6-2015

National Quality Awards in Healthcare and Actual Quality in U.S. Hospitals

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NATIONAL QUALITY AWARDS IN HEALTHCARE AND
ACTUAL QUALITY IN U.S. HOSPITALS

by

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A dissertation submitted to the Graduate College
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
Public Affairs and Administration
Western Michigan University
June 2015

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This study examined performance outcome data from the Medicare Compare Hospital database for differences in performance between national award-winning hospitals and non-national award-winning hospitals. Specific variables examined were related to clinical care and were identified in literature as well as professional medical associations and societies as being quality indicators. National award-winning hospitals were defined as those having received the Malcolm Baldrige Quality Award in Healthcare or the Healthgrades Distinguished Hospital for Clinical Excellence. The characteristics of highly reliable organizations were also used to align the indicators of excellence for Malcolm Baldrige and Healthgrades recipients. Finally, a closer examination of data from three high-risk departments—Obstetrics Units, Emergency Departments and Operating Departments—within hospitals that had received national quality awards and those that had not was conducted to see if there was a difference in performance in high-risk areas. Through quantitative analysis, findings indicate overall that those hospitals receiving a national quality award performed better in more variables than those hospitals that have not received a national quality award. Contributions of this work lie in the alignment of national awards to the characteristics of highly reliable

organizations and more concrete analysis on performance for hospitals to review as their journey toward quality and patient safety continues.

DEDICATION

Dedicated to my Dad, John C. Beaudin,

I am so proud of you.

ACKNOWLEDGMENTS

To my daughters Ryth Cathrine and Ella John, without you I am simply not me. Thank you!

To my husband Ryan, thank you for your continual understanding and encouragement.

To Dr. Raymond Thompson, thank you for your support and guidance.

To my committee, Dr. Robert Peters (Chair), Dr. Patricia Reeves, Dr. Kieran Fogarty, and Dr. Marianne Di Pierro, thank you for your guidance.

To those friends that spent time talking about a topic they didn't care about, clearing my head, and paving the way for productive thought, thank you for giving to me the most expensive thing you have, your time, in order to make me better.

And finally to my Dad, John, my Mom, Carol, and my sisters Jeanene and Sarah, thank you for making me believe that I can do anything.

Beth M. Beaudin-Seiler

TABLE OF CONTENTS

Table of Contents—Continued

CHAPTER

Table of Contents—Continued

CHAPTER

Table of Contents—Continued

CHAPTER

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Background

Healthcare is a high-risk industry, which means that its fundamental core work is subject to potential dangers or hazards that can at times result in a high probability of error; this high error rate poses great risks to organizations and their employees, as well as to their patients. The Institute of Medicine's (IOM) original report *To Err is Human,* as well as subsequent follow up reports in 2005 and 2009, indicates that patient safety and quality continues to be a problem within the healthcare industry in the United States (Clancy, 2009; Kohn, Corrigan, & Donaldson, 1999; Leape & Berwick, 2005). One in three patients still experiences adverse events during the course of their hospital stay (Classen et al., 2011).

The complexities of healthcare systems result in the fact that hospitals are prone to errors. Pham et al. (2012) define medical error as "a preventable adverse event or near miss due to the failure of a planned action to be completed as intended or use of a wrong plan to achieve an aim" (p. 448). Some of the most common medical errors include medication errors such as wrong medication or wrong dosage; hospital-acquired infections such as surgical site, bacteria, or any other infection that was not incubating before admission to the hospital; teamwork and safety culture, for example, lack of implementing error reporting measures or lack of team training; patient falls; hand-off errors such as between shift changes or between department transfers; diagnostic errors such as misdiagnosis; and surgical errors—wrong sided surgery, wrong patient, foreign materials left in patient, for example (Pham et al., 2012). The estimated annual cost of medical errors in 2008 was $17.1 billion (Van Den Bos et al., 2011).

However, this figure may not accurately reflect the real economic costs of these medical errors. Studies by Classen et al. (2011) indicate that 90% of adverse events are missed in conventional reporting and are not reflected in patient safety indicators that healthcare facilities typically utilize to gauge medical errors. Classen et al.'s study examined the most popular patient safety tracking systems used in the United States (voluntary reporting and the Agency for Healthcare Research and Quality's [AHRQ] Patient Safety Indicators) and compared them to the Institute for Healthcare Improvement's Global Trigger Tool. The study's findings indicate that the two most popular methods used by most healthcare delivery organizations and supported by policy makers to measure safety of care is voluntary reporting and AHRQ's Patient Safety Indicators. They may fail to detect 90% of adverse events that occur among hospitalized patients (Classen et al., 2011). And this is one of the reason why medical errors are not always easy to recognize, especially when the effects of some adverse event suffered by the patient are not long-lasting. For example, in the need of a healthcare team to manage a patient's pain, two pain medications are administered too close together and the patient becomes unresponsive and begins to show signs of respiratory failure. The patient does not go into complete failure and within a day becomes responsive again.

Because they do not recognize this situation as an error, the healthcare team in this hypothetical example may not report this error. Yet another reason that it is difficult to identify medical errors is that patients are in hospitals because they are ill and are already in compromised health. Differentiating between the disease process and a medical error can be very difficult. Take the same example of the medication error above, and now introduce the fact that the patient has pneumonia. This patient's respiratory rate may appear to be compromised from a disease process and may not be readily attributable to the mismanaged timing of pain medication, and thus, the incident is not reported. There is difficulty in establishing clear indices for the actual number of adverse events that occur. Classen et al.'s (2011) study used a broader definition of adverse event: "unintended physical injury resulting from or contributed to by medical care that requires additional monitoring, treatment, or hospitalization, or results in death" (p. 583). This definition also did not require the harm to have been preventable or indicate that the event led to a major disability. Given the omission of these categories, it is clear that the number of deaths due to medical error may be 10 times greater than previously reported by the IOM (Classen et al., 2011).

Data from the 1999 IOM report (Kohn, Corrigan & Donaldson, 1999) came from two studies, one conducted in 1984 in New York and the other conducted in 1992 in Utah and Colorado, which found that hospitalized patients experienced adverse events, defined as injuries caused by medical management, at a rate of 2.9% and 3.7%, respectively. These percentages were extrapolated over the 33.6 million admissions to U.S. hospitals which leads to the 44,000–98,000 deaths due to medical error cited in the report (Kohn et al., 1999). The Classen et al. (2011) study identified the difficulty with the current most common methods to accurately report adverse events in hospitals. Therefore, it is reasonable that the studies cited in the IOM report also reflected difficulty in identifying clear adverse events and rates could be higher than originally reported.

Cost of Medical Errors

This means that the cost of medical errors to the U.S. economy in 2008 may have been as high as $980 billion per year, when calculating both medical expenses and quality-adjusted life years (Andel, Davidow, Hollander, & Moreno, 2012), a far cry from the $17.1 billion figure indicated in the Van Den Bos et al. (2011) study. Quality-adjusted life year estimation modeling is not a precise science: depending on the method used to determine utility values for the calculation of quality-adjusted life years, very different cost utility ratios can be generated (Marra et al., 2007). Yet, while difficult to measure because the value of an individual life is not exact, it is clear that such indicators must be considered when factoring economic impact (Andel et al., 2012). There is a correlative relationship between medical errors and the degree to which patients win legal lawsuits. A study conducted by Studdert et al. (2006) reviewed a random sample of malpractice claims from five liability insurers. The study searched for whether a medical injury had occurred and if so, whether it was due to error. In addition the study analyzed claims that lacked evidence of error. It was found that most claims that were not associated with errors or injuries did not receive compensation and when they did receive compensation it was significantly lower than claims that did involve injuries that were due to medical errors. Overall the study found that claims that lack evidence of medical error were not uncommon; however, most of those were denied compensation. The real expense comes from claims that involved injuries due to errors (Studdert et al., 2006). Therefore, costs associated with legal lawsuits are relevant to factor in as a contributing cost of medical errors. With the burden of costs associated with medical errors being shouldered by the

U.S. economy, it is reasonable to use this factor as support for the research questions in this study.

Type of Medical Errors

The circumstances surrounding the type, kind, and degree of medical errors begs the question regarding specific departments within the hospital setting where these errors occur most frequently, as well as the actual correlative expenses. According to the 2013 Annual Report of the National Practitioner Data Bank (NPDB, 2014b), 76,839 medical malpractice reports and adverse action reports were filed in the United States. Diagnosis-related and treatment-related cases had 2,026 claims payments during 2012. Surgery-related, anesthesia-related and intravenous (IV) and blood products-related cases had 5,452 claims payments, and obstetrics-related cases had 585 claims payments. Malpractice award payments in 2012 for diagnosis and treatment-related cases averaged $337,892 per payment. In 2012, the malpractice award payment for surgery/anesthesia and IV-blood-related cases averaged $299,337 per payment, while the average malpractice award payment for obstetrics-related cases was $572,199, highlighting the fact that obstetrics errors occur much less frequently than errors in other departments such as surgical errors, but when they do occur, they are more costly in terms of compensation (NPDB Annual Report, 2014b). The number of medical errors and the costs associated with those errors has resulted in increased healthcare costs that both organizations and patients must bear.

Factors Contributing to Medical Errors

Some of the factors that contribute to medical errors concern a lack of communication and cooperation among healthcare professionals; lapses in judgment; and individual variations and an over-reliance on the knowledge, skills, and individual interpretation of humans as the basic safety mechanism, rather than the use of clearly delineated standard operating procedures that would reduce individual variation (Healey & McGowan, 2011; Pham et al., 2012; Rogers & Gaba, 2011).

The implementation of checklists, for example, represents a move in the direction of standardization (Makary, 2012). The use of checklists can provide a foundation for standard operating procedures that are read aloud and responded to in order to establish a universal awareness of the patient's situation, thereby creating a smaller window for potential error. Similarly, internal systems and processes seem to have evolved over time as organizations have become bigger and more complex; yet, they are heavily bureaucratic and entrenched in practices that run counter to quality initiatives, factors, which continue to contribute to problematic procedural flaws. For example, the timely and accurate administration of medications currently requires a circuitous pathway that is not efficient: an order moves from the physician to the RN to the pharmacist to the pharmacy, and then makes its way back from pharmacy to the unit to the RN so that medications can be administered (Lanham & Maxson-Cooper, 2003). This process is unwieldy and inefficient: the simpler, more efficient route is for the physician to implement the order directly into his or her computer, where the requisition is directly relayed to the pharmacy for processing, with another direct process in place to route the medications back to the unit to be administered. However, such direct processing is not always part of standard practices in many hospitals (Lanham & Maxson-Cooper, 2003).

Consider that the more steps and the more people involved in a process, without oversight of the incremental elements of the process, the more the opportunity for error to occur, rather than the process reflecting a system of checks and balances. Medical errors, the factors contributing to and the prevention of them, have been the focus of many scholarly works in an effort to draw critical attention to this problem; however, for the majority of healthcare organizations, changes have not been successfully implemented to counteract these deficiencies (Clancy, 2009). Clancy argues that a predominant factor in not having made greater strides in combating medical errors in the first 10 years of trying is the fragmented environment in which healthcare is given. She argues that to address medical errors a hospital must change its culture and systems and improve communication and teamwork within each individual unit and the hospital as a whole. But, instead, a number of healthcare systems reward high volume and highly compensated procedures over preventative care and improving patient outcomes (Clancy, 2009). Thus, it may be that quantity versus quality is reflective of a more profit-driven philosophy, rather than a humanitarian-based perspective.

Safety Standards and Organizational Culture

In 10 years after the Institute of Medicine (IOM) report article (Clancy, 2009), Robert Wachter (2010) praised the Joint Commission for its efforts to create safety standards and enforce them. However, he points out that after the low-hanging fruit is picked, the Joint Commission role as regulator and accreditor leaves it with almost useless tools to make progress in complex, nuanced areas. Wachter points to the lack of patient safety research, patient engagement, healthcare provider leadership, as well as a rudimentary capacity to measure safety as reasons why more progress has not been made. As a result, patient safety and well-being are therefore compromised in hospital settings that do not reflect recognition of medical errors, as do highly reliable organizations in which accountability, transparency, and quality inhere within the organizational culture.

Organizational culture has routinely emerged as an important variable necessary to the successful change in an organization (Latta, 2009). Organizational culture is defined as “the shared perceptions, patterns of belief, symbols, rites and rituals, and myths that evolve over time and function as the glue that holds the organization together” (Akgun, Keskin, & Byrne, 2012, p. 103). The role in the values, beliefs and the underlying assumptions that members of a particular organization share about appropriate behavior cannot be overestimated (Akgun et al., 2012). If the culture of a healthcare organization is not conducive to addressing patient safety issues, then attempts to redesign systems and ensure sustainability of changes becomes challenging at best, if not impossible (Provonost et al., 2006). Culture defines the quality and safety of any workplace, including medicine (Makary, 2012). Changing the healthcare culture from command and control to one of continuous improvement is the goal for the successful implementation of patient safety initiatives (Toussaint & Gerard, 2010). John Toussaint and Roger Gerard, physicians, as well as authors of *On the Mend: Revolutionizing Healthcare to Save Lives and Transform the Industry* (2010), describe the current management of healthcare as autocratic, top-down and controlling, identifying it as a command and control management system. They argue that until the management system changes to one of continuous improvement, patient safety initiatives will be inconsistent at best.

Yet, despite deficiencies in creating healthcare cultures that espouse total quality initiatives and to impact medical errors in their organizations, there are hospitals that have achieved national quality awards, specifically the Malcolm Baldrige National Quality Award and Healthgrades Distinguished Hospital Award for Clinical Excellence, and arguably these hospitals may be described as highly reliable organizations. The concept of inculcating quality into the national American landscape heralded the advent of the Malcolm Baldrige National Quality Award, which was established by Congress in 1987 to enhance the competitiveness of American businesses within the global market, and included healthcare in 1999. These national award-winning hospitals have shown dedication to the implementation of quality and safety objectives with measureable outcomes: these outcomes are continuously evaluated, measured and assessed and then subjected to continuous process improvement (Malcolm Baldrige, 2013a). This cycle, then, becomes part of an ongoing process, grounded in the philosophical premise that processes can and should always be improved. This philosophical premise is an example of the type of culture that is necessary for achieving greater safety and quality and reducing errors, which is why winners of the Malcolm Baldrige Award and the Distinguished Hospital for Clinical Excellence Award for hospitals have been selected for the purposes of this study.

Not surprising for those that study the field of public affairs and administration, there has been a long and continued governmental awareness of providing and preserving U.S. citizens' healthcare and to sustain well-being. This awareness started in 1798, with the Act for the Relief of Sick and Disabled Seamen; however, until recently, governmental involvement was focused upon the identification of populations of people who could gain access to healthcare or for the purposes of studying diseases, or to determine the safety of medications, but not necessarily focused on the assurance of quality and safety in the hospital (U.S. Department of Health and Human Services [DHHS], 2014).

Problem Statement

Individuals who require medical interventions may find themselves "at greater or significantly greater risk" at hospitals that have disconnect between the intention to promote safety and their actual safety rates. Current research indicates upwards of 440,000 people die each year due to medical errors, and can cost as much as $980 billion to the U.S. economy (Andel et al., 2012; James, 2013). That is equivalent to nearly three Boeing 747 aircraft crashing every day for an entire year. Hospitals can remain unenlightened about both the potential harm, as well as the potential medical advances that can emerge when shifts in cultural philosophy inspire purposeful quality changes. Improvements in patient safety, and the reduction of errors, depend on overcoming organizational culture barriers that impede the implementation of quality improvement strategies. For public administrators and government policy makers understanding medical errors and quality in healthcare is critical to the well-being of the citizens and the health of the financial structure of the economy. It is imperative, therefore, to study national quality award-winning models and the outcomes wrought by following quality initiatives and compare them to non-national quality award-winning models.

Purpose Statement and Research Questions

Although logic suggests hospitals receiving national quality awards have lower levels of medical errors and better performance on quality indicators, and are worth the cost in resources to obtain or publicize these awards, the literature does not indicate whether this is the case. This project will examine the differences between national quality award-winning hospitals' quality outcomes as compared to the outcomes of non-national quality award-winning hospitals. It will establish differences, if any, in three high-risk departments (OB-GYN; Operating Department, and Emergency Department) of these hospitals. It will examine specific variables collected by the Medicare Hospital Compare database for the approximately 4,000 hospitals in the United States listed in the database. Hospitals with missing data for half or more of the specific variables will be excluded from the analysis. All hospitals will offer Emergency Department (ED), Obstetrics Department (OB-GYN), and Operating Department (OD) services and will be Acute Care Centers. The Malcolm Baldrige Quality Award-Winning hospitals and the Healthgrades Distinguished Hospital for Clinical Excellence Award from 2012, 2013, and 2014 will be identified as national quality award winners. The remaining hospitals will be identified as non-national quality award winners.

This project is guided by four research questions:

1. Do hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than non-national award-winning hospitals?
2. Do Obstetric Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Obstetric Departments in non-national award-winning hospitals?

3. Do Operating Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Operating Departments in non-national award-winning hospitals?
4. Do Emergency Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Emergency Departments in non-national award-winning hospitals?

Significance

This study seeks to contribute information that healthcare organizations can utilize to facilitate, sustain, and foster the adoption of a wider array of quality measurements and error improvements in their organizations. It also seeks to contribute information to the field of public affairs and administration in providing a possible strategy of science to research quality in healthcare. It will do so by understanding if hospitals that have received these specific national quality awards perform at a higher level of quality in specific quality variables than hospitals that have not received these awards. In addition, the study will hold major benefits for diverse constituencies:

1. Positive findings from this study could be utilized by hospitals to foster and sustain an organizational culture that enhances quality within their organizations, an action which will positively impact patient care and safety.

   Dr. Marty Makary, a specialist at Johns Hopkins Hospital and professor at Johns Hopkins Bloomberg School of Public Health is regarded as an international expert in patient safety and an advocate for transparency in healthcare. Makary makes a distinction between hospitals dedicated to quality improvements through best practices in medicine and transparency, and those hospitals that ignore the danger signs that signal untoward practices which place patients in jeopardy (Makary, 2012).

2. Findings can also provide information to public administrators, policy makers, hospital administrators and unit decision makers, influencing the types of policies that can be implemented to drive quality initiatives and evaluate quality results. In 2008, a policy developed by the Centers for Medicare & Medicaid Services limited payment to hospitals for treating costly and avoidable conditions that were acquired during the patient's in-hospital stay. This policy represented the first national government effort to tie reimbursement directly to performance, and it heralds a new philosophy of accountability (McHugh, Martin, Orwat, & Van Dyke, 2011). This policy was expanded under the Patient Protection and Affordable Care Act, which indicates that federal payments to treat hospital-acquired conditions are prohibited. Furthermore, starting in 2015, the Centers for Medicare & Medicaid Services will reduce payments by 1% for hospitals that are in the top quartile of hospital-acquired illnesses and conditions and will publicly post the rates of those conditions on their website (McHugh et al., 2011). Hospitals should be motivated to address these negative conditions out of concern for human well-being; however, if they are not motivated out of compassion and caring, then they will certainly be motivated by the financial

constraints placed upon them: in essence, penalties and liabilities for medical errors. The need is to address these issues, not conceal them.

Methods Overview

This study utilized a quantitative approach and conduct a two sample *t* test analysis to examine the differences between hospitals that have received national quality awards and their clinical performance outcomes versus non-national quality award-winning hospitals and their clinical performance outcomes. The two sample *t* test was used because the data collected are in a continuous variable format that allows for the comparison of means. Data from the open source Medicare Hospital Compare database was collected for all hospitals across the United States. National quality award-winning hospitals are defined as those that have received either the Malcolm Baldrige National Quality Award or the Healthgrades Distinguished Hospital for Clinical Excellence Award in 2012, 2013, or 2014. Hospitals not receiving either of these two awards were categorized as non-national quality award-winning.

Variables from the Medicare Hospital Compare database were refined to include only key variables in clinical quality. The refinement process examined empirical research in the literature as well as national professional medical organizations and societies that have identified quality indicators as their focus. The researcher used empirical evidence and focus of national medical organizations to categorize variables into OB-GYN variables, ED variables, and OD variables. Data analysis could be run on multiple levels to understand the overall association between national quality award-winning hospitals and non-national quality award-winning hospitals. Data analysis could also be run on the clinical outcome variables of those high-risk departments.

Definitions

Adverse Event – unintended physical injury resulting from or contributing to by medical care that requires additional monitoring, treatment, or hospitalization, or results in death (Classen et al., 2013).

AHRQ – Agency for Healthcare Research & Quality is the health services research arm of the U.S. Department of Health and Human Services, providing a major source of funding and technical assistance for health service research and training at U.S. universities and other institutions (AHRQ, 2014a).

Centers for Medicare & Medicaid Services – U.S. federal government programs providing health insurance to the elderly and indigent citizens of the U.S (Centers for Medicare & Medicaid Services, 2014a).

Cost of Medical Errors – the U.S. dollar amount expended on medical services, follow-up care and quality adjusted life years on patients that have experienced a medical error in the healthcare industry.

Distinguished Hospital Award for Clinical Excellence – a national quality award recognizing the top 5% hospitals for overall clinical excellence based on risk-adjusted mortality and complication rates calculated by Healthgrades (2013a).

Global Trigger Tool – the Institute for Healthcare Improvement's tool for measuring adverse events that uses reviewers conducting retrospective reviews of patient records (Institute for Healthcare Improvement, 2014).

Healthgrades – a U.S. company providing healthcare consumers with information needed to make more informed decisions including information about the provider's experience, patient satisfaction and hospital quality (Healthgrades, 2014).

High-risk industry – an organization which has fundamental core work that is subject to potential dangers or hazards that at times can have a high probability of error, posing great risk to the organization, employees, and patients.

Highly Reliable Organization – organizations that exist in hazardous, fast-paced, highly complex systems that are technically advanced with low occurrence of errors for long periods of time (Baker, Day, & Sala, 2006; Beyea, 2005; Stock, McFadden, & Gowen, 2006).

Highly Reliable Organization Theory – a theory that training, learning and redundancy can lead to high levels of safety and reliability in organizations that are hazardous, fast-paced, and highly complex (Weick & Sutcliff, 2007).

IOM – Institute of Medicine, a part of the National Academy of Science and is the health arm, established in 1970 to provide unbiased and authoritative advice to decision makers and the public on healthcare in the U.S. (IOM, 2014).

Malcolm Baldrige National Quality Award – established by Congress in 1987 to enhance the competitiveness of American businesses within the global market, healthcare was added in 1999 (Malcolm Baldrige, 2013a).

Medicare Hospital Compare Database – Data collected by the U.S. federal government on the quality of care at over 4,000 Medicare-certified hospitals across the country. Data are not risk-adjusted, but are merely reported for consumers to help make decisions on where to get healthcare and for hospitals to improve the quality of care they provide (Medicare Hospital Compare, 2014d).

Medical Error – preventable adverse events or near miss due to the failure of a planned action to be completed as intended or use of a wrong plan to achieve an aim.

National Practitioner Data Bank – a confidential information clearinghouse created by Congress with the primary goals of improving healthcare quality, protecting the public, and reducing healthcare fraud and abuse in the U.S. (NPDB, 2014a).

National Award-Winning Hospital – hospitals having received either the Malcolm Baldrige Quality Award or the Distinguished Clinical Excellence Award by Healthgrades.

Non-National Award-Winning Hospital – hospitals that have not received the Malcolm Baldrige Quality Award or the Distinguished Clinical Excellence Award by Healthgrades.

Organizational Culture – the shared perceptions, patterns, belief, symbols, rites and rituals, and myths that evolve over time and function as the glue that holds an organization together.

Patient Protection and Affordable Care Act – Act designed to ensure all Americans have access to quality, affordable healthcare; components include quality, affordable healthcare, role of public programs in healthcare, improving the quality and efficiency of healthcare, healthcare work force, transparency and program integrity, improving access to innovative medical therapies, community living assistance services and supports, revenue provisions (Patient Protection and Affordable Care Act, 2014).

Quality Adjusted Life Years (QALY) – a calculation that assumes an average of 10 lost years of life at $75,000 to $100,000 per year lost in economic impact when calculating the premature death of a patient (Andel et al., 2012).

Summary

Medical errors in the United States continue to be a problem. This project seeks to understand the association between national quality award-winning hospitals and their performance on key quality outcome variables as they compare to non-national quality award-winning hospitals. National quality award-winning hospitals are those that have been awarded either the Malcolm Baldrige Quality Award for Healthcare or the Distinguished Hospital for Clinical Excellence Award by Healthgrades. Non-national award-winning hospitals are those that have not received either of these two awards, however could have received other awards including specialty awards. For purposes of this study, safety/quality and errors are coupled concepts; if there are high error rates, there is a lack of quality. Understanding the association regarding these hospitals' performance on key quality outcome variables will allow patients and consumers of the U.S. healthcare system better information on choosing where to seek healthcare; in addition, this information will allow hospitals, public administrators, and policy makers to see the correlation between national quality awards and key outcome variables in healthcare quality, which may provide a strategy in how to conduct research on quality in healthcare. Findings from this study will be submitted for publication in journals and presented at conferences focusing on medical error and patient safety.

CHAPTER II

LITERATURE REVIEW

Organization of the Literature Review

Information in this section will be organized and include the following:

- Background
- Healthcare and Government
- Magnitude of Medical Errors
- Types of Medical Errors and Where They Occur
- Three High-Risk Departments: A Profile
- Categories of Medical Errors & Frequency – Errors that directly and indirectly result in adverse events
- Overall Cost of Medical Errors
- Legal Cost of Medical Errors
- Mechanisms to Address Errors
- Characteristics of Highly Reliable Organizations
- Cultures of Reliable Organizations
- Malcolm Baldrige National Quality Award
- Healthgrades Distinguished Hospital Clinical Excellence Award
- Medicare Hospital Compare Quality of Care Database
- Summary

Background

Chapter I clearly delineates the complexity of medical errors in hospitals in the United States. Medical errors not only compromise patient safety and well-being, but also impede hospitals' ability to deliver quality care in a safe environment. Further, medical errors cost hospitals their reputations and also result in law suits and cost settlements that pose substantial financial burdens. Hospitals that fail to measure the frequency and severity of medical errors fail to estimate these losses; in other words, they do not assess risk and continue to conduct business without cognizance of the true consequences—the loss of life and patient safety, the loss of financial solidity, and the loss of reputation of quality that may also impact professional staff.

Medical errors are described in the literature in a one-dimensional model which fails to take into account that these adverse events far too frequently occur in multiple dimensions. In other words, medical errors can be compounded, occurring within a complex of errors. It is therefore difficult to account for exact costs within such a compounded framework; nevertheless, it is not difficult to appreciate the spiraling financial costs that evolve out of this complexity. Initiatives to operate more efficiently often gird many industries which appreciate quality principles guided by assessment and evaluation, continuous process improvement, and transparency of data. These approaches not only permit the problems or difficulties to emerge, but also measure the outcomes of amelioratives. These organizations, often referred to as "highly reliable organizations" (HROs), pave the way for other like-minded organizations that aspire to these quality ends.

This research explored whether the target population of U.S. hospitals has differing outcome performance measures in clinical excellence based on whether specific national quality awards have been received. The literature supports the concept that pockets of quality can inhere in institutions and organizations; therefore, this study will also assess three high-risk hospital departments that typically hold the most potential for costly medical errors. These departments, the OB-GYN, OD, and ED, will be examined to determine clinical outcome performance compared with the general hospital profile.

Healthcare and Government

In 1798, the Act for the Relief of Sick and Disabled Seamen marked the beginning of federal involvement in healthcare; however, until recently, the involvement was focused upon the identification of populations of people who could gain access to healthcare or for the purposes of studying diseases, or to determine the safety of medications, but not necessarily focused on the assurance of quality and safety in the hospital (U.S. DHHS, 2014). There were three major areas of legislation in healthcare, the first being research, which began in 1887 when the federal government opened a one-room laboratory for research on disease (U.S. DHHS, 2014). The second area of legislation in healthcare was concerned with overseeing and monitoring access to healthcare. This initiative began in 1920 with the Snyder Act, which concerned itself with authorizing government funding for healthcare access for Native Americans and was the first time the government developed a broad Native American healthcare policy (Nelson, 2010).

Patient safety and quality of care represents the third area of concern and it started in 1999 with the renaming of previous legislation to the Agency for Healthcare Research and Quality, which was tasked with the improvement of quality, safety efficiency and effectiveness of healthcare (AHRQ, 2014a). This initiative was followed in 2005 by the start of the congressional movement towards safety: the Patient Safety and Quality Improvement Act established certified patient safety organizations tasked with collecting voluntary error and near miss reports in healthcare. In addition, it also provided protections for those healthcare professionals reporting errors or near-miss information (U.S. DHHS, 2014).

The most recent legislation, the 2010 Patient Protection and Affordable Care Act, was a combination of access to healthcare care and quality improvement of healthcare. It focused on mandating insurance coverage for all people, but it also included a number of programs and agencies developed for improving quality and performance as well as prevention and wellness (U.S. DHHS, 2014).

Magnitude of Medical Errors

The Institute of Medicine's (IOM) report in 1999 (Kohn, Corrigan & Donaldson, 1999), which stated that upwards of 98,000 people die each year due to preventable medical errors, is indicative of a concerning trend that existed prior to 1999. The IOM report is significant in that it is one of the first official reports that captured the reality of medical errors. The report provided insight into medical errors that essentially have been shrouded amidst bureaucratic practices that prevent transparency, and thus, compromise patient safety (Kohn et al., 1999). Until the IOM report in 1999, information regarding the severity of the problem was limited to academic literature, making this report a landmark.

In 2008, to the question, “How much of a problem is patient safety?” Dr. Lucian Leape responded, “The unsettling fact is that no one knows” (Consumers Union, 2009). Dr. Leape’s observation that no one knows the severity of the problem of medical errors may well be true. According to the IOM report, there is no national system of accountability through the concept of transparency, and there is no national tracking unit that coordinates patient safety efforts (Kohn et al., 1999).

Thus, the estimated numbers of errors and their impact on patients may be low. The IOM report contained data collected from review of medical records in 1984 and extrapolated an estimate of 98,000 deaths due to medical errors each year (James, 2013). However current research, using data published in studies from 2008–2011, shows the number of deaths due to medical error is estimated at upwards of 400,000 each year (James, 2013). Empirical evidence of medical errors within the hospital setting is not always transparent, a fact that may deter identification and amelioration of adverse advents. Hospitals may fear reprisals if they publish data on medical errors: federal penalties, loss of reputation of quality, and loss of consumer confidence are three such examples. However, concealing such information may not hold a benefit, as medical researchers such as Marty Makary (2012) and others indicate. Research examining communication and resolution programs or disclosure, apology, and offer programs in healthcare indicate that these types of transparency programs that disclose medical errors to patients, apologize for them, and offer compensation are viewed by healthcare stakeholders as having a great potential to improve medical liability and patient safety, even more so than healthcare tort reform options (Bell et al., 2012; Sage et al., 2014). Existing are conversations in the field that concern the manner in which the phenomenon of medical errors and adverse events can and should be reduced or eliminated in an effort to ensure a quality culture of best practices through which patient safety is sustained. Existing also are hospitals of merit which are quality award-winning hospitals that have striven toward patient safety goals and have attained recognition as highly reliable organizations dedicated to best practices through transparency. Highly reliable organizations are advocates of these same quality principles of transparency, continuous process improvement, and tracking, affected through organizational cultures aligned with these goals.

Types of Medical Errors and Where They Occur

Pham et al. (2012) define medical error as "a preventable adverse event or near miss due to the failure of a planned action to be completed as intended or use of a wrong plan to achieve an aim" (p. 448). An adverse event is then defined as "an unintended patient harm caused by medical management rather than by a disease process, which results in a prolonged hospital stay, morbidity, or mortality" (p. 448). In other words, medical errors result, in part, from untoward medical practices that reflect complex interconnections between process and procedure, in addition to simple human error. The genesis for the pantheon of medical errors is wide and broad. The element of responsibility figures prominently in this regard because these elements are preventable, unlike disease processes which generally are not always. However, there are significant numbers of medical errors which occur annually and which draw concern from hospital administrators, physicians, nurses, and other healthcare providers.

These medical errors span across a spectrum of various types and kinds, some of which occur due to human error, carelessness, lack of cohesion among medical team members, among others. Errors can emerge from systemic issues, as well as the challenged health of healthcare providers themselves, as typified in the 1984 Libby Zion case where emergency room doctors, exhausted from overly-long shifts in the ER, did not diagnose the young woman correctly and gave her a medication that resulted in her death. A New York state investigation as well as a civil trial ensued and addressed several issues surrounding the woman's death: long resident and intern working hours contributing to fatigue, medication errors, and use of restraints to combat the untoward effects of the prescribed medication, which eventually led to her death. The law suit resulted in the Libby Zion Law, which limits the number of hours that a New York resident physician can work to 80 hours per week to combat fatigue (Lerner, 2006).

Medication errors are just one facet of the larger picture of medical errors. Some of the most common medical errors include medication errors such as wrong medication or wrong dosage; hospital-acquired infections such as surgical site, bacteria, or any other infection that was not incubating before admission to the hospital; lapses in teamwork and safety culture such as implementing error reporting measures or lack of team training; patient falls; patient hand-off errors such as between shift changes or between department transfers; diagnostic errors such as misdiagnosis; surgical errors such as wrong sided surgery, wrong patient, or foreign materials left in patient (Pham et al., 2012).

The number of patients injured or killed each year by medical errors reflects only those that have been reported. Research shows that the reporting of these adverse events is woefully low (Classen et al., 2011). Classen et al. (2011) evaluated three adverse events/error reporting methods. They included a hospital's voluntary reporting system, the Agency for Healthcare Research and Quality's Patient Safety Indicators, and the Institute for Healthcare Improvements Global Trigger Tool. The study examined the ability of these reporting methods to detect the rate of adverse events in three leading hospitals which are deeply invested in advanced patient safety programs and quality. The findings show that the two methods most commonly used by most healthcare facilities to measure safety of care are voluntary reporting systems and the Agency for Healthcare Research and Quality's Patient Safety Indicators. Yet, according to Classen et al.'s study, these two most commonly used reporting systems detect approximately only 10% of the events that actually occur. Reasons for failure to detect adverse events in these reporting systems can be due to differences in definition of adverse event, issues of time/resources and cost to implement complete systems, fear of litigation, a reluctance to report one's own errors, uncertainty of when something is an adverse event, and the lack of change when reporting does occur (Garrouste-Orgeas et al., 2012; Zeeshan, Dembe, Seiber, & Lu, 2014). Because of these barriers, Zeeshan, Dembe, Seiber, and Lu (2014) suggest that the estimates for adverse events are underestimated.

According to Classen et al. (2011), if only 10% of adverse events are consistently captured, the IOM's report of 98,000 deaths annually and the National Healthcare Quality Report (NHQR, 2013) estimate of 3,023,000 injuries are low. The Classen et al. study reveals that in actuality annual deaths due to medical error may be 10 times that number. Newer research from James (2013), who conducted a meta-analysis of four studies between 2008-2011, now indicates that the number of premature deaths associated with medical errors is at a lower limit of 210,000 and may be as high as 440,000 per year. James' newer data also indicate that medical errors which lead to serious harm seem to be

10- to 20-fold more common than lethal harm. In James' meta-analysis study, serious harm included the following: required prolonged hospital stay, permanent harm, and life sustaining intervention being required.

Three High-Risk Departments: A Profile

Anecdotal evidence from Baker et al. (2006) suggests the elements of highly reliable organizations are not uniformly distributed through a hospital and not all hospital settings necessarily carry with them an explicit risk. However, some hospital settings do. The National Practitioner Database data indicate that the three highest risk/most-loss departments within a hospital are the Obstetrics Unit (OB-GYN), the Emergency Department (ED), and the Operating Department (OD) (NPDB, 2014b). Table 1 illustrates the number of payments and the mean payout of claims in 2012 for these three areas, as well as other areas for comparison. These data show that these three departments are where most malpractice claims are filed and where most payments are made. They are not necessarily where the most frequent errors occur: medication errors and hospital-acquired infections are the largest offenders, but cannot be attributed to any one department. However, when errors in these three areas do occur, they are more expensive than just additional medical costs, as the average payout on malpractice claims is high. For example, in 2012 there were 5,152 surgical-anesthesia-IV-blood related malpractice claims filed with an average payment of $299,337 per claim. While the surgical related errors do not come close in terms of frequency to hospital-acquired infections which average about 2 million each year, they are very costly for a hospital to absorb.

Table 1

Number of Payments and Mean Payout of Medical Malpractice Claims in 2012

Department	Number of Payments in 2012	Mean Payment in 2012
Obstetrics Dept	585	$572,199
Emergency Dept[a]	2026	$337,892
Operating Dept[b]	5452	$299,337
Monitoring-related	323	$293,769
Behavioral Health-related	222	$278,249
Equipment/Product-related	49	$160,323
Other	26	$282,567

Note. This is not an exhaustive list of errors, but a sample of claims filed.
[a]Emergency Department includes Diagnosis-related cases and Treatment-related cases.
[b]Operating Department includes Surgery-related cases; Anesthesia-related cases; IV & Blood Products-related.

For the purposes of the support in the selection of OB-GYN, OD, and ED as a focus for this study, adverse events and costs related to each areas were consolidated to provide a more realistic picture of the number of adverse events and costs for those departments. For example, diagnosis-related cases, meaning misdiagnosed cases that led to claims, and treatment-related cases, meaning cases where there was an error in treatment that led to claims, were combined to make up the Emergency Department cases. While not all diagnosis and treatment related claims can necessarily be attributed to Emergency Departments, Mark Graber, founding president of the Society to Improve Diagnosis in Medicine, argues that the Emergency Department is a “petri dish” for diagnostic mistakes, which is why for purposes of this project they are attributed to the Emergency Department (Boodman, 2013). Misdiagnosis has continually been problematic for the healthcare industry and is the hidden part of the iceberg of medical errors (Boodman, 2013).

Along the same principle, it stands to reason that the Operating Department includes cases identified as surgery-related, anesthesia-related, and IV intravenous and blood products related, since these are correlative. Operating Departments are not the only place in hospital settings that IV and blood product related errors can occur; however, patients in the OR will have IV placement and blood products, therefore it is reasonable to place IV and blood product related errors into the Operating Department area. Therefore, cases of wrong site surgery or errors in anesthesia medications or wrong type blood given are combined to represent the Operating Department claims. While other studies have not necessarily grouped Operating Department claims this way, this project will based on the reasonability that surgery-related, anesthesia-related and IV and blood product related claims mainly occur in the Operating Department. The estimated surgical mortality is 21 out of every 1,000 surgical procedures (not necessarily attributed to medical error); with almost 100 million surgical procedures performed annually in the U.S. there are roughly 1,000,000 patients that will die within 30 days of surgery (Lyons & Popejoy, 2014).

Finally, obstetrics joins the triumvirate of high-risk fields. More than four million women give birth each year in the United States, making delivery the most common reason for hospitalization (Callaghan, Creanga, & Kuklina, 2012). The Centers for Disease Control and Prevention (CDC, 2014b) define severe maternal morbidity as the most severe complications in pregnancy, both physical and psychological, that cause adverse effects on a woman’s health (CDC, 2014b). Studies of obstetrical adverse events have shown that upwards of 78% of cases had communication error as a factor that led to the event (Shannon, 2011). The NPDB data reveal that when obstetrics claims do occur, they are very expensive. The average award in a successful lawsuit involving a neurologically impaired infant is $1,150,687 (Shwayder, 2007). The CDC suggests that the rise of severe maternal morbidity is due to a number of factors, including increases in maternal age, pre-pregnancy obesity, pre-existing chronic medical conditions, and cesarean delivery (CDC, 2014b).

Whether the medical errors are happening in Obstetrics, the Emergency Department, or Operating Department, they are costly in every way imaginable. Data from Van Den Bos et al. (2011) study show that medical errors do not necessarily result from particularly complex medical procedures or the use of elaborate medical technology. Instead they are caused by common and relatively straightforward medical services.

The National Patient Safety Foundation (NPSF) has listed the most common and most worrisome medical errors that should have focused attention and research. They include wrong-site surgery, medication errors, health-care acquired infections, falls, readmissions, and diagnostic errors (NPSF, 2013). The NPDB data clearly indicate the necessity and the inherent logic in including the three areas of the Emergency Department, Operating Department, and Obstetrics as focal areas of research for this study.

Categories of Medical Errors and Frequency

With the focus on patient safety and quality and reducing medical errors, hospitals logically may look to the frequency and severity of costs of certain medical errors as the first areas to aim improvement strategies. Table 2 indicates the frequency and severity of medical costs for the top medical errors as well as the frequency of malpractice claims and average cost of malpractice payment (AHRQ, 2013; Boodman, 2013; Centers for Medicare & Medicaid Services [CMS], 2014c; NPSF, 2013; NPDB, 2014b; Pham et al., 2012). From this table it is easy to identify the frequency of errors, the severity of medical costs, and the additional costs of malpractice settlements, supporting the municipal finance framework for risk management that indicates organizations should start with the errors that occur most and/or cost the most and then move in a logic order from there. We can see that surgical errors, obstetric errors, and diagnostic/treatment errors do not occur as frequently as medication errors, hospital-acquired infections, or falls, but when they do occur, they are very expensive in legal ramifications, not including follow-up medical costs.

Errors That Directly Result in Adverse Events

Medication errors. According to the IOM, there may be 1.5 million preventable medication errors annually, making this type of error one of the most common and most costly of preventable errors at a rate of $3.5 billion annually (Pham et al., 2012). Even if based on the number of medications dispensed each year, this is a relatively low error rate. The Agency for Healthcare Research and Quality considers medication errors completely preventable and is listed as one of the errors that should never happen (AHRQ, 2014b).

Medication errors include administering the wrong drug, the right drug but the wrong dosage, or administering the right drug but one which results in a harmful drug interaction, as in the Libby Zion case. Some studies include the delay of receiving medication as part of the definition of a medication error (Flynn, Liang, Dickson, Xie, & Suh, 2012). All of these facets together fall into the classification of preventable medication errors.

Table 2

Frequency and Cost of Medical Errors

Error	Frequency	Medical Cost	Average Medical Cost	Frequency of Malpractice Claims	Average Payment of Malpractice Claim	Total Malpractice Claims
Medication Error	1.5 million	$3.5 billion	$2,333	511	$246,756	$126 million
Hospital-Acquired Infections	2 million	$11 billion	$5,500	–	–	–
Falls	500,000	$30 billion	$60,000	–	–	–
Diagnostic and Treatment Errors	80,000	–	–	2026	$337,892	$684 million
Surgical Errors	4,108	$1.5 billion	$365,141	2893	$205,203	$837 million
Obstetrics Errors	10,398	–		585	$572,199	$334 million

Note. "–" refers to data not reported.

Hospital-acquired infections. Hospital-acquired infections are ones that are not present or incubating at the time of patient admission but are contracted while the patient is hospitalized. Examples include urinary tract infections, surgical site infections, and blood stream infections. Results of these infections can include death and at the very least result in the expenditure of additional resources, extended care, and substantial financial cost (Pham et al., 2012).

Prevalence of falls. Falls are the largest single category of adverse events that are reported in hospitals in the United States. According to the National Patient Safety Foundation, researchers estimate there are more than 500,000 falls in hospitals each year (NPSF, 2013).

Diagnostic errors. Diagnostic errors account for approximately 80,000 deaths each year in the United States. Studies dealing with autopsy have shown that 5% of patients with clinical misdiagnoses may have avoided death if the correct diagnosis had been made (Boodman, 2013). Studies show that diagnoses that are delayed, missed, or incorrect affect 10% to 20% of cases, and a 2009 report funded by the Agency for Healthcare Research and Quality found that 28% of diagnostic mistakes reported anonymously by physicians were life-threatening or resulted in death or permanent disability. In other words, diagnostic errors from all of healthcare (primary physician offices to hospitals) occur often and with severe consequences (Boodman, 2013).

Surgical errors. The median overall adverse event rate per hospital is 9.2%. Of that, surgical adverse events make up 39% (deVries, Ramrattan, Smorenburg, Gouma, & Boermeester, 2008). Many of the surgical errors can be linked to communication failures, lack of competence/experience, interruptions, excessive workload, errors in judgment, a failure to detect a hazard, lack of supervision for trainees, and emergent surgeries (Pham et al., 2012). Examples of surgical errors include wrong-site surgery, which is defined as a surgical procedure that is performed on the wrong side, site, limb, body part or wrong patient; and retained foreign objects, an error which occurs when an instrument or foreign body is left inside the patient after surgery (Pham et al., 2012). According to a report by Wu and Aufses (2012), the Joint Commission estimates there is a national incidence rate of wrong site surgery as high as 40 per week. Lyons and Popejoy (2014) indicate there are 100 million surgical procedures conducted annually in the United States. Assuming the national incidence rate of wrong site surgery is 40 per week, calculated out that is 2,080 per year, which works out to be a rare occurrence, but is the number one concern of 65% of Operating Department nurses across the United States (Infection Control Today, 2013).

Errors that Indirectly Result in Adverse Events

Communication and team work errors. Teamwork and communication errors are commonly cited as causal factors that result in adverse events, and poor teamwork has been linked with an increased risk of complications and death in surgical patients (Pham et al., 2012). Research has shown that the operating room is one of the most common locations for medical errors and adverse events to happen, with the most commonly cited cause of surgical error being a breakdown in communication (Lyons & Popejoy, 2014). For example, surgical procedures are complex and are sometimes conducted in less than ideal conditions. With approximately one half to two thirds of all errors being attributed to surgical care, the World Health Organization developed the surgical safety checklist. This checklist helps both teamwork and communication in that they provide a visual tool for standardizing communication. It also provides a virtual reminder of safety measures and best practices which can improve compliance. For example, the surgical checklist reminds the surgical team to administer an antibiotic within 60 minutes of incision helping to reduce the incidence of surgical site infections (Lyons & Popejoy, 2014).

Hand-off errors. Hand-off errors or transitions happen when patients move from one department to another. For example, this type of error occurs when a patient is transferred from an operating room to intensive care unit or from one healthcare provider to another during a shift change. Inconsistencies in hand-off processes and procedures from department to department and provider to provider can cause a breakdown in critical information. Communication failures have been identified in up to 70% of what should be sentinel events (Pham et al., 2012). According to the Joint Commission, a sentinel event is an unexpected occurrence, or risk of occurrence, involving death or serious physical or psychological injury that signals the need for an immediate response or investigation (Joint Commission, 2014). According to the Joint Commission, some of the most common sentinel events from 2013 are wrong patient, wrong-site, wrong-procedure surgeries; delay in treatment; unintended retention of a foreign body; and falls (Joint Commission, 2014).

Overall Costs of Medical Errors

Getting to the true cost of medical errors in the United States has proven difficult. The estimated annual cost of medical errors in 2008 was $17.1 billion. Of that, $3.7 billion were errors that Medicare deems as "never events" or what is now being called seriously reported events, such as wrong-site or wrong person surgery, medication errors, and falls (Van Den Bos et al., 2011). For a complete list see of these events, see Appendix A (National Quality Form, 2014a). This number, however, does not include the nonmedical cost of errors (Van Den Bos et al., 2011). National Practitioner Data Bank data provide only the number of malpractice claims filed and paid out but do not take into consideration additional medical costs. Nonmedical/additional costs include ancillary services, prescription drug services, inpatient and outpatient care, lost wages, missed work, and short-term disability claims, which adds up to approximately $1.1 billion (Andel et al., 2012). According to a study conducted by Andel et al. (2012), if the quality-adjusted life years (QALY) calculation is applied to the IOM's report of 98,000 medical errors annually resulting in death, the cost increases to $98 billion annually. That QALY calculation assumes an average of 10 lost years of life at $75,000 to $100,000 per year in lost economic impact. However, if the study by Classen et al. (2011) is correct in indicating that preventable death is 10 times the figure originally reported by the IOM, then the cost of medical errors is upwards of $980 billion annually (Andel et al., 2012). These costs do not reflect the cost of lost quality of life or longevity as a result of injury. While the cost of medical errors in the United States is staggering, the common basis for comparing the impacts of the different types of medical errors will be the number of annual deaths. According to Andel et al., (2012) $1.4 billion were attributed to mortality rates.

Legal Cost of Medical Errors

The cost of human suffering and death aside, critical factors in their own right, there are also legal ramifications with which hospitals must contend. The 2012 Annual Report of the National Practitioner Data Bank (NPDB) shows there were 9,194 medical malpractice allegations filed, with the largest malpractice payment awarded to obstetrics-related cases, averaging $572,199 per payment for 585 allegations. Diagnosis-related cases that can be linked to the Emergency Department average $337,892 per payment for

2,026 allegations. Surgery-related cases averaged $299,337 for 5,452 allegations (NPDB, 2014b). A study looking at NPDB data from 2009 showed that the three most common types of adverse events in hospitals were classified as surgical, diagnostic, and treatment (Bishop, Ryan, & Casalino, 2011). Results of the IOM report indicate that medication errors added $5,000 to the cost of every hospital admission (Healey & McGowan, 2011). According to a report by Healey and McGowan (2011), hospital-acquired infections impact over 2 million patients each year with an annual cost of upwards of 11 billion. Patients who sustain a fall stay 12 days longer in the hospital and have over $4,200 higher costs than patients who do not fall, and it is estimated that 7% of legal claims against hospitals are a directly attributed to falls (Pham et al., 2012). According to the Centers for Disease Control and Prevention (2014a), in 2010 the direct medical cost of patient falls on the U.S. healthcare system was $30 billion.

Tort reform in healthcare is intended to provide liability protection to physicians, such as the “safe harbor” legislation, which provides protection to physicians when they have followed designated guidelines; however, the medical liability system is riddled with inefficiencies and inaccuracies (Kachalia, Little, Isavoran, Crider, & Smith, 2014). Lipira and Gallagher (2014) argue that the inequities between the association of medical errors and medical malpractice claims leaves physicians vulnerable and with a fear of litigation causing them to not disclose adverse events. Evidence shows that traditional tort reforms such as imposing damages caps and shortening the time period in statutes of limitations are supposed to benefit physicians; however, they have not reduced the number of claims against physicians and they do very little to address their concerns about liability (Kachalia et al., 2014).

Mechanisms to Address Errors

An organization's performance depends on the actions of the management to maximize assets at appropriate times (Carrigan & Kujawa, 2006). John Buell (2010) reports that the only way to know if something needs correcting is for the people closest to the process to help identify what is going on with the process. At the same time, directors, managers, and executives need to be fully committed to supporting the findings and recommendations (Buell, 2010).

Pepper and Spedding (2010) argue that failing to integrate cultural aspects of continuous improvement strategies can limit the impact of the improvement; therefore, a strategy that integrates culture with a scientific approach will be most beneficial. There are many blueprints for how to engage managers in process improvement strategies; however, this group may not be the most important one that needs to buy in. A culture that embraces the idea that the work occurs on the floors of the departments with the front line workers, not with the administration, has a better chance of reaching organizational transformation (Grunden, 2009). Physician buy-in is critical for any process improvement strategy to take hold (Carrigan & Kujawa, 2006). Research by Stock et al. (2006) provides evidence that organizational culture plays an important role in addressing and dealing with hospital errors. The study suggests a group culture with an emphasis on human development, commitment to others, and participation appears to be a positive factor in reducing errors, especially in early stages of a hospital's error reduction plan. They argue that if a hospital recognizes the importance of reducing medical errors, the organizational culture should emphasize that goal and allocate resources toward obtaining that goal (Stock et al., 2006).

Healthcare has often turned to other high-risk industries such as aviation and nuclear power to take on strategies to help mitigate errors. For example, tools such as surgical checklists and team training (patterned off the aviation industry) have been some of the more widely adopted strategies but still have not significantly impacted patient safety (Makary, 2012). Stock et al. (2006) argue that insufficient training, the inability to learn from past mistakes, and the failure to create a safety culture result in a greater occurrence of medical errors.

High-risk industries such as air traffic control, air carriers and nuclear power have been able to obtain high levels of safety and quality by implementing the principles of highly reliable organization theory (O'Neill, 2011). Similar to errors in healthcare, errors in aviation are most commonly associated with humans and the interaction with their systems (Shappell et al., 2006). Tiny errors can turn quickly into a catastrophic event; the difference in healthcare is that the event is one person at a time, whereas an aviation event may impact up to several hundred individuals at one time. Awareness of the necessity for organizational and cultural commitment to the principles of quality, as those manifest within Highly Reliable Organizations, is key for establishing patient safety and can play a role in the reduction of errors (Hines et al., 2008). However, hospitals must align themselves consciously with these outcomes, as they do not occur serendipitously. An examination of the theory that girds HROs frames this point.

Highly Reliable Organization Theory

Frameworks such as high reliable organization theory may take hospitals further in their error reduction strategies by changing the healthcare culture to one focused on reliability (Hines et al., 2008). Highly reliable organization theory posits that organizations can achieve acceptable levels of safety in hazardous environments through the appropriate organization and management of technology, people and processes. The theory emphasizes a culture of reliability and argues that training, learning and redundancy of critical systems can lead to high levels of safety within complex, tightly coupled systems (Stock et al., 2006). The principles of highly reliable organization theory include sensitivity to operations, commitment to resilience, deference to expertise, preoccupation with failure, and a reluctance to simplify (Weick & Sutcliffe, 2007). Hospitals must understand these concepts and support an organizational culture in which they can be applied (Hines et al., 2008). For a hospital, these principles would manifest themselves to include heavy redundancy, specialization in training, information transfer and transparency, high funding allocations and prioritizing safety (O'Neil, 2011).

Stock, McFadden and Gowen (2006) examined highly reliable organization theory to address the problem of medical errors. They expected organizational culture to play a significant role in the reduction of medical errors as it is a fundamental principle of HRO theory. Their findings suggest that organizational culture does play an important role in dealing with hospital errors, but that other cultural variables may be present and impact the ability to deal with hospital errors. These include separate managerial variables (personal managerial style) or separate organizational variables (organizational alignments), for example; however, these variables only revealed a partial impact, and organizational culture still plays the more prominent role. They suggest future research between organizational cultures of different sub-departments within hospitals. They hypothesize that differences between organizational cultures of Surgical Departments and

Emergency Departments would lead to differences in error reduction outcomes (Stock et al., 2006).

Characteristics of Highly Reliable Organizations

Highly reliable organizations (HRO) have certain common characteristics of the environment in which they exist. The organization functions in a hazardous, fast-paced, highly complex system (Baker et al., 2006; Beyea, 2005; Stock et al., 2006). According to Baker et al. (2006), there are eight structural characteristics of a highly reliable organization: (1) hyper-complexity; (2) tightly coupled; (3) extreme hierarchical differentiation; (4) many decision makers working in complex communication networks; (5) high degree of accountability; (6) frequent, immediate feedback regarding decisions; (7) compressed time factors; and (8) synchronized outcomes. This hyper-complexity is defined as "an extreme variety of components, systems, and levels, each having their own standard procedures, training routines, and command hierarchy" (Baker et al., 2006, p. 1586). HRO organizations are also tightly coupled, meaning there is interdependence across many departments and levels. There are also clear differentiations in the organizational structure in which levels and roles are clearly defined. There are many decision makers working in a complex communication network, working simultaneously toward the outcome, and because of the catastrophic consequences that can result from an error, there is a high degree of accountability on the organization (Baker et al., 2006). Therefore, it is not surprising that the IOM report, *To Err is Human*, advocates "enhanced teamwork" (Baker et al., 2006) among physicians, nurses, and other healthcare providers, as well as "interdisciplinary team training programs" through which managerial principles and heightened communication are fostered (Kohn et al., 1999). Teamwork, then, is a critical element of HROs, and hospitals and other healthcare organizations must necessarily “act as HROs” (Baker et al., 2006, p. 1590)

Cultures of Reliable Organizations

It has long been presumed that people are the greatest resource of an organization and the key to providing outstanding performance (Delaney & Huselid, 1996). Highly reliable organization theory holds that organizations can reach tolerable levels of safety in high-risk or hazardous environments by using proper organization and management of technology, people and processes (Stock et al., 2006). Highly reliable organizations theory focuses on a culture of reliability and insists that training, learning, and redundancy can lead to high levels of safety. The theory addresses organizations that function in hazardous, fast-paced, highly complicated, and technically advanced settings with relatively low occurrence of errors for long periods of time (Baker et al., 2006). These organizations have certain attributes or characteristics that have allowed them to function at a high level of reliability for long periods of time, even though the potential of their failures could lead to catastrophic events. These organizations are designed and managed so well that when an error does occur, the organization uses the knowledge gained from the event to prevent similar errors reoccurring (Beyea, 2005). Research in hospital settings indicates that the “context in which work occurs”—that is, the “organizational culture”—is associated with patient safety (Provonost et al., 2006). Therefore, the interplay between organizational culture and the desired outcomes of patient safety bear consideration.

Weick and Sutcliffe (2007) argue that the difference between organizations that are highly reliable and organizations that are not is that HRO’s act mindfully. They organize in a way that enables them to notice when the unexpected is happening; therefore, they are able to stop the development of a full-blown error. If some of the unexpected happenings do develop, the organization will remain resilient and focus on the quick restoration of function. Weick and Sutcliffe suggest that for organizations that are highly reliable, this mindfulness comes from a continual updating and deepening of context, problem definition, and remedies. In other words, these organizations stay focused on identifying problems, finding solutions, and making sure those solutions are working. But the key is that HRO's recognize in early stages the unexpected happenings and meet the subtle signals of a potential problem with a strong response (Weick & Sutcliffe, 2007). In addition, they foster communication and team work as concomitants of effective, highly reliable organizations, which adapt the "lessons of high-reliability science"—those from aviation, for example, and implement them into healthcare settings.

The Institute for Healthcare Improvement has provided ideas regarding why the reliability of healthcare has been so inconsistent. This organization notes: (1) improvement methods in healthcare are overly dependent on vigilance and hard work, (2) benchmarking practices to mediocre outcomes gives a false sense of process reliability, (3) the attitude of clinical autonomy creates wide and unjustifiable performance variation, and (4) processes are not designed to meet reliability goals (Resar, 2006).

Hines et al. (2008) report that hospitals share many of the same environmental characteristics of other organizations that have achieved high reliability: hyper-complexity; tight coupling; extreme hierarchical differentiation; multiple decision-makers in a complex communication network; high degree of accountability; need for frequent, immediate feedback; and compressed time constraints. Hospitals are hyper-complex environments that depend on the effective coordination of physicians, nurses, pharmacists, technicians, and support staff to care for the patient. Hospitals are tightly coupled, which means that teams of people depend on each other to accomplish tasks and goals. For a patient undergoing surgery, teams of doctors, nurses, technicians, housekeeping, and transport must be coordinated for the surgery to run smoothly. Hospitals have a clear hierarchical differentiation, although in HROs during times of crisis, decision-making is deferred to the most knowledgeable person on the team regardless of his or her position. Hospitals have many decision-makers that must work together for the best care of the patient. There is a high degree of accountability in hospitals. Hospitals have the ability to get frequent and immediate feedback. It is a matter of developing a system and mind-set that will allow people to receive and respond to that feedback. Hospital staffs face time constraints daily and sometimes do not have the resources to obtain additional assistance. Therefore, using highly reliable organization theory as a framework through which to address errors and patient safety is appropriate.

While all of these environmental characteristics are shared among hospitals and other HROs, Hines et al. (2008) noted there are two other challenges to the healthcare environment that may be unique to that environment. First, higher workforce mobility: hospitals tend to have a workforce that has a higher turnover rate and teams that are frequently missing people. This results in additional costs to training, but also increases the importance of standardization. Second, care of patients rather than machines: patients are unpredictable, they are not mechanical and do not come with meticulously documented handbooks. The behaviors of patients vary and they can change over time.

These additional environmental characteristics do not mean that HRO concepts cannot be integrated into healthcare organizations. It merely means they need to be accounted for when HRO concepts are being introduced to healthcare.

There are hospitals that have demonstrated quality principles and have received national quality awards. It can be argued that these hospitals represent organizations that are on the pathways to becoming s highly reliable organizations and that the Malcolm Baldrige Award, specifically, is an award that leads to the culmination of this journey. Thus, Malcolm Baldrige awardees are on an evolutionary trajectory as they seek to become HROs (Pope, 2015).

Malcolm Baldrige National Quality Award

According to the Malcolm Baldrige website, the Malcolm Baldrige National Quality Award, Public Law 100-107 signed on August 20, 1987, led to the creation of a new public-private partnership (Malcolm Baldrige, 2014a). The findings and purposes section of Public Law 100-107 states:

> The leadership of the United States in product and process quality has been challenged strongly (and sometimes successfully) by foreign competition, and our Nation's productivity growth has improved less than our competitor's over the last two decades. Strategic planning for quality and quality improvement programs, through a commitment to excellence in manufacturing and services, are becoming more and more essential to the well-being of our Nation's economy and our ability to compete effectively in the global marketplace. Improved management understanding of the factory floor, worker involvement in quality, and greater emphasis on statistical process control can lead to dramatic improvements in the cost and quality of manufactured products. The concept of quality improvement is directly applicable to small companies as well as large, to service industries as well as manufacturing, and to the public sector as well as private enterprise. In order to be successful, quality improvement programs must be management-led and customer-oriented, and this may require fundamental changes in the way companies and agencies do business. Several major industrial nations have successfully coupled rigorous private-sector quality audits with national awards giving special recognition to those enterprises the audits identify

> as the very best. A national quality award program of this kind in the United States would help improve quality and productivity by:
>
> - helping to stimulate American companies to improve quality and productivity for the pride of recognition while obtaining a competitive edge through increased profits;
> - recognizing the achievements of those companies that improve the quality of their goods and services and providing an example to others;
> - establishing guidelines and criteria that can be used by business, industrial, governmental, and other organizations in evaluating their own quality improvement efforts; and
> - providing specific guidance for other American organizations that wish to learn how to manage for high quality by making available detailed information on how winning organizations were able to change either cultures and achieve eminence.
>
> (Malcolm Baldrige, 2013e)

Performance excellence is specifically defined by the Baldrige Award as "an integrated approach to organizational performance management that results in (1) delivery of ever-improving value to customers and stakeholders, contributing to organizational sustainability; (2) improvement of overall organizational effectiveness and capabilities; and (3) organizational and personal learning" (Malcolm Baldrige, 2013c). The Malcolm Baldrige National Quality Award began recognizing healthcare institutions in their pursuit of excellence in 1999. Since that time, there have been 19 U.S. healthcare organizations/systems recognized with the National Quality Award. Table 3 identifies these hospitals and their state, the year awarded, and the size of the hospital by indicating the number of beds or indicating how many hospitals participate in the healthcare system.

Table 3

Malcolm Baldrige Quality Award Winners in Healthcare

Hospital	State	Year Awarded	Size
Hill Country Memorial	TX	2014	86 beds
St. David's Heathcare	TX	2014	6 hospital system
Sutter Davis Hospital	CA	2013	48 beds
North Mississippi Health Services	MS	2012	6 hospital system
Henry Ford Health System	MI	2011	5 hospital system
Scheck Medical Center	IN	2011	93 beds
Southcentral Foundation	AK	2011	3 hospital system
Advocate Good Samaritan Hospital	IL	2010	333 beds
Atlanticare Regional Medical Center	NJ	2009	589 beds
Heartland Health	MO	2009	353 beds
Poudre Valley Health	CO	2008	270 beds
Mercy Health System	WI	2007	3 hospital system
Sharp Healthcare	CA	2007	4 hospital system
North Mississippi Medical Center	MS	2006	650 beds
Bronson Methodist Hospital	MI	2005	404 beds
Robert Wood Johnson University Hospital Hamilton	NJ	2004	242 beds
Baptist Hospital, Inc	FL	2003	492 beds
Saint Luke's Health System (St. Luke's Hospital)	MO	2003	582 beds
SSM Health Care	MO, WI, IL, OK	2002	19 hospital system

For a healthcare organization to be eligible for the Malcolm Baldrige National Quality Award, it must be headquartered in the United States; have existed for at least one year; ensure that operational practices are available for examination and information from the seven criteria categories, and can be shared. In 2012 an additional eligibility requirement was adopted. Organizations must also have a recent history of performance excellence, by having been evaluated by the national Baldrige Award committee (having previously won, or having recently received a site visit, or having scored an 8 or higher on feedback reports); having received a top performance award from another program in the Alliance for Performance Excellence; having 25% or more of the organization workforce located outside the organization's home state; or indicating there is no Alliance for Performance Excellence program available for the respective organization (Malcolm Baldrige, 2013d).

In addition to the application addressing the seven criteria categories, fees associated with the cost of administering the award are due by the applicant (Malcolm Baldrige, 2013d). A nonrefundable $360 fee to certify eligibility is due along with an application fee. For healthcare organizations with faculty and staff of 500 or more, the application fee is $18,000 (for faculty and staff under 500, $9,600). Those healthcare organizations earning a site visit based off of their application submission will be charged a site visit fee. For healthcare organizations with faculty and staff of 500 or more, the site visit fee is between $50,000 and $60,000 (for faculty and staff under 500, the site visit fee is between $30,000 and $35,000). Of course also is the cost of personnel for the hospital organization to prepare documents and host accreditors (Malcolm Baldrige, 2013b).

Malcolm Baldrige Indicators of Excellence and HRO Principles

Research by Pope (2015) suggests that a number of Malcolm Baldrige Health Care criteria are congruent with standards of highly reliable organizations. Therefore, the quality indicators of the Malcolm Baldrige Award can logically be mapped on to the principles existing in highly reliable organizations. This mapping is a contribution to the literature from this study. See Table 4 below.

The preface section of the Baldrige Award requires applicants to understand the essence of their organizations and to demonstrate the collaborative and competitive environment in which they operate. These indicators reflect the following HRO principles: sensitivity to operations, preoccupation with failure, and a commitment to resilience.

Category 1 of the Baldrige Award reflects leadership and overall governance of the organization. These indicators of quality reflect sensitivity to operations. Category 2 reflects strategic planning which can be mapped to the HRO principles of sensitivity to operations and commitment to resilience. Category 3 reflects customer focus, which reflects sensitivity to operations from a unique viewpoint. Category 4 focuses on measurement, analysis and knowledge management, and can be reflected in all five HRO principles: sensitivity to operations, commitment to resilience, preoccupation with failure, deference to expertise, and reluctance to simplify. Category 5 focuses on the workforce the capability and capacity and can be mapped to deference of expertise, sensitivity to operations, and reluctance to simplify. Category 6 examines the organization’s operations and can be mapped on to all five HRO principles. Category 7 focuses on results of the organization, and would also reflect all five principles of highly reliable organizations:

Table 4

Indicators of Excellence from Malcolm Baldrige Award and Healthgrades Awards as They Are Aligned with Principles of Highly Reliable Organization Theory

Principle of HRO	Malcolm Baldrige	Healthgrades
Sensitivity to Operations	Demonstrate an understanding of their organization and a collaborative and competitive environment. Category 1: Leadership and governance Category 2: Strategic planning Category 3: Customer focus Category 4: Measurement, analysis, and knowledge management Category 5: Workforce capability and capacity Category 6: Organizational operations Category 7: Results/Outcomes of the organization	Clinical Outcomes for common procedures utilizing risk adjusted methodology to account for co-morbidities.
Commitment to Resilience	Category 2: Strategic planning Category 4: Measurement, analysis, and knowledge management Category 6: Organizational operations Category 7: Results/Outcomes of the organization	Clinical Outcomes for common procedures utilizing risk adjusted methodology to account for co-morbidities.
Deference to Expertise	Category 4: Measurement, analysis, and knowledge management Category 5: Workforce capability and capacity Category 6: Organizational operations Category 7: Results/Outcomes of the organization	Clinical Outcomes for common procedures utilizing risk adjusted methodology to account for co-morbidities.
Preoccupation with Failure	Category 4: Measurement, analysis, and knowledge management Category 6: Organizational operations Category 7: Results/Outcomes of the organization	Clinical Outcomes for common procedures utilizing risk adjusted methodology to account for co-morbidities.
Reluctance to Simplify	Category 4: Measurement, analysis, and knowledge management Category 5: Workforce capability and capacity Category 6: Organizational operations Category 7: Results/Outcomes of the organization	Clinical Outcomes for common procedures utilizing risk adjusted methodology to account for co-morbidities.

sensitivity to operations, commitment to resilience, deference to expertise, preoccupation with failure, and reluctance to simplify.

All of the categories of the Malcolm Baldrige Award are relevant to the focus on medical error reduction. Each of these categories reflects an area in which the literature has identified as impacting the rate of medical errors. For example, Categories 1 and 2 reflect leadership, overall governance, and strategic planning, which has been stated in numerous studies as essential for the reduction of medical errors (Carrigan & Kujawa, 2006; Provonost et al., 2006; Resar, 2006; Sherman, 2010; Stock et al., 2006). Category 3 reflects a customer focus, which would mean in a hospital setting patient-centered, again with a number of studies showing patient-centered care should be the goal (Dabney & Tzeng, 2013; Schall, Sevin, & Wasson, 2009; Wolf, Lehman, Quinlan, Zullo, & Hoffman, 2008). Categories 4 and 7 reflect identification of problem areas. Results from a number of studies suggest reporting and tracking errors is critical information to their reduction (Carrigan & Kujawa, 2006; Garrouste-Orgeas et al., 2012; Stock et al., 2006). Finally, Categories 5 and 6 reflect the workforce and the organization’s operations, which also have been identified in the literature through teamwork studies as being important to the reduction of medical errors (Baker et al., 2006; Starmer et al., 2013).

Healthgrades Distinguished Hospital Clinical Excellence Award

The second national quality award recognized in this study is the Healthgrades Distinguished Hospital Clinical Excellence Award. In 1998, Healthgrades began objectively evaluating the quality of nearly every hospital in the United States in order to recognize top performing hospitals providing the best outcomes for their patients (Healthgrades, 2014). Their purpose is to provide critical information to consumers when selecting a physician or hospital. The evaluations of hospitals are done completely on clinical outcomes. There is no fee to in order to be evaluated by Healthgrades; however, there is a licensing fee to market or publicize any award received and the amount can vary and may be upwards of $145,000 (Rau, 2013). The Healthgrades methodology uses approximately 40 million Medicare discharge reports for the most recent 3-year period, data from the Agency for Healthcare Research and Quality as well as voluntary submission forms from hospitals. Data are examined with adjustments for patient's age, gender, and medical condition. The clinical outcomes of each hospital are analyzed using a logistic regression-based, risk-adjusted model that collects data for 31 procedures and conditions, 14 patient safety indicators, 10 patient experience indicators, 22 timely and effective care indicators, and 3 readmission rates.

Individual risk models are established for each condition relative to each specific outcome. Using these models, Healthgrades is able to attach star ratings to each of the conditions or procedures outcomes for each hospital. The hospital performances in these categories are then stratified into one of three performance categories: 1 star = performance that is statistically worse than expected; 3 stars = performance that is not statistically different than expected; and 5 stars = performance that is statistically better than expected (Healthgrades, 2013b). A listing of the Overall Clinical Awards and Specialty Awards is outlined in Appendix B.

The Distinguished Hospital for Clinical Excellence Award acknowledges that many hospitals have specific areas of expertise and high-quality outcomes in certain areas; however, the hospitals receiving this award exhibit comprehensive high-quality care based on risk-adjusted mortality and complication rates for common procedures and conditions. Using Medicare inpatient data from the Medicare Provider Analysis and Review database, hospitals must have had a minimum of 30 cases over the last 3 years of the study and at least 5 cases in the most recent year of study in at least 19 of the 27 listed conditions/procedures. Data gathered from the Centers for Medicare & Medicaid Services Medicare Provider Analysis and Review were obtained and a listing of all eligible hospitals that met the criteria was developed. Hospitals that met the criteria were analyzed further. The average performance rating and average *z*-score for each hospital was calculated by averaging all of their Medicare Provider Analysis and Review-based performance ratings. The corresponding *z*-scores for all outcomes (in-hospital complications, in-hospital mortality, 30-day mortality, and 180-day mortality) are averaged as well. Hospitals were then ranked in descending order by their average overall performance any ties were broken by average *z*-score. The top 5% of hospitals in the United States were then identified (Healthgrades, 2013b).

Healthgrades' quality and excellence programs focus exclusively on healthcare organizations. However, Healthgrades' programs focus on quality outcomes rather than a holistic review of the organization. Blending the Malcolm Baldrige Award and Healthgrades Distinguished Hospital Award provides the most solid support for a hospital earning "national quality award" status in this project. A mapping of indicators in the Healthgrades database and principles of HROs is also in Table 4 above.

Although logic suggests hospitals receiving national quality awards have lower levels of medical errors and better performance on quality indicators, the literature does not indicate whether this is the case. Therefore, non-national award-winning hospitals will be included in the study to determine whether award winners do have lesser error rates than non-national award winners. It is plausible that non-national award winners may have equivalent error rates as award winners; however, they may not have the time or the money or personnel to apply for national awards.

Medicare Hospital Compare Quality of Care Database

The data source for this project is the Medicare Hospital Compare Quality of Care database was established by the Centers for Medicare & Medicaid Services (CMS) in partnership with organizations representing consumers, doctors, hospitals, accrediting agencies, and other federal agencies to provide the best information possible to patients seeking information on the track records of Medicare-certified doctors and hospitals in the United States. The purpose of the database is to improve hospitals' quality of care by distributing objective, easy-to-understand data on hospital performance, as well as quality information from the consumer's perspective (Medicare Hospital Compare, 2014a).

The variables captured in the database are agreed upon between the CMS, hospital industry, and public stakeholder representatives such as The Joint Commission, National Quality Forum and the Agency for Research Quality in Healthcare, and hospital industry leaders (Medicare Hospital Compare, 2014c). Table 5 identifies the variables reported on in the Medicare Hospital Compare database.

Table 5

Medicare Hospital Compare Database Variables

Category	Variable	Scale
Survey of Patients' Experiences	Patients reported nurses "always" communicated well	%
	Patients reported doctors "always" communicated well	%
	Patients reported they "always" received help as soon as they wanted	%
	Patients reported their pain was "always" well controlled	%
	Patients reported staff "always" explained medications before giving	%
	Patients reported their room and bathroom was "always" clean	%
	Patients reported their room was "always" quiet at night	%
	Patients reported they were given information on recovery at home	%
	Patients gave their hospital a rating of 9 or 10 on a scale from 0-10	%
	Patients reported they would definitely recommend the hospital	%
Timely and Effective Care	Average # of minutes before outpatients with chest pain or possible heart attack was transferred to another hospital	Min
	Average # of minutes before outpatients with chest pain or possible heart attack got ECG	Min
	Outpatients with chest pain or possible heart attack who got drugs to break up clots within 30 minutes of arrival	%
	Outpatients with chest pain or possible heart attach who got aspirin with 24 hours of arrival	%
	Heart attack patients given PCI within 90 minutes of arrival	%
	Heart attack patients given aspirin at discharge	%
	Heart attack patients given a prescription for statin at discharge	%
	Heart failure patients given discharge instructions	%
	Heart failure patients given an evaluation of left ventricular systolic function	%
	Heart failure patients given ACE inhibitor or ARB for left ventricular systolic dysfunction	%
	Pneumonia patients whose initial ER blood culture was performed prior to administration of first hospital dose of antibiotics	%
	Pneumonia patients given the most appropriate initial antibiotic	%
	Outpatients having surgery who got an antibiotic at the right time	%

Table 5—Continued

Category	Variable	Scale
Timely and Effective Care, cont.	Surgery patients who were given an antibiotic at the right time	%
	Surgery patients whose preventative antibiotics were stopped at the right time	%
	Patients who got treatment at the right time to help prevent blood clots after certain types of surgery	%
	Outpatients having surgery who got the right kind of antibiotic	%
	Surgery patients who were taking beta blockers, were kept on before and after their surgery	%
	Surgery patients given the right kind of antibiotic	%
	Heart surgery patients whose blood sugar is kept under good control in the days right after surgery	%
	Surgery patients whose urinary catheters were removed on the first or second day after surgery	%
	Patients having surgery who were actively warmed in the OR or whose body temperature was near normal by the end of surgery	%
	Average time patients spent in ED before they were admitted to hospital as an inpatient	Min
	Average time patients spent in ED after the doctor decided to admit them as an inpatient before leaving the ED	Min
	Average time patients spent in the ED before being sent home	Min
	Average time patients spent in the ED before they were seen by a healthcare professional	Min
	Average time patients who came to the ED with broken bones had to wait before receiving pain medication	Min
	Percentage of patients who left the ED before being seen	%
	Percentage of patients who came to ED with stroke symptoms who received brain scan results within 45 minutes of arrival	%
	Patients assessed and given influenza vaccination	%
	Patients assessed and given pneumonia vaccination	%
	Children who received reliever medication while hospitalized for asthma	%
	Children who received systemic corticosteroid medication while hospitalized for asthma	%

Table 5—Continued

Category	Variable	Scale
Timely and Effective Care, cont.	Children and their caregivers who received a home management plan of care document while hospitalized for asthma	%
	Ischemic stroke patients who got medicine to break up a blood clot within 3 hours after symptoms started	%
	Ischemic stroke patients who received medicine known to prevent complications caused by blood clots within 2 days of arriving at the hospital	%
	Ischemic or hemorrhagic stroke patients who received treatment to keep blood clots from forming anywhere in the body within 2 days of arriving at the hospital	%
	Ischemic stroke patients who received a prescription for medicine known to prevent complications caused by blood clots before discharge	%
	Ischemic stroke patients with a type of irregular heartbeat who were given a prescription for a blood thinner at discharge	%
	Ischemic stroke patients needing medicine to lower cholesterol who were given a prescription for this medication before discharge	%
	Ischemic or hemorrhagic stroke patients or caregivers who received written materials about stroke care and prevention during their hospital stay	%
	Ischemic or hemorrhagic stroke patients who were evaluated for rehabilitation services	%
	Patients with blood clots who got the recommended treatment	%
	Patients with blood clots who were treated with an intravenous blood thinner and checked for increased risk of bleeding	%
	Patients who got treatment to prevent blood clots on the day of or after admission for surgery	%
	Patients who got treatment to prevent blood clots on the day of or after being admitted to ICU	%
	Patients who developed blood clot while in the hospital who did not get treatment that could have prevented it	%
	Patients with blood clots who were discharged on a blood thinner medication and received written instruction on that med	%
	Percent of newborns whose deliveries were scheduled too early, when a scheduled delivery was not medically necessary	%

Table 5—Continued

Category	Variable	Scale
Readmissions, Complications & Death	Rate of unplanned readmission for heart attack patients	No better; Average; Better
	Death rate for heart attack patients	No better; Average; Better
	Rate of unplanned readmission for heart failure patients	No better; Average; Better
	Death rate for heart failure patients	No better; Average; Better
	Rate of unplanned readmission for pneumonia patients	No better; Average; Better
	Death rate for pneumonia patients	No better; Average; Better
	Rate of unplanned readmission after hip/knee surgery	No better; Average; Better
	Rate of unplanned readmission after discharge from hospital (hospital-wide)	No better; Average; Better
	Rate of complications for hip/knee replacement patients	No better; Average; Better
	Serious complications	No better; Average; Better
	Death among patients with serious treatable complications after surgery	No better; Average; Better
	Central line-associated bloodstream infections	No better; Average; Better
	Catheter-associated urinary tract infections	No better; Average; Better
	Surgical site infections from colon surgery	No better; Average; Better

Table 5—Continued

Category	Variable	Scale
Readmissions, Complications & Death, cont.	Surgical site infections from abdominal hysterectomy	No better; Average; Better
	Methicillin-resistant Staphylococcus Aureus (MRSA) blood laboratory identified events	No better; Average; Better
	Clostridium difficile laboratory identified events	No better; Average; Better
	PCI readmission rate within 30 days of hospital discharge following PCI procedure	No better; Average; Better
Use of Medical Imaging	Outpatients with low back pain who had an MRI without trying recommended treatments first, such as physical therapy	%
	Outpatients who had a follow-up mammogram, ultrasound, or MRI of the breast within 45 days after a screening mammogram	%
	Outpatient CT scans of the chest that were “combination” (double) scans	%
	Outpatient CT scans of the abdomen that were “combination” (double) scans	%
	Outpatients who got cardiac imaging stress tests before low-risk outpatient surgery	%
	Outpatients with brain CT scans who got a sinus CT at the same time	%
Medicare Payment	Medicare hospital spending per patient	Ratio
Number of Medicare Patients	Shows the number of Medicare patients with a certain condition that a hospital treated during the current data collection period.	Number

The Hospital Compare data are made up of a mixture of self-reported information through multiple CMS reporting systems, data submitted to the Joint Commission, Medicare enrollment and claims data, the Centers for Disease Control and Prevention, and Hospital Consumer Assessment of Healthcare Providers and Systems (Medicare Hospital Compare, 2014c). Not all variables reported on by the Medicare Hospital

Compare database are used in this study. Discussion on the refinement of the variables is detailed in Chapter III.

Summary

Medical errors continue to be a major problem in the United States healthcare system. New research suggests upwards of 440,000 people die each year due to medical errors (James, 2013). A logical framework in which to evaluate medical errors is by the frequency and severity of cost in which they occur. In this framework, medical errors in Operating Departments and Emergency Departments occur more frequently than in Obstetric Departments. However, cost of malpractice settlements in obstetrics is much higher than in Operating Departments or Emergency Departments. Other high-risk industries such as air traffic control, air carriers, and nuclear power have successfully implemented highly reliable organization theory (HROT) and have incredible safety and quality records to show for it, supporting the idea that HROT may be applicable to healthcare environments to reduce medical errors. Anecdotal evidence suggests that some elements of HROT are already in the hospital culture, especially those that have received national quality awards. By using data from the Medicare Hospital Compare database, this study assesses clinical performance outcomes related to quality in national quality award-winning hospitals and non-national quality award-winning hospitals. The hypothesis of the study is that hospitals receiving specific national quality awards will have better clinical performance indicators on quality variables than hospitals that have not received these national quality awards.

CHAPTER III

METHODOLOGY

Overview of Purpose and Methods

The *To Err is Human* report by the Institute of Medicine highlighted the need for hospitals to focus on patient safety, and recent research estimates that upwards of 440,000 people die each year due to medical errors in the United States (James, 2013). With the understanding that medical errors and quality are hand-in-hand concepts, the purpose of this study is to better understand the association between national quality award-winning hospitals and their clinical performance outcomes as compared to non-national quality award-winning hospitals, and determine if there is a difference in three high-risk departments of these hospitals.

The Research Questions are as follows:

1. Do hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than non-national award-winning hospitals?
2. Do Obstetric Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Obstetric Departments in non-national award-winning hospitals?

3. Do Operating Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Operating Departments in non-national award-winning hospitals?
4. Do Emergency Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Emergency Departments in non-national award-winning hospitals?

This project proposes the following hypotheses:

H_0: Hospitals that have received a national quality award are similar to hospitals that have not received a national quality award on quality variables.

H_1: Hospitals that have received a national quality award have better performance outcomes on quality variables than hospitals that have not received a national quality award.

H_0: Obstetrics Departments in hospitals that have won a national quality award are similar to Obstetrics Departments in hospitals that have not received a national quality award on quality variables.

H_2: Obstetrics Departments in hospitals that have won a national quality award have better performance outcomes on quality variables than Obstetrics Departments in hospitals that have not received a national quality award.

H_0: Operating Departments in hospitals that have won a national quality award are similar to Operating Departments in hospitals that have not received a national quality award on quality variables.

H_3: Operating Departments in hospitals that have won a national quality award have better performance outcomes on quality variables than Operating Departments in hospitals that have not received a national quality award.

H_0: Emergency Departments in hospitals that have won a national quality award are similar to Emergency Departments in hospitals that have not received a national quality award on quality variables.

H_4: Emergency Departments in hospitals that have won a national quality award have better performance outcomes on quality variables than Emergency Departments in hospitals that have not received a national quality award.

The study utilized a two-sample *t* test (also known as independent sample *t* test) to examine the associations between two groups of hospitals (national quality award-winning and non-national quality award-winning) and 11 key quality variables from the timely and effective care section collected by the Medicare Hospital Compares Database. The two-sample *t* test was selected first because the data met the first three assumptions that would suggest it is appropriate to use the *t* test for analysis. The dependent variable data are continuous; the independent variable has two categories (national award-winning and non-national award-winning); and there are different participants in each group with no overlap (Laerd Statistics, 2015).

Data housed in the Medicare Hospital Compares Database was collected through a number of different sources, including voluntary reporting from the CMS Abstraction and Reporting Tool, Medicare Enrollment and Claims data, VA Administrative Data, National Healthcare Safety Network by the CDC, and AHRQ Patient Safety Indicators (Medicare Hospital Compare, 2014c).

The timely and effective care variables indicate the percentage of patients who received best practice treatments for their condition and determine how quickly patients are treated with certain medical emergencies, as well as reflect preventive treatment. Measures reported here reflect the accepted standard of care based on current scientific evidence. The measures are regularly reviewed and revised to ensure they are up to date. The measures do not have a risk adjustment calculation, but are reported as percentages (Medicare Hospital Compare, 2014b). There are 86 total variables collected by the Medicare Hospital Compare database, with 50 variables listed in the timely and effective care category (Medicare Hospital Compare, 2014d).

The key quality variables in this project come from the timely and effective care category and have been refined from the 50 variables in that category to 11 through an examination of the empirical literature as well as professional organizations and societies dealing with healthcare quality.

The 11 variables are: Average number of minutes before EKG is completed for patients with chest pains; Heart attack patients given PCI within 90 minutes of arrival; Heart Failure patients given ACE inhibitor or ARB for Left Ventricular Systolic Dysfunction; Pneumonia patients given the most appropriate initial antibiotic; Patients having surgery who got an antibiotic at the right time prior to surgery; Patients having surgery who got the right kind of antibiotic; Heart surgery patients whose blood glucose is kept under control in the days after surgery; Surgery patients whose urinary catheters were removed on the first or second day of surgery; Average time patients spent in ER before they were admitted to the hospital as an inpatient; Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery; and Newborns whose deliveries were scheduled too early when it was not medically necessary.

The identification of the key quality variables used in this project was established by cross-referencing quality indicators from the National Quality Forum (2014b); American Medical Association (2014); National Committee for Quality Assurance (2014); American College of Cardiology (2014); National Quality Measures Clearing House (2014); Ambulatory Care Quality (AQA) Alliance (2014); and empirical research from Caretta, Chukmaitov, Tang, and Shin (2013); Nietert et al. (2007); and Moore et al., (2013). Table 6 below identifies the variables selected and the professional societies and empirical studies that have identified them as a focus for quality as well as the unit/department those variables can be attributed to.

Table 6

Refined Variables of the Medicare Compare Database

Indicators	Medicare Compare	National Quality Forum	American Medical Association	National Committee for Quality Assurance	American College of Cardiology	Studies
Heart Attack patients given PCI within 90 Minutes	X				X	X
Avg # of minutes before ECG was given	X		X		X	
Heart Failure patients given ACE inhibitor or ARB for LVSD	X		X			X
Pneumonia where appropriate antibiotics were given	X					X
Heart Surgery patients with controlled blood sugar	X	X				

Table 6—Continued

Indicators	Medicare Compare	National Quality Forum	American Medical Association	National Committee for Quality Assurance	American College of Cardiology	Studies
Surgery patients with urinary catheters removed timely	X	X				
Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery	X		X			
% of newborns whose deliveries were scheduled too early when it was not medically necessary	X		X			
Avg time patients spent in ER before being admitted	X					X
Patients having surgery who got antibiotics at the right time	X		X			
Patients having surgery who got right kind of antibiotics	X			X		X

Research Design

The design used in this study is a quantitative approach using 2014 data from an open source the Medicare Hospital Compare Quality of Care database. Data from national quality award-winning hospitals and non-national quality award-winning hospitals were compared against each other using a two-sample *t* test. The two-sample *t* test allowed for a comparison between the means of two unrelated groups, in this case national award-winning hospitals versus non-national award-winning hospitals and their performance outcomes in the refined key quality variables. All hospitals reporting into the Medicare Hospital Compare database were included in the analysis. The exception were those hospitals that are missing data from half or more of the identified variables. A confidence level of 95% was used in the analysis.

Population and Sampling

According to the Medicare.gov website, there are 4,861 hospitals that are Medicare-certified and that are reported on in the Medicare Hospital Compare database (CMS, 2014b). In order to resolve any sampling issues or errors that might have occurred, all hospitals reported on in the Medicare Hospital Compare database were included in the analysis. Exceptions include those hospitals that are missing data for half or more of the variables, as it is unlikely that missing data for that many variables are due to random chance, but more likely are due to an undesirable characteristic (i.e., no ED, OB, or OD units) in the hospital for this project. For example, the institution that is not an acute care hospital, but a specialty organization that still reports to Medicare, is not a focus of this project. All hospitals will offer Emergency Department (ED), Obstetrics (OB-GYN), and Operating Department (OD) services and provide Acute Care Services.

There are 19 Malcolm Baldrige Quality Award in Healthcare recipients, and 474 hospitals have earned the 2012, 2013, or 2014 Healthgrades Distinguished Hospital for Clinical Excellence Award. Hospitals were categorized into national quality award-winning hospitals (if they have received the Malcolm Baldrige Quality Award, and/or Distinguished Hospital for Clinical Excellence Award) or non-national quality award-winning hospitals (if they have not received one of these awards).

Data Collection Procedures and Timelines

Human Subject Institutional Review Board approval was obtained to collect the data from the open-source Medicare Hospital Compare database. These data were downloaded from the Medicare website. These data reflect ratings from the last quarter of 2014. The data are able for download in an Excel format that easily uploaded into the SPSS version 22 software program that was used to run the statistical analysis. Prior to any running of analyses, the data were scrubbed, identifying only the 11 refined key quality variables and looking for missing data. Hospitals were coded using a State/Number identifier, such as MI-1 represented Michigan hospital #1.

Hospitals that were missing data for half (6) or more of the project's variables were excluded from the spreadsheet. Data collection was completed by March 31, 2015.

Instrumentation and/or Data Collection Protocols

Prior to the beginning of data collection, an exemption from the Human Subjects Institutional Research Board (HSIRB) was obtained, as these data are open source, there was no contact with human subjects, and no information can be attributed to an individual. After securing exemption from the HSIRB, data collection began with a download of 2014 data from the over 4,000 hospitals reported in the Medicare Hospital Compare database. All of the national quality award-winning hospitals were identified and coded. There are 19 Malcolm Baldrige National Quality Award winners for healthcare since 2002, and 474 hospitals have been awarded the Healthgrades Distinguished Hospital for Clinical Excellence Award since 2012.

Once all hospitals in the national quality award-winning category had been identified, the remaining hospitals reported in the Medicare Hospital Compare database were selected into the non-national quality award-winning category. The non-national quality award-winning hospitals had not received either the Malcolm Baldrige National Quality Award or the Healthgrades Distinguished Hospital for Clinical Excellence Award. However, they could have received specialty awards or other awards.

Once all hospitals for the project were selected into national quality award-winning or non-national quality award-winning, data collection of the key quality variables began. Any hospital that has missing data for half or more of the key quality variables was excluded from the analysis, as it is unlikely that the missing data are due to random chance. Appendix C includes the data collection worksheet used in this project. The variables collected have a mixture of different types of reporting scales, minutes, and percentages. Table 7 identifies the reporting scales, the type of data, and the analysis used.

For those variables reporting in percentages, data transformation (e.g., arcsine) was completed to account for any skewness in distribution prior to conducting the two-sample *t* test.

Table 7

Specific Key Variables for Data Analysis from Medicare Hospital Compare Database

Variable	Scale	Type	Analysis
Heart attack patients given PCI within 90 minutes of arrival	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Average number of minutes before ECG is completed for patients with chest pains	Minutes	Continuous	Independent *t* test/ Mann–Whitney *U* test

Table 7—Continued

Variable	Scale	Type	Analysis
Heart Failure patients given ACE inhibitor or ARB for Left Ventricular Systolic Dysfunction	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Pneumonia patients given the most appropriate initial antibiotic	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Heart surgery patients whose blood glucose is kept under control in the days after surgery	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Surgery patients whose urinary catheters were removed on the first or second day of surgery	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Newborns whose deliveries were schedule too early when it was not medically necessary	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Average time patients spent in ER before they were admitted to the hospital as an inpatient.	Minutes	Continuous	Independent *t* test/ Mann–Whitney *U* test
Patients having surgery who got an antibiotic at the right time prior to surgery	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test
Patients having surgery who got the right kind of antibiotic	Percentage	Continuous	Independent *t* test/ Mann–Whitney *U* test

Data Analysis Plan

A two-sample *t* test (with a 95% confidence level) using the computing software, SPSS was conducted in this project; however, if any assumptions to the two-sample *t* test were violated, then a non-parametric Mann-Whitney *U* test was conducted as needed.

The independent variable is the hospitals grouped into national quality award-winning and non-national quality award-winning. The dependent variable for the Emergency Department was the average time (in minutes) that patients spent in the ED before they were admitted to the hospital as an inpatient. This variable reports only those patients who were actually admitted to the hospital and does not include patients not admitted. This variable was selected to represent the Emergency Department because research shows that timeliness in the Emergency Department is critical to certain illnesses (heart attacks, sepsis, stroke) and can be a measure of quality and safety for Emergency Departments (Pham et al., 2014). The dependent variables for the Operating Department were whether the patients received the right kind of antibiotic prior to surgery as well as if they received the antibiotic at the right time. These variables were selected because empirical evidence indicates surgical site infections are considered to be the most preventable form of nosocomial infections among surgery patients, is directly linked to the surgery department, and considered to reflect quality in the Operating Department (Mujagic et al., 2014). Finally, the dependent variable for the Obstetrics Department was newborns whose deliveries were scheduled, either by caesarean section or induction, 1 to 3 weeks early when it was not medically necessary. This is the only variable in the Medicare Compare database that reports on obstetrics. However, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN, 2014) argues that labor is a complex physiologic event for women involving intricate interactions with multiple hormones that should not be induced, altered, or augmented unless medically warranted.

A two-sample *t* test was conducted for the remaining variables that were selected for their linkage to empirical studies or identification by professional associations and societies: Average number of minutes before ECG is completed for patients with chest pains; Heart attack patients given percutaneous coronary intervention (PCI) within 90 minutes of arrival; Heart Failure patients given angiotensin-converting-enzyme (ACE) inhibitor or angiotensin receptor blockers (ARB) for Left Ventricular Systolic Dysfunction; Pneumonia patients given the most appropriate initial antibiotic; Patients having surgery who was given an antibiotic at the right time prior to surgery; Patients having surgery who received the right kind of antibiotic; Heart surgery patients whose blood glucose is kept under control in the days after surgery; and Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery.

Using the two-sample *t* test allowed for the analysis of the means between the two groups (national quality award-winning and non-national quality award-winning hospitals) and the performance outcome for the quality variable being examined. The *t* test determined whether a hospital having earned a national quality award has statistically significant differences in their mean performance outcome score of key quality variables as compared to non-national quality award-winning hospitals. However, if any of the assumptions to use the two sample *t* test were violated, then the non-parametric Mann–Whitney *U* test was used to determine differences in medians of performance. Figure 1 identifies the process of analysis for the key quality variables of this project.

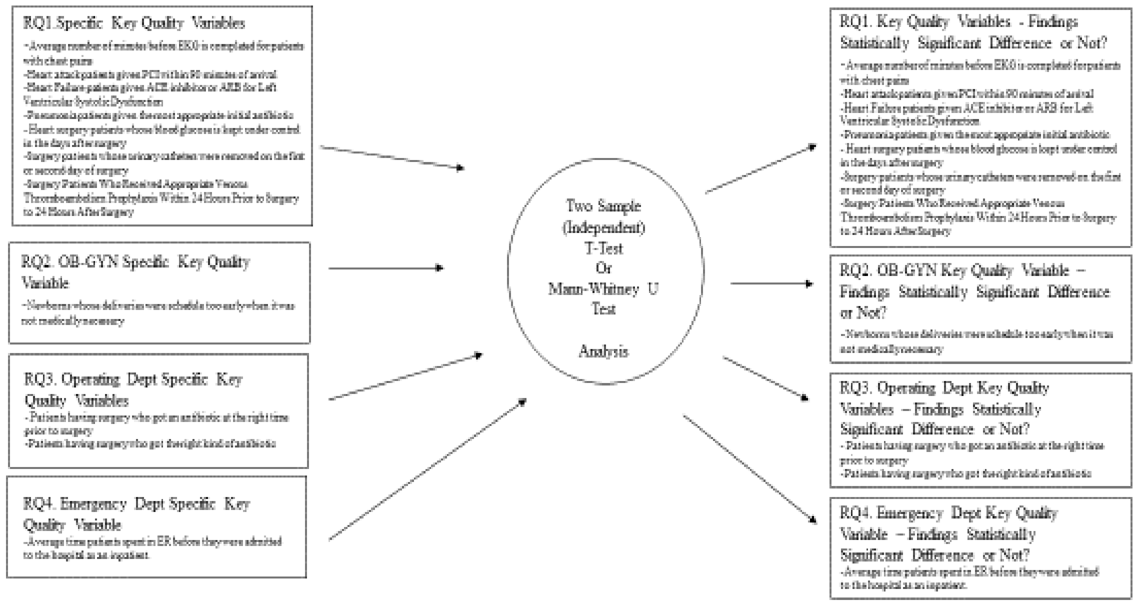

Figure 1. Conceptual map of data analysis.

Delimitations

Several delimitations were chosen in order to establish homogeneity among hospital subjects. The entire population of hospitals that report into the U.S. Medicare Hospital Compare database was initially selected; however, hospitals that had missing data for half or more of the refined variables were excluded. The Medicare Hospital Compare database collects information on 86 variables, but only those in the Timely and Effective Care category were selected, because these variables were unaltered in any way. Next, the variables were refined from 86 to 11 through a search of quality indicators from the literature and professional societies and association; however, selection of different variables may yield different results. Finally, it is also noted that hospitals that have self-selected to apply for a national quality award such as the Malcolm Baldrige may have better funding, more staff, and more resources not necessarily directly related to quality that is not being measured in this study.

Summary

A quantitative methodology utilizing the Medicare Hospital Compare database as the data source answered the research questions posed in this study:

1. Do hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than non-national award-winning hospitals?
2. Do Obstetric Departments in hospitals that have won national quality awards have higher scores in key quality performance variables (clinical excellence) than Obstetric Departments in non-national award-winning hospitals?
3. Do Operating Departments in hospitals that have won national quality awards have higher scores in key quality performance variables (clinical excellence) than Operating Departments in non-national award-winning hospitals?
4. Do Emergency Departments in hospitals that have won national quality awards have higher scores in key quality performance variables (clinical excellence) than Emergency Departments in non-national award-winning hospitals?

Refined data in the Medicare Hospital Compare database, from the timely and effective care section, was categorized into national quality award-winning versus non-national quality award-winning. The refinement of the variables from the Medicare Hospital Compare database was based on examination of empirical studies and review of professional medical associations to examine only key indicators of quality. The data analysis plan proposed to conduct a two-sample (independent) *t* test or Mann–Whitney *U* test for the analysis in order to address the research questions posed.

CHAPTER IV

RESULTS

Overview of Purpose and Questions

Logic suggests hospitals receiving national quality awards have lower levels of medical errors and better performance on quality indicators; however, the literature does not indicate whether this is the case. The purpose of this study was to better understand the differences between national quality award-winning hospitals and their clinical performance outcomes on specific variables as compared to non-national quality award-winning hospitals. This study also examined the difference between the earlier profiled three high-risk departments of these hospitals and whether there is a difference in performance between hospitals in these departments.

The Research Questions are as follows:

1. Do hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in specific key quality performance variables (clinical excellence) than non-national award-winning hospitals?
2. Do Obstetric Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in specific key quality performance variables (clinical excellence) than Obstetric Departments in non-national award-winning hospitals?

3. Do Operating Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in specific key quality performance variables (clinical excellence) than Operating Departments in non-national award-winning hospitals?
4. Do Emergency Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in specific key quality performance variables (clinical excellence) than Emergency Departments in non-national award-winning hospitals?

Description of Data

Human Subjects Institution Review Board approval was obtained to conduct this research under the exempt category; a copy of the approval letter is included in Appendix D. Data from the Medicare Hospital Compare database from the year ending 2014 were downloaded for analysis in this project. There are 86 variables collected in the database; 50 of them are related to timely and effective care. Out of the Timely and Effective Care category, 11 variables were selected as key quality indicators for use in this project. They were selected based on literature review and a review of the professional medical associations and societies in the United States that outline quality indicators.

There are 4,861 healthcare organizations that report into the Medicare Hospital Compare database. Not all, however, offer the same services; therefore, any reporting organization that had missing data for six or more of the selected key quality variables was excluded from analysis. This resulted in 3,118 healthcare organizations that were eligible for analysis in this study.

The healthcare organizations were then separated into two groups, national quality award-winning, represented in the data analysis with a 1, and non-national quality award-winning represented in the data analysis with a 0. Those hospitals having received the Malcolm Baldrige Quality Award for Healthcare and/or the Healthgrades Distinguished Hospital for Clinical Excellence Award were identified as national quality award-winning. All others were identified as non-national quality award-winning. When a Malcolm Baldrige Award-Winning system occurred, all hospitals within that system were depicted as a national quality award winner. There were 493 identified national quality award-winning organizations and 2,625 non-national quality award-winning organizations. Of the 493 national quality award-winning organizations, 11 have received both awards.

Data Analysis Process and Results

Using SPSS version 22, each variable was evaluated separately using a two-sample (independent) *t* test analysis or Mann–Whitney *U* tests as applicable at the .05 level of significance. When using an independent *t* test analysis, there are six assumptions that need to be met in order to determine whether using the analysis is appropriate or if another test should be used. Those assumptions are (1) there is a continuous dependent variable; (2) the independent variable is categorical with two groups; (3) there are independent observations (meaning there are no cases in which they would be listed in both categories); (4) there should be no significant outliers; (5) the dependent variable should be approximately normally distributed for each group of the independent variable;

and 6) there is homogeneity of variances, meaning the variance is equal in each group of the independent variable (Laerd Statistics, 2015). Should the variable fail to adhere to any of the assumptions for the independent *t* test, then a non-parametric Mann–Whitney *U* test was conducted. Table 8 provides an overview of the statistical analysis for each of the variables. Additional statistical analysis charts can be found in Appendix E.

Table 8

Overview of Statistical Analysis

Variable	National Quality Award-Winning Hospitals Mann–Whitney *U* Test	Non-National Quality Award-Winning Hospitals Mann–Whitney *U* Test
PCI %	Median = 98% *M* = 95.78% *U* = 209,961 *z* = 1.137 *p* = .255 Mean Rank 771.79 *N* = 353	Median = 98% *M* = 95.50% *U* = 209,961 *z* = 1.137 *p* = .255 Mean Rank 742.63 *N* = 1145
ECG Minutes	Median = 7 minutes *M* = 7.84 minutes *U* = 104,413 *z* = .578 *p* = .564 Mean Rank 874.4 *N* = 129	Median = 7 minutes *M* = 7.85 minutes *U* = 104,413 *z* = .578 *p* = .564 Mean Rank 848.5 *N* = 1571
ACE I %	Median = 100% *M* = 97.8% *U* = 464,138 *z* = 2.099 *p* = .036 Mean Rank 1,328.61 *N* = 414	Median = 100% *M* = 96.57% *U* = 464,138 *z* = 2.099 *p* = .036 Mean Rank 1251.95 *N* = 2114,
PNEU %	Median = 98% *M* = 97.36% *U* = 635,019 *z* = 4.795 *p* = .000 Mean Rank 1,722.45 *N* = 420	Median = 97% *M* = 95.84% *U* = 635,019 *z* = 4.795 *p* = .000 Mean Rank 1,501.74 *N* = 2643

Table 8—Continued

Variable	National Quality Award-Winning Hospitals Mann–Whitney *U* Test	Non-National Quality Award-Winning Hospitals Mann–Whitney *U* Test
Blood Glucose %	Median = 97% *M* = 94.91% *U* = 109,861 *z* = 1.493 *p* = .135 Mean Rank 531.97 *N* = 281	Median = 96% *M* = 93.92% *U* = 109,861 *z* = 1.493 *p* = .135 Mean Rank 501.64 *N* = 738
Urinary Cath %	Median = 99% *M* = 97.97% *U* = 584,049 *z* = 2.951 *p* = .003 Mean Rank 1,601.09 *N* = 420	Median = 99% *M* = 96.79% *U* = 584,049 *z* = 2.951 *p* = .003 Mean Rank 1,470.59 *N* = 2557
Clots %	Median = 99% *M* = 98.96% *U* = 632,221.5 *z* = 4.516 *p* = .000 Mean Rank 1,715.79 *N* = 420	Median = 99% *M* = 98.03% *U* = 632,221.5 *z* = 4.516 *p* = .000 Mean Rank 1,512.82 *N* = 2660
[a]OB %	Median = 2% *M* = 3.46% *U* = 343,569.5 *z* = 3.212 *p* = .001 Mean Rank 1,112.06 *N* = 371	Median = 3% *M* = 5.09% *U* = 343,569.5 *z* = 3.212 *p* = .001 Mean Rank 1,237.62 *N* = 2065
[a]ED Minutes	Median = 290 minutes *M* = 299.3 minutes *U* = 674,939 *z* = 7.467 *p* = .000 Mean Rank 1,820.93 *N* = 419	Median = 259 minutes *M* = 277.35 minutes *U* = 674,939 *z* = 7.467 *p* = .000 Mean Rank 1,475.48 *N* = 2626
[a]AntiTime %	Median = 99% *M* = 97.89% *U* = 504,593.5 *z* = 2.366 *p* = .018 Mean Rank 1,464.65 *N* = 399	Median = 98% *M* = 96.75% *U* = 504,593.5 *z* = 2.366 *p* = .018 Mean Rank 1,364.51 *N* = 2358

Table 8—Continued

Variable	National Quality Award-Winning Hospitals Mann–Whitney *U* Test	Non-National Quality Award-Winning Hospitals Mann–Whitney *U* Test
[a]AntiKind %	Median = 99% M = 97.91% U = 577,873 z = 1.879 p = .060 Mean Rank 1,589.17 N = 419	Median = 98% M = 97.0% U = 577,873 z = 1.879 p = .060 Mean Rank 1,504.26 N = 2612

[a]Variables assigned to high-risk departments

Overall Variables

RQ 1: *Do hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than non-national award-winning hospitals?*

This question focuses on all 11 variables selected through literature review and searches of professional associations and societies in the medical field that examine quality indicators. Seven of the 11 variables show a statistically significant difference in the mean or median outcome performance of national quality award-winning hospitals as compared to non-national award-winning hospitals (ACEI %, p = .036; Pneu %, p = .000; Urinary Cath %, p = .003; Clots %, p = .000; OB %, p = .001; ED Minutes, p = .000; AntiTime %, p = .018). Six out of the seven variables show a statistically significant higher score, while only the Emergency Department minutes variables shows a statistically significant lower score for national quality award-winning hospitals, which will be discussed more in Chapter V.

The findings suggest that, overall for these specific key variables, hospitals that have received a national quality award perform better on more of the identified key quality variables than non-national award-winning hospitals. Additionally, those variables assigned to the high-risk departments show statistically significant difference in performance, some better, some not, between national quality award-winning hospitals and non-national quality award-winning hospitals. More on these specific variables will be discussed as well.

PCI % Variable

The PCI % variable is the percentage of patients having a heart attack that are given percutaneous coronary intervention within 90 minutes of arrival of the hospital. Findings from the Mann–Whitney *U* tests analysis indicate there is no statistically significant difference between national quality award-winning hospitals and non-national quality award-winning hospitals in the performance outcome of this variable (p = .255).

In order to determine whether the independent *t* test analysis is appropriate to use for this variable, the last three assumptions need to be examined. First, there should be no major outliers. This variable, as seen in Figure 2, shows numerous outliers, which in turn means that the data will not be normally distributed. Because both the outlier assumption and the normality of distribution assumption were not met, this variable was transformed to determine if the distribution of the data could be normalized. The transformation computation applied reflect and inverse transformation; however, the data still continued to be skewed to the left. Therefore, it is determined the independent *t* test is no longer the most appropriate analysis, and a non-parametric Mann–Whitney *U* test is most appropriate because the Mann–Whitney *U* test can handle skewed normality of data distribution issues.

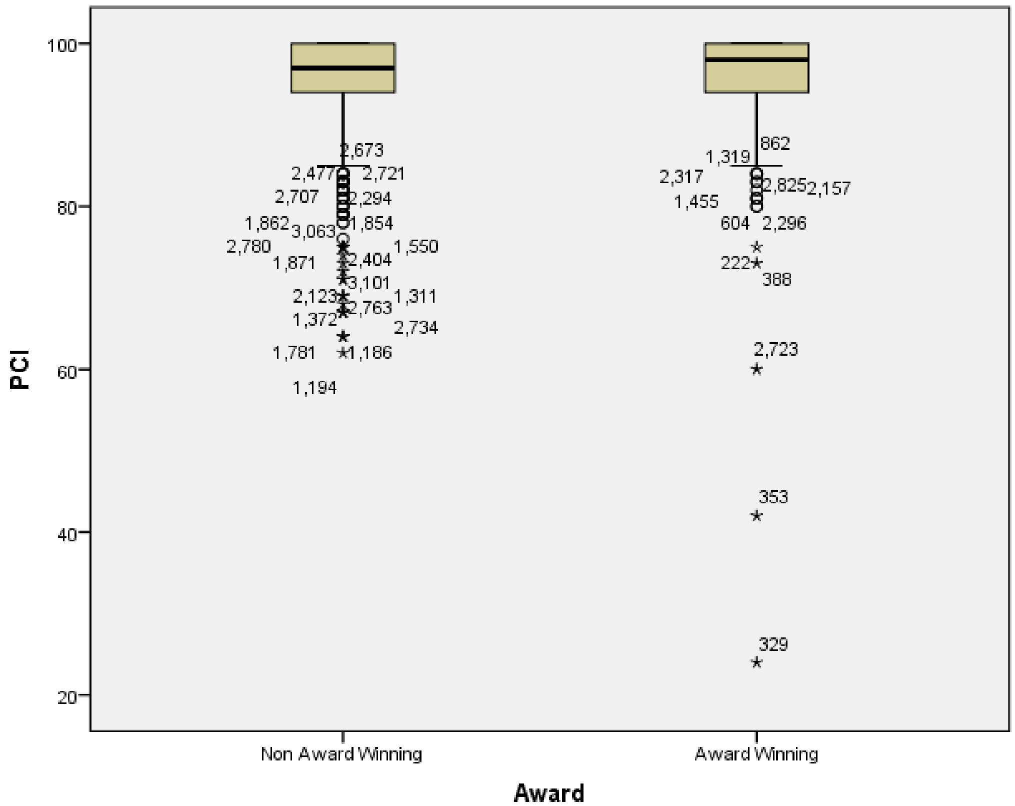

Figure 2. Box plot for PCI % variable.

The data for this variable satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape).

Distribution of the PCI scores for national award-winning hospitals and non-national award-winning hospitals were similar, as assessed by virtual inspection. PCI scores for non-national award-winning hospitals (mean rank 742.63) and national award-winning (mean rank 771.79) were not statistically different, $U = 209{,}961$; $z = 1.137$, $p = .255$. The median for national quality award-winning hospitals percentage of patients that receive PCI within 90 minutes of arrival is 98% and the mean is 95.78%. The median for non-national quality award-winning hospitals percentage of patients that receive PCI within 90 minutes of arrival is 97% and the mean is 95.5%.

After conducting multiple tests on this variable, it is concluded there is no statistically significant differences between the medians of the national award-winning hospitals and non-national award-winning hospitals in heart attack patients given PCI within 90 minutes of arrival at the hospital.

EKG Minutes Variable

The EKG minutes variable is the average number of minutes before and EKG (electrocardiogram, also referred to as ECG) is completed for patients complaining of chest pains. Findings from the analysis indicate there is no statistically significant difference in the median performance outcome between national quality award-winning hospitals and non-national quality award-winning hospitals for this variable using the Mann–Whitney *U* test ($p = .564$). Examination of the data for assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances) was conducted. Boxplots for this variable indicate outliers in the data as shown below in Figure 3.

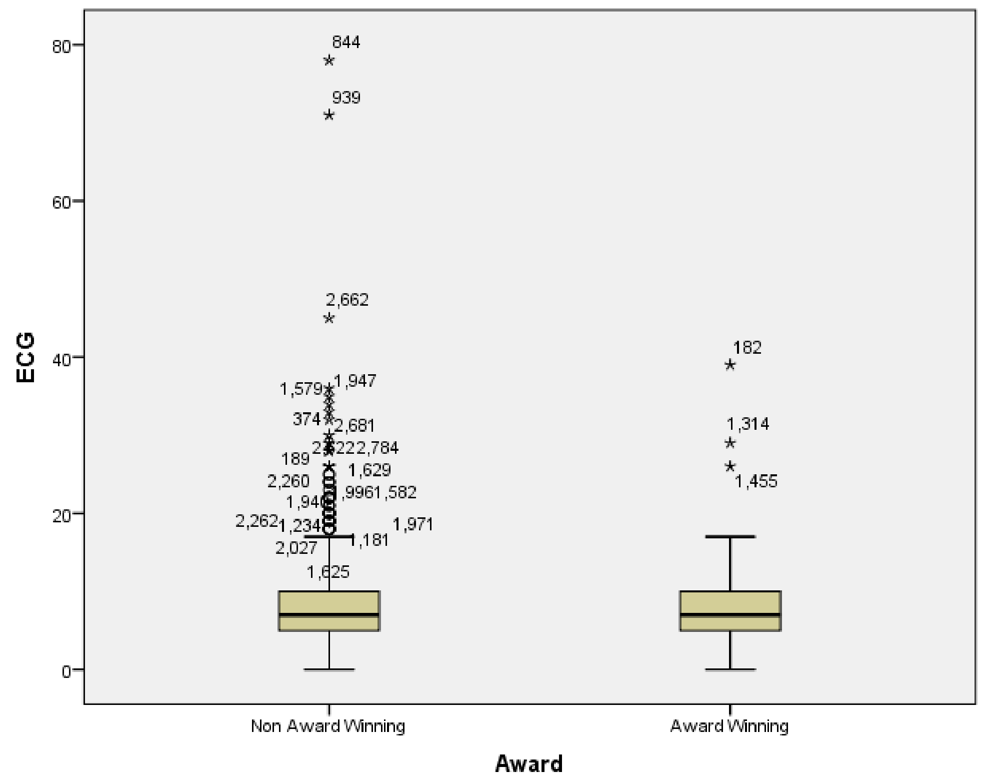

Figure 3. Boxplot for EKG Minutes variable.

With the numerous outliers in these data, it is known that the data are also not normally distributed. Visual assessment of the histograms and Q-Q plots show a skew to the right.

Because of the violations of assumption #4 (outliers) and #5 (normality of distribution) transformation of the variable was computed as skewed data to the right, using logarithmic transformation. Re-evaluation of the variable indicated that outliers still existed in the data, and the data were still not normally distributed.

With these continued violations in assumptions, the most appropriate analysis is the Mann–Whitney *U* test. The Mann–Whitney *U* test addresses the problem of violating the normality of distribution because it examines medians in a rank order. Therefore, this analysis was run to determine if there were differences in the median between national award-winning hospitals and non-national award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape).

Distribution of the EKG scores for national award-winning hospitals and non-national award-winning hospitals were similar, as assessed by virtual inspection. EKG scores for non-national award-winning hospitals (mean rank 848.5) and national award-winning (mean rank 874.4) were not statistically different, $U = 104{,}413$; $z = .578$. $p = .564$. The median time to EKG for non-national award-winning hospitals is 7 minutes and the mean time is 7.84 minutes. The median time to EKG for national award-winning hospitals is 7 minutes and the mean time is 7.85 minutes.

After conducting multiple tests on this variable it is concluded there is no statistically significant differences between the medians of the national award-winning hospitals and non-national award-winning hospitals in the EKG time variable.

ACE Inhibitor % Variable

The ACE inhibitor % variable is the percentage of heart failure patients given an ACE (angiotensin converting enzyme) inhibitor or ARB (angiotensin receptor blockers) for left ventricular systolic dysfunction. Findings indicate there is a statistically significant difference between the medians of national quality award-winning hospitals and non-national quality award-winning hospitals for this variable ($p = .036$). Examination of the data for assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances) was conducted. Boxplots for this variable indicate outliers in the data as shown below in Figure 4.

With the numerous outliers, the data are not normally distributed. A visual assessment of the histograms indicates the data are skewed to the left.

With violations of assumptions #4 (outliers), #5 (normal distribution) and #6 (homogeneity of variance), a transformation computation was done on this variable. Because of the skewed data to the left, reflect and inverse transformation was done. Re-examination of this variable indicated no outliers; however, the normality of distribution was still not met as assessed by Kolmogorov-Smirnov test of normality (p = .000), and homogeneity of variance was still not met as assessed by Levene's test for equality of variances (p = .000).

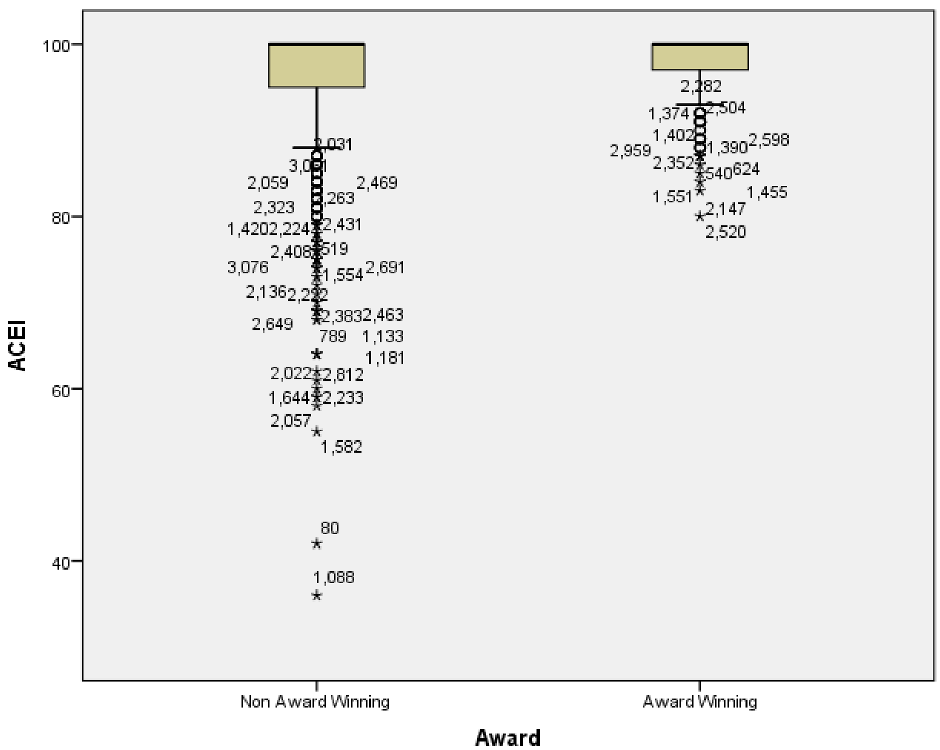

Figure 4. Boxplot for ACE I % variable.

With these continued violations in assumptions, a Mann–Whitney *U* test was run to determine if there were differences in the median between national award-winning hospitals and non-national award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape). Distribution of the ACE inhibitor scores for national award-winning hospitals and non-national award-winning hospitals were similar, as assessed by virtual inspection. ACE inhibitor scores for non-national award-winning hospitals (mean rank 1,251.95) and national award-winning (mean rank 1,328.61) were statistically different, $U = 464{,}138$; $z = 2.099$. $p = .036$. The median percentage of heart failure patients to receive ACE inhibitors for non-national award-winning hospitals is 100% and the mean is 96.57%. The median percentage of heart failure patients to receive ACE inhibitors for national award-winning hospitals is 100% and the mean is 97.8%.

The Mann–Whitney *U* test ranks all the observations and then sums the ranks from one of the groups and compares it to the expected rank sum. With a sufficiently large sample size the difference in ranks will be large enough to be statistically significant even when the medians are equal (Laerd Statistics, 2015). From examination of the means in this variable, however, we see that the percentage of heart failure patients receiving ACE inhibitors in non-national quality award-winning hospitals is considerably lower than national quality award-winning hospitals. The outliers in the boxplot shown above indicates there are a number of hospitals in the non-national quality award-winning category performing at a lower level than national quality award-winning hospitals and bringing down the mean for the group, even though the medians are the same.

Results from the initial run of the independent *t* test showed statistically significant differences in the means of this variable. Yet the transformation did not provide relief from the violations of assumptions for the independent *t* test for normal distribution.

After conducting multiple tests on this variable it is concluded that the results of the Mann–Whitney *U* tests indicate statistical significance in the median of the national award-winning hospitals and non-national award-winning hospitals in the ACE inhibitor percentage variable. While the medians for each category are the same at 100%, the mean ranks and the means indicate better performance outcomes for national award-winning hospitals in this variable.

Pneumonia % Variable

The pneumonia % variable refers to the percentage of pneumonia patients that were given the most appropriate initial antibiotic. Findings indicate there is a statistically significant difference between the medians of national quality award-winning hospitals and non-national quality award-winning hospitals in performance outcome for this variable (p = .000). Examination of the data for assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances) was conducted. Boxplots for this variable indicate numerous outliers in the data as shown in Figure 5.

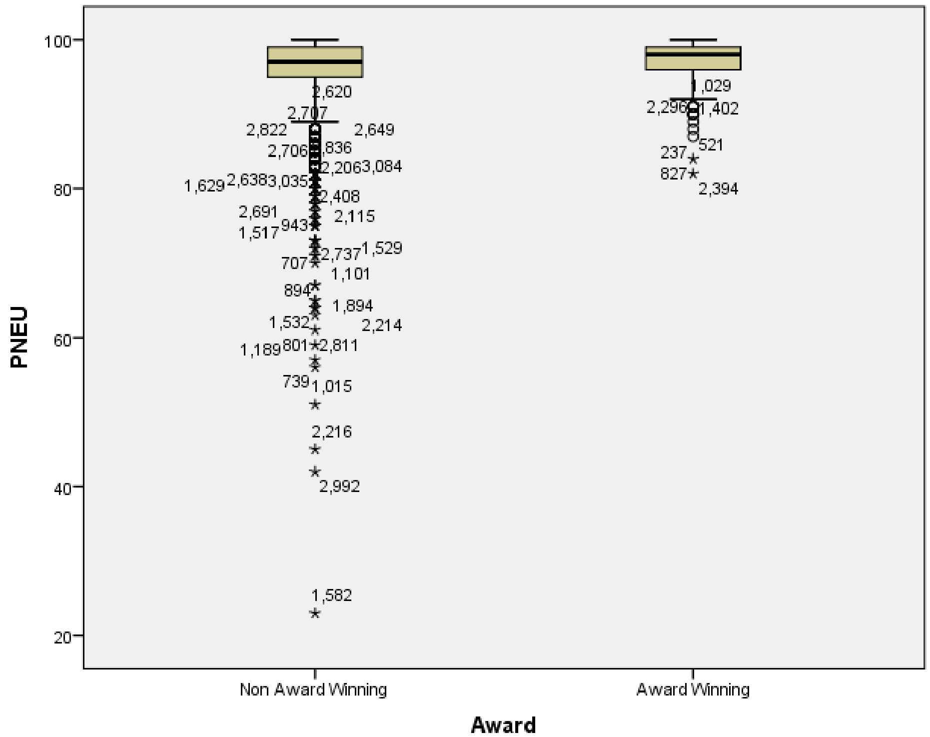

Figure 5. Boxplot for Pneumonia % variable.

With the numerous outliers the data also shows a non-normal distribution. Visualization of the histogram showed skewed data to the left. With the violations to assumptions #4 (outliers), #5 (normality of distribution) and #6 (homogeneity of variances), a transformation computation of the variable was conducted as reflect and inverse transformation computation. During re-examination of the data, it was found that outliers remained and the data still did not meet the assumption of normal distribution.

With these continued violations in assumptions, a Mann–Whitney *U* test was run to determine if there were differences in the median between national quality award-winning hospitals and non-national quality award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories;

whether the distribution of data has the same shape). Distribution of the pneumonia % scores for national quality award-winning hospitals and non-national quality award hospitals were similar, as assessed by virtual inspection. Pneumonia % scores for national quality award-winning hospitals (mean rank 1,722.45) and non-national quality award-winning hospitals (mean rank 1,501.74) were statistically different, U = 635,019; z = 4.795; p = .000. The median percentage of pneumonia patients receiving the appropriate initial antibiotic for national quality award-winning hospitals is 98% and the mean is 97.36%. The median percentage of pneumonia patients receiving the appropriate initial antibiotic for non-national award-winning hospitals is 97% and the mean is 95.84%. Therefore, it is concluded there is a significant difference in the medians of percentage of pneumonia patients receiving the appropriate initial antibiotic in national quality award-winning hospitals as compared to non-national quality award-winning hospitals. With a better performance outcome from national quality award-winning hospitals.

Blood Glucose % Variable

The blood glucose % variable refers to heart surgery patients whose blood glucose is kept under control in the days after surgery. Findings indicate there is no statistically significant difference between the median for national quality award-winning hospitals and non-national quality award-winning hospitals in the performance outcome of this variable (p = .135). Examination of the data for assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances) was conducted. Boxplots for this variable indicate numerous outliers in the data as shown in Figure 6.

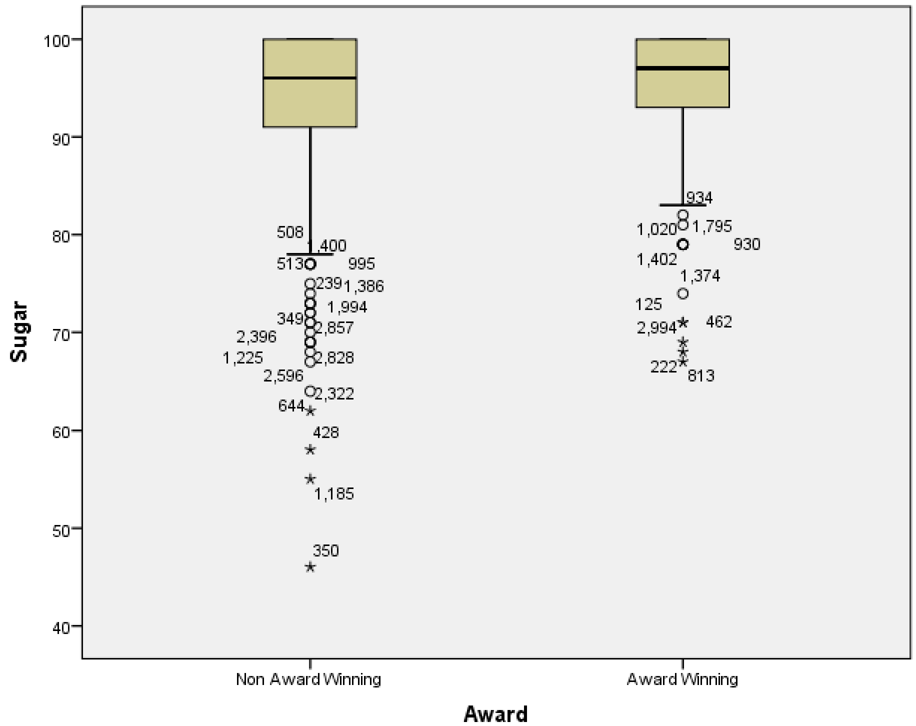

Figure 6. Boxplot for Blood Glucose % variable.

With the numerous outliers we can see the data are not normally distributed as well. Finally, the assumption of homogeneity of variances is not met as assessed by Levene's test for equality of variances (p = .002). Visualization of the histogram showed skewed data to the left.

With the violations in assumption #4 (outliers), #5 (normal distribution), and #6 (homogeneity in variances), and skewed data to the left, a transformation computation was done with the variable as reflect and logarithmic transformation. Re-examination of the variable indicated no outliers within the group. However data were still not normally distributed as assessed by the Kolmogorov-Smirnov test of normality (p = .000).

With these continued violations in assumptions, a Mann–Whitney *U* test was run to determine if there were differences in the median between national quality award-winning hospitals and non-national quality award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape). Distribution of the blood sugar % scores for national quality award-winning hospitals and non-national quality award hospitals were similar, as assessed by virtual inspection. Blood sugar % scores for national quality award-winning hospitals (mean rank 531.97) and non-national quality award-winning hospitals (mean rank 501.64) were not statistically different, U = 109,861.5; z = 1.493; p = .135. The median percentage of heart surgery patients whose blood sugar was kept under control in the days following surgery for national quality award-winning hospitals is 97% and the mean is 94.91%. The median percentage of heart surgery patients whose blood sugar was kept under control in the days following surgery for non-national award-winning hospitals is 96% and the mean is 93.92%. With the violations of assumptions in the independent *t* test it is determined that the Mann–Whitney *U* test is more appropriate. Therefore, it is concluded there is not a significant difference in the medians of percentage of heart surgery patients whose blood sugar was kept under control in the days following surgery in national quality award-winning hospitals as compared to non-national quality award-winning hospitals.

Urinary Catheters % Variable

The urinary catheters % variable refers to surgery patients whose urinary catheters were removed on the first or second day of surgery. Findings indicate there is a statistically significant difference in the median performance outcome between national quality award-winning hospitals and non-national quality award-winning hospitals for this variable (p = .003). Examination of the data for assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances) was conducted. Boxplots for this variable indicate numerous outliers in the data as shown in Figure 7.

With the numerous outliers, a non-normal distribution of data occurs as well. Visualization of the histogram showed data skewed to the left. With the violations in assumption #4 (outliers), #5 (normal distribution), and #6 (homogeneity in variances), and skewed data to the left, a transformation computation was done with the variable as reflect and logarithmic transformation. Re-examination of the variable indicated outliers remained in the data, and data were still not normally distributed.

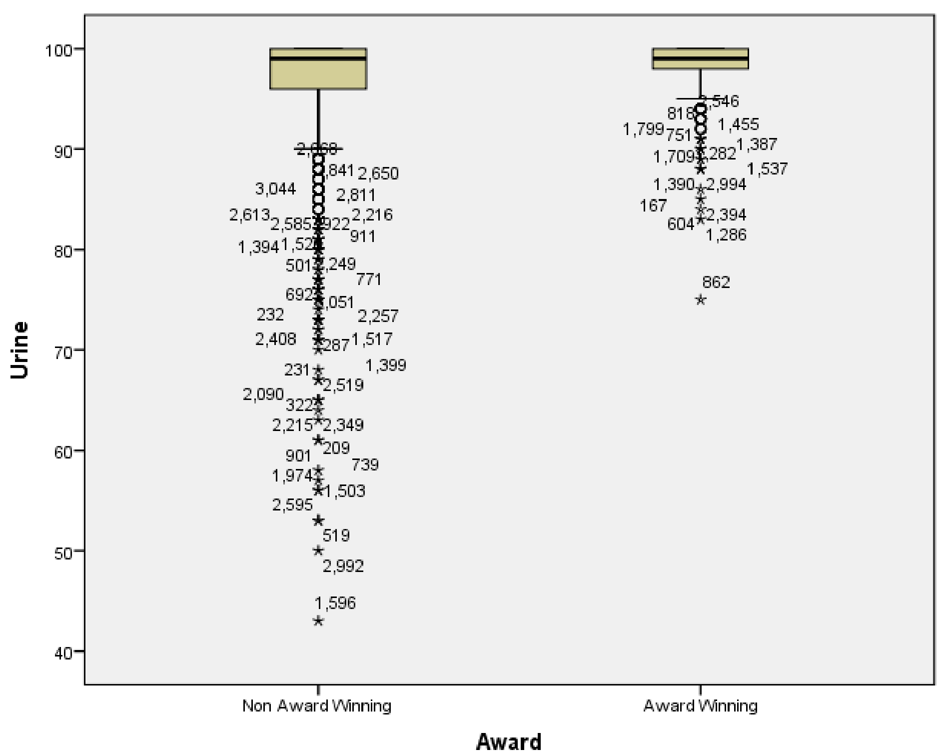

Figure 7. Boxplot for Urinary Catheter % variable.

With these continued violations in assumptions, a Mann–Whitney *U* test was run to determine if there were differences in the median between national quality award-winning hospitals and non-national quality award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape). Distribution of the urine catheter % scores for national quality award-winning hospitals and non-national quality award hospitals were similar, as assessed by virtual inspection. Urine catheter % scores for national quality award-winning hospitals (mean rank 1,601.09) and non-national quality award-winning hospitals (mean rank 1,470.59) were statistically different, $U = 584{,}049$; $z = 2.951$; $p = .003$. The median percentage of surgery patients whose urinary catheters were removed on the first or second day after surgery for national quality award-winning hospitals is 99% and the mean is 97.97%. The median percentage of surgery patients whose urinary catheters were removed on the first or second day after surgery for non-national award-winning hospitals is 99% and the mean is 96.79%. With the violations of assumptions in the independent *t* test it is determined that the Mann–Whitney *U* test is more appropriate.

Therefore, it is concluded there is a statistically significant difference in the medians of percentage of surgery patients whose urinary catheters were removed on the first or second day after surgery in national quality award-winning hospitals as compared to non-national quality award-winning hospitals. Again, however, this variable shows medians that are the same at 99%, so a closely examination of the mean ranks and the means as well as the boxplot indicates that there are some hospitals in the non-national quality award-winning category performing at a very low level in this variable. Bringing down the mean and indicating the better performance is in the national quality award-winning hospitals even though the medians are the same.

Blood Clot % Variable

The blood clot % variable refers to surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery to prevent blood clots. Findings indicate there is a statistically significant difference in the means in the performance outcome between national quality award-winning hospitals and non-national quality award-winning hospitals for this variable (p = .000). Examination of the variable showed for assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances) showed numerous outliers in the dataset as assessed by the boxplot shown in Figure 8.

With the numerous outliers, normality of distribution of the data was also not met. Visualization of the histograms skewed data to the left. With the violations of assumption #4 (outliers), #5 (normal distribution), and #6 (homogeneity of variance) a transformation computation of the data was conducted using reflect and inverse transformation. Re-evaluation of the variable indicated that no outliers existed in data. However, data were still not normally distributed as assessed by the Kolmogorov-Smirnov test of normality, p = .000; and data still had not met the assumption of homogeneity of variance, p = .004.

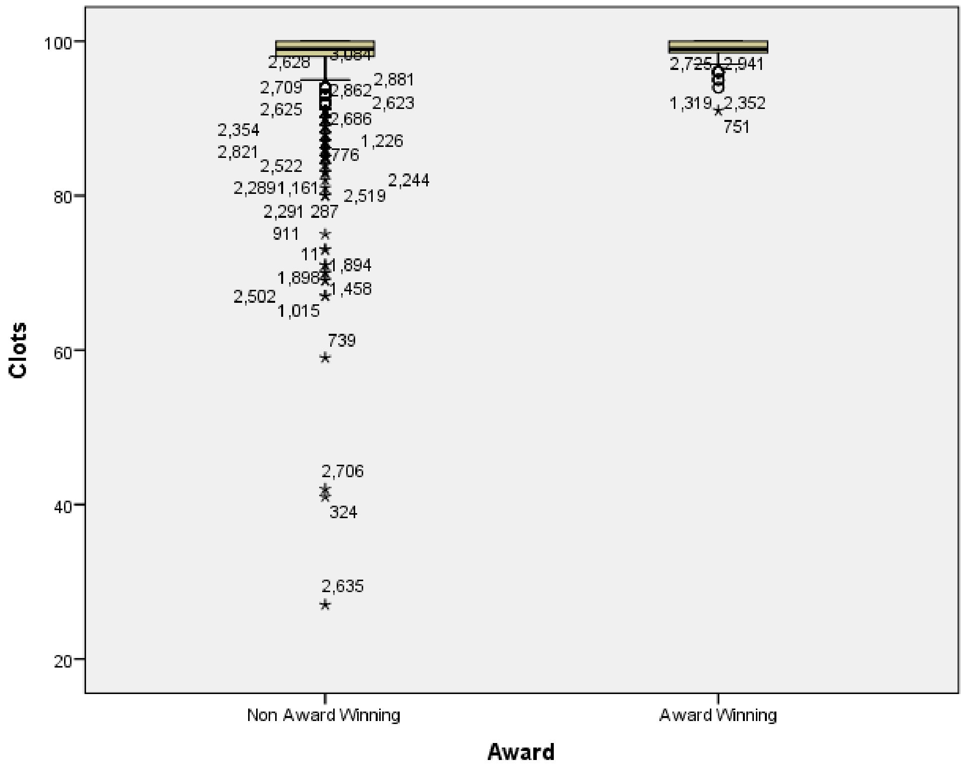

Figure 8. Boxplot for Blood Clots % variable.

With these continued violations in assumptions to the independent *t* test, a Mann–Whitney *U* test was run to determine if there were differences in the median between national quality award-winning hospitals and non-national quality award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape). Distribution of the blood clot % scores for national quality award-winning hospitals and non-national quality award-winning hospitals were similar, as assessed by virtual inspection. Blood clot % scores for national quality award-winning hospitals (mean rank 1,715.79) and non-national quality award-winning hospitals (mean rank 1,512.82) were statistically different, U = 632,221.5; z = 4.516; p = .000. The median percentage of surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery for national award-winning hospitals is 99% and the mean is 98.96%. The median percentage of surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery for non-national quality award-winning hospitals is 99% and the mean is 98.03%. With the violations to the assumptions for the independent t test it is determined the Mann–Whitney U test is appropriate.

Therefore, it is concluded there is a significant difference in the medians of percentage of surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery in national quality award-winning hospitals as compared to non-national quality award-winning hospitals. Again, this variable indicates the same medians for both categories of hospitals. In further examination of the mean ranks and means as well as the boxplot there are a few hospitals in the non-national quality award-winning category that are performing low in this variable and the better performance is in hospitals that have received the national quality awards.

Obstetrics Department

RQ 2: *Do Obstetric Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Obstetric Departments in non-national award-winning hospitals?*

This research question focuses on the one obstetrics variable collected in the study which examines the percentage of births that were delivered 1–3 weeks early either by induction or caesarean section when it was not medically necessary. The findings show that hospitals that have received national quality awards (Median–2%; p = .000) have a statistically significant lower percentage (a better score) than non-national quality award-winning hospitals (Median–3%; p = .000).

The variable directly linked to the high-risk Obstetrics Department is the percentage of newborns whose deliveries were scheduled too early when it was not medically necessary, either by induction or caesarean section. Findings indicate there is a statistically significant difference in the median performance outcome for national quality award-winning hospitals and non-national quality award-winning hospitals for this variable (p = .001). Upon examination of the variable for the additional assumptions of the independent *t* test, it was found that numerous outliers were present in the data as shown in Figure 9.

With the numerous outliers, there was not normal distribution of the data. Visualization of the histograms showed skewed data to the right.

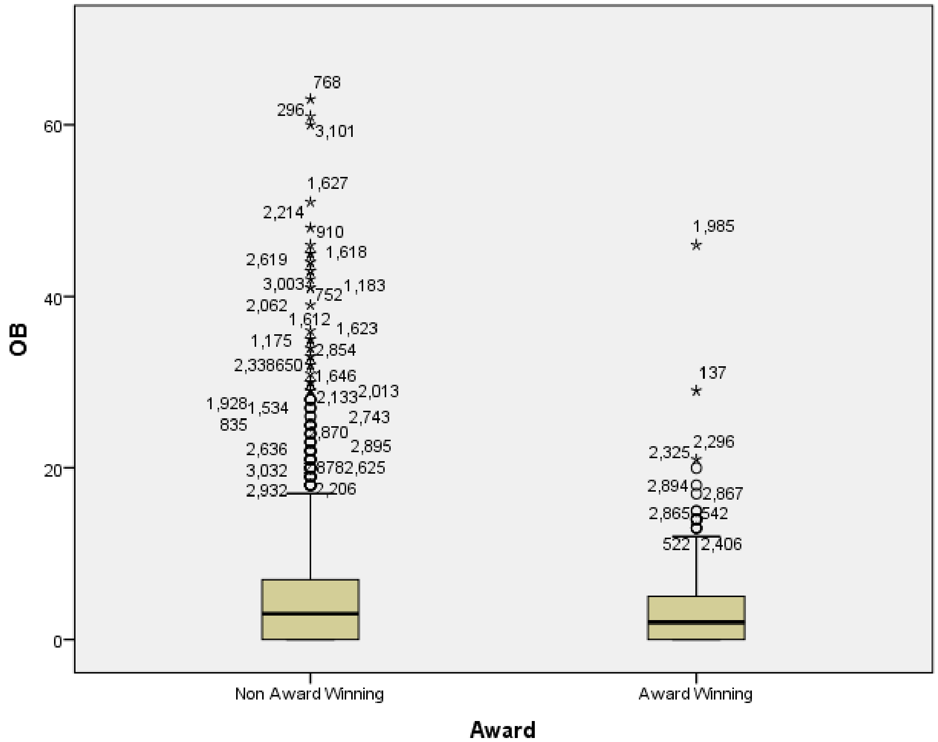

Figure 9. Boxplot for OB % variable.

With the violations of assumption #4 (outliers), #5 (normal distribution), and #6 (homogeneity of variance), a transformation computation of the data was conducted using inverse transformation. Re-evaluation of the variable indicated that outliers still existed in data, and that the data were still not normally distributed. With these continued violations in assumptions to the independent *t* test, a Mann–Whitney *U* test was run to determine if there were differences in the median between national quality award-winning hospitals and non-national quality award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape). Distribution of the OB % scores for national quality award-winning hospitals and non-national quality award-winning hospitals were similar, as assessed by virtual inspection. OB % scores for national quality award-winning hospitals (mean rank 1,112.06) and non-national quality award-winning hospitals (mean rank 1,237.62) were statistically different, U = 343,569.5; z = –3.212; p = .001. The median percentage of newborns whose deliveries were scheduled too early when it was not medically necessary for national quality award-winning hospitals is 2% and the mean is 3.46%. The median percentage of newborns whose deliveries were scheduled too early when it was not medically necessary for non-national quality award-winning hospitals is 3% and the mean is 5.08%. With the violations to the assumptions for the independent *t* test, it is determined the Mann–Whitney *U* test is appropriate. Therefore, it is concluded there is a significant difference in the medians of percentage of newborns whose deliveries were scheduled too early when it was not medically necessary in national quality award-winning hospitals as compared to non-national quality award-winning hospitals.

Operating Department

RQ 3: *Do Operating Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Operating Departments in non-national award-winning hospitals?*

This research question examines two variables that are directly linked to the Operating Department. Patients that receive the right kind of antibiotic prior to surgery, and at the right time prior to surgery. These two variables are linked specifically to the Operating Department because they occur within that department, whereas the blood glucose variable, for example, may be more attributable to the floor unit than the operating unit. The antibiotic timing variable showed a statistically significant difference in better performance in the percentage of patients that receive an antibiotic prior to surgery at the correct time for national quality award-winning hospitals (Median–99%; $M = 97.89\%$; $p = .018$) and non-national quality award-winning hospitals (Median–98%; $M = 96.75\%$; $p = .018$). However, while the median percentage of patients that received the right kind of antibiotic prior to surgery is higher in national quality award-winning hospitals (Median–99%; $M = 97.91\%$; $p = .060$) than non-national quality award-winning hospitals (Median–98%; $M = 97\%$; $p = .060$), it is not statistically significant.

There are two variables in this project attributed to the Operating Department, receiving the correct kind of antibiotic prior to surgery, at the correct time. Findings indicate that there is a statistically significant difference between the median performance outcome between national quality award-winning hospitals and non-national quality award-winning hospitals when looking at timing of antibiotics prior to surgery ($p = .018$). However, there is no statistically significant difference between the mean performance outcome between national quality award-winning hospitals and non-national quality award-winning hospitals when looking at the type or kind of antibiotic given before surgery ($p = .060$). These variables were examined for the remaining assumptions of the independent *t* test, outliers, normality of distribution, and homogeneity of variances. Evaluation of these variables revealed the following: both the correct kind of antibiotic and the correct time variables showed numerous outliers in the dataset as examined by boxplots shown in Figure 10 and Figure 11.

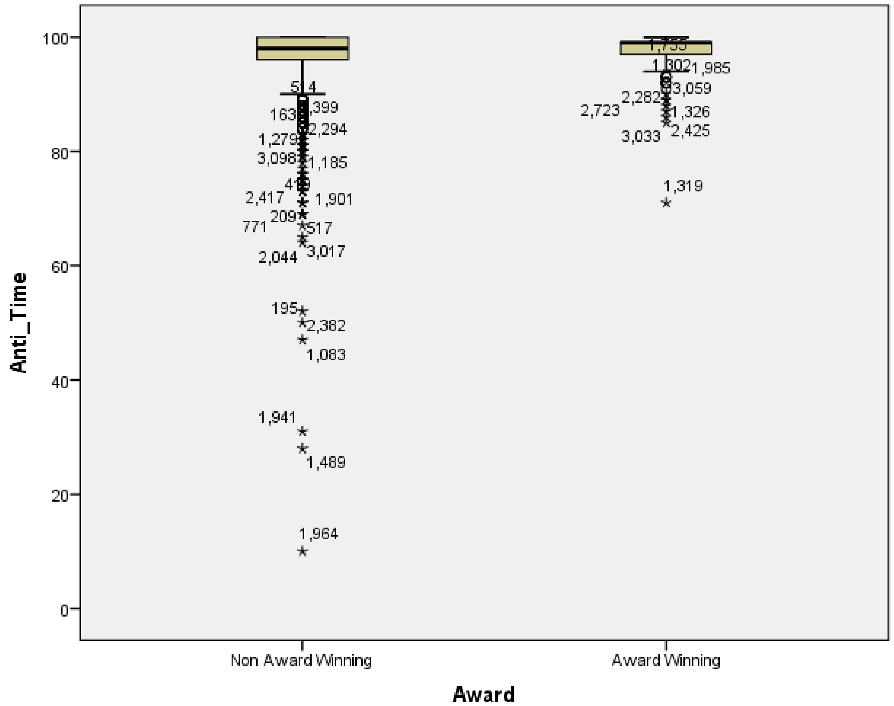

Figure 10. Boxplot for Antibiotic Time % variable.

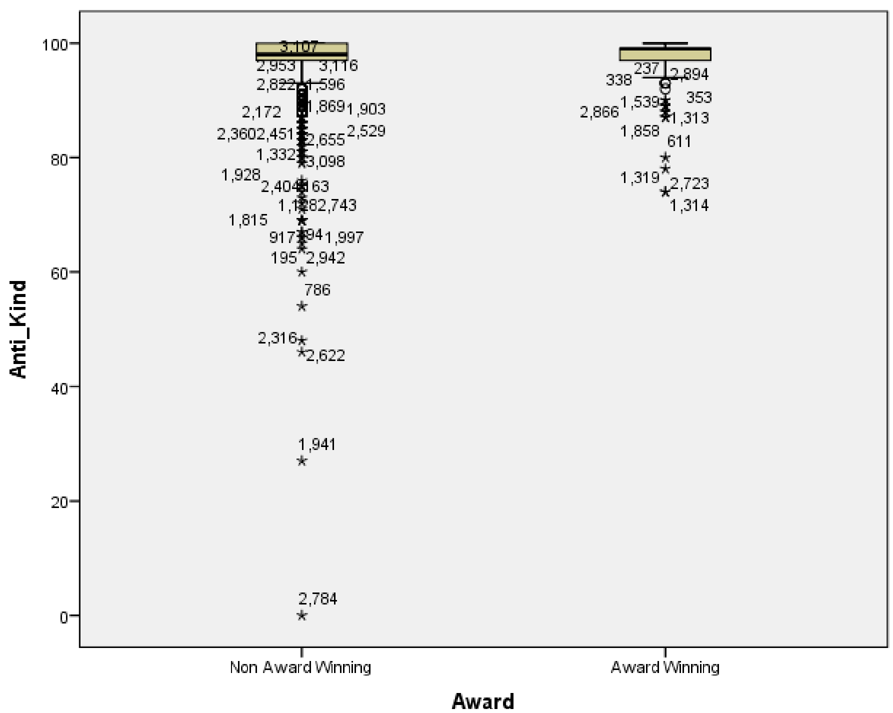

Figure 11. Boxplot for Antibiotic Kind % variable.

With the numerous outliers in both variables, normal distribution of data was not met for either variable. Visualization of the histograms data skewed to the left as shown below for both variables. With the violations to assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances), transformation computations for both variables were completed for skewed data to the left using reflect and inverse transformation. Re-examination of the data showed outliers remained, and the normality of distribution for both variables was still not met.

With these continued violations to the assumptions of the independent *t* test, a Mann–Whitney *U* test was done to determine if there were differences in the median between national quality award-winning hospitals and non-national quality award-winning hospitals for both variables. The data in both variables satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape). Distribution of the antibiotic kind and time scores for national quality award-winning hospitals and non-national quality award-winning hospitals were similar, as assessed by virtual inspection. Antibiotic kind scores for national quality award-winning hospitals (mean rank 1,589.17) and non-national quality award-winning hospitals (mean rank 1,504.26) were not statistically different, $U = 577{,}873$; $z = 1.879$; $p = .060$. The median percentage of patients having surgery who got the right kind of antibiotic is 99% for national quality award-winning hospitals and the mean is 97.91%. The median percentage of patients having surgery who got the right kind of antibiotic for all other hospitals is 98% and the mean is 97%. Antibiotic time scores for national quality award-winning hospitals (mean rank 1,464.65) and non-national quality award-winning hospitals (mean rank 1,364.51) were statistically different, U = 504,593.5; z = 2.366; p = .018. The median percentage of patients having surgery who got the antibiotic at the right time prior to surgery is 99% for national quality award-winning hospitals and the mean is 97.89%. The median percentage of patients having surgery who got the antibiotic at the right time prior to surgery for all other hospitals is 98% and the mean is 96.75%.

With the violations to the assumptions for the independent *t* test, it is determined the Mann–Whitney *U* test is appropriate. Therefore, it is concluded there is a statistically significant difference in the median of percentage of surgery patients who receive an antibiotic at the right time prior to surgery in national quality award-winning hospitals as compared to non-national quality award-winning hospitals. However, there is not a statistically significant difference in the median percentage of surgery patients who received the right kind of antibiotic in national quality award-winning hospitals as compared to non-national quality award-winning hospitals.

Emergency Department

RQ 4: *Do Emergency Departments in hospitals that have won national quality awards (Malcolm Baldrige and/or Distinguished Clinical Excellence Award) have higher scores in key quality performance variables (clinical excellence) than Emergency Departments in non-national award-winning hospitals?*

This variable examines the average number of minutes a patient spends in the Emergency Department prior to being admitted to the hospital as an inpatient if that is the appropriate course of action. In this variable there is a statistically significant difference between the median in national quality award-winning hospitals (Median–290; p = .000) and non-national quality award-winning hospitals (Median–259; p = .000); however, we see it is the non-national quality award-winning hospital that has as the lower (and better) score.

There are many variables that can be linked to the Emergency Department; however, for purposes of this study the variable is the average time patients in the Emergency Department before they were admitted to the hospital as an inpatient. This variable does not examine patients that only needed to be treated and sent home, but looks at the ones that were sick enough to be admitted and the average time the spent in the Emergency Department before that happened. Findings indicate there is a statistically significant difference in the mean performance outcome between national quality award-winning hospitals and non-national quality award-winning hospitals (p = .000). However, the lower time occurs within non-national quality award-winning hospitals. Examination of the variable for assumption #4 (outliers), #5 (normal distribution), and #6 (homogeneity of variances) revealed that there were numerous outliers in the dataset as shown in Figure 12.

With the numerous outliers, normality of distribution of data was not met. Visualization of the histograms indicated skewed data to the right. With the violations in assumptions #4 (outliers), #5 (normality of distribution), and #6 (homogeneity of variances), the variable was transformed using a computation for skewed data to the right, a square root computation. Re-examination of the variable revealed, outliers still existed in the data, and normality of distribution was still not met.

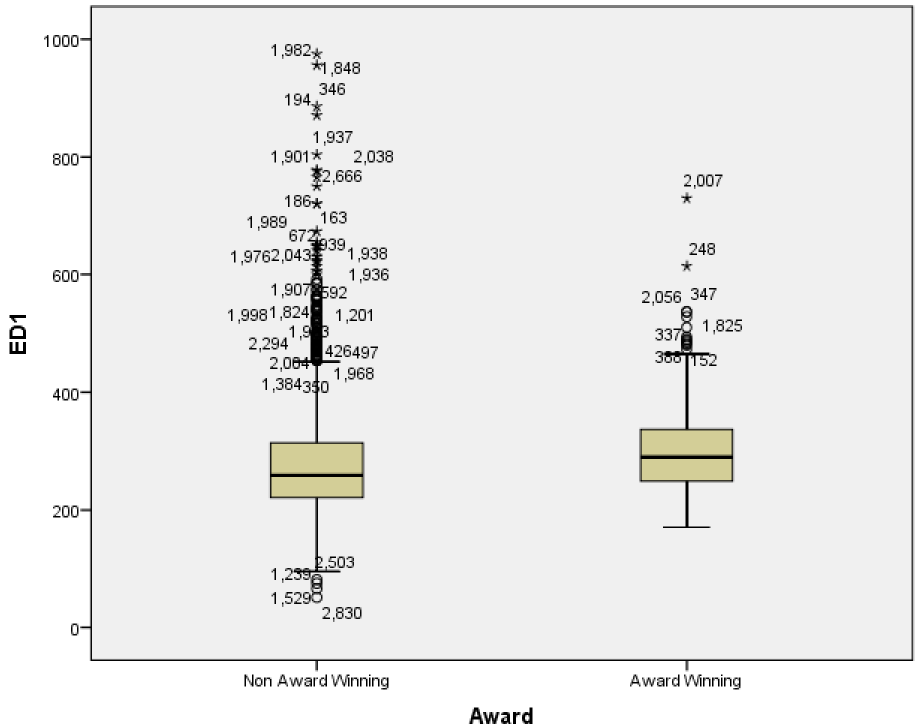

Figure 12. Boxplot for ED Minutes variable.

With the continued violations in the transformed variable, it was decided that a Mann–Whitney *U* test should be conducted to determine if there were differences in the median between national quality award-winning hospitals and non-national quality award-winning hospitals. The data satisfied the assumptions of the Mann–Whitney *U* test (the dependent variable is continuous; there is one independent variable with two categories; cases cannot be in both categories; whether the distribution of data has the same shape).

Distribution of the ED time scores for national quality award-winning hospitals and non-national quality award-winning hospitals were similar, as assessed by virtual inspection. ED time scores for national quality award-winning hospitals (mean rank 1,820.83) and non-national quality award hospitals (mean rank 1,475.48) were statistically different, $U = 674{,}939$; $z = 7.467$; $p = .000$. The median time patients spent in the Emergency Department before they were admitted to the hospital as an inpatient for national quality award-winning hospitals is 290 minutes and the mean is 299.3 minutes. The median time patients spent in the Emergency Department before they were admitted to the hospital as an inpatient for non-national quality award-winning hospitals is 259 minutes and the mean is 277.35 minutes. With the violations to the assumptions for the independent *t* test, it is determined the Mann–Whitney *U* test is appropriate. Therefore, it is concluded there is a significant difference in the median of time patients spent in the Emergency Department before they were admitted to the hospital as an inpatient for national quality award-winning hospitals as compared to non-national quality award-winning hospitals.

Malcolm Baldrige and Healthgrades Award Analysis

Additional analyses which separated out the award-winning hospitals into Malcolm Baldrige only and Healthgrades only categories yielded interesting findings. The statistical findings can be seen in Table 9 and Table 10 below. Findings indicate there are three variables with statistical significant difference between Malcolm Baldrige winners and all other hospitals (PCI %, $p = .002$; Urinary Cath %, $p = .027$; Clots %, $p = .001$), while for Healthgrades Distinguished Hospitals for Clinical Excellence Award winners, findings indicate there are six variables with statistical significant differences between their ratings and all other hospitals (Pneu %, $p = .000$; Urinary Cath %, $p = .011$; Clots %, $p = .000$; OB %, $p = .001$; ED minutes, $p = .000$; Anti Time %, $p = .036$).

Table 9

Statistical Gindings of Malcolm Baldrige Award Winners

Variable	MB National Quality Award-Winning Hospitals Mann–Whitney *U* Test	Non-National Quality Award-Winning Hospitals Mann–Whitney *U* Test
PCI %	Median = 100% *M* = 98.13% *U* = 23,495.5 *z* = 3.166 *p* = .002 Mean Rank 773.92 *N* = 31	Median = 97% *M* = 95.52% *U* = 23,495.5 *z* = 3.166 *p* = .002 Mean Rank 583.48 *N* = 1467
ECG Minutes	Median = 7 minutes *M* = 7.35 minutes *U* = 13,682.5 *z* = .176 *p* = .861 Mean Rank 813.85 *N* = 17	Median = 7 minutes *M* = 7.86 minutes *U* = 13,682.5 *z* = .176 *p* = .861 Mean Rank 794.29 *N* = 1683
ACE I %	Median = 100% *M* = 97.81% *U* = 44,442.5 *z* = 1.530 *p* = .126 Mean Rank 1,220.15 *N* = 37	Median = 100% *M* = 96.76% *U* = 44,442.5 *z* = 1.530 *p* = .126 Mean Rank 1,073.48 *N* = 2491
PNEU %	Median = 98% *M* = 97.56% *U* = 62,830.5 *z* = 1.772 *p* = .076 Mean Rank 1,553.46 *N* = 41	Median = 97% *M* = 96.03% *U* = 62,830.5 *z* = 1.772 *p* = .076 Mean Rank 1,339.23 *N* = 3022
Blood Glucose %	Median = 96% *M* = 94.43% *U* = 8,436.5 *z* = –.049 *p* = .961 Mean Rank 378.80 *N* = 23	Median = 96% *M* = 94.19% *U* = 8,436.5 *z* = –.049 *p* = .961 Mean Rank 381.07 *N* = 996

Table 9—Continued

Variable	MB National Quality Award-Winning Hospitals Mann–Whitney *U* Test	Non-National Quality Award-Winning Hospitals Mann–Whitney *U* Test
Urinary Cath %	Median = 99% *M* = 98.22% *U* = 62,746.5 *z* = 2.218 *p* = .027 Mean Rank 1,551.40 *N* = 41	Median = 99% *M* = 96.94% *U* = 62,746.5 *z* = 2.218 *p* = .027 Mean Rank 1,295.46 *N* = 2936
Clots %	Median = 100% *M* = 99.32% *U* = 69,853.5 *z* = 3.207 *p* = .001 Mean Rank 1,724.74 *N* = 41	Median = 99% *M* = 98.14% *U* = 69,835.5 *z* = 3.207 *p* = .001 Mean Rank 1,345.24 *N* = 3039
OB %	Median = 2% *M* = 3.58% *U* = 38,445.5 *z* = –.603 *p* = .546 Mean Rank 1,152.91 *N* = 40	Median = 3% *M* = 4.86% *U* = 45,296.5 *z* = –.603 *p* = .546 Mean Rank 1,219.59 *N* = 2396
ED Minutes	Median = 264 minutes *M* = 266.2 minutes *U* = 51,064.5 *z* = –.566 *p* = .571 Mean Rank 1,266.48 *N* = 41	Median = 259 minutes *M* = 280.56 *U* = 51,064.5 *z* = –.566 *p* = .571 Mean Rank 1,335.05 *N* = 3004
AntiTime %	Median = 99% *M* = 98.0% *U* = 56,213.5 *z* = 1.823 *p* = .068 Mean Rank 1,392.06 *N* = 41	Median = 98% *M* = 96.9% *U* = 56,213.5 *z* = 1.823 *p* = .068 Mean Rank 1196.66 *N* = 2716
AntiKind %	Median = 99% *M* = 98.12% *U* = 58,245.5 *z* = .984 *p* = .325 Mean Rank 1,441.62 *N* = 41	Median = 98% *M* = 97.11% *U* = 58,245.5 *z* = .984 *p* = .325 Mean Rank 1,325.20 *N* = 2990

Table 10

Statistical Findings of Healthgrades Award Winners

Variable	National Quality Award-Winning Hospitals Mann–Whitney *U* Test	Non-National Quality Award-Winning Hospitals Mann–Whitney *U* Test
PCI %	Median = 98% M = 95.68% U = 196,648.5 z = .725 p = .468 Mean Rank 755.01 N = 335	Median = 97% M = 95.54% U = 196,648.5 z = .725 p = .468 Mean Rank 736.25 N = 1,162
ECG Minutes	Median = 8 minutes M = 7.94 minutes U = 95,592 z = .740 p = .459 Mean Rank 876.03 N = 117	Median = 7 minutes M = 7.83 minutes U = 95,592 z = .740 p = .459 Mean Rank 841.61 N = 1,582
ACE I %	Median = 100% M = 97.79% U = 435,301.5 z = 1.888 p = .059 Mean Rank 1,311.66 N = 390	Median = 100% M = 96.59% U = 435,305.1 z = 1.888 p = .059 Mean Rank 1,241.59 N = 2137
PNEU %	Median = 98% M = 97.34% U = 590,588 z = 4.523 p = .000 Mean Rank 1,703.10 N = 392	Median = 97% M = 95.86% U = 590,588 z = 4.523 p = .000 Mean Rank 1,490.55 N = 2670
Blood Glucose %	Median = 97% M = 94.85% U = 104,622 z = 1.391 p = .163 Mean Rank 524.88 N = 268	Median = 96% M = 93.96% U = 104,622 z = 1.391 p = .163 Mean Rank 496.43 N = 751
Urinary Cath %	Median = 99% M = 97.94% U = 540,018 z = 2.532 p = .011 Mean Rank 1,574.10 N = 392	Median = 99% M = 96.81% U = 540,018 z = 2.532 p = .011 Mean Rank 1,459.81 N = 2584

Table 10—Continued

Variable	National Quality Award-Winning Hospitals Mann–Whitney *U* Test	Non-National Quality Award-Winning Hospitals Mann–Whitney *U* Test
Clots %	Median = 99% *M* = 98.92% *U* = 581,854.5 *z* = 3.857 *p* = .000 Mean Rank 1,680.82 *N* = 392	Median = 99% *M* = 98.04% *U* = 581,854.5 *z* = 3.857 *p* = .000 Mean Rank 1,503.76 *N* = 2687
OB %	Median = 2% *M* = 3.40% *U* = 315,215.5 *z* = 3.396 *p* = .001 Mean Rank 1,088.82 *N* = 344	Median = 3% *M* = 5.08% *U* = 315,215.5 *z* = 3.396 *p* = .001 Mean Rank 1,224.35 *N* = 2091
ED Minutes	Median = 292 minutes *M* = 301.77 minutes *U* = 640,179 *z* = 7.891 *p* = .000 Mean Rank 1,833.29 *N* = 391	Median = 259 minutes *M* = 277.22 minutes *U* = 640,179 *z* = 7.891 *p* = .000 Mean Rank 1,460.72 *N* = 2653
AntiTime %	Median = 99% *M* = 97.91% *U* = 466,410 *z* = 2.093 *p* = .036 Mean Rank 1,443.17 *N* = 371	Median = 98% *M* = 96.76% *U* = 466,410 *z* = 2.093 *p* = .036 Mean Rank 1,352.70 *N* = 2385
AntiKind %	Median = 99% *M* = 97.92% *U* = 539,818.5 *z* = 1.859 *p* = .063 Mean Rank 1,576.61 *N* = 391	Median = 98% *M* = 97.0% *U* = 539,818.5 *z* = 1.859 *p* = .063 Mean Rank 1,490.83 *N* = 2639

Summary

Approval from the Human Subjects Institutional Review Board was obtained and data collection and analysis followed. Over 3,000 hospitals in the Medicare Hospital

Compare database were analyzed examining 11 specific variables as key quality indicators. Those hospitals having received the Malcolm Baldrige and/or Healthgrades Distinguished Hospital for Clinical Excellence Award were grouped into the national quality award-winning category; the rest were grouped into the non-national quality award-winning category. Independent *t* tests or Mann–Whitney *U* tests were conducted to determine if there was statistical significance of the means or medians between the two groups. When assumptions of the independent *t* test were violated, the Mann–Whitney *U* test was used to examine the medians of the two groups. Findings showed that overall there were statistically significant better performances in more variables from hospitals that had received national quality awards than non-national quality award-winning hospitals. Further examination showed that obstetric departments in national quality award-winning hospitals had statistically significant better outcomes in their metric variable than non-national quality award-winning hospitals. While Operating Departments showed a split in the findings, there was a statistically significant difference in the percentage of patients that received an antibiotic in the right time prior to surgery in hospitals that have received national quality awards compared to non-national quality award-winning hospitals. However, no statistical significance was found in the percentage of patients who received the right kind of antibiotic prior to surgery between national quality award-winning hospitals and non-national quality award-winning hospitals. Finally, there was a statistically significant difference in the median number of minutes that patients spent in the Emergency Department prior to being admitted as inpatients between the two categories; however, the better score existed in the non-national quality award-winning hospitals. Interestingly, when the data were analyzed as

Malcolm Baldrige Award winners compared to all others, and then again as Healthgrades Award winners compared to all others, the results indicate Healthgrades Award winners perform better in more variables than Malcolm Baldrige Award winners. The Malcolm Baldrige Award-Winning hospitals had statistically significant differences in performances in 3 out of 11 variables (all 3 being better performing) (see Table 9 above for results), while the Healthgrades Award-Winning hospitals had statistically significant differences in performances in 6 out of 11 variables (5 of those being better performing) (see Table 10 above for results).

CHAPTER V

DISCUSSION

Summary of Major Results

The findings of this study suggest that national quality award-winning hospitals have better performance outcomes on specific quality variables than non-national quality award-winning hospitals, as collected and reported by the Medicare Hospital Compare database. The variables specified in this study reflect the percentage of correct procedures. For some of the variables, the higher the percentage, the more often the treatment occurred in the correct time and in the correct manner. For one variable (the OB variable), the lower the percentage, the better the quality. Regardless of which way the data are reported, the receiving of a national quality award reflects positive action in 6 out of 11 variables examined with only 1 variable exhibiting an opposite relationship. Overall, this is an expected finding. It is logical that those hospitals that have received national quality awards are in fact performing better than those that have not because these hospitals may be functioning more as highly reliable organizations. Research findings from Pope (2015) support the findings of this study. She found that Malcolm Baldrige Quality Award-Winning hospitals are not quite yet highly reliable organizations, but come closer to reflecting an HRO than other hospitals. However, as the data were analyzed a step further and examined the type of national award received (i.e., either the Malcolm Baldrige or the Healthgrades Award), findings indicated there are more variables with statistically significant better performances in Healthgrades Distinguished Hospitals for Clinical Excellence recipients than in Malcolm Baldrige recipients.

It can be argued that these national quality award-winning hospitals are emulating principles of highly reliable organizations, and if other hospitals want to increase safety and quality, they should look to the indicators of excellence from the Malcolm Baldrige Award and Healthgrades Awards as they are aligned with principles of highly reliable organization theory, and how their own organizations fit into that alignment (see Table 4).

Weick and Sutcliffe (2007) explain that HROs make continued efforts to analyze their systems, looking for errors, near misses, and the dangers of complacency, continually looking at the sensitivity of their operations and developing situational awareness for their organization (Weick & Sutcliffe, 2007). As argued above, those hospitals receiving national quality awards have invested time and resources into performance, system improvements, and elements of highly reliable organizations in order to be recognized as a national quality award winner.

Obstetrics Unit

The findings in the obstetrics variable suggest there is a statistically significant difference between national quality award-winning hospitals and non-national quality award-winning hospitals when it comes to early deliveries. As outlined in Chapter II, the Obstetrics Department is a litigation hotbed, where medical errors do not necessarily occur frequently, but when they do they are costly. These findings indicate that national quality award-winning hospitals have a statistically significant lower occurrence (Median–2%; p = .000) of early deliveries when they were not medically necessary than non-national quality award-winning hospitals (Median–3%; p = .000). This finding makes sense, and could be an indicator of defensive medicine (ordering tests/procedures or avoiding high-risk patients to avoid liability) in the ideology of doctors in these hospitals, or could reflect the make-up of patients (privately insured vs. Medicare) in these hospitals (Shurtz, 2014). Regardless, the Association of Women's Health, Obstetric and Neonatal Nurses' official position statement indicates "reserving induction and augmentation of labor for pregnant women with medical indications promotes the best health outcomes for women and infants and is the best use of health care resources" (AWHONN, 2014, p. 678).

The findings within this unit are consistent with highly reliable organizations in that the unit is functioning at a level that is sensitive to its operations. Weick and Sutcliffe (2007) argue that organizations that are sensitive to their operations are more situational and less strategic. Meaning they are attentive to where the real work gets accomplished and have well-developed situational awareness (Weick & Sutcliffe, 2007). This situational awareness allows obstetric departments to provide care that is safe for the patients and reflects best practices.

Operating Department

The Operating Department variables consisted of patients that received the right kind of antibiotic in the right time frame to prevent surgical site infections. The findings in these two Operating Department variables indicate that national quality award-winning hospitals have a statistically significant better performance (Median–99%; p = .018) percentage of patients that receive an antibiotic in the proper time prior to surgery than non-national quality award-winning hospitals (Median–98%; p = .018). However, there is no statistically significant difference in the percentage of patients that receive the right kind of antibiotic prior to surgery between national quality award-winning hospitals (Median–99%; p = .060) and non-national quality award-winning hospitals (Median–98%; p = .060). This finding is somewhat expected because it makes sense that the kind of antibiotic is not an area of struggle for Operating Departments, but getting the timing of it can be. Both of these variables are directly controlled by the Operating Department, the kind and timing of the antibiotic is accomplished by the professionals in this department.

It is logical that the timing of the antibiotic is statistically significant between national quality award-winning hospitals and non-national quality award-winning hospitals, as Operating Departments use checklists to aid in the execution of operations (Gawande, 2009). It is expected that these national quality award-winning hospitals would have processes in place that allow for more patients to receive antibiotics in a timely and effective manner. The kind of antibiotic may not be as impactful, because the kind is not the issue; the struggle is whether it has come on board at an appropriate time to help prevent surgical site infections (Mujagic et al., 2014). The findings of these variables again reflect organizations that are replicating highly reliable organizations. These organizations are adhering to the sensitivity to operations for a big picture viewpoint (Weick & Sutcliffe, 2007).

Emergency Department

The Emergency Department variable examined the average time patients spent in the Emergency Department before being admitted as inpatients to the hospitals. The findings of this variable were somewhat unexpected. National quality award-winning hospitals had a statistically significant difference (Median–290; p = .000) in the median time for these patients; however, it was higher (therefore a poorer) score than non-national quality award-winning hospitals (Median–259; p = .000). It was expected that national quality award-winning hospitals would have process and procedures that allowed for the most effective and expeditious care in the Emergency Department. It was expected that these hospitals would recognize it is not in the best interest of the patient or the department to keep patients in the Emergency Department longer than needed (Pham et al., 2014).

There could be a number of reasons why finding that average number of minutes spent in the ED prior to admission into the hospital was higher in national quality award-winning hospitals and was not expected. First, national quality award-winning hospitals could be providing more testing of patients prior to admitting to the medical floor as an inpatient, which could inflate the median number of minutes. Second, the national quality award-winning hospitals could be busier because more people recognize the quality of their care, which may cause delays in processing patients through the system. Finally, national quality award-winning hospitals may see sicker patients and with sicker patients they may be more closely observed in the Emergency Department before being admitted to the hospital. Having longer times in the Emergency Department prior to admittance to the hospital for national quality award-winning hospitals may actually be an indicator of being a highly reliable organization. As Weick and Sutcliffe (2007) note, the second principle of an HRO is a reluctance to simplify. They take deliberate steps to create more complete and detailed sketches of what is going on, understanding that situations are often complex and dynamic. So therefore, by taking longer, the national quality award-winning hospitals may in fact be providing more quality of care and emulating HROs more closely.

Malcolm Baldrige and Healthgrades Individually

As the statistical analyses were re-examined with the specific national quality award as the dependent variable, it showed that there are more variables with statistically significant differences in Healthgrades award winners than Malcolm Baldrige Award winners. This could merely be a difference in the number of Malcolm Baldrige Quality winners that exist as compared to the number of Healthgrades Distinguished Hospital for Clinical Excellence Award winners. It could also mean that winning the Malcolm Baldrige Quality Award is much more of a holistic award focusing on the organization as a whole rather than outcomes-focused, whereas Healthgrades is completely outcomes-focused. It may also bring about discussion that paying for the Malcolm Baldrige Quality Award is a marketing tactic and does not have strong implications to better quality in those that have received the award. While there is no cost initially for the Healthgrades award, should the hospital want to market or publicize receiving the distinction, the hospital would have to pay for that licensing.

Discussion

The findings of this research and the findings of the additional analysis of the Malcolm Baldrige and Healthgrades awards begs the question of where will resources best be spent in terms of quality improvement. Should hospitals invest resources, time, effort, and money into obtaining and marketing these awards? If we examine the findings as they align to the areas that we have identified as the most costly for hospitals to endure, the OB-GYN, OD, and ED, we see that overall two out of four variables assigned to these areas are depicting a statistically significant difference in performances in a better way between national quality award-winning hospitals and non-national quality award-winning hospitals. Yet when a further examination between the kinds of national awards received is conducted, we find that for Malcolm Baldrige winners none of the variables assigned to these high-risk areas are statistically different in performance than hospitals that have not won the Malcolm Baldrige Award. For the Healthgrades Distinguished Hospital for Clinical Excellence Award winners, we find that two out of the four variables assigned to the high-risk areas are statistically different in performance in a better way than hospitals that have not received this Healthgrades Award. As we discussed earlier, the ED metric for both overall award winners and for specific Healthgrades winners indicated a statistically significant difference in performance; however, it was the non-award-winning hospitals that performed better in this variable. This actually may be an indication that award-winning hospitals are aligning with principles of highly reliable organizations in a reluctance to simplify.

The answer to the question “Is it worth it for hospitals to invest resources into obtaining and marketing these awards?” is maybe. For Malcolm Baldrige Award-winning hospitals, they perform better on 27% of the variables selected for analysis. Conversely, that means they do not perform better on 73% of the variables selected. For Healthgrades Distinguished Hospital for Clinical Excellence Award winners, they perform better on 45% of the variables selected for analysis, which means they do not perform better on 55% of the variables selected. Looking specifically at the OB-GYN unit, the average damages awarded in a successful lawsuit involving a neurologically impaired infant is $1,150,687 (Shwayder, 2007). Is it worth the hundreds of hours of manpower, other resources and upwards of $50,000 in fees/site visit fees to go through the Malcolm Baldrige Award process in order to reduce the opportunity for liability in obstetrics? Possibly, but if the organization already performs at a high level in obstetrics, maybe not. These two quality awards have opposite evaluation points. The Malcolm Baldrige starts at the beginning, has upfront costs in fees, and a large hospital could easily spend over $100,000 in resources of personnel and fees, including a site visit fee, in order to participate in the assessment. For the Healthgrades Award, the start is at the outcomes level, there is no upfront cost to the hospital, they have not invested personnel or fees to be evaluated by Healthgrades, and all hospitals are calculated and ranked without a request by the hospital. However, should their hospital perform at a level high enough to receive an award, in order to market or publicize the honor, a licensing fee is required and can be upwards of $145,000, according to Rau (2013).

Overall findings indicate there are some variables where the mean scores for the non-national quality award-winning hospitals are considerably lower than national quality award-winning hospitals. This indicates that there are some non-award-winning hospitals performing very low and dragging the mean down. For those hospitals, documentation of a continuous process improvement plan, assessment of that plan, and initiatives for performance outcomes improvement as required by the Malcolm Baldrige assessment may prove to be exceedingly beneficial in their journey to quality. The answer to the question “Is it worth it?” depends on what the hospital needs: does it need a diagnostic test equivalent to the Malcolm Baldrige, or does it need to publicize the fact that it can handle high-risk obstetrics with low percentages of early deliveries.

Limitations

Limitations to this study that must be acknowledged are as follows. First, the variables selected from the Medicare Hospital Compare database are from the Timely and Effective Care category. There were no risk-adjustment calculations done on these sets of data to account for co-morbidities in patients or other systemic issues. The Medicare database acknowledges only certain markers of quality which may or may not reflect actual error rates.

Second, the variables selected were done so based on literature review and identification by professional medical associations and societies in the United States. Selection of different variables could yield different results and findings.

Third, the selection of variables to represent each high-risk area was done so based on logic and necessity. For example, there is only one obstetrics metric in the Medicare Hospital Compare database for timely and effective care; therefore, that variable was used. For the Operating Department, the variables that could be directly attributed to that department were used, and others where the Operating Department was merely a step in the process were not linked to them. For example, blood glucose levels being monitored or urinary catheters being removed—those are variables that occurred in and around the operating room; however, compliance with them would happen on the medical/recovery floor, not necessarily in the operating room. For the Emergency Department, the average number of minutes may or may not be a direct reflection of the Emergency Department. Instead, it could be a reflection of a systemic hospital issue that manifested itself as wait time in the Emergency Department. A different variable representation of the high-risk departments may yield different results and findings.

Fourth, there may be other databases with which to examine quality in healthcare other than the Medicare Hospital Compare database, such as LeapFrog or the Healthgrades database.

Finally, there may be other awards that represent a national quality component and would be appropriate to use in an examination of quality in hospitals, such as those from the National Committee for Quality Assurance or the American Health Care Association.

Implications for Policy, Practice, and Organization

The results of this study provide a number of implications for policy, practice, and organization. First, for patients: this study suggests that national quality award-winning hospitals do perform at a higher level in specific clinical care variables than non-national quality award-winning hospitals. Patients can use this information to look for hospitals that have won a national quality award.

Second, for hospitals: this study suggests that hospitals that have received a national quality award have better outcome performance in specific clinical care variables. Hospitals that have not received a national quality award may look to these findings and to these hospitals to better understand how they have achieved these outcomes, as they can use these hospitals as benchmarks of quality. The mapping of components of the Malcolm Baldrige and Healthgrades Awards to characteristics of highly reliable organizations can be useful to hospitals as well, as a starting point on their quality journey. However, as hospitals move down the path of quality, they should strive to examine their own data, their own trends, and their own performances as part of a continuous quality improvement plan that exists in highly reliable organizations.

Finally, for public administrators and policy makers: without question legislation and government influence is one aspect that can shape the culture of an industry and organization. The most recent legislation, the 2010 Patient Protection and Affordable Care Act, was a combination of access to healthcare care and quality improvement of healthcare. It focused on mandating insurance coverage for all people, but it also included a number of programs and agencies developed for improving quality and performance as well as prevention and wellness (U.S. DHHS, 2014). This legislative influence on healthcare finally focuses on the quality and safety of the delivery of healthcare. The Affordable Care Act combines the use of financial incentives as well as penalties to promote a coordination of quality care for patients (Kocher & Adashi, 2011). These policies represent the first national efforts to tie reimbursement directly to hospital performance (McHugh et al., 2011). The Patient Protection and Affordable Care Act emphasize quality in a number of ways and is a strong federal regulatory push toward the goal of “flawless execution” (Furrow, 2011, p. 1732).

The findings of this study suggest that hospitals receiving national quality awards perform better in specific clinical outcomes than those hospitals that do not, which could help public administrators in the evaluation of quality in healthcare. In addition, public administrators and government units can create a forum of best practices, where national award-winning hospitals can provide insights and lessons learned for hospitals striving to achieve quality could be an incredible resource in the movement forward of patient safety and quality.

Implications for Future Research

Future work should include more quality variables and a re-examination of high-risk departments, specifically the Emergency Department. With the inclusion of more variables, a stronger difference between the performance outcomes and the national quality award-winning categories can be established, providing a better understanding of whether receiving a national quality award really means better quality in performance outcomes across a larger spectrum. A re-examination of the variables representing high-risk departments may provide a stronger difference as well and may provide better insight for individual departments looking to improve quality.

Future work should include a broader definition of quality to better understand the difference between error rates and quality, as well as identification of other awards that could represent quality at a national level.

Also, while the current findings indicate there is a statistically significant difference in the performance outcomes of a number of specific variables between national quality award-winning hospitals and non-national quality award-winning hospitals, the findings do not delve into why that is occurring. Follow-up qualitative research in these national quality award-winning hospitals may yield interesting findings and best practices that could help non-national quality award-winning hospitals improve performance outcomes.

Conclusions

Arguably hospitals that have received national quality awards can be said to be reflective of highly reliable organizations, in their sensitivity to operations, reluctance to simplify, and their preoccupation with failure. The findings of the Mann–Whitney *U* test performed in this study indicate for more variables than not, there is a better statistically significant difference in performance outcomes for national award-winning hospitals compared to non-national award-winning hospitals. Variables linked to OB Departments and Operating Departments in national award-winning hospitals indicate better statistically significant differences in performance outcomes in early delivery and timing of antibiotics, and no statistically significant difference in kind of antibiotics. While time spent in Emergency Departments is higher (a lower performance) in national quality award-winning hospitals than non-national quality award-winning hospitals at a statistically significant level, that finding may still reflect elements of highly reliable organizations, in that those EDs that have higher times are showing a reluctance to simplify in order to gain a better more detailed sketch of the situation. However, in looking at the logical question of whether or not it is worth it for hospitals to pursue, obtain, and market these national quality awards, the answer is a resounding maybe. Some hospitals, those that are performing considerably lower than their quality award-winning peers, may benefit from the forced self-examination that going through the process of achieving a Malcolm Baldrige Award would require. However, those hospitals that are already performing to the same standard as a national quality award-winning hospital may find utilizing those resources would be better spent on other quality initiatives.

I will refrain from suggesting that either one of these awards is not worth the cost, because first, in this research the cost is really unknown. While the fees for the Malcolm Baldrige Award are upwards of $50,000, the man hours and resources expended by the hospital in preparing the application and setting into motion the assessment can be staggering. Compared to Healthgrades, where there is no upfront cost to be evaluated on the hospital's performance, should they want to publicize any awards received, then comes a cost that can be as high as $145,000 depending on how and where the hospital markets and publicizes the award (Rau, 2013). But secondly, I refrain from saying these awards are not worth the cost because I believe that any initiative that focuses on quality performance for healthcare is a worthy endeavor. However, I would propose instead to not ask the question whether pursuing the Malcolm Baldrige or Healthgrades Awards are worth the cost, but instead ask what is it the hospital can do to move toward becoming a highly reliable organization? By virtue of this research and other work by Pope (2015), we see that those hospitals that have received national quality awards are functioning more closely and adhering more consistently with principles of highly reliable organizations, and that should be the goal. It is not the pursuit of the award that should be the focus for the hospitals, but instead pursuit of the principles of highly reliable organizations, and with that journey will come the quality performance outcomes worthy of national awards.

Implications of these findings can provide patients with better information on which hospitals to search for in regard to quality care, and can provide hospitals with information on possibly where to allocate resources for quality improvement initiatives, as well as a mapping tool for how the indicators of quality for the Malcolm Baldrige Award and Healthgrades Award can reflect highly reliable organizations.

Finally, the findings can provide public administrators and policy makers with information on using national quality awards as actual indicators of quality as they evaluate programs and government initiatives of quality. With the legislative focus, first, on understanding disease; second, on access to care; and, third, on safety and quality, a culture was established in the healthcare industry that rewarded research into the disease processes and providing access to care for people, not necessarily for quality and safety, until very recently. What has resulted is an industry culture that has created punitive environments and is shrouded in secrecy. If a mistake in healthcare is made, it needs to be covered up. If it is not covered up, then blame must be assigned, shame must be dealt, and the individual is the problem. Legislation or government awareness can shape the culture of an industry and organization, and healthcare is no exception. Legislators with the power to finance healthcare research and to create policies that focus on the good of the public as a whole will guide the healthcare culture (Moses et al., 2013).

Future work should focus on broadening the number of variables examined, and a re-examination of the variables that are allocated to high-risk departments, in order to better understand if national quality awards equate to actual quality in several performance outcomes variables. Finally, future work should also include qualitative studies to better understand how and why these national quality award-winning hospitals have performance outcomes that are better than non-national award-winning hospitals.

The science is not yet there to definitively call for public administrators and policy makers to endorse, require, or reward hospitals that have obtained these national quality awards. There is much more work to be done in the investigation of the science of evaluating hospital performance.

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Appendix A

List of Serious Reporting Events

List of Serious Reporting Events, previously known as "never events"
(http://www.qualityforum.org/Topics/SREs/List_of_SREs.aspx)

1. SURGICAL OR INVASIVE PROCEDURE EVENTS

1A. Surgery or other invasive procedure performed on the wrong site

1B. Surgery or other invasive procedure performed on the wrong patient

1C. Wrong surgical or other invasive procedure performed on a patient

1D. Unintended retention of a foreign object in a patient after surgery or other invasive procedure

1E. Intraoperative or immediately postoperative/postprocedure death in an ASA Class 1 patient

2. PRODUCT OR DEVICE EVENTS

2A. Patient death or serious injury associated with the use of contaminated drugs, devices, or biologics provided by the healthcare setting

2B. Patient death or serious injury associated with the use or function of a device in patient care, in which the device is used or functions other than as intended

2C. Patient death or serious injury associated with intravascular air embolism that occurs while being cared for in a healthcare setting

3. PATIENT PROTECTION EVENTS

3A. Discharge or release of a patient/resident of any age, who is unable to make decisions, to other than an authorized person

3B. Patient death or serious injury associated with patient elopement (disappearance)

3C. Patient suicide, attempted suicide, or self-harm that results in serious injury, while being cared for in a healthcare setting

4. CARE MANAGEMENT EVENTS

4A. Patient death or serious injury associated with a medication error (e.g., errors involving the wrong drug, wrong dose, wrong patient, wrong time, wrong rate, wrong preparation, or wrong route of administration)

4B. Patient death or serious injury associated with unsafe administration of blood products

4C. Maternal death or serious injury associated with labor or delivery in a low-risk pregnancy while being cared for in a healthcare setting

4D. Death or serious injury of a neonate associated with labor or delivery in a low-risk pregnancy

4E. Patient death or serious injury associated with a fall while being cared for in a healthcare setting

4F. Any Stage 3, Stage 4, and unstageable pressure ulcers acquired after admission/presentation to a healthcare setting

4G. Artificial insemination with the wrong donor sperm or wrong egg

4H. Patient death or serious injury resulting from the irretrievable loss of an irreplaceable biological specimen

4I. Patient death or serious injury resulting from failure to follow up or communicate laboratory, pathology, or radiology test results

5. ENVIRONMENTAL EVENTS

5A. Patient or staff death or serious injury associated with an electric shock in the course of a patient care process in a healthcare setting

5B. Any incident in which systems designated for oxygen or other gas to be delivered to a patient contains no gas, the wrong gas, or are contaminated by toxic substances

5C. Patient or staff death or serious injury associated with a burn incurred from any source in the course of a patient care process in a healthcare setting

5D. Patient death or serious injury associated with the use of physical restraints or bedrails while being cared for in a healthcare setting

6. RADIOLOGIC EVENTS

6A. Death or serious injury of a patient or staff associated with the introduction of a metallic object into the MRI area

7. POTENTIAL CRIMINAL EVENTS

7A. Any instance of care ordered by or provided by someone impersonating a physician, nurse, pharmacist, or other licensed healthcare provider

7B. Abduction of a patient/resident of any age

7C. Sexual abuse/assault on a patient or staff member within or on the grounds of a healthcare setting

7D. Death or serious injury of a patient or staff member resulting from a physical assault (i.e., battery) that occurs within or on the grounds of a healthcare setting

Appendix B

Healthgrades Overall and Specialty Excellence Awards

Healthgrades Overall and Specialty Excellence Awards

Overall Excellence Awards	Specialty Excellence Awards
- America's 50 Best Hospitals – These hospitals are recognized as the top 1% in the nation for consistent clinical quality based on risk-adjusted mortality and complication rates year after year.	- Bariatric Surgery Excellence Award - Cardiac Care Excellence Award - Critical Care Excellence Award - Coronary Intervention Excellence Award
- America's 100 Best Hospitals – These hospitals are recognized as the top 2% in the nation for consistent clinical quality year after year.	- Gastrointestinal Care Excellence Award - Gastrointestinal Surgery Excellence Award - General Surgery Excellence Award - Gynecologic Surgery Excellence Award
- Patient Safety Excellence Award – These hospitals are in the top 10% in the nation for preventing infections, medical errors and other complications based on 14 standard patient safety indicators.	- Heart Transplant Excellence Award - Joint Replacement Excellence Award - Kidney Transplant Excellence Award - Liver Transplant Excellence Award
- Distinguished Hospitals for Clinical Excellence Award – These hospitals are in the top 5% nationally for overall clinical excellence. They exhibit comprehensive and consistent quality across several medical specialties based on risk-adjusted mortality and complication rates.	- Lung Transplant Excellence Award - Maternity Care Excellence Award - Neurosciences Excellence Award - Neurosurgery Excellence Award
- Emergency Medicine Excellence Award – These hospitals have emergency departments in the top 5% nationally for patients admitted to the hospital after being treated in the emergency department.	- Orthopedic Surgery Excellence Award - Prostatectomy Excellence Award - Pulmonary Care Excellence Award - Spine Surgery Excellence Award
- Pediatric Patient Safety Excellence Award – These hospitals are in the top 10% in the nation for pediatric patient safety, preventing infections, medical errors and other complications in children based on 8 standard patient safety indicators. (Pediatric variables are not part of the study, because the focus has been on adult care, however it is included in this listing because it is an "award" that any one of the participating hospitals could have received.	- Stroke Care Excellence Award - Vascular Surgery Excellence Award - Women's Health Excellence Award

Appendix C

Data Collection Sheet

Data Collection Sheet

Subject	ST	WINNER	MB	HDHCE	EKG_Min	PCI_%	ACE_%	PN_ANTI_%	RT_ANTI_%	RT_KIND_	BS_CONT_%	CATH_TIME%	ER_TIME_MIN	CLOT_%	OB_%

Appendix D

Human Subjects Institutional Review Board Approval

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: March 4, 2015

To: Robert Peters, Principal Investigator
Beth Beaudin-Seiler, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair Amy Naugle

Re: HSIRB Project Number 15-03-06

This letter will serve as confirmation that your research project titled "National Quality Awards in Healthcare and Actual Quality in U.S. Hospitals" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., ***you must request a post approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study)."*** Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: March 3, 2016

251 W. Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276

Appendix E

Data Analysis Informational Charts

Data Analysis Informational Charts by Variable

Group Statistics

	Award	N	Mean	Std. Deviation	Std. Error Mean
PCI	.0	1145	95.50	5.992	.177
	1.0	353	95.78	6.979	.371
ED1	.0	2626	277.35	89.107	1.739
	1.0	419	299.30	73.943	3.612
ACEI	.0	2114	96.57	6.041	.131
	1.0	414	97.80	3.439	.169
ECG	.0	1571	7.85	5.356	.135
	1.0	129	7.84	5.153	.454
Anti_Time	.0	2358	96.75	5.641	.116
	1.0	399	97.89	2.699	.135
Anti_Kind	.0	2612	97.00	5.630	.110
	1.0	419	97.91	2.972	.145
OB	.0	2065	5.09	7.169	.158
	1.0	371	3.46	4.620	.240
PNEU	.0	2643	95.84	5.429	.106
	1.0	420	97.36	2.672	.130
Sugar	.0	738	93.92	7.101	.261
	1.0	281	94.91	5.962	.356
Urine	.0	2557	96.79	5.397	.107
	1.0	420	97.97	2.885	.141
Clots	.0	2660	98.03	3.829	.074
	1.0	420	98.96	1.231	.060

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PCI	Equal variances assumed	.294	.588	-.737	1496	.461	-.280	.380	-1.025	.465
	Equal variances not assumed			-.680	521.843	.497	-.280	.412	-1.088	.529
ED1	Equal variances assumed	7.139	.008	-4.786	3043	.000	-21.950	4.586	-30.942	-12.957
	Equal variances not assumed			-5.475	628.778	.000	-21.950	4.009	-29.823	-14.077
ACEI	Equal variances assumed	41.442	.000	-4.030	2526	.000	-1.234	.306	-1.834	-.633
	Equal variances not assumed			-5.763	992.033	.000	-1.234	.214	-1.654	-.814
ECG	Equal variances assumed	.077	.782	.018	1698	.986	.009	.489	-.951	.968
	Equal variances not assumed			.018	151.617	.985	.009	.473	-.927	.944
Anti_Time	Equal variances assumed	35.883	.000	-3.975	2755	.000	-1.144	.288	-1.709	-.580
	Equal variances not assumed			-6.422	1102.296	.000	-1.144	.178	-1.494	-.795
Anti_Kind	Equal variances assumed	24.521	.000	-3.263	3029	.001	-.918	.281	-1.469	-.366
	Equal variances not assumed			-5.035	985.714	.000	-.918	.182	-1.275	-.560
OB	Equal variances assumed	30.400	.000	4.215	2434	.000	1.626	.386	.870	2.383
	Equal variances not assumed			5.666	734.766	.000	1.626	.287	1.063	2.190
PNEU	Equal variances assumed	46.076	.000	-5.615	3061	.000	-1.516	.270	-2.045	-.987
	Equal variances not assumed			-9.035	1075.455	.000	-1.516	.168	-1.845	-1.187
Sugar	Equal variances assumed	9.258	.002	-2.079	1017	.038	-.992	.477	-1.928	-.056
	Equal variances not assumed			-2.247	597.951	.025	-.992	.441	-1.859	-.125
Urine	Equal variances assumed	41.563	.000	-4.354	2975	.000	-1.173	.269	-1.702	-.645
	Equal variances not assumed			-6.641	985.690	.000	-1.173	.177	-1.520	-.826
Clots	Equal variances assumed	43.387	.000	-4.950	3078	.000	-.933	.188	-1.302	-.563
	Equal variances not assumed			-9.764	1956.479	.000	-.933	.096	-1.120	-.745

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of PCI is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.255	Retain the null hypothesis.
2	The distribution of ED1 is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.
3	The distribution of ACEI is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.036	Reject the null hypothesis.
4	The distribution of ECG is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.564	Retain the null hypothesis.
5	The distribution of Anti_Time is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.018	Reject the null hypothesis.
6	The distribution of Anti_Kind is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.060	Retain the null hypothesis.
7	The distribution of OB is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.001	Reject the null hypothesis.
8	The distribution of PNEU is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.
9	The distribution of Sugar is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.135	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
10	The distribution of Urine is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.003	Reject the null hypothesis.
11	The distribution of Clots is the same across categories of Award.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.