a new innovation to reduce readmission which also has no relation to the educational background of CEOs.

In summary, all of the programs mentioned above either have no relation to CEO educational background or were not directly related to management verses medical background issues. This is consistent with the findings from this current study of no difference between physician and non-physician CEOs in 30 day readmission rates.

The readmission reduction was not different between the two groups and there was no association with the CEO's background. On the other hand, the clinical outcome findings (AMI, HF, and pneumonia mortality reduction/safety) showed association with physician CEOs, and the study can be explained by expert leadership theory (Goodall, 2012). Accordingly, the experts in the hospital's core business (specialized patient care) were physician CEOs who led the improvement of a particular quality care (mortality) and safety in this study, had the medical industry experience, and maintained deep medical knowledge in the core of the business (see Theoretical Framework in Literature Review−The Expert Leadership Theory-TEL). Using the same theory, it was expected that in the short-term, non-physician CEOs with background and expertise in finance and who carefully supervised cost would reduce expenses per patient discharge.

Conclusions

The results of this study showed statistically significant reduction in mortality rates ($p<.05$) in three common diseases: acute myocardial infarction (AMI), heart failure

(HF), and pneumonia as quality indicators. The patient safety index (PSI) was also

statistically lower (p<.05) in hospitals with physician CEOs showing fewer adverse

events. On the other hand, the expense per patient discharge was significantly higher

(p<.05) among hospitals with physician CEOs (who were outperformed by non-physician

CEOs). The hospital operating profit margins did not show statistically significant

differences between the study group and the comparison group. This can be rephrased by

saying; to achieve better mortality rates, higher expenses for quality could be incurred,

but the profit margin can be maintained (see Figure 5.1).

Inherent Medical Knowledge	Less Financial Knowledge
Better	At extra
Mortality Quality/Safety	Expense
Maintain Bottom Line (Operation Profit Margin)	

Figure 5.1. Summary of physician CEOs and their performance.

A bigger issue is that the U.S. healthcare system lags behind health systems in

other countries, which raises questions regarding the role of leadership. The findings of

this research reveal that in several of the mortality measure for quality and safety,

physician CEOs outperformed non-physician CEOs. This research does not demonstrate

that the U.S. healthcare system will be dramatically improved if there are more physician

CEOs. However, the small percentage of variance in mortality and safety (PSI) explained

by having physician CEOs, which represent less than 10%, can be a small part of the

bigger picture in reshaping the health system in the United States. These findings should

encourage us to search for other possible business models that make the health industry

sustainable and of great value.

Significance of Findings

CMS reimbursement is usually higher for hospitals above the benchmark for mortality rate reduction. This form of payment for performance (P4P) is expected to play an increasingly greater role with the implementation of the Patient Affordable Prevention and Care Act (PAPCA) and the Accountable Care Organization (ACO) financial future.

Additionally, the ACO incentive P4P will bring a challenge to hospitals to balance their increased capital expenditures for new medical technology and the demand on ACOs to reduce costs. This proposition has to be balanced with the charges, expected profit, and the improved clinical mortality rates.

Limitations

This study was cross-sectional and only permitted assessment of associations. It did not allow for the examination of causal associations in performance. Further, it was particularly susceptible to biases resulting from unobserved heterogeneity among healthcare services included in the analysis. This study did not include adjustment for clustering, and the failure to adjust for clustering increases the risk of a Type 1 error, a false positive finding.

Additionally, this study did not address whether a physician CEO's characteristics and leadership style or management skills produced lower rates of AMI, HF, or pneumonia mortality. As such, this study permitted assessment of associations but did not permit an examination of causal associations.

The reliability and validity measures remain, to some extent, unproven. While the uses of these measures is becoming standardized and increasingly being recommended by CMS for mortality and readmission, their use is challenging.

Even though methods used to construct these measures were similar and included a balance of quality, safety, and financial domains, the measures addressed a small number of common diseases in mortality and readmissions and limited financial measures that represented cost and profit. In a complex medical care landscape, with too many variables interweaving to produce the final quality service line, these matters are not simple.

For example, these measures do not take into account the patient experience, which, although subjective, is an important factor in determining quality. Services are provided to patients who should value the quality of the service and the outcome of their care. Currently, the outcome is not valued by the one who experiences the service. Instead, it is determined as a measure accepted by a third party but reported by the provider of the service. Also, the receiver of the service does not pay for the service that is prepaid or to be paid by the third party. Patient surveys of hospital quality, copayment of services, and independent party reporting for quality measures could be future steps to be considered in hospital performance and as such to be part of future research.

The use of performance measures, such as composite scores, is likely to provide more robust data quality. However, composite measures may also lead to simplistic conclusions as there is no detail of factors that confound or mediate those outcome measures.

There are clearly many factors that impact a patient's quality of care and a healthcare service's performance. The measures used in previous studies only covered a small proportion of these factors, and thus may not truly reflect healthcare service performance as a whole. It is therefore difficult to conclude that performance measures

are the most appropriate and the most likely to provide the greatest understanding of overall service performance. Consequently, the measure factors presented in this study are only one part of a larger, more complex set of factors which are important to performance and need to be explored in the future.

Variables at specific hospitals could have been lower than other times, but the average may not have been reflective, especially regarding the financial operative profit margin direction. Moreover, this could be negative with loss or positive with gain; however, the direction is important because one hospital is improving, and the other is suffering. This is a limitation when the average is calculated because improvement will be cancelled with loss, and a short period (three and a half years) will not be reflective of the true performance.

This study did not address the case of a non-physician CEO who has a highly effective CMO to diminish the rate of AMI and HF mortality. The process of care performance was limited to three conditions (AMI, HF, and Pneumonia) instead of the entire hospital population. There were no other areas tested in clinical quality, and generalizations to other clinical areas of hospital care must be made with caution especially as many services are not in the domain of these three entities.

The cost per patient discharge was a total inpatient cost and not specific to cardiac care or pneumonia since it included other inpatient care. The operating profit margin was also general and not specific to disease or department tested. A direct link of cost and profit to specific clinical entities needs to be addressed in future studies. Additionally, the sample size reduced the strength of statistical findings. Thus, future research with larger sample sizes should be conducted.

Data were limited due to the small number of physician CEOs (in the U.S., only 3.6% of 6,000 hospitals). This study utilized a convenience sample of physician administrators, which may have created selection bias even though it was the necessary method of sampling due to the small number of hospitals with physician CEOs.

This study could not test CEO characteristics empirically as it was beyond the scope of the research question. This limited the study to certain hospital characteristics. Future investigators are encouraged to examine CEO characteristics in further research.

Strengths of This Study

1. Measures were objective and standardized since composite scores were used for performance measures.

2. Measures were adjusted for case-mix severity.

Recommendations for Management Practice and Health Professional Schools

A hospital board's expectations should be realistic when it employs a physician CEO for the purpose of improving certain quality metrics (e.g., 30 days mortality reduction). The board, as well as the CEO of any hospital, regardless of the background of the CEO, should be creative about implementing a new business model that can sustain the ailing industry, including medical leadership, not necessarily at the level of CEO in improving quality and safety. Hospital boards and healthcare managers should look at the findings of this study since one of the options to reduce mortality rates and patient safety index is to retain physician CEOs. This appears to be a viable strategy if the operation margin is sound, but the mortality rate is suffering. However, this strategy should be used with caution if the expense per discharge is already high. Further, this strategy should not be used in isolation from the big picture facing the healthcare

industry. The researcher suggests that these models will help but does not believe that there is one panacea to cure the industry.

If increased demand for physician CEOs increases, professional schools can fill the gap of management education among physicians by creating innovative programs focused on strategic management and leadership development which are customized for physicians.

Recommendations for Future Research/Analysis

Future research should address some of the limitations previously mentioned. Ideally, a larger pool of physician CEOs could be tested. An empirical study is needed to compare physician CEOs with non-physician CEOs who have effective CMOs.

In this study, CEOs stayed in their current position for at least three and a half years to be included in an attempt to strengthen the relationship between performance and tenure. Longer tenure in future studies could be helpful to identify this relationship.

Whether physician CEOs truly have a direct and positive impact on the mortality variables is not established in this study, as this study does not permit causal inference; future studies to find causality are needed.

Leadership characteristics of effective CEOs in hospitals must also be compared between the two groups. A prospective study is needed to assess the intervention for poor quality indicators seen in certain hospitals and whether the choice of a physician CEO could be part of the intervention plan. Additional studies quantifying effective strategies for hospital employment are needed to make the best decisions regarding CEO characteristics and the effect of CEO employment on clinical and financial performance of hospitals.

Summary

Clinical mortality quality and patient safety are critical components of healthcare management. Affordable care with reduced cost will be an essential part of healthcare sustainability in the United States. Finally, to have a meaningful operating profit margin, a higher payment for better, clinical quality performance must be considered.

This study sought to determine the performance of hospitals that employed physician CEOs. It is the first quantitative study testing the performance of these hospitals using composite scores measures.

The study group of hospitals that employed physician CEOs and the comparison group of hospitals that employed non-physician CEOs were compared on 30-days mortality and readmission rates in AMI, HF, and Pneumonia. All three mortality measures were lower and statistically significant among hospitals that employed physician CEOs; including mortality in acute myocardial infarction (AMI), heart failure (HF), and pneumonia.

The Patient Safety Index (PSI) was also compared between the two groups. It was found to be lower with less adverse events among the physician CEOs group and reached strong statistical difference. Contrary to clinical quality, the expense per patient discharge was found to be lower among hospitals that employed non-physician CEOs. This finding was also statistically significant.

The hospital profit margin related to operation and patient care was found to be only slightly higher but was not statistically significant among hospitals that employed physician CEOs.

Readmission rates of the common three diagnoses were not different between hospitals with physician and non-physician CEOs. These quality measures (preventing readmission) depended on other factors that were not related to the CEO's background.

Physician CEOs also achieved better clinical quality (reduced mortality) without affecting the general operation margin even though they incurred more general expenses per patient discharge.

A new business model is needed to improve the U.S. healthcare system. The hiring of more physician CEOs when they outperformed non-physician CEOs may help on a small scale and only in hospitals with sound profit margins and poor rates of mortality for the three common diagnoses investigated. This study may serve as a practical tool to inform hospital boards of the use of one emerging employment strategy of physician CEOs and the extent to which it can contribute to clinical and financial performance.

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APPENDIX A

METHODOLOGY

Methodology-Top 100 hospitals

Methods for identifying complications of care. To make valid normative comparisons of hospital outcomes, it was necessary to adjust raw data to accommodate differences that resulted from the variety and severity of admitted cases. It was also necessary to account for individual facility characteristics that affected the clinical outcomes measures, such as the hospital's geographic location, size, teaching status, and community setting (urban versus rural).

Risk-Adjusted Mortality Index Models

Valid normative comparisons of mortality and complications rates were created by using patient-level data to control effectively for case mix and severity differences. This was done by evaluating ICD-9-CM diagnosis and procedure codes in order to adjust for severity within clinical case mix groupings. Conceptually, patients with similar characteristics (i.e., age, sex, principal diagnosis, procedures performed, admission type, and comorbid conditions) were grouped to produce expected, or normative, comparisons. In the same way, facilities with similar characteristics were also grouped together. Through extensive testing, this methodology produced valid normative comparisons using readily available administrative data, eliminating the need for additional data collection.

Normative database of case-level data from Projected Inpatient Data Base (PIDB) national all-payer database containing over 21 million all-payer discharges annually were obtained from approximately 2,500 hospitals, representing more than 50% of all discharges from short-term, general, nonfederal hospitals in the United States. The data include age, sex, and length of stay (LOS); clinical groupings (Medicare Severity

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Diagnosis-Related Groups (MS-DRGs), ICD-9-CM principal and secondary diagnoses, ICD-9-CM principal and secondary procedures); hospital identification; admission source and type; present on admission (POA) indicators; and discharge status. Hospital characteristics were obtained by linking each hospital's identification number with American Hospital Association and Medicare Cost Report data.

Excluded patient groups were neonates, cases coded as palliative care (ICD-9-CM code V66.7), cases transferred to other short-term hospitals, and cases with stays shorter than one day. Also, clinical groupings such as psychiatry/mental illness, substance abuse, rehabilitation, obstetrics, and pediatrics (under 17 years of age) required special consideration with regard to outcomes and so were excluded from the general risk-adjusted mortality measure.

Note: This section details the methods used to produce the 100 Top Hospitals® award winners. For details on the methods used to find the Everest Award winners, please see the special Everest Awards section of this document.

A standard logistic regression model was used to estimate the risk of mortality or complications for each patient. This was done by weighting the patient records of the client hospital by the logistic regression coefficients associated with the corresponding terms in the model and the intercept term. This action produced the expected probability of an outcome for each eligible patient (numerator) based on the experience of the norm for patients with similar characteristics (age, clinical grouping, severity of illness, and so forth) at similar institutions (hospital bed size, census division, teaching status, urban or rural community setting). This methodology also ensured that facilities were compared to other facilities with similar characteristics.

Thomson Reuters staff physicians suggested important clinical patient characteristics that were also incorporated into the models. After assigning the predicted probability of the outcome for each patient, the patient-level data could then be aggregated across a variety of groupings, including hospital, service, or the DRGs and RDRGs classification systems, which were developed at Yale University in the 1980s.

Thomson Reuters 100 Top Hospitals

Expected Complications Rate Index Models

Risk-adjusted complications refer to outcomes that may be of concern when they occur at a greater than expected rate among groups of patients, possibly reflecting systemic quality of care issues. The Thomson Reuters complications model uses clinical qualifiers to identify complications that have occurred in the inpatient setting. The complications used in the model are displayed in the following table:

Complications that have occurred in the inpatient setting

Complication	Patient Group
Post-operative complications relating to urinary tract	Surgical only
Post-operative complications relating to respiratory system except pneumonia	Surgical only
GI complications following procedure	Surgical only
Infection following injection/infusion	All patients
Decubitus ulcer	All patients
Post-operative septicemia, abscess, and wound infection	Surgical, including cardiac
Aspiration pneumonia	Surgical only
Tracheostomy complications	All patients
Complications of cardiac devices	Surgical, including cardiac
Complications of vascular and hemodialysis devices	Surgical only
Nervous system complications from devices/complications of nervous system devices	Surgical only
Complications of genitourinary devices	Surgical only
Complications of orthopedic devices	Surgical only
Complications of other and unspecified devices, implants, and grafts	Surgical only
Other surgical complications	Surgical only
Miscellaneous complications	All patients
Cardio-respiratory arrest, shock, or failure	Surgical only
Post-operative complications relating to nervous system	Surgical only
Post-operative acute myocardial infarction	Surgical only
Post-operative cardiac abnormalities except AMI	Surgical only
Procedure-related perforation or laceration	All patients
Post-operative physiologic and metabolic derangements	Surgical, including cardiac
Post-operative coma or stupor	Surgical, including cardiac
Post-operative pneumonia	Surgical, including cardiac
Pulmonary embolism	All patients
Venous thrombosis	All patients
Hemorrhage, hematoma or seroma complicating a procedure	All patients
Post-procedure complications of other body systems	All patients

Complications of transplanted organ (excludes skin and cornea)	Surgical only
Disruption of operative wound	Surgical only

The Thomson Reuters complications model uses clinical qualifiers to identify complications that have occurred in the inpatient setting.

Complications rates are calculated from normative data for two patient risk groups: medical and surgical. A standard regression model was used to estimate the risk of experiencing a complication for each patient. This was done by weighting the patient records of the client hospital by the regression coefficients associated with the corresponding terms in the prediction models and intercept term. This method produced the expected probability of a complication for each patient based on the experience of the norm for patients with similar characteristics at similar institutions. After assigning the predicted probability of a complication for each patient in each risk group, it was then possible to aggregate the patient-level data across a variety of groupings.

Patient Safety Indicators

The Agency for Healthcare Research and Quality (AHRQ) is a public health service agency within the federal government's Department of Health and Human Services. The agency's mission includes both translating research findings into better patient care and providing policymakers and other healthcare leaders with information needed to make critical healthcare decisions. The AHRQ's Patient Safety Indicators (PSIs) were used in calculating risk-adjusted patient safety index performance measure. This information on PSIs was culled from the AHRQ website (ahrq.gov): The AHRQ Quality Indicators measure healthcare quality by using readily available hospital inpatient

administrative data. Patient Safety Indicators are a set of indicators providing information on potential in-hospital complications and adverse events following surgeries, procedures, and childbirth. The PSIs were developed after a comprehensive literature review, analysis of ICD-9-CM codes, review by a clinician panel, implementation of risk adjustment, and empirical analyses. The Patient Safety Indicators provided a perspective on patient safety events using hospital administrative data. Patient Safety Indicators also reflect quality of care inside hospitals, but focus on surgical complications and other iatrogenic events.

For the risk-adjusted patient safety index performance measure, all PSIs that occurred with sufficient frequency to generate provider-specific output were examined. Of the 20 PSIs included in the original AHRQ methodology, only 15 produced non-zero PSI rates on the Medicare data. Four measures related to birth or other obstetrical-related conditions, which did not occur in the age group in this investigation. Transfusion reactions generated rates that were too low for the AHRQ PSI software to generate provider-specific output. Due to the unreliability of E coding, the following conditions were excluded: complications of anesthesia (PSI 1), foreign body left in during procedure (PSI 5), postoperative hip fracture (PSI 8), and accidental puncture and laceration (PSI 15), which rely on E codes. Since the original analysis was done, PSI 2 (death in low-mortality DRGs) no longer has risk values in the model. Decubitis ulcer (PSI 3) and postoperative pulmonary embolism or deep vein thrombosis (PSI 12) were also excluded. Exclusion of these two PSIs will be reevaluated when more data are available that use POA coding. The AHRQ model version used in this study was Version 4.2, published

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September, 2010. The model used POA coding in 2009 MedPAR data and imputed POA in 2008 MedPAR data.

The final set of eight PSIs in this study included the following:

• Death among surgical inpatients with serious, treatable complications (PSI 4)

• Iatrogenic pneumothorax (PSI 6)

• Selected infections due to medical care (PSI 7)

• Postoperative hemorrhage or hematoma (PSI 9)

• Postoperative physiologic and metabolic derangement (PSI 10)

• Postoperative respiratory failure (PSI 11)

• Postoperative sepsis (PSI 13)

• Postoperative wound dehiscence (PSI 14)

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ECRI and PSI: Complementary Methodologies

Given its high level of importance, an emphasis on patient safety was increasing by using both the PSI (AHRQ) and expected complications rate index (ECRI) methodologies to calculate two separate outcome measures. Both PSI and ECRI are methodologies for identifying complications of care. Although the definitions have some similarities, there are enough differences that the two are useful complements to each other. ECRI is an overall complication methodology in which the outcome is the occurrence of one or more of 30 complications of care. Whereas the AHRQ PSIs used in this study was based on eight separate models that evaluated the occurrence of eight distinct complications of care, one of which is mortality related — an adverse outcome that is not included in ECRI.

Index Interpretation

An outcome index is a ratio of an observed number of outcomes to an expected number of outcomes in a particular population. This index is used to make normative comparisons and is standardized in that the expected number of events is based on the occurrence of the event in a normative population. The normative population used to calculate expected numbers of events is selected to be similar to the comparison population with respect to relevant characteristics, including age, sex, region, and case mix.

The index is simply the number of observed events divided by the number of expected events and can be calculated for outcomes that involve counts of occurrences (e.g., deaths or complications). Interpretation of the index relates to the experience of the comparison population relative to a specified event to the expected experience based on the normative population.

Examples:

10 events observed ÷ 10 events expected = 1.0:

The observed number of events is equal to the expected number of events based on the normative experience.

10 events observed ÷ 5 events expected = 2.0:

The observed number of events is twice the expected number of events based on the normative experience.

10 events observed ÷ 25 events expected = 0.4:

The observed number of events is 60% lower than the expected number of events based on the normative experience. Therefore, an index value of 1.0 indicates no

difference between observed and expected outcome occurrence. An index value greater than 1.0 indicates an excess in the observed number of events relative to the expected based on the normative experience. An index value less than 1.0 indicates fewer events observed than would be expected based on the normative experience. An additional interpretation is that the difference between 1.0 and the index is the percentage difference in the number of events relative to the norm. In other words, an index of 1.05 indicates 5% more outcomes, and an index of 0.90 indicates 10% fewer outcomes than expected based on the experience of the norm. The index can be calculated across a variety of groupings (e.g., hospital, service, and DRG).

Core Measures

Core measures were developed by the Joint Commission and endorsed by the National Quality Forum (NQF), the non-profit public-private partnership organization that endorses national healthcare performance measures, as minimum basic care standards. Core measures are a widely accepted method for measuring quality of patient care that includes specific guidelines for heart attack (acute myocardial infarction (AMI), heart failure (HF), pneumonia, pregnancy and related conditions, and surgical-infection prevention. Composite core measures mean percent were based on the AMI, HF, pneumonia, and surgical-infection prevention areas of this program, using Hospital Compare data reported on the Centers for Medicare and Medicaid Services (CMS) website.

AMI Core Measures

1. Patients given angiotensin-converting (ACE) inhibitor or angiotensin II receptor (ARB) for left ventricular systolic (LVS) dysfunction*

2. Patients given aspirin at discharge*

3. Patients given beta blocker at discharge*

4. Patients given percutaneous coronary intervention within 90 minutes of arrival

HF Core Measures

5. Patients given ACE inhibitor or ARB for LVS dysfunction

6. Patients given discharge instructions

7. Patients given an evaluation of LVS function

8. Patients given smoking cessation advice/counseling*

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Pneumonia Core Measures

9. Patients given initial antibiotic(s) within six hours after arrival

10. Patients whose initial emergency room blood culture was performed before the administration of the first hospital dose of antibiotic(s)

11. Patients given the most appropriate initial antibiotic(s)

12. Patients assessed and given pneumococcal vaccination

13. Patients assessed and given influenza vaccination

14. Patients given smoking cessation advice/counseling

Surgical Infection Prevention Core Measures

15. Patients who were given an antibiotic at the right time (within one hour before surgery) to help prevent infection

16. Patients whose preventative antibiotics were stopped at the right time (within 24 hours after surgery)

17. Patients who were given the right kind of antibiotic to help prevent infection

18. Patients who got treatment at the right time (within 24 hours before or after their surgery) to help prevent blood clots after certain types of surgery

19. Patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries

20. All heart surgery patients whose blood sugar (blood glucose) was kept under good control in the days right after surgery*

21. Patients needing hair removed from the surgical area before surgery, who had hair removed using a safer method (electric clippers or hair removal cream – not a razor)

22. Patients who were taking beta blocker before coming to the hospital, who were kept on the beta blockers during the period just before and after their surgery

Three AMI measures were excluded due to under-reporting in the Hospital Compare database.

The excluded AMI measures were:

• Patients given aspirin at arrival

• Patients given smoking cessation advice/counseling

• Patients given fibrinolytic medication within 30 minutes of arrival

In addition, for all hospitals in the small community hospital comparison group, several core measures were excluded due to non-reporting. These are footnoted in the list above. In calculating each hospital's core measures mean percent, the comparison group median core measure value was substituted for a missing core measure. In addition, the comparison group median core measure value was substituted when the hospital reported core measures with patient counts less than or equal to 25 or with relative standard error values greater than or equal to 0.30. This was done because the original reported values were considered statistically unreliable.

30-DAY RISK-ADJUSTED MORTALITY RATES

AND 30-DAY RISK-ADJUSTED READMISSION RATES

This study included two extended outcome measures — 30-day mortality and 30-day readmission rates, as defined by the CMS Hospital Compare dataset (third quarter, 2010). The longitudinal data period contained in this analysis was July 1, 2006, through June 30, 2009. The Hospital Compare website and database were created by CMS, the Department of Health and Human Services, and other members of the Hospital Quality Alliance. The data on the website came from hospitals that agreed to submit quality information that is made public. Both of the measures used in this study have been endorsed by the NQF. CMS calculates the 30-day mortality and 30-day readmission rates from Medicare enrollment and claims records using sophisticated statistical modeling techniques that adjust for patient-level risk factors and account for the clustering of patients within hospitals. Both rates are based on heart attack, heart failure, and pneumonia patients.

CMS' three mortality models (heart attack, heart failure, and pneumonia) estimate hospital-specific, risk-standardized, all-cause 30-day mortality rates for patients hospitalized with a principal diagnosis of heart attack, heart failure, and pneumonia. All-cause mortality is defined as death from any cause within 30 days after the index admission date, regardless of whether the patient dies while still in the hospital or after discharge.

* This measure was excluded for small community hospitals due to very low reporting.

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CMS' three readmission models estimate hospital-specific, risk-standardized, all-cause 30-day readmission rates for patients discharged alive to a non-acute-care setting with a principal diagnosis of heart attack, heart failure, or pneumonia. Patients may have been readmitted back to the same hospital or to a different hospital or acute-care facility. They may have been readmitted for the same condition as their recent hospital stay or for a different reason (this is to discourage hospitals from coding similar readmissions as different readmissions).23

Protecting Patient Privacy

In accordance with patient privacy laws, no individual hospital data were reported based on 11 or fewer patients. This affected the following measures:

• Risk-adjusted mortality index

• Risk-adjusted complications index

• 30-day mortality rates for acute myocardial infarction (AMI), heart failure, and pneumonia

• 30-day readmission rates for AMI, heart failure, and pneumonia

• Average LOS

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MEDICARE COST REPORT LINE ITEMS USED IN THE PERFORMANCE
MEASURES CALCULATIONS

A number of calculations included data from the Medicare Cost Report. Below are
calculations and the Cost Report locations (worksheet, line, and column) for all of these
items. The following apply to the 100 Top Hospitals study and the hospital Medicare
Cost Report for the hospital fiscal year ending in 2008. Locations of the elements varied
between Cost Reports. The line and column references are the standard based on CMS
Form 2552-96. Any deviations from this standard were checked by system and manual
data analysis to ensure that the coding had been done properly.

Case Mix- and Wage-Adjusted Inpatient Expense per Discharge

$[((0.62 \times$ Acute Inpatient Expense $\div$ CMS Wage Index$) + 0.38 \times$ Acute Inpatient
Expense$) \div$ Acute Inpatient Discharges$] \div$ Medicare Case Mix Index

Acute Inpatient Expense = Inpatient Expense — (Sub provider Expense — Nursery
Expense — Skilled Nursing Facility Expense — Intermediate-Care Facility Expense —
Other Long- Term Care Facility Expense — Cost Centers Without Revenue (e.g. organ
procurement, outpatient therapy, other capital-related costs, etc.)

Inpatient Expense = Sum Over All Departments [(Inpatient Department Charges $\div$
Department Charges$) \times$ Department Cost]

Individual Element Locations in the Medicare
Cost Report:

• Acute Inpatient Discharges — Worksheet S-3, Line 12, Column 15

• Inpatient Department (cost center) elements:

• Fully Allocated Cost — Worksheet C, Part 1, Column 1

• Total Charges — Worksheet C, Part 1, Column 8

• Inpatient Charges — Worksheet C, Part 1, Column 6

• Medicare Case Mix Index — Federal Register: CMS Inpatient Prospective Payment

System (IPPS) Fiscal Year 2009 Final Rule

• CMS Wage Index — CMS Federal Register:

CMS IPPS Fiscal Year 2009 Final Rule

Adjusted Operating Profit Margin

[(Net Patient Revenue + Other Operating Revenue — (Total Operating Expense +

Related Organization Expense)) ÷ (Net Patient Revenue + Other Operating Revenue)]

×100

Other Operating Revenue = [Total Other Income — Other Income: Contributions,

Donations, etc. — Other Income From Investments]

Individual Element Locations in the Medicare

Cost Report:

• Net Patient Revenue — Worksheet G-3, Line 3, Column 1

• Total Other Income — Worksheet G-3, Line 25, Column 1

• Other Income: Contributions, Donations, Etc. — Worksheet G-3, Line 6, Column 1

• Other Income from Investments — Worksheet G-3, Line 7, Column 1

• Total Operating Expense — Worksheet G-3,

Line 4, Column 1

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• Related Organization Expense — Worksheet A-8, Line 14, Column 2

(This information is the basis for the variables results, which provided as a courtesy by Truven Health Analytics.)

APPENDIX B

PERMISSION TO USE FIGURES

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EC1Y

8TZ July

22, 2014

To whom it may concern,

I hereby authorize the use of diagrams from my academic articles to be used in Dr. Al-Midani's dissertation thesis.

With best wishes and congratulations!

Amanda Goodall

APPENDIX C

INSTITUTIONAL REVIEW BOARD LETTER OF APPROVAL

DATE: May 15, 2012

MEMORANDUM

TO: Muhammad Al-Midani
Principal Investigator

FROM: Cari Oliver, CIP
Assistant Director, UAB OIRB

RE: Request for Determination—Human Subjects Research
**IRB Protocol #N120513005 – Performance Outcomes (Clinical and
Financial) of Physician Administrators (CEOs) at Acute Care Hospitals**

A member of the Office of the IRB has reviewed your application for Designation of Not Human
Subjects Research for above referenced proposal.

The reviewer has determined that this proposal is **not** subject to FDA regulations and is
not Human Subjects Research. Note that any changes to the project should be resubmitted to the
Office of the IRB for determination.