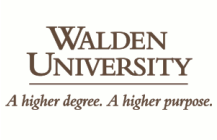




2016

# Relationships Among Administrative Computerization, Hospital Size, and Administrative Expenses

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This is to certify that the doctoral study by

Pamela J Gallagher

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Abstract

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Hospital Size, and Administrative Expenses

by

Pamela J. Gallagher

MBA, City University of Seattle, 2005

BSBA, Thomas Edison State College, 1995

Doctoral Study Submitted in Partial Fulfillment

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Doctor of Business Administration

Walden University

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## Abstract

The healthcare industry is computerizing administrative functions in an attempt to reduce expenses and remain competitive. This correlational study of 3,088 Medicare-certified, short-term, acute-care hospitals in the United States was based on a general systems theory framework; it sought to examine the relationships among the independent variables of hospital size and administrative computerization and the dependent variable of administrative expenses. Secondary data from Health Information Management Systems Society's surveys and cost reports from the Centers for Medicare and Medicaid services were used. Correlation analyses with an alpha of .05 were used to test 3 of the 4 hypotheses; regression analysis was used to test the final hypothesis. Approximately 52% of the variance in administrative expenses was explained by the number of beds, a moderate-to-high relationship. Only 6.3% of the variance in administrative expenses was explained by the amount of administrative computerization, a significant but small relationship. Only 9% of the variance in administrative computerization was explained by the hospital size, a significant but small relationship. The results of this study can be used as a basis to determine whether investment in technology in administration will reduce health care expenses. Appropriate investment in technology can contribute to social change by reducing consumer health care costs.

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# Dedication

Dedication to family, whether through blood or choice, including those who passed before. We are all part of a continuing cycle, to leave each day better than the one before.

# Acknowledgments

This journey has been a team effort. Dr. Diane Dusick provided unwavering support and inspiration and I deeply appreciate her wisdom and time that made it possible for me to complete my study. Dr. Jorge Gaytan provided valuable feedback and showed a deep respect for my time by being so responsive. Dr. Charlotte Carlstrom helped expand my thinking and thus improved my overall study. Dr. Freda Turner could be counted on for words of encouragement. Thanks to my family and friends who supported me and are extremely pleased, I have finished my study and they will no longer have to field requests to read this section or listen to this part. Thanks to the Walden Faculty, Library and Writing Center staff, and my colleagues at Walden who were intricate parts of my successful journey. It has been a privilege.

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# Section 1: Foundation of the Study

The Centers for Medicare and Medicaid Services (CMS; 2012b) noted that health care expenses in the United States have continually increased since 1965. CMS (2012b) projected that health care expenses will continue to increase.

According to Emmanuel et al. (2012), escalations of both clinical and health care administrative expenses have contributed to the increased cost of health care and current health care reform, notably the Affordable Care Act, would not sufficiently address the two main drivers of health care expenses: quantity and price. Emmanuel et al. wrote that targeted solutions to reduce health care expenses, including administrative expense reduction, might curtail these rising expenses. Technology use by administration has the potential to be a targeted solution, According to Lee, McCullough, and Town (2013), computerization in other industries has streamlined processes and reduced expenses. Lee et al. (2013) also noted that while computerization was to have the same effects in health care, especially in the administrative areas, these results have been not been achieved.

## Background of the Problem

Health care expenses have been a top economic concern in the United States for decades; however, solutions to reduce expenses have been elusive. Emmanuel et al. (2012) stated that the burden of health care expenses for the American people continues to increase and threatens education and infrastructure investments. Increasing health care expenses raises the debt level of the United States government and reduces middle class wages (Emmanuel et al., 2012). Health care expenditures were 13.8% of gross domestic

product in 2000 and grew to 17.9% of gross domestic product by 2010 (Martin, Lassman, Washington, & Catlin, 2012). Personnel from the CMS (2012b) projected that by 2019 health care spending will be 19.3% of the gross domestic product or $4.5 trillion. Rising health care expenses have offset income gains for Americans (Auerbach & Kellerman, 2011).

Berwick and Hackbarth (2012) noted that wasteful practices contributed to higher health care expenses. Fineberg (2012) classified administrative expenses, as an area of wasteful expense. The administrative category of health care expenses is the focus of this doctoral study.

## Problem Statement

The rapid and continual changes in the health care industry underscore the need for computerized solutions to increase efficiencies and reduce expenses in order to remain competitive (Lee, Lee, & Schniederjans, 2011; Wang, Liang, Zhong, Xue, & Xiao, 2012). Government legislation drives spending on information technology to lower health care costs (Neumeier, Berner, Burke, & Azuero, 2015). The United States government is promoting information technology investment (computerization) in health care by designating over $29 billion through the American Recovery and Reinvestment Act of 2009 (Manchikanti, Benyamin, Falco, & Hirsch, 2014). The general problem is that hospital administrators with computerization strategies have limited success in reducing expenses while maintaining regulatory compliance for Medicare reimbursement. The specific problem is that hospital administrators often have limited

information about the relationship among administrative computerization, hospital size, and administrative expenses.

## Purpose Statement

The purpose of this quantitative, correlational study was to examine the information that administrators need about the relationships among administrative computerization, hospital size, and administrative expenses. The independent variables were administrative computerization and hospital size. The dependent variable was administrative expenses. The targeted population was published cost reports from acute-care, short-stay, Medicare-certified hospitals in the United States that had corresponding responses from the HIMSS survey. The implications for positive social change included the potential for administrators to examine the relationships among variables to realign resources. This knowledge may help administrators reduce administrative expenses and lower the financial burden for health care consumers in the United States. Lower costs would increase accessibility to health care because, as Baughman et al. (2015) noted, high health care costs were a deterrent to seeking medical care.

## Nature of the Study

The quantitative methodology is appropriate when researchers want to test hypotheses about relationships (Wisdom, Cavaleri, Onwuegbuzie, & Green, 2012). According to Allison (1977), researchers use correlation to examine if a linear combination of independent variables can predict a relationship with a dependent variable. Schultze and Avital (2011) noted that qualitative research is more appropriate

for exploring behaviors and social processes, while quantitative research is better suited for determining relationships. A mixed methods research method combines both quantitative and qualitative methods (Riazi & Candlin, 2014). Exploration of behaviors or social processes would not allow me to answer my research question, thus a quantitative method was used for this study.

I used a correlational design with archival data, because I wanted to determine the relationships between variables and make predictions (Turner, Balmer, & Coverdale, 2013). Cukier and Mayer-Schoenberger (2013) wrote that research using archived data and showing correlation may be enough to make business decisions more quickly. The ability to influence the population of this study is not feasible, which Zohar and Polachek (2014) noted is necessary for an experimental or quasi-experimental research design. The purpose of this doctoral study was to examine relationships, not to determine why relationships exist. Thus, a correlational, nonexperimental design was appropriate.

## Research Questions

I used four research questions to address the purpose of the study, that is, what information do hospital administrators need about the relationships among administrative computerization, hospital size, and administrative expenses? The independent variables were administrative computerization and hospital size. The dependent variable was administrative expenses. I examined relationships between administrative computerization, hospital size, and administrative expenses in Medicare-certified, acute-care, short-term hospitals.

RQ1. What is the relationship between hospital size and administrative expenses?

RQ2. What is the relationship between administrative computerization and administrative expenses?

RQ3. What is the relationship between administrative computerization and hospital size?

RQ4. Is there a significant linear relationship among a combination of administrative computerization, hospital size, and total administrative expenses?

## Hypotheses

$H1_0$: There is no statistically significant relationship between hospital size and administrative expenses.

$H1_a$: There is a statistically significant relationship between hospital size and administrative expenses.

$H2_0$: There is no statistically significant relationship between administrative computerization and administrative expenses.

$H2_a$: There is a statistically significant relationship between administrative computerization and administrative expenses.

$H3_0$: There is no statistically significant relationship between administrative computerization and hospital size.

$H3_a$: There is a statistically significant relationship between administrative computerization and hospital size.

$H4_0$: There is a statistically significant relationship among administrative computerization, hospital size, and administrative expenses.

$H4_a$: There is no statistically significant relationship among administrative computerization, hospital size, and administrative expenses.

## Theoretical Framework

General systems theory (GST), which was developed by von Bertalanffy in the late 1920s (von Bertalanffy, 1972), is the foundation of this study. A key construct of GST is that the interactions or relationships between components of systems, or among systems are as, or more important than, the components themselves (von Bertanlanffy, 1972). For purposes of this study, information technology (IT) is a system, the hospital itself is a system (which varies based on the size of the hospital), and the financial branch of the hospital is a system. The purpose of the study was to examine the relationships among these three systems.

Aerts et al. (2007) added that the focus of GST was on the effects that components had on each other and noted that a researcher's use of a GST framework recognizes that interdisciplinary factors influence outcomes or behaviors. Kefalas (2011) defined systems thinking as interdisciplinary, where relationships are the focus. Another key construct of GST is that it is an integrated approach to research (Gulyaev & Stonyer, 2002) and that it is a unifying theoretical framework (Simon et al., 2013).

## Definition of Terms

Several terms used in this study might have different interpretations. The definitions provided below reflect the terms used in this doctoral study.

*Acute-care hospital.* An organization that provides medical care for inpatients (usually short-term), including surgeries and other necessary treatments (CMS, 2014a).

*Administrative computer systems.* Hospital administrative systems are those that support the functions of providing clinical services: (a) financial and accounting applications, (b) materials management, (c) personnel management, (d) patient scheduling, and (e) patient billing (Bardhan & Thouin, 2012).

*Administrative expenses.* The expenses necessary to deliver support functions in health care, (a) general accounting, (b) cost accounting, (c) budgeting, (d) patient verification, (e) patient scheduling, (f) billing and collections, (g) materials management, (h) human resources, and (i) management information systems are administrative expenses (Himmelstein, Wright, & Woolhandler, 2010).

*Centers for Medicare and Medicaid Certification Number (CCN).* The number assigned by the CMS that indicates type of health care provider and participation in Medicare and Medicaid. The CCN was originally a provider number (CMS, 2007). The CCN number is the common identifier for the CMS data and the HIMSS data.

*Hospital size.* The Healthcare Information Management Systems Society (HIMSS, 2012) defined hospital size by the number of Medicare licensed beds in an organization. The number of licensed beds is the same from the CMS and HIMSS.

*Medicare-certified hospital.* A hospital that meets a set of standards termed "conditions of participation" by the CMS and is subjected to review and accreditation by the CMS (2014b).

## Assumptions, Limitations, and Delimitations

Assumptions are those elements of a study the researcher presumes to be true without providing evidence (Paul & Elder, 2013). Limitations are elements of the study over which the researcher exercises no control (Soilkki, Cassim, & Anis, 2014). By contrast, those elements the researcher controls, such as the population and sample, are delimitations (Soilkki et al., 2014)

### Assumptions

I assumed the information used from the CMS accurately represented the administrative expenses of the hospitals included in the study, and that the HIMSS survey data accurately reflected the bed size and the information for calculating administrative computerization for the hospitals that responded. I assumed that the data reported to the CMS were accurate, as the reports are subject to audit, and there are penalties for misrepresentation (CMS, 2014a). Due to the voluntary nature of the HIMSS survey, I assumed that the respondents answered truthfully and that the variables were measured without error.

### Limitations

Limitations of this study included the research design, the use of available information, and the inclusion of a limited number of variables. A research design using

data to determine relationships does not provide information on why a relationship does or does not exist (Cukier & Mayer-Schoenberger, 2013). I used secondary data in my study. The CMS collects data to ensure appropriate payment of government funds for Medicare-certified organizations. HIMSS collects survey data to expand on its return on investment for health care IT reporting and includes clinical IT that is not included in my study. Another limitation of my study was the selection of a limited number of variables, and Lai et al. (2013) wrote that the exclusion of variables from a study could influence results. Generalization from the findings of this research study may not be applicable to other types of health care facilities.

**Delimitations**

Simon and Goes (2013) wrote that delimitations are research limitations set by researchers. I delimited the data for the independent variables of administrative computerization and hospital size to the available data for 2012 in the HIMSS and the CMS data sets. I did not include variables such as hospital ownership type and location. I restricted the population to Medicare-certified short-term acute-care hospitals that represent 67% of all hospital types.

I did not include other types of Medicare-certified health care entities such as (a) behavioral health, (b) long-term acute-care, (c) skilled nursing facilities, and (d) critical access hospitals. Nonparticipating hospitals, such as federal or emergency hospitals, were not included in this study and represent approximately 10% of acute, short-stay hospitals (CMS, 2011). An additional delimitation of my study population is that the hospitals

must have data for the year 2012 in both the CMS and the HIMSS Analytics data sets to obtain the information for the variables included in my study.

## Significance of the Study

The results of this quantitative study may be of use to decision makers who determine funds allocated to administrative IT in hospitals. Determining the relationships among the variables may provide direction for further analysis for spending decisions. The hospital and community may derive benefits from the appropriate allocation of funds that may reduce health care costs while maintaining health care quality (Young & DeVoe, 2012). Kellermann and Jones (2013) noted that those in the health care industry needed guidance for investments in IT.

### Contribution to Business Practice

Himmelstein et al. (2010) revealed in their previous research that, despite increased spending on computerization, there is little evidence to support a relationship among administrative computerization, hospital size, and administrative expenses. I used data from 2012 to enhance knowledge and understanding about the relationships among administrative computerization, hospital size, and administrative expenses. Health care leaders could use the research results to provide direction on effective computerization spending in the health care administrative areas.

Information from this study would be used by business leaders to strategically allocate resources to enhance positive financial performance. Cukier and Mayer-Schoenberger (2013) noted that using data for research to discover what relationships

exist, may be beneficial in making timely business decisions. Blumenthal and Dixon (2012) wrote that information on health care spending was critical to policy makers who set governmental health care reimbursement rates. Ding (2014) added that research that reveals relationships between hospital characteristics and expenses might influence governmental policies

**Implications for Social Change**

The implications for positive social change and improved business practice include the potential to realign health care resources because of lower administrative spending. Health care business leaders may use the results of this study to realign or reduce health care administrative expenses and influence positive business practice, thus leading to positive social change. Lowering administrative costs would reduce overall health care spending without sacrificing health care quality (Young & DeVoe, 2012).

High health care expenses have reduced access to health care services (Gusmano, 2011) and Berwick and Hackbarth (2012) added that the reduction of non-value added processes in health care administration would reduce the health care expenses without reducing services. The negative social impact of excessive administrative expenses due to government payment for health care leads to an economic burden on taxpayers (Cutler & Ly, 2011). The reduction of health care administrative expenses would improve business performance and could have positive effects on the availability of health care services.

## A Review of the Professional and Academic Literature

The purpose of this quantitative, correlational study was to examine the relationships among administrative computerization, hospital size, and administrative expenses for Medicare-certified hospitals in the United States. The independent variables were administrative computerization and hospital size. The dependent variable was administrative expenses.

In the literature review, I present the development of health care business management and operations. This discussion explains how the industry evolved and drove the need for computerized solutions. I demonstrate how computerization evolved through the development of health care delivery systems, including the influence of government regulations and insurance.

I reviewed literature on the development and outcomes of administrative computerization in health care. I provided areas that directly and indirectly pertain to this study, including comparing and contrasting differing perspectives from the research. The general systems theoretical framework was evident throughout the studies included in the literature review, despite a micro approach to individual components of information systems by some of the researchers. These studies provided support for the need for additional research on relationships among administrative computerization, hospital size, and administrative expenses.

**Strategy for Searching the Literature**

I conducted the literature review through the lens of general systems theory, focusing on the interactions and relationships between subsystems. The theoretical framework is based on the premise that relationships between components of a system or relationships between systems are at least as important as the individual components (Symonds & Gorard, 2010). References totaled 178, with 158 peer-reviewed journal articles. More than 85% of references were published within the last 5 years. To provide depth and understanding, I included additional sources, including (a) books, (b) trade publications, (c) trade websites, and (d) government websites when appropriate.

Relevant literature was identified via individual searches via combinations the key search terms: *health care, administrative, nonclinical, information technology, IT spending, cost, expenditure, hospital, Medicare, systems theory,* and *expenses*. The following databases were used: ABI/INFORM Complete, Academic Search Complete, Business Source Complete/Premier, ERIC, and MEDLINE.

The review led to the discovery of additional resources. For example, references in selected articles provided direction for additional research and a more in-depth review of the topic. To provide a balanced view of the relationships among administrative computerization, hospital size, and administrative expenses, I sought out studies to obtain various points of view.

## General Systems Theory

General systems theory is the framework for this study where I examined the relationships between components of three systems within the overall health care system: technology, physical, and financial. Von Bertanlanffy (1972) noted that relationships between components of systems, or among systems are as, or more important than, the components themselves. The purpose of my study was to examine the relationships among administrative computerization, hospital size, and administrative expenses.

GST was used to examine the relationships among these components to determine if a significant relationship exists that may not be recognized by examining isolated components within an individual system. Examination of one system or component of a system may lead to a different action taken than if relationships between other components or systems were included in the examination. An examination of an IT system for administrative computerization would focus on the operations and interactions within the IT system. Comparisons of administrative computerization in hospitals would show operating performance results of high performing systems versus low performing systems regardless of financial impact. Ranking performance without financial consideration may direct different action than the results that would include examinations of the relationships from the financial system, such as total administrative expenses.

Montgomery and Oladapo (2014) noted that research using a GST approach allows for an integrated approach for examining relationships between two systems or among three or more systems. Kaine and Cowan (2011) wrote that using GST is a way to

view outcomes of a system as the result of the interactions and relationships between components in systems, rather than examining a specific component. Each variable in my study is from a different system within the overall health care system.

Administrative computerization from the IT system can influence the financial system component and total administrative expenses, which may be influenced by the size of the organization. The expenditures for administrative computerization may be offset by reductions from increased efficiencies. Examining relationships among the three systems may provide direction on whether organization size and administrative computerization show a relationship to administrative expense.

A GST approach does not isolate the examination of variables (Montgomery & Oladapo, 2014). The focus of GST is on the interdependence and relationships (Marshall & Farahbakhsh, 2013). Hanson (1995) noted that using GST allows for the recognition of patterns from the examination of the relationships between two or more interrelated components that may not be visible if examined separately. Hanson continued that GST is considered a whole approach and research crosses system boundaries. Marshall and Farahbakhsh (2013) expanded on the importance using GST in systems research noting that the functions of a system are lost when taken apart. GST is applicable to a wide range of disciplines from biology to economics (Hanson, 1995).

Kazley and Diana (2011) used general systems theory to examine relationships between systems in health care and found general system theory appropriate when examining the interrelated and complex systems in health care. The relationships between

components of low complexity systems are more tightly connected than those relationships in high complexity systems and the increase of new elements adds to the complexity of health care systems (Kazley & Diana, 2011). Kazley and Diana (2011) revealed that examination of variables from different systems revealed different results and provided additional information. The results of the study revealed that there were disparities in the number of fully implemented systems when the variables were examined using two different reporting systems (Kazley & Diana, 2011). Examining the relationships between the systems revealed relevant information on the discrepancies in measuring EMR implementation using different systems (Kazley &Diana, 2011).

Adam and de Savigny (2012) concurred that GST is well suited to research in the complex health care environment that will examine relationships. Due to the complexity of health care systems, keeping a reductionist approach and examining one component or system within a system may not be the most appropriate (Adam & de Savigny, 2012). Adam and de Savigny noted that research devoted to isolated components was valuable research and that systems research complemented this research through a more holistic approach. Swanson et al. (2012) added that use of systems thinking in research would shorten the void between research and application. The changes in the health care environment and additions in technology continue to increase the complexity in the health care system. Porra, Hirschheim, and Parks (2005) added that GST provided a framework to conduct an historical study. The relationships may change over time due to the changing complexity of the system.

Kefalas (2011) expanded on systems theory or systems thinking by identifying three main features of systems thinking as (a) a worldview, (b) interdisciplinary, and (c) focused on relationships. The interactions and the interdisciplinary trait of systems thinking allows for the use of theories and results from other research areas (Kefalas, 2011). Pouvreau (2014) noted that theories such as information theory and operations research are derived from systems theory. These and other related theories are included in the literature review as researchers focused on relationships between components of a system or between systems in health care computerization. The focus on relationships within and between systems was applicable to this study. I have provided results from various disciplines and researchers that revealed interactions between systems and components of systems related to computerization and the evolution of health care systems.

**History of Health Care Administration**

An examination of the literature regarding the development of health care administration revealed the underlying need for administrative computerization. Marciarille (2011) noted the current provision of health care services has dramatically changed from the late 18th century home-centered care paradigm to the specialized care facilities of today. Marciarille also recognized that the changes in health care delivery shifted the early focus of health care services from a social and charity focus to a business focus. A shift in the location of health care services from patients' homes to health care facilities drove the need for health care organizations to provide business services, and

administration increased (Marciarille, 2011). Leleu, Moises, and Valdmanis (2014) wrote that hospitals have two major systems: administrative and clinical. Despite the interconnection of the systems, the focus of this research study is on the administrative system. This sub-section includes a review and consideration of the changes in the health care delivery model that drove growth of administration and the need for computerization to increase efficiency and cost effective management.

The increased expenses of providing health care in institutionalized settings also increased administration as an attempt to contain and regulate expenses (Marciarille, 2011). The shift in the delivery of health care drove the expansion of management and thus a shift of influence to the health care business segment of managerial controls (Kuhlmann & Annadale, 2012). The growth of the health care industry continued and represented 17.9% of the United States gross domestic product by 2010 (Martin et al., 2012). Michelman and Kim (1990) wrote that the health care industry continued to grow, and the organizational structure of health care entities evolved from standalone hospitals to integrated health systems. Michelman and Kim noted that larger and more complex administration systems are necessary to support the integrated health systems. The design of the U.S. health industry, influenced by government initiatives and reforms, was in conflict with serving public needs (Perkins, 2010). The resulting business structure of restricted competition and specialized health centers created high-cost organizations (Perkins, 2010).

Administrative functions and spending grew not only because of the health care industry development and expansion, but also because of increased government oversight and regulations (Younis et al., 2009). Health care is one of the most highly regulated industries (Stiefel, 2012). Younis et al. (2009) wrote that due to compliance and audits, government-regulated industries have higher administrative expenses than non-government regulated industries. Stiefel (2012) revealed that in 2004, the health care industry spent almost one trillion dollars on regulatory compliance.

Government regulations were not the only contributor to increased national health care expenses. Kahn et al. (1990) relayed that in 1965, the U.S. Government introduced Medicare, a federal insurance program, to serve the elderly population. Since the implementation of the Medicare, government spending on health care has grown from $1.8 billion to over $524 billion in 2010 (CMS, 2012a). Kahn et al. noted that Medicare originally reimbursed health care providers based on expenses incurred, or a retrospective view. This retrospective payment methodology continued until 1983 (Kahn et al., 1990).

Richardson (2011) revealed that a change in reimbursement policy in 1983, to a fixed payment methodology, or prospective payment system, was an attempt to reduce government spending. Despite these changes, Medicare spending has increased from 14.6% of total national health expenditures in 1980 to 20.5% in 2011 (Moses et al. 2013). The shift from cost reimbursement to prospective payment system added additional pressure to health care organizations to reorganize and reduce expenses (Michelman & Kim, 1990). Conlan and Posner (2011) concurred and wrote that changes in the federal

government [Medicare] operations and regulations drove health care spending and changes within the health care industry.

Brubaker, Picano, Breen, Marti-Bonmati, and Semelka (2011) and Ferguson and Johnson (2011) disclosed that the United States spends a larger percentage of gross domestic product on health care than other major countries without greater health outcomes. Kim, Tannera, Foster, and Kim (2014) concurred that administrative inefficiencies contributed to the high cost of health care in the United States. Administrators must carefully consider projections of savings from investment of funding in IT. The U.S. government has underestimated expenses and savings related to the expansion of programs. Schansberg (2011) demonstrated the disparity between government estimation of expenses and actual expenses by revealing that Medicare personnel underestimated the original expenses estimate for 1990, from a prediction in 1965, by $98 billion.

The growth and expenses of health care administration continued to grow as the health care industry grew. The U.S. government continues to try to improve the quality of health care and lower the cost through additional regulatory reform, however, administrative expenses continued to increase. Peterson (2011) noted that increased health care expenses were a driver of government legislation to reduce health care expenses. Two recent legislative acts addressing health care spending are the American Recovery and Reinvestment Act and the Affordable Care Act. Though Peterson noted that expense reduction was a key driver of legislation, Sisko et al. (2010) estimated the

amount of increased administrative expenses for the implementation of the Affordable Care Act to be $37.7 billion through 2019. Keehan et al. (2011) concurred and wrote that administrative expenses would increase for federal, state, and local government.

Fineberg (2012) found that excessive administrative expenses contributed to overall higher levels of expenses. Emmanuel et al. (2012) added that 14% of excessive health care expenses were due to administrative expenses. Cutler, Wikler, and Basch (2012) stated that there should be regulations to standardize and reduce administrative expense. A portion of American Recovery and Reinvestment Act titled The Health Information Technology for Economic and Clinical Health Act specifically addressed health information technology (Blumenthal, 2011). A goal of government health care legislation is to reduce government spending while improving the quality of health care (Oshima & Emanuel, 2013).

**Health care computerization.** Leidner, Preston, and Chen (2010) wrote that computerization is a critical element for success in the health care industry, especially in the administrative areas. Lee et al. (2011) wrote that health care organizations needed computerization to remain viable. Computerization could increase efficiencies and reduce expenses so organizations could remain sustainable and competitive (Lee et al., 2011). The rapid and continual changes in the health care industry underscored the need for technology solutions (Lee et al., 2011). Wang et al. (2012) added that organizations in changing industries needed computerization to remain competitive.

Jones, Heaton, Rudin, and Schneider (2012) noted that the focus on health care computerization increased with the allocation of funding by the Obama administration. The United States government's commitment to invest $19 billion in information technology to reduce health care expenses also influenced the increase in the number of research studies to determine the return on investment (Das, Yaylacicegi, & Menon, 2011). Despite legislation that underscores the belief that computerization is critical for success, there is currently little information to validate a positive financial relationship between administrative computerization and administrative expenses. A review of the literature exposed several barriers in health care that may have affected positive results of computerization.

**Barriers to computerization.** A review of the literature revealed that barriers to computerization in health care varied considerably. Boonstra and Broekhuis (2010) segmented barriers to computerization into eight categories: (a) financial, (b) technical, (c) time, (d) psychological, (e) social, (f) legal, (g) organizational, and (h) change process. Boonstra and Broekhuis warned against addressing any one barrier in isolation as other barriers may rise and impede computerization. Otto and Nevo (2013) revealed barriers to computerization in health care were (a) policies, (b) complexity, (c) lack of standards, and (d) resistance. Mukhopadhyay, Singh, and Kim (2011) noted that the regulatory environment and structure of health care organizations inhibited computerization and added to the complexity of the industry.

Barriers to computerization are the conflicts of social versus economic goals in health care. Karsh, Weinger, Abbott, and Wears (2010) wrote that the competition between the focus of computerization on documentation and revenue generation and the intent of clinical personnel to improve the health and welfare of patients hindered computerization. These divergent paths, of clinical versus administrative functions, promoted discourse between clinical and nonclinical factions (Karsh et al., 2010). Leleu et al. (2014) concurred that the competition between social and economic added to the complexity in achieving financial results. The following section includes an in-depth review of the barriers to computerization in health care, including (a) conflicting focus, (b) complexity, (c) standardization, (d) expenses, and (e) funding.

**Administrative computerization.** Jiwani, Himmelstein, Woolhandler, and Kahn (2014) wrote that an expected outcome of the implementation of American Recovery and Reinvestment Act would be the reduction of administrative expenses through standardization and automation. Cutler et al. (2012) wrote that other industries achieved savings from standardization and automation and projected that the savings in health care could exceed $11 billion dollars annually. Mithas, Tafti, Bardhan, and Mein Goh (2012) found a significant relationship between computerization and firm profitability, though they did not focus their research on health care entities.

Das et al. (2011) found that investment in administrative computerization in health care produced immediate, though short term results in productivity. Das et al. also noted that computerization could improve productivity; however, the cost may not be

lower. Payne et al. (2012) noted that increased efficiencies in administrative functions such as billing and collections reduced the expenses for record maintenance.

Technology is key to increased efficiencies in the health care industry (Buntin, Burke, Hoaglin, & Blumenthal, 2011). However, Cao, Gan, and Thompson (2013) noted, there had to be congruence between the business processes and technology solutions in order for computerization to be successful. Michelman and Kim (1990) added that the success in computerization requires the integration of transaction processing systems and information reporting systems.

Himmelstein et al. (2010) examined the relationships between administrative computerization and administrative expenses. Himmelstein et al. (2010) calculated administrative computerization by taking the total number of fully operational administrative computer systems in a hospital and dividing by the number of systems available at the time of the research. I used this method in determining administrative computerization.

**Conflicting focus.** The balancing of social versus economic goals of health care has been at the root of the conflict in determining what organizational deliverables should be. Bijl (2011) noted the difficulty in measuring outcomes of health care as it relates to the quality of life measurement, and it is difficult to quantify economically. Perkins (2010) noted that regulatory and business influencers drove the outcomes of the conflict between social and economic benefits. The self-preservation and the pursuit of individual objectives within in the health care industry decreased the inefficiencies and increased

expenses of the industry as a whole (Perkins, 2010).

Regulatory requirements and business drivers in the health care industry were often at odds. The advancement of high cost, centralized medical centers, at the detriment of low cost dispersed primary care services resulted in an environment that had excess, high cost, capacity and increased overhead expenses (Perkins, 2010). Miller and Tucker (2014) noted that it was self-preserving for an organization to keep information contained within the organization. Sharing of patient information with either patients or competitor organizations made it easier for patients to receive services from those competitors (Miller & Tucker, 2014).

The struggle of defining goals and outcomes also was evident in computerization in health care and the misalignment of business objectives with technology solutions hindered implementation (Spaulding, Furukawa, Raghu, & Vinze, 2013). Melin and Axelsson (2013) wrote that the divergent expectations of the stakeholders within the health care organizations often conflicted with one another, primarily between medical and nonmedical fractions. Lapointe, Mignerat, and Vedel (2011) identified four competing fractions in competition to define technology outcomes: (a) clinical, (b) administrative, (c) governmental, and (d) patient. These four areas had divergent views, and these views influenced expectations, actual use, and determination of computerization success (Lapointe et al., 2011). Setia, Setia, Krishnan, and Sambamurthy (2011) wrote that the overall expectation of many health care organizations to provide

care, even to those who cannot pay, is in conflict with the expectation of financial viability.

Goh, Gao, and Agarwal (2011) noted that successful computerization relied on the understanding of stakeholders' expectations. Meeting the expectations of end users determined the success of computerization (Goh et al., 2011). Bardhan and Thouin (2012) stated that computerization improved both clinical and nonclinical quality measures in health care. Bardhan and Thouin also revealed that use of administrative computerization could reduce overall hospital expense. Bardhan and Thouin did not specifically examine the relationships between administrative computerization and hospital size. Hikmet, Banerjee, and Burns (2012) wrote that the expectations of positive financial outcomes rather than quality improvement were often unmet. Diverse stakeholders with diverse expectations set diverse expectations for computerization and Goh et al. noted unmet end user expectations could lead to resistance to computerization.

Computerization has resulted in increased task time for end users in health care and thus resistance to computerization was strong (Goh et al., 2011). Goh et al. (2011) noted that computerization forced changes in workflow that disrupted routines. Hikmet et al. (2012) and Marmor and Oberlander (2012) wrote that realistic expectations and awareness of the deliverables of the computerization were leading drivers for increased computerization in health care organizations. Kaplan and Harris-Salamone (2009) defined a successful computerization project as one that met end users expectations; Kaplan and Harris-Salamone added that other elements of computerization success

included implementation completed on time and within the financial allowance.

Petter, DeLone, and McLean (2013) noted 43 variables related to the determination of the success of computerization. These variables included many items outside the actual system components and installation, such as attitudes and perceptions of end users (Petter et al., 2013). Kaplan and Harris-Salamone (2009) noted that the lack of clear expectations and requirements were major reasons why computerization projects are deemed unsuccessful. Despite the significant references to the difficulty in implementing information technology due to technical issues, Kaplan and Harris-Salamone noted that addressing the (a) financial, (b) social, and (c) cultural components of computerization drove higher success rates in health care.

**Complexity.** The highly regulated and complex nature of health care entities made it more difficult to implement technology processes that were successful in other industries (Radnor, Holweg, & Waring, 2012). Basole, Bodner, and Rouse (2013) identified the structure of health care as a complex adaptive system as compared to a traditional system. Basole et al. noted that the outcomes of a health care system are determined by components of the system, rather than by a planned or designed system. Wang et al. (2012) noted that computerization had different outcomes in stable versus dynamic environments. Lee et al. (2011) noted that the quick and continual changes in the health care environment increased the overall complexity.

The vast amount of data and complex transactions of health care organizations can minimize the positive impact of computerization used in other business environments

(Koh & Tan, 2011). Wu and Kuo (2012) stressed that the health care industry is more complex that other industries due to the interdependence of (a) patients, (b) providers, and (c) payers and divergent goals of each of these stakeholders. Basole et al. (2013) added that the requirements of government agencies and even the consumers increased the complexity of the industry.

Cresswell and Sheikh (2013) discovered that the intertwined (a) technical, (b) social, and (c) organizational aspects of health care organizations added to the complexity of computerization. Kivinen and Lammintakanen (2013) attributed rapid changes in the health care industry as another reason for difficult computerization. The rapid growth of the health care industry provided the potential to use technology as a competitive advantage; however, complexity increased with the growth and negated some technology solutions (Thakur, Hsu, & Fontenot, 2011). According to Fichman, Kohli, and Krishnan (2011), the highly complex environment is a major reason the health care industry lagged behind other industries in computerization, despite evidence that IT increases productivity and efficiency in other industries (Hikmet et al., 2012). Jiang, Han, Titus, and Liberatore (2010) wrote that, in addition to deficits in IT infrastructure, lack of employee technology knowledge contributed to the low level of health care computerization.

The diverse populations and technology requirements within in a health care organization increased the difficulty in the selection of appropriate solutions that would meet the needs across departments (Cresswell & Sheikh, 2013). Health care workforce

composition also adds to the complexity of implementation and use of technology. Fichman et al. (2011) relayed that multidisciplinary teams in health care add to the difficulty in the selection and use of technology. Lluch (2011) added that the highly professionalized and autonomous nature of personnel in health care created a barrier to computerization.

A high level of skill and knowledge input from health care technology users impeded acceptance and use of standard technology solutions (Robert, Greenhalgh, MacFarlane, & Peacock, 2010). Goh et al. (2011) concurred that the high independent nature of many professionals in health care added to the difficulty of implementing technology solutions that had a wide level of acceptance. In addition, Fichman et al. (2011) found that clinical personnel's perception that technology was impersonal impeded adoption of computerization.

In addition to the inherent complexity in health care that drove lower adoption of computerization, Blackwell (2008) wrote that the development of computerization in health care started with specialized technology solutions for distinct disciplines. Setia et al. (2011) added that isolated implementation of computer systems within organizations led to redundant processes, which negatively affected overall performance. Lenz, Peleg, and Reichert (2012) noted that computerization in the health care industry is comprised of many specialized systems.

The lack of standardization and interoperability between specialized systems added to the difficulty of using technology for a comprehensive solution to streamline

operations, both internal and external to organizations (Bradley, Pratt, Byrd, Outlay, & Wynn, 2012; Lenz et al., 2012;). The change from individual unit computerization focus to an organizational wide focus added to the level of complexity (Bradley et al., 2012). Iveroth, Fryk, and Rapp (2012) stated the importance of aligning the appropriate technology with the intended use. Outcomes from the use of health care computer systems depended on the combination of systems and end users (Iveroth et al., 2012). Williams (2013) noted that the replacement of legacy systems or the requirement of potentially expensive and time-consuming interfaces hindered the move to integration and interoperability.

Yang, Kankanhalli, Ng, and Lim (2013) revealed that end user perception of the complexity of computerization affected the actual use. Hung, Hung, Tsai, and Jiang, (2010) wrote that the complexity, viewed from the user, was determined by the understanding and the ease of use of the system. If the user did not understand or found the system difficult to use, it was determined complex (Hung et al., 2010). Even if the outcomes from computerization were better than the previous state, the actual or perceived difficulty of use hampered use and implementation (Yang et al. (2013).

Setia et al. (2011) noted the difficulty in conducting research on the health care industry, due to the variance in regulatory requirements from different states. Doonan and Tull (2010) wrote the different and potentially competing regulations between the various states added to the complexity of national reform. Younis et al. (2009) noted that health regulations focused on the protection or improvement of the health and safety of the

public though the expenses were born by the individual organizations providing services. Even when regulatory changes had support from a business focus, Doonan and Tull noted the concern for administrative complexity in complying with regulations. Stiefel (2012) wrote that health care regulations could increase expenses without improving safety or quality. Stiefel noted that this occurred when regulations that addressed issues, including computerization, were implemented in isolation.

Blumenthal and Tavenner (2010) noted that more recent health care technology regulations are being coordinated to enhance deliverables for health care providers. Ding (2014) noted research that showed hospital characteristics that could increase efficiencies and reduce expenses would drive health care legislation. Government agencies could use this information to set reimbursement rates lower as the goal of the government is to reduce spending (Ding, 2014). Ding added that knowledge of how hospital characteristics affected efficiencies and expenses would help hospitals change to adapt to lower reimbursements.

Cutler and Ly (2011) demonstrated that health care administration was more complex and more costly in the United States when compared to other high-income countries. Berwick and Hackbarth (2012) noted that the complexity in the United States added unnecessary administrative expenses and estimated a range of these expenses to be from $107 billion to $389 billion in 2011. The high-end estimate of $389 billion represents 31% of the total wasteful spending in health care and is the largest category, ahead of overtreatment and fraud (Berwick & Hackbarth, 2012).

**Standardization.** Chandra, Kumar, and Ghildayal (2011) added that some of the administrative complexity was due to meeting external requirements, primarily insurance companies. The complex and diverse requirements by the insurance companies place administrative burdens on hospital operations (Chandra et al., 2011). Cutler et al., (2012) noted that other industries reduced administrative complexity and expenses through standardization. The banking industry was one example where standardized processes throughout an industry increased administrative efficiencies and decreased expenses (Cutler et al., 2012). Cutler et al. used Walmart as an example of a strong influencer in the retail industry that drove administrative efficiencies and reduced expenses by requiring its retail partners to comply with operating standards. The federal government, a significant player in the health care industry, has made efforts to reduce administrative expenses through regulations, including standardization of processes (Cutler et al., 2012). Cutler and Ly (2011) also noted that health care administrative complexity has reached the point where legislation is required for simplification.

Requirements in the Affordable Care Act legislation dictate the use of computerization to simplify and standardize processing (Cutler & Ly, 2011). Cutler et al. (2012) reiterated that the reduction of cost through the reduction of administrative complexity is a preferable avenue compared to cost reduction by the reduction of medical services. According to Berwick and Hackbarth (2012), administrative complexity increased expenses of health care administration and the lack of standardization is one of

the leading causes of inefficiencies in administrative IT use (Jaana, Tamim, Paré, & Teitelbaum, 2011).

Melin and Axelsson (2013) indicated in their research that the need for both standardization and flexibility added to the complex nature of health care. The challenge is greater with the push for integration of administrative and clinical computerization (Blackwell, 2008). Emmanuel et al. (2012) stated that administrators must integrate clinical and administrative functions to realize administrative expenses reduction. Cutler et al. (2012) wrote that standardization would optimize technology use and reduce expenses. Standardization of administrative processes could save health care providers $20 billion per year according to Cutler et al.

Government policies can drive standardization and interoperability (Salzberg et al., 2012). O'Malley (2011) stated a nationwide health information network, as structured under the Health Information Technology for Economic and Clinical Health Act, would provide a platform for information sharing across different entities and providers. Reynolds and Wyatt (2011) noted that the U.S. government, through the Veterans Administration, is advancing the standardization of technology in health care. Hamel, Blumenthal, Stremikis, and Cutler (2013) noted that the requirements of the Affordable Care Act are also driving standardization through regulation in administrative areas.

**Hospital size.** Hospital size was one of the two independent variables included in this study. Fareed, Ozcan, and DeShazo (2012) noted that the hospital size influenced operational efficiencies, including those using technology. Fareed et al. wrote the number

of inpatient beds or the number of patients utilizing the hospital services defined hospital size, though the number of beds or patients used to determine size categories may vary.

Fareed et al. (2012) stated that smaller hospitals do not have the same benefits from economies of scale of larger hospitals. Cetin, Aksu, and Ozer (2012) wrote that smaller sized hospitals did benefit from increased performance of technology, despite lacking the benefit from economies of scale. Cetin et al. attributed this to additional training and focus on the technology that was available in smaller hospitals. Cetin et al. concluded that administrative technology positively affected administrative expenses, and smaller hospitals had a significantly higher benefit from administrative technology than larger hospitals.

Lee et al. (2013) contradicted Cetin et al.'s (2012) finding and wrote that large hospitals may have increased benefits from technology due to the larger volume of data processed. Himmelstein et al. (2010) concluded that investment in administrative technology in did not decrease administrative expenses overall, and higher administrative expenses were evident at smaller hospitals. Zhang et al. (2013) conducted a research study and demonstrated that there was a positive relationship between hospital size and technology adoption.

**Administrative expenses.** Restuccia, Cohen, Horwitt, and Shwartz (2012) noted that in addition to the complexity and a decrease in productivity, the high cost of computerization was associated with lower levels of health care computerization. Moores (2012) revealed the high expenses for both implementation and ongoing maintenance as

barriers to computerization. Wolf, Harvell, and Jha (2012) discovered that hospitals without access to external funds had lower rates of computerization within the health care industry. Reynolds and Wyatt (2011) also noted that computerization cost is a significant barrier to computerization in health care and recommended the use of open source software to increase competition and to reduce expenses.

Lluch (2011) also agreed that startup expenses were barriers to computerization. However, the government provided funding for computerization to incentivize health care organizations to implement computerized solutions. Szczerba and Huesch (2012) noted the need for increased funding for health care computerization, as technology is the underpinning for improving processes. Though Sisko et al. (2010) wrote that providing additional funds for computerization would increase administrative expenses. Sisko et al. estimated that Government health care policy and regulation changes, such as the Affordable Care Act, would require $2.4 billion for additional administration expenses for the payment of incentives to expand technology.

Cutler et al. (2012) wrote that financial incentives to expand technology, such as those initiatives by the Health Information Technology for Economic and Clinical Health Act, would help hospitals fund the cost of technology. Blumenthal (2011) wrote that the United States Government is promoting computerization in health care by designating over $29B through the American Recovery and Reinvestment Act of 2009. Buntin et al. (2011) expected the investment of government funds into health care information technology to reduce expenses and improve care. The information from increased health

care information technology implementation and use will provide data to the government to analyze and appropriate funds (Buntin et al., 2011).

Leidner et al. (2010) noted that the benefactors of the investment in computerization by a health care organization are often located outside the organization's boundaries, such as insurance companies. Blumenthal (2011) wrote the lack of direct benefit to the health care organization was a reason for the delay in computerization for health care providers. Blumenthal (2011) then noted other drivers such as reductions in Medicare reimbursement would push hospitals to reduce expenses through various avenues including technology. Payne et al. (2012) demonstrated that computerization could reduce expenses by streamlined record maintenance and increased efficiencies in administrative functions, such as billing and collections. Cutler et al. (2012) wrote that standardization is critical to achieving administrative cost reductions. Other industries, such as banking and retail, have financially benefited from standardized processes and formats (Cutler et al., 2012).

Hikmet et al. (2012) noted that health care organizations were often not investing in the most suitable computerization for the organization. The proper selection of IT products is critical for success (Hikmet et al., 2012); though Reynolds and Wyatt (2011) recognized the difficulty in selecting appropriate solutions due to the complexity of evaluating health care systems. Leidner et al. (2010) stated that even when the divergent groups within the health care organizations agreed on the importance for computerization the return on investment did not support the cost of implementation.

Lack of clear measurements of successful computerization implementation added to the complexity of choosing a solution that would have a positive financial return (Reynolds & Wyatt, 2011). Schryen (2013) also noted that determining return on specific IT projects was difficult due to disparate ways of measuring results. Himmelstein et al. (2010) and Madapusi and D'Souza (2012) noted the potential for exclusion of positive financial results, due to a lag in performance. Moores (2012) added that there was not a clear indication on whether computerization reduced expenses or increased efficiencies.

Himmelstein et al. (2010) did not find evidence that administrative computerization reduced administrative expenses in the data from 2003-2007. Since 2007, significant changes in health care administrative technology have taken place, primarily due to the new legislation (Cutler & Ly, 2011). Legislation enacted in 2010, even mandated electronic processing in some areas of health care administration (Cutler & Ly, 2011).

A review of the literature revealed that administrative expenses contributed to the high cost of health care (Hamel et al., 2013; Himmelstein et al., 2010). Himmelstein et al. (2010) noted that administrative health care spending in 2007 in the United States comprised 24.9% of total health care expenses. In comparison with Canadian health care spending, the United States had 44% higher administrative health care staffing than Canada (Cutler & Ly, 2011). Cutler and Ly (2011) also indicated that administrative expenses were the largest contributor to higher medical expenses when they compared medical expenses internationally of other high-income countries.

Hamel et al. (2013) wrote that non-value added administrative expenses needlessly increased health care expenses. While Himmelstein et al. (2010) revealed that, the reduction of administrative expenses would lower overall health expenses. Lee et al. (2013) added that hospitals should see the same administrative productivity improvements and related cost reductions as other industries.

Jaana et al. (2011) revealed that there has been a shift in the concerns of the information technology segment from a focus on obtaining and maintaining IT talent to productivity and expenses reduction. Brubaker et al. (2011) wrote that the increased cost of health care services due to health care reform is a concern. Brubaker et al. revealed in their research that there were no clear indications of how expanded universal coverage would affect the level of health care spending. Blumenthal and Tavenner (2010) noted that computerization did not indicate effectiveness.

The added component of meeting meaningful use criteria, embedded in the Health Information Technology for Economic and Clinical Health Act, indicated the need to measure impacts of computerization (Blumenthal & Tavenner, 2010). The return on investment of computerization varied between organizations in the same industry segment and between different industry segments (Jiang et al., 2010). Research by Jiang et al. (2010) indicated that underlying reasons for computerization, such as those driven by competitive forces, regulatory or cost reduction, produced different levels of return. Jiang et al. revealed that return on investment was lower in service industries, such as health care, compared to manufacturing industries. Borzekowski (2009) noted that

technology that automates work and replaces lower skilled workers has the greatest impact on cost reduction. The complexity in the health care environment, both clinical and administrative, makes it difficult to replace workers with automation technology. Borzekowski added that computerization might complement higher skilled workers.

Robert et al. (2010) noted that treating computerization, as an ongoing process that continues to develop, will result in the best outcomes. Caldeira, Serrano, Quaresma, Pedron, and Romão (2012) concurred that accurate results depend on the ongoing assessment of computerization. Benefits may not be immediately recognized and should be increased as the technology is fully assimilated into the organization (Caldeira et al., 2012). Blackwell (2008) declared the integration of administrative data and clinical data would drive successful advancement of health care IT. Setia et al. (2011) added that technology use could expand over time and increase benefits. Szczerba and Huesch (2012) added that technology could assist in mitigating the complexity within in health care.

Melin and Axelsson (2013) noted that it was difficult to determine the success of computerization in health care due to the complexity of implementation and variances in expected outcomes. Kaplan and Harris-Salamone (2009) warned that the meanings and determinations of success were often in the perception of the stakeholders. Payne et al. (2012) added that some of the difficulties in assessing financial benefits of technology in health care included differences in the (a) functionalities, (b) capabilities, and (c) applications. Despite the difficulties in measuring outcomes, Payne et al. noted that

health care IT had the potential to reduce expenses. Cutler and Ly (2011) concurred that investment in technology would simplify and increase efficiencies in the administrative component of health care. Cutler and Ly did not report on the cost of investment in administrative technology compared to a reduction in administrative expenses. The results of using administrative computerization to reduce administrative expenses were not conclusive.

The literature revealed the common theme that health care was a highly complex industry (Radnor et al., 2012; Wu & Kuo, 2012). Gabow, Halvorson, and Kaplan (2012) reiterated that the high cost of health care has impeded the competitiveness of businesses in the United States. Regulatory reform would not be a sustainable solution if health care expenses continue to rise more quickly than income levels (Doonan & Tull, 2010).

Fineberg, (2012) viewed technology as a potential tool to increase efficiencies and reduce administrative expenses in health care. Wang et al. (2012) revealed that there was agreement that computerization was thought to be beneficial, however, noted that computerization did not always lead to improved organizational performance. Payne et al. (2012) stated that there was a general thought that computerization would be a critical component of reducing health care expenses, despite the lack of standard measurements of economic impact.

My review of the literature indicated there was no clear indication that the level administrative computerization affected administrative expenses. Uncles and Kwok (2013) noted the importance of replication of research to enhance generalizability. Exact

replication is not required, and differentiated or partial replication can support prior research findings and increase validity (Uncles & Kwok, 2013). I sought to expand knowledge regarding the financial impact of administrative computerization, hospital size, and administrative expenses in Medicare-certified hospitals in the United States.

## Summary and Transition

Section 1 included the foundation of the study, background of the problem, problem statement, purpose statement, nature of the study, research questions, and hypotheses. I also presented the theoretical framework, definition of terms, assumptions, limitations, and delimitations. I also revealed the potential contributions to business practice and implications for social change, followed by a review of the professional and academic literature.

The literature review in Section 1 provided support for the further examination of relationships among administrative computerization, hospital size, and administrative expenses. The importance of examining the relationships among system components and even systems was evident throughout the examination of the literature, from the development of health care administration to the review of administrative technology. Marciarille (2011) noted a disconnect in health care system development when Medicare Part B (outpatient) funding was added to Part A (inpatient) with no alignment. Ignoring the relationship between these major funding components led to disjointed processes that increased expenses and negatively affected health care (Marciarille, 2011). Marciarille

also noted that there had to be an integrated approach that combined legal, clinical, and financial components.

Boonstra and Broekhuis (2010) revealed that the relationships between the barriers to computerization were as important as the barriers. Karsh et al. (2010) added that understanding the relationships among the components of health information technology increased computerization success. Leidner et al. (2010) supported that the examination of relationships between systems and system components is critical to learning and to increasing the body of knowledge surrounding technology implementation and outcomes in hospitals performance.

A review of the literature provided no overwhelming evidence that there was a significant relationship among administrative computerization, hospital size, and administrative expenses. Zhang et al. (2013) recommended further research to examine cost benefits of administrative technology. An examination of the relationships among administrative computerization, hospital size, and administrative expenses using data that are more current may help provide direction in making business decisions on the use of technology in health care administration.

A further examination of the relationships between the variables added to the body of knowledge relating to these variables. Section 2 includes the purpose of the study and details of the role of the researcher. Details on participants, research method, research design, population, ethical research, data collection instrument, data collection technique,

data analysis, and study validity are also included in Section 2. The doctoral study findings with recommendations for further action or study follows in Section 3.

# Section 2: The Project

Section 2 begins with an expanded purpose statement from Section 1, followed by details of the role of the researcher. In addition, Section 2 includes details on the participants of the study and a description of the research method and design. I provided support for the population and sample used in the study and details on ethical research. I also included descriptions of the data collection instruments, data collection techniques, data analysis, and study validity.

## Purpose Statement

The purpose of this quantitative, correlational study was to examine the information that administrators need about the relationship among administrative computerization, hospital size, and administrative expenses. The independent variables were administrative computerization and hospital size. The dependent variable was administrative expenses. The targeted population was published cost reports from acute-care, short-stay, Medicare-certified hospitals in the United States that had corresponding responses from the HIMSS survey. The implications for positive social change include the potential for administrators to examine the relationships among variables to realign resources. This knowledge may help administrators reduce administrative expenses and lower the financial burden for health care consumers in the United States. Lower costs might increase accessibility to health care because Baughman et al. (2015) noted that high health care costs were a deterrent to seeking medical care.

## Role of the Researcher

I developed and tested hypotheses in this quantitative correlational research study as Bansal and Corley (2012) stated that the role of the quantitative researcher is to test hypotheses. Cokley and Awad (2013) noted that the role of the quantitative researcher included recognizing researcher bias in data collection. Chen, Chiang, and Storey (2012) added that it is a researcher's responsibility to apply the appropriate analytics for the study. I tested the hypotheses using multiple regression analysis, which is appropriate for testing hypotheses with more than one independent variable and one dependent variable (Nathans, Oswald, & Nimon, 2012).

I have 20 years of experience in nonprofit health care finance, in Medicare-certified, acute-care, short-stay hospitals, and am familiar with the data sets and sources that I used in my study. My experience as a financial executive includes allocating limited funds for expenditures, including allocating funds for administrative information technology. A desire to allocate funds for the best possible results, including a positive return on investment, drove the need to explore the effects of information technology spending in administration. I recognize the value of research is to provide a basis for improving business performance.

My study is quantitative in nature and I used data originating from health care organizations. Individual organizations or hospitals were not individually identified in my study. I did not use individuals or individually identifiable data, consequently the

Belmont Report does not apply to my study. The Walden University IRB approval number for this study is 10-08-15-0044186.

## Participants

The population for this study included published cost reports from Medicare-certified short-stay, acute-care hospitals in the United States that had corresponding responses from the HIMSS survey. The census was comprised of those hospitals that have filed Medicare cost reports for the study period 2012 and have participated in the HIMSS annual IT survey 2012. Collum, Menachemi, and Sen (2016) noted the limitation of using only Medicare cost report data was mitigated as the population included almost all the adult acute-care hospitals in the United States. A census was available for the proposed study and thus a sample was not used. There were no human participants included in this research study; I included only historical data.

I gained access to the population's data through the CMS and HIMSS survey data. Population data from the CMS is available for download from the website. I used a third party to download specific data elements for my study. Personnel from the American Hospital Directory downloaded the required data fields from the CMS website and provided them in an Excel data file. The required fields were: CMS Certification Number, FY End Date, Facility Name, Type of Facility, Administrative and General Total Costs.

The population data from HIMSS is available through an end-user agreement with no cost to the end-user. HIMSS does require recognition for the use of any data. I entered

into an agreement with HIMSS and downloaded the data for the population included in my study. The population data from these two sources provided me with data to answer the four research questions.

RQ1. What is the relationship between hospital size and administrative expenses?

RQ2. What is the relationship between administrative computerization and administrative expenses?

RQ3. What is the relationship between administrative computerization and hospital size?

RQ4. Is there a significant linear relationship among a combination of administrative computerization, hospital size, and total administrative expenses?

Using archived data allows a larger population to be included in the study in a timely manner. The period covered for the current study includes data from 2012. The population consisted of all short-stay, acute-care hospitals that have filed Medicare cost reports and have participated in the HIMSS annual survey of the U.S. hospital IT market.

## Research Method

Case and Light (2011) wrote that the research questions determine the selection of a research methodology. I answered my research questions using numerical data and statistical analysis. A quantitative methodology is best for my study as numerical data and statistical analysis are fundamental to quantitative research (Symonds & Gorard,

2010). Rozin, Hormes, Faith, and Wansink (2012) added that researchers use quantitative methods to examine relationships, numerically, which I did in my study. I used a quantitative research method to examine the relationships among hospital administration computerization, hospital size, and administrative expenses.

Qualitative research is better suited for the exploration and understanding of relationships (Wisdom et al., 2012). Symonds & Gorard (2010) added that qualitative methods rely on words and narrative analysis. A qualitative methodology did not support the purpose of my current research study, as I did not explore the reasons why relationships do or do not exist or include narrative analysis. I examined whether significant relationships existed, thus, a quantitative method was best suited for my research study.

## Research Design

I used a multiple linear regression research design approach to examine the relationships among administrative computerization, hospital size, and administrative expenses. Stürmer, Wyss, Glynn, and Brookhart (2014) wrote that nonexperimental designs were appropriate when time, cost, or ethics would prohibit research. The cost and time to alter the behavior related to information systems and hospital size to determine the effect on administrative expense was beyond the scope of this study. The examination of existing relationships among the variables of the organizations was the intent of this research study.

Washburn (2012) noted that when events have already taken place a

nonexperimental design is appropriate. Schultze and Avital (2011) noted that qualitative research is more appropriate for exploring behaviors and social processes while quantitative research is better suited for determining relationships. Palinkas et al. (2011) stated that qualitative researchers seek to understand while quantitative researchers seek to measure. I used historical, numerical data to examine relationships between variables.

Washburn (2012) wrote that a correlational study is best suited to examine or determine relationships that do not imply causation. Comparative causation studies that infer causation may be nonexperimental; however, they need to include elements, such as a control group or pretests (VanDeValk & Constas, 2011). The use of historical data and the purpose of this study to examine relationships, while not implying causation, support the use of a correlation design approach as the most appropriate.

## Population and Sampling

The population for this research study was published reports from Medicare-certified hospitals in the United States and that had corresponding responses from the HIMSS survey. The short-stay, acute-care hospitals that filed Medicare cost reports and participated in the HIMMS annual survey in 2012 were included in this study. A census was available for the proposed study and thus a sample was not used.

The data for the dependent variable (DV), administrative expenses, were extracted from 2012 Medicare cost reports filed at the time of data collection. I used the data services of the American Hospital Directory to extract the data from the submitted Medicare cost reports. I extracted the data for the two independent variables from the

HIMSS annual survey data of the U.S. hospitals IT markets for 2012. The census included all acute-care, short-term hospitals that have responded to the HIMSS survey and have filed a Medicare cost report for 2012. Each hospital has data merged from each data set to ensure each hospital has the information for level of administrative computerization, hospitals size, and administrative expense.

## Ethical Research

I used archived data in this research study. Individual hospital data remains confidential. Consents from hospitals are not needed for use of Medicare data. Data were downloaded from the CMS website, for the dependent variable, administrative expenses, and individual hospitals were not identified in this study. All Medicare certified hospitals are required to submit annual cost reports that contain the information used in this study, as a condition to participate in the Medicare program.

I obtained information from HIMSS Analytics, for the independent variables, administrative computerization and hospital size that was previously collected through a voluntary, annual survey conducted by HIMSS personnel and individual organizations were not identified in this study. As an incentive to participate, HIMSS offers participants a copy of the compiled survey. A user agreement (Appendix A) is needed to access HIMSS data. HIMSS is a nonprofit organization with a focus on health care. Data that contain individual hospital information, for this study will be stored electronically for 5 years, in a secure remote site. The data will be deleted after 5 years.

## Data Collection Instruments

I used secondary data obtained directly from the HIMSS Analytics Database and the CMS Healthcare Cost Report Information System (HCRIS). Data from the HIMSS Analytics Database is comprised of information from the 2012 HIMSS annual survey of the U.S. hospital IT market. The annual HIMSS IT survey is distributed to over 5,200 hospitals. In addition to the survey questions on hospital demographics, there are questions on the status and future plans for over 100 IT applications (HIMSS, 2011).

Zhivan and Diana (2012) added that the HIMSS' survey database contained information from almost all nonfederal hospitals. HIMSS Analytics' personnel conducts the survey; HIMSS Analytics has been conducting surveys and analyzing data since 1975 (HIMSS, 2014). The team at HIMSS Analytics continually collects data using structured frameworks (HIMSS, 2011). The HIMSS' Analytics' team then reviews the data to provide reliable and accurate data (HIMSS, 2011). The reviewed analyzed results of the survey are provided to the survey respondents for review and feedback (HIMSS, 2011). The U.S. Department of Health and Human Services' Office of the National Coordinator for Health IT recognized HIMSS Analytics as the only source that collects, analyzes, and updates specific health care IT data (Federal Business Opportunities, 2014). Himmelstein et al. (2010) added that the HIMSS survey data are strengthened due to the information technology professional group that sponsors the survey is the largest in the industry and that this was a motivator for respondents to answer accurately. HIMSS allows access to survey data through an end user agreement (HIMSS, 2012) presented in Appendix A.

**Administrative Computerization**

I obtained information to calculate the independent variable for administrative computerization and independent variable of hospital size from the HIMSS database. The independent variables were both ratio variables. I calculated the independent variable of administrative computerization by dividing the number of fully implemented administrative systems by the total number of administrative systems that were available at the time of the HIMSS annual survey, which was 2012.

The categories included in administrative systems are (a) accounts payable, (b) ADT/registration, (c) asset tracking, (d) benefits administration, (e) budgeting, (f) business intelligence, (g) contract management, (h) cost accounting, (i) credit/collections, (j) data warehousing-financial, (k) document management, (l) electronic forms management, (m) enterprise master person index, (n) enterprise resource planning, (o) executive information system, (p) financial modeling, (q) general ledger, (r) materials management, (s) patient billing, (t) patient scheduling, (u) payroll, (v) personnel management, and (w) time and attendance. I used two application status responses to deem systems implemented. These status responses are (a) live and operational and (b) to be replaced. I categorized all other responses as not implemented.

Burton and Mazerolle (2011) noted that construct validity was important to ensure that the survey instrument measures what a researcher intended. Himmelstein et al. (2010) used annual HIMSS survey data from 2003-2007 to calculate the computerization

in hospitals. Himmelstein et al. (2010) and revealed that HIMSS survey data highly correlated with lists of most wired hospitals for the same period.

The voluntary nature of the HIMSS annual survey is a potential threat to validity. Ansolabehere and Hersh (2012) noted that voluntary surveys are subject to bias, due to sampling bias, and wrote that misreporting may also affect validity. I used two independent variables this study, administrative computerization, and hospital size. There is the potential that variables outside of those included in this study may significantly influence administrative expenses.

**Hospital Size**

I obtained the independent variable, hospital size, from the HIMSS Analytics' database field, NofBed. This field represents the number of licensed beds in a facility. Fareed et al. (2012) wrote that number of beds is a characteristic that represents hospital size.

**Administrative Expenses**

The dependent variable, administrative expenses, is also a ratio variable that is available in a data field, administrative and general expenses total that I retrieved from the CMS' HCRIS, via data services from the American Hospital Directory. Administrative expenses are part of the required information that is submitted by organizations on cost reports. I did not use other expenses reported such as direct clinical expenses, as the focus of this study is administrative expenses. The CMS personnel (2014a) presented that the data are accurate and complete at the time of availability

through their website. Hospitals submit administrative expenses in the annual hospital cost reports to a designated Medicare administrative contractor. Hospitals receiving Medicare funding are required to submit annual cost reports to their designated Medicare administrative contractor.

Hospitals that do not submit timely expenses reports are subject to penalties, including withholding of federal payments (CMS, 2014c). The Medicare administrative contractors are responsible for reviewing the cost reports to ensure the accuracy of data before forwarding to HCRIS (CMS, 2014c). Medicare administrative contractors also conduct audits of cost reports to ensure compliance with reporting requirements (CMS, 2014c). The CMS personnel (2014a) provide cost report data through their website from 1996 through current filings. Personnel from the Research Data Assistance Center (2013) noted that information is updated quarterly in HCRIS; however, it may take 18 months to complete a fiscal year's data.

## Data Collection Technique

I used secondary data for this study from published HIMSS's surveys and published cost reports from the CMS. Schlomer and Copp (2014) noted that some of the advantages to using secondary data included availability, lower expenses, and large populations. Alvarez, Canduela, and Raeside (2012) noted that use of secondary data allowed researchers to focus on research questions and data analysis. Alvarez et al. continued that secondary data were usually the result of well-designed, larger surveys

from national or international organizations that would be outside the abilities of individual researchers.

Chazan-Cohen, Halle, Barton, and Winsler (2012) added that using secondary data might add knowledge beyond the results of the research from the original surveys. Combining data from different secondary data sets also expanded research possibilities (Chazan-Cohen et al., 2012). Chazan-Cohen et al. noted that the researcher had to be aware that there might be a trade-off between depth of information and breadth of information.

Liese et al. (2013) cautioned researchers on the potential data validity issues in using secondary sources. Ghani, Zheng, Wei, and Friedman (2014) warned that it was important to understand the original purpose of the data collected to ensure that secondary use would be appropriate. The original purpose of the Medicare Cost Report was to validate expenses related to health care services provided to Medicare beneficiaries (CMS, 2014d). The information collected through Medicare cost reports includes data useful to this study.

I used Microsoft Access 2010, version 14.0.7149.5000 to download data for the two independent variables from the HIMSS Analytics Database obtained from voluntary surveys administered by HIMSS Analytics personnel. I extracted information on the CMS certification numbers (CCN), number beds for each entity, administrative computerization, and status of implementation related to administrative computer systems and import into Microsoft Excel 2010, version 14.0.7149.5000

I accessed data for the dependent variable, administrative expenses, for 2012 from the CMS, through HCRIS. I used data services from the American Hospital Directory to extract and export into Excel the data fields, CCN, FY End Date, Facility Name, Type of Facility, Administrative and General Total Costs for my study. These data were merged with the HIMSS Analytics' data using the VLookup function in Excel and using the CCN also referred to as the provider number.

Electronic data received from the CMS, via the American Hospital Directory data services, and HIMSS are stored and maintained in electronic format. The data is stored in a secure, password-protected, remote location. I stored the research data in a remote, secure location and will destroy it after 5 years.

## Data Analysis

I used four research questions to determine what information hospital administrators need regarding the relationship among administrative computerization, hospital size, and administrative expenses. The independent variables were administrative computerization and hospital size. I calculated administrative computerization by dividing the number of systems in the live and operational and to be replaced categories by the total number of administrative systems available. The dependent variable was administrative expenses. I examined relationships among administrative computerization, hospital size, and administrative expenses.

RQ1. What is the relationship between hospital size and administrative expenses?

RQ2. What is the relationship between administrative computerization and administrative expenses?

RQ3. What is the relationship between administrative computerization and hospital size?

RQ4. Is there a significant linear relationship among a combination of administrative computerization, hospital size, and total administrative expenses?

I used a multiple regression analysis to determine if the combination of two independent variables, administrative computerization and hospital size, have a significant relationship to administrative expenses. Nathans et al. (2012) wrote that researchers use multiple regression analysis to answer questions with two or more independent variables and one dependent variable.

The results of the regression analysis indicated the regression coefficient is significantly different from 0. A $p$ value of .05 or lower will indicate whether the independent variables contribute significantly to the dependent variable. Standardized coefficients allowed for the comparison of the independent variables, regardless of their units of measurement, as an increase of one standard deviation in one independent variable is equivalent to one standard deviation in another independent variable when examining standardized coefficients (Allison, 1977).

However, because the census included all acute-care hospitals that have filed cost reports and have responded to the 2012 HIMSS annual survey, small effect sizes, as

measured by the standardized coefficients, are considered untenable even if they are significant (Preacher, 2015). The larger the standardized coefficient, the larger the effect size, provided the independent variables are not correlated (Preacher, 2015). I tested for multicollinearity among the independent variables prior to assessing the effect size.

When considering multiple independent variables, researchers can use a variety of statistical tests, including factorial ANOVA, logistic regression, or discriminant analysis (Allison, 1977). Selection of an appropriate method is based, in part, on the level of measurement of the variables (Bernard, 2013). Factorial ANOVA and logistic regression are appropriate when the independent variables are categorical (Bernard, 2013). Discriminant analysis is used to predict group membership of a categorical dependent variable with continuous independent variables (Bernard, 2013).

**Assumptions**

Assumptions surrounding multiple regressions include multicollinearity, sample size, outliers, normality, and homoscedasticity, and independence of residuals (Rovai, Baker, & Ponton, 2014). Because a census was available for the proposed study, sample size was not an issue. I used SPSS to test assumptions related to multiple regression.

**Multicollinearity.** To test for multicollinearity, I used SPSS, version 21, to perform a scatterplot. I checked, visually, for correlation, adding a line of best fit. I used SPSS to run the variance inflation factor (VIF) and disclose the results. A second independent variable, hospital size, was included with administrative computerization in the examination of the relationship to total administrative expenses. Collinearity between

the two independent variables may make it difficult to determine the impact of individual variables. York (2012) recommended using additional data to decrease the potential of collinearity, however noted that this was not effective in instances with perfect collinearity. I used a larger data set, than the size from the results of a power analysis, in my study.

**Normality**. According to Allison (1999) and Pedhazur (1997), multiple regression is robust to violations of the assumption of normality. Allison (1999) noted that the sample size is even moderately large; the normality assumption is not relevant. Because the data is a census, violations of the assumption of normality are not important to this analysis.

**Independence of residuals**. I used SPSS to perform normality and residual plots to confirm normality, homoscedasticity, and detect outliers. Depending on the results, I confirmed these assumptions, and eliminated extreme outliers found in the results. I used SPSS to help analyze the data to answer the four research questions. Pfister, Schwarz, Carson, and Janczyk (2013) noted that SPSS is a statistical software package used to calculate statistics for multiple regression analysis.

## Study Validity

This is a quantitative correlational study. I used data sets from HIMSS for the two independent variables and information from the CMS HCRIS database. I did not conduct experimental research. I relied on archival data. The data set from the CMS (2014a) contains data that are from mandated annual reporting for all hospitals that receive

government funding through the Medicare program. The CMS (2012a) imposes penalties for incorrect reporting.

HIMSS is an independent organization that provides accurate, reliable data (HIMSS, 2012). I used 3,088 hospitals in this study, which is the number of acute-care hospitals that responded to the HIMSS survey and filed a cost report for 2012. The HIMSS survey data is dependent on voluntary survey respondents. Seddon and Scheepers (2012) noted that voluntary respondent surveys do not represent a nonprobability sample and researchers should use caution in generalizing research results. I noted caution for causality due to the awareness of the influences of system components outside the area of study.

The census included all Medicare-certified, acute-care, short-stay hospitals that have data in both the HIMSS and CMS data sets. The data in this research study will be available for five years after the study and repetition of this study using a different sample may increase the generalizability of this study. Thomas and Magilvy (2011) wrote that reliability in research is increased when the research can be replicated. This research study is designed to be replicable, using the selected data sets, and for expansion of research, using similar data sets from different time periods.

## Summary and Transition

Section 2 includes an expanded purpose statement, a description of the role of the researcher, support for the population used for this study, and a description of the

research method and design. A description of data collection and analysis and information on the reliability and validity of this study is also included in Section 2.

A wide range of studies and outcomes surrounding the use of technology in health care indicated a need to validate some of the existing research. Lluch (2011) noted the need for additional research to examine cost and computerization in health care. Payne et al. (2012) noted the difficulty in validating the generally held assumption that technology provided a positive economic impact to health care. Expanding on the research of Himmelstein et al. (2010) the results of this study may provide a platform for further study to validate the financial impact of administrative technology in health care.

Section 3 includes details of data collection, techniques, and analysis. There I present findings, applications to professional practice, implications for social change, recommendations for further study, and a conclusion.

Section 3: Application to Professional Practice and Implications for Change

## Overview of the Study

The purpose of this quantitative, correlational study was to examine the information that administrators need about the relationship among administrative computerization, hospital size, and administrative expenses. I gathered data from 3,088 acute, short-term hospitals, by accessing secondary data from HIMSS and CMS. These hospitals had data in both HIMSS survey data and Medicare cost reports for 2012.

Analysis of the data revealed that there were no meaningful relationships among the level of computerization, hospital size, and administrative expenses based on the examination of the data from hospitals in my study. Hospital size accounted for almost 52% of the variance in administrative expense, a moderate to high relationship. The level of administrative computerization only accounted for 6.3% of the variance in administrative expenses and only 9% of the variance in administrative computerization can be accounted for by the hospital size, both very small relationships. Additional analysis showed that when controlling for hospitals size, almost none of the variance in administrative costs was uniquely due to administrative computerization.

## Presentation of Findings

I addressed four research questions to determine what information hospital administrators need regarding the relationship among administrative computerization, hospital size, and administrative expenses. The independent variables were administrative computerization and hospital size; the dependent variable was administrative expenses. I

examined relationships among administrative computerization in hospitals, hospital size, and administrative expenses. I used multiple regression analysis with an alpha of .05 to determine if the combination of two independent variables, administrative computerization and hospital size, have a significant relationship to administrative expenses.

## Tests of Assumptions

Assumptions surrounding multiple regressions include multicollinearity, sample size, outliers, normality, and homoscedasticity, and independence of residuals (Rovai et al., 2014). Because a census was available for the proposed study, sample size was not a concern. I used SPSS to test assumptions regarding (a) multicollinearity and (b) independence of residuals.

**Multicollinearity.** To test for multicollinearity, I used SPSS, version 21, to perform a scatterplot. While a visual inspection of the scatterplot (see Figure 1) indicated some correlation between the two independent variables, the concentration of most of the data points along the bottom of the X-axis revealed that hospitals with a low number of beds could have anywhere from no computerization to 100% computerization, and similarly, hospitals with high computerization could have anywhere from no computerization to 100% computerization. This finding is supported by a review of the variance inflation factor (VIF) and tolerance. The results indicated that the high tolerance (.911) and low VIF (1.097) reveal no multicollinearity issues.

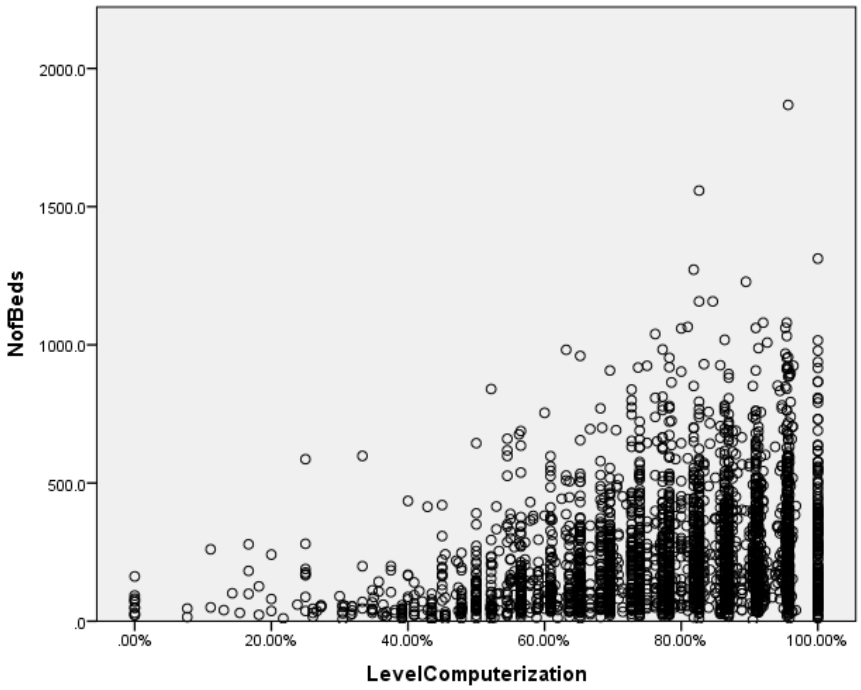


*Figure 1*. Scatterplot: Number of beds and level of computerization.

**Normality.** According to Allison (1999) and Pedhazur (1997), multiple regression is robust with respect to violations of the assumption of normality. Allison noted that if the sample size is even moderately large, the normality assumption is not relevant. Because the data are a census and not a sample, violations of the assumption of normality are not important to this analysis.

**Independence of residuals.** I used SPSS to perform normality and residual plots to confirm normality, homoscedasticity, and detect outliers. The results (see Figures 2 and 3) indicated that the residuals plot indicated heteroscedasticity and the normal P-P plot deviated from normality. Therefore, in lieu of a standard multiple regression, I conducted bootstrapping using 1,000 samples**.**

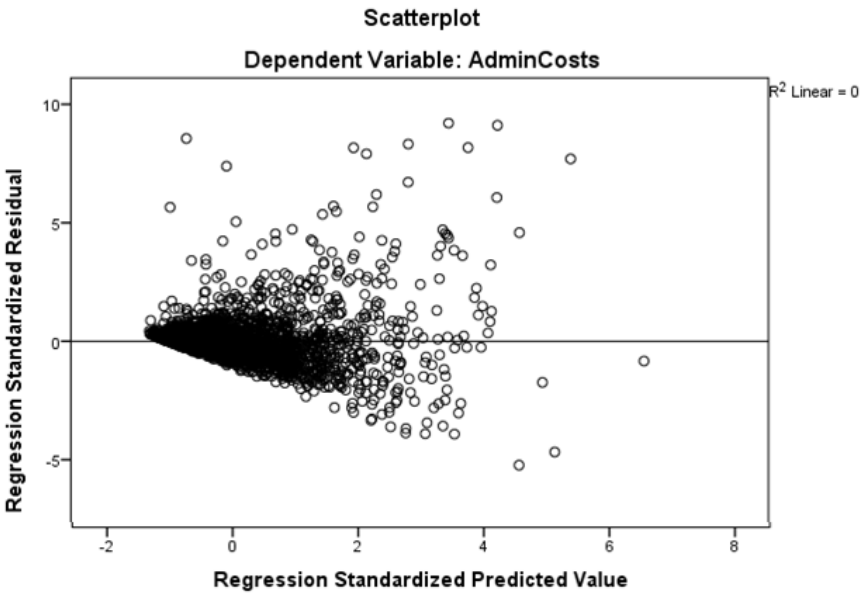


*Figure 2*. Scatterplot: Standardized residuals by standardized predicted value.

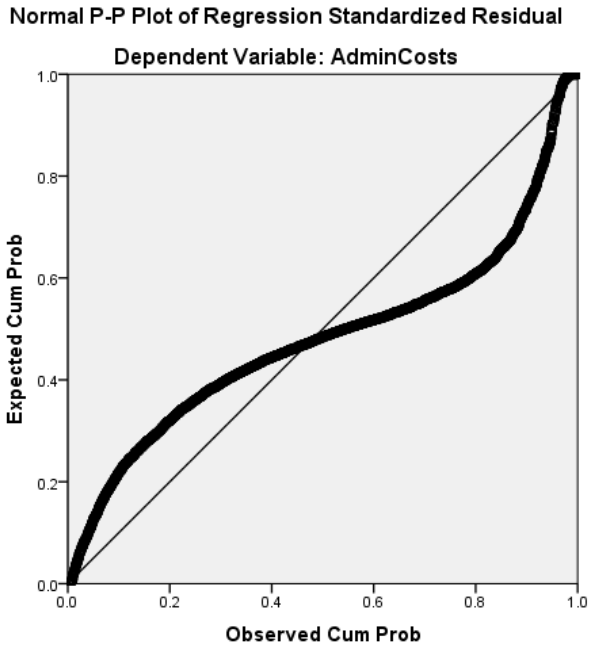


*Figure 3*. Normal probability plot.

**Descriptive statistics.** A total of 3,088 Medicare-certified short-stay, acute-care hospitals in the United States had corresponding responses from the HIMSS survey. Administrative costs had minimum of over $386 thousand to a maximum of over $733 million, explaining the large standard deviation of over $58 million (see Table 1). Responding hospitals had a minimum of four beds to a maximum of nearly 1,900 (see Table 1). Hospitals reported having from no computerization to 100% computerization (*M* = 77.51%, see Table 1).

Table 1

*Descriptive Statistics: Administrative Costs, Number of Beds, Level of Computerization*

| | *Administrative Costs* | *Number of Beds* | *Level of Computerization* |
|---|---|---|---|
| | Statistic | Statistic | Statistic |
| Mean | $42,475,818.47 | 237.373 | 77.5082% |
| Median | $23,882,201.00 | 177.000 | 81.2500% |
| Mode | $368,325[a] | 49.0 | 86.96% |
| Standard deviation | $58,095,447.665 | 200.9941 | 16.56195% |
| Minimum | $36,8325 | 4.0 | 0.00% |
| Maximum | $733,474,320 | 1868.0 | 100.00% |

*a*Multiple modes exist

**Research Question 1**. *What is the relationship between hospital size as measured by the number of beds and administrative expenses?* To address this question, one hypothesis was tested with an alpha of .05. The results indicated that there is no statistically significant relationship between hospital size and administrative expenses in Medicare-certified hospitals in the United States was rejected; the zero-order coefficient was .72, $p = .007$ (see Table 4). Approximately 52% of the variance in administrative

expenses can be accounted for by the number of beds, a moderate to high relationship.

**Research Question 2.** *What is the relationship between administrative computerization and administrative expenses?* To address this question, one hypothesis was tested examining the zero order correlation coefficient, $\alpha = .05$. The results indicated that the null hypothesis that there is no statistically significant relationship between administrative computerization and administrative expenses in Medicare-certified hospitals in the United States was rejected; the zero order coefficient was .25, $p < .001$ (see Table 4). Only 6.3% of the variance in administrative expenses can be accounted for by the amount of administrative computerization, a very small relationship.

**Research Question 3.** *What is the relationship between administrative computerization and hospital size?* To address this question, one hypothesis was tested. The results indicated that the null hypothesis that there is no statistically significant relationship between administrative computerization and hospital size in Medicare-certified hospitals in the United States was rejected, $r = .30$, $p < .001$. Only 9% of the variance in administrative computerization can be accounted for by the hospital size, a very small relationship.

**Research Question 4.** *Is there a significant linear relationship among a combination of administrative computerization, hospital size, and total administrative expenses?* The fourth null hypothesis, that there is no significant linear relationship between a combination of administrative computerization, hospital size, and total administrative expenses, was tested using 1,000 bootstrapping samples to address the

violations of homoscedasticity and 95% confidence intervals based upon the bootstrap analysis.

The results indicate that the regression analysis was significant, $F(2, 3086) = 1662.063$, $R = .72$, $p < .001$ (see Tables 2 and 3). Approximately 52% of the variance in administrative costs is accounted for by the two variables. Further analysis of the regression coefficients (see Table 4), however, reveal that hospital size accounts for nearly all the amount of variance in the dependent variable, administrative costs. The zero-order correlation coefficient between level of computerization and administrative costs was .25. The .25 was reduced to .035 in the multiple regression model (see Table 4), revealing that computerization has minimal impact on the dependent variable.

Table 2

*Model Summary: Regression Analysis*

| *R* | $R^2$ | Adj $R^2$ | SE of the Estimate |
|---|---|---|---|
| .720 | .519 | .518 | 40322503.905 |

Table 3

*Regression Analysis: ANOVA Table*

| | *df* | *F* | *p* |
|---|---|---|---|
| Regression | 2 | 1662.063 | < .001 |
| Residual | 3086 | | |
| Total | 3088 | | |

**Hospital size.** The positive slope for hospital size (.71) as a predictor of administrative costs indicated there was a .71 increase in administrative costs for each additional one-unit increase in hospital size, controlling for level of computerization. The

squared semi-partial coefficient that estimated how much variance in administrative costs was uniquely predictable from hospital size was .46, indicating that 46% of the variance in costs is uniquely accounted for by hospital size, when controlling for level of computerization (see Table 4).

**Level of computerization.** The positive slope for hospital size (.04) as a predictor of administrative costs indicated there was a .04 increase in administrative costs for each additional one-unit increase in level of computerization, controlling for hospital size. The squared semi-partial coefficient that estimated how much variance in administrative costs was uniquely predictable from level of computerization was .001, indicating that virtually none of the variance in costs is uniquely accounted for by level of computerization, when controlling for hospital size (see Table 4).

Table 4

*Regression Coefficients*

| | *β* | Std. Error | Beta | *t* | *p* |
|---|---|---|---|---|---|
| (Constant) | -15780687.680 | 3476245.673 | | -4.540 | < .000 |
| Hospital Size | 204865.344 | 3781.925 | .709 | 54.170 | < .000 |
| Level Comp | 124206.418 | 45897.049 | .035 | 2.706 | .007 |

| | *β*95% Bootstrap CI | Zero-order | Partial | Part |
|---|---|---|---|---|
| (Constant) | [-22596677.292, -8964698.067] | | | |
| Hospital Size | [197449.998, 212280.690] | .719 | .698 | .677 |
| Level Comp | [34214.560, 214198.276] | .247 | .049 | .034 |

## Applications to Professional Practice

Health care administrators that allocate funding for technology need to include the total financial impact of technology investment when making decisions. Conflicting information from previous researchers, discovered during the literature review, revealed the need for further study regarding technology implementation in health care. Fareed et al. (2012) stated that smaller hospitals do not have the same benefits from economies of scale of larger hospitals. Cetin et al.'s (2012) wrote that smaller-sized hospitals did benefit from increased performance of technology, despite lacking the benefit from economies of scale. Jiwani et al. (2014) claimed that the reduction of administrative expenses would be reduced through standardization and automation. The results of my study that revealed while the results were significant, the amount of variance in administrative costs explained by level of administrative computerization was so small that there is a need for deeper analysis of technology investments.

Administrators must establish realistic expectations and accountability for outcomes, including financial investments, as part of the assessment for investing in technology. The results of this study support the finding of Moses et al. (2013) that administrative computerization has not reduced costs in health care as it has in other industries. Moses et al. continued that investment in computerization is generally politically supported and there are no expectations for immediate improvement. McGowan, Cusack, and Bloomrosen (2012) noted that technology investments driven political funding incentives, such as those provided by American Recovery and

Reinvestment Act of 2009, might not be sustainable. Results of my study revealed that computerization has not increased administrative costs meaningfully. The results of my study support the research of Adler-Milstein, Bates, and Jha (2013) that indicated the need for more sustainable business models, incorporating technology, in order to improve overall health care systems.

A key construct of general systems theory is that the interactions or relationships between components of systems, or among systems are as, or more important than, the components themselves (von Bertanlanffy, 1972). For purposes of this study, information technology (IT) is a system, the hospital itself is a system (which varies based on the size of the hospital), and the financial branch of the hospital is a system. The purpose of the study was to examine the relationships among these three systems. Marshall and Farahbakhsh (2013) noted the focus of GST is on the interdependence and relationships of components within and among systems. The examination of relationships of among administrative computerization, hospital size, and administrative expenses, in this study, and the results reinforce the use of GST and the need to examine additional variables and relationships to develop a deeper understanding of the use of technology in health care.

## Implications for Social Change

Reducing administrative costs is one way to lower health care costs without reducing services. The results of my study demonstrated that there is a need for detailed analysis and accountability for financial outcomes when investing in computerization. Detailed analyses of the financial outcomes of technology investments, along with

nonfinancial outcomes, may lead to reallocation of limited funds. Cromwell, Peacock, and Mitton (2015) and Guindo et al. (2012) stressed the importance of cost effectiveness when allocating limited health care resources.

The outcomes of my study lend support for the inclusion of financial expectations when planning technology investments in an environment where technology spending is encouraged and politically supported. Political support for increasing computerization is evidenced by the government funding $30 billion from 2011 thru 2019 through the Affordable Care Act (Agha, 2014). McGowan et al. (2012) noted that investments based on political forces might have long-term results may offset short-term gains.

Information from the Institute of Medicine (2013) revealed that the health and economic outcomes of the United States are interconnected. The Institute of Medicine information report also noted that high administrative costs diverted resources from patient care. Baughman et al. (2015) also noted that high health care costs prevented people from seeking medical care. Cromwell et al. (2015) and Guindo et al. (2012) noted it is important to consider cost effectiveness when allocating limited health care resources. The high cost of health care necessitates decreased investments in other positive social benefits such as education and physical infrastructure improvements (Emanuel et al., 2012).

Creating sustainable business plans will increase the opportunities for long-term success, including sustainable health care programs. Adler-Milstein et al. (2013) noted the high failure rate of long-term viability for technology-based health care initiatives.

Cromwell et al. (2015) noted the difficulty in balancing the pressures from external and internal investors. Positive financial outcomes should not be the only consideration in technology investments; however, financial outcomes need to be included to increase the potential for sustainable programs in health care. Allocation for technology investment that includes financial expectations will provide a stronger platform for more appropriate health care spending and potential expense reduction. Positive social change is a result of investing in sustainable programs that provide benefits to the communities the health care organizations serve.

## Recommendations for Action

Investments in technology need to be vetted thoroughly to increase the potential for positive organizational and financial outcomes. Hospital administrators need to have a positive return on the investment in computerization to reduce health care expenses. The results of this study provide information to hospital administrators that while higher levels of computerization are significantly related to administrative costs, the amount of variance is so small as to have a minimal effect on costs.

Dykman and Davis (2012) wrote that employee involvement in changing processes for using technology increased employee morale and implementation success. Thus, employees need to be engaged in changing work processes in order to obtain the best outcomes for technology implementation. Dykman and Davis also noted that expenses may increase during implementation and that may delay savings. Employee

capabilities, including resistance, need to be included in the overall assessment of technology investment.

In addition to publishing this study in ProQuest, I plan to disseminate the results through both formal and informal presentations to colleagues, and publishing the results of this study with a peer-reviewed journal. Peers and colleagues in the industry might use the results of this study to delve deeper into the allocation of technology funding. The results that showed the lack of a meaningful relationship between administrative computerization and administrative expenses indicates a need to examine the allocation of technology funding. The results of this study should not deter increasing computerization; they should direct administrators toward more aligned investments.

Alignment of components from various systems in the healthcare system, financial, technology, and people may increase the chances of successful outcomes. Kellerman and Jones (2013) noted organizations might need to redesign processes to take full advantage of technology. Financial expectations should be a requirement for decisions on technology investments to assist in the assessment of sustainable programs.

## Recommendations for Further Research

Limitations of this study included the research design, use of available information, and inclusion of a limited number of variables. One limitation of this study was the selection of a limited number of variables, and Lai et al. (2013) wrote that the exclusion of variables from a study could influence results. Examining relationships of additional variables may add insight to why technology in health care has not seen the

same positive economic results as other industries. Himmelstein et al. (2014) noted that regulatory costs are a higher administrative burden in health.

Further research on whether higher regulatory costs negate technology savings in health care could be conducted. A research design using data to determine relationships does not provide information on why a relationship does or does not exist (Cukier & Mayer-Schoenberger, 2013). A qualitative analysis exploring why technology implementation has not led to the anticipated results may reveal opportunities for improved alignment of processes and technology, as noted by Kellerman and Jones (2013).

James and Savitz (2011) also noted the necessity of aligning technology with required outcomes and further research in this area may produce direction for technology investment in health care that would result in increased efficiencies and lower costs. A deeper examination and exploration of administrative technology use in health care may reveal information that will prove useful in optimizing technology. Further study is needed to determine whether there are differences in other variables between hospitals of similar size with different levels of computerization. Examination of variables, such as employee stress or satisfaction may lead to insight on the use of administrative computerization that expands beyond the financial focus.

Expanding the scope and examining the relationships between variables from other systems in health care may provide support or direction for administrative technology investment. Including clinical system variables and building on the research

of Bardhan and Thouin (2012), who indicated that investment in administrative technology may result in lower total operating costs, may reveal meaningful relationships between administrative computerization and total operating costs. Multidisciplinary approaches to technology investments will result in programs that combine financial and quality outcomes.

## Reflections

Working in administrative area of the health care industry, technology investment is often seen as the next logical step. Relying on information from other industries and often technology vendor pitches, decisions were made to invest in technology solutions, primarily to increase efficiencies and reduce costs. However, while computerization did not contribute a meaningful amount to administrative costs, neither did it reduce administrative costs. This result was not expected. For hospitals that have not yet embraced computer technology, this minimizes the argument to avoid technology because of increased expense.

By contrast, the result from the study indicating that hospital size was significantly and positively related to administrative expense was expected. Larger hospitals incur more expenses, in total, due to volume of transactions. Most of my career has been in advancing the use of technology, primarily in the administrative and business areas. The results of this study are the basis for closer examination of why there was not a larger variance explained by level of administrative and administrative expenses. Billions

of dollars from the U.S. government are available for investment health care technology (Agha, 2014), and it is the responsibility of health care leaders to invest appropriately.

Research for my study brought exposure to differing research results and reinforced my selection in conducing further research on my topic. Each study that I read added to my quest for personal knowledge and the opportunity to be a contributor to the existing knowledge available. Reflecting on my DBA study process, I realized that research is a continual journey and that the results of one study are a step in the ongoing quest for additional knowledge. Learning and developing the skills, through the guidance and direction of expert resources at Walden, has allowed me to become part of a community where I can strive to add value by increasing knowledge. This study was an opportunity to expand my limited view of the relationship among administrative computerization, hospital size, and administrative expenses and to open avenues for additional research.

## Conclusion

Technology is synonymous with health care delivery and the escalating costs of health care are negatively affecting both the ability to delivery health care services and the U.S. economy as a whole. Despite governmental incentives and regulations associated with health care technology implementation, there have been no clear indications of positive financial outcomes. The results of my study revealed that computerization, neither increased nor decreased administrative expenses in acute-care, short-stay,

Medicare-certified hospitals in the United States. Jiang et al. (2010) noted that other industries have seen financial benefits from the use of technology (Jiang et al., 2010).

The size of the hospital was significantly and meaningfully related to administrative costs and this was not surprising. The low variance explained in administrative costs due to level of computerization is an important finding due to the expectation that technology would reduce administrative costs (Lee et al., 2011; Neumeier et al., 2015; Wang et al., 2012). However, while the relationship between computerization and administrative costs in this study was significant, the minimal amount of variance explained in administrative costs due to level of computerization supports the need to increase the scrutiny and diligence in technology investment. Understanding the impact of these two variables on hospital costs could have immediate results on the direction of spending health care dollars.

Decision makers need to consider detailed analyses of costs and expected outcomes, along with accountability measures before deciding on technology investments. A sound basis for appropriate and responsible decisions will increase the potential for positive outcomes due to technology investment. Decisions for technology investments have the potential to significantly increase the sustainability of health care programs and improve the overall health and well-being of those served. Planning sustainable programs that include the benefits and costs of technology will improve overall health care system outcomes.

# References

Adam, T., & de Savigny, D. (2012). Systems thinking for strengthening health systems in LMICs: Need for a paradigm shift. *Health Policy and Planning, 27*, 1-3. doi:10.1093/heapol/czs084

Adler-Milstein, J., Bates, D. W., & Jha, A. K. (2013). Operational health information exchanges show substantial growth, but long-term funding remains a concern. *Health Affairs, 32*, 1486-92. doi:10.1377/hlthaff.2013.0124

Aerts, D., Apostel, L., De Moor, B., Hellemans, S., Maex, E., van Belle, H., & van der Veken, J. (2007). *World views. From fragmentation to integration*. Retrieved from www.vub.ac.be

Agha, L. (2014). The effects of health information technology on the costs and quality of medical care. *Journal of Health Economics*, *34*, 19–30. doi:10.1016/j.jhealeco.2013.12.005

Allison, P. D. (1977). Testing for interaction in multiple regression. *American Journal of Sociology, 83*, 144-153. Retrieved from http://www.press.uchicago.edu/

Allison, P. D. (1999). *Multiple regression: A primer*. Thousand Oaks, CA: Pine Forge Press.

Alvarez, J., Canduela, J., & Raeside, R. (2012). Knowledge creation and the use of secondary data. *Journal of Clinical Nursing, 21*, 2699-2710. doi:10.1111/j.1365-2702.2012.04296

Ansolabehere, S., & Hersh, E. (2012). Validation: What big data reveal about survey

misreporting and the real electorate. *Political Analysis, 20*, 437-459. doi:10.1093/pan/mps023

Auerbach, D. I., & Kellerman, A. L. (2011). A decade of health care cost growth has wiped out real income gains for an average U.S. family. *Health Affairs, 30,* 1630-1636. doi:10.1377/hlthaff.2011.0585

Bansal, P., & Corley, K. (2012). What's different about qualitative research? *Academy of Management Journal, 55,* 509–513. doi:10.5465/amj.2012.4003

Bardhan, I. R., & Thouin, M. F. (2012). Health information technology and its impact on the quality and cost of healthcare delivery. *Decision Support Systems, 55,* 438-455. doi:10.1016/j.dss.2012.10.003

Basole, R.C., Bodner, D.A., & Rouse, W.B. (2013). Healthcare management through organizational simulation. *Decision Support Systems, 55*, 552-563. doi.org/10.1016/j.dss.2012.10.012

Baughman, K.R., Burke, R.C., Hewit. M.S., Sudano, J.J., Meeker, J., & Hull, S.K. (2015). Associations between difficulty paying medical bills and forgone medical and prescription drug care. *Population Health Management*. doi:10.1089/pop.2014.0128.

Bernard, H. R. (2013). *Social research methods: Qualitative and quantitative approaches* (2nd ed.). Thousand Oaks, CA: Sage.

Berwick, D. M., & Hackbarth, A. D. (2012). Eliminating waste in U.S. health care. *Journal of the American Medical Association, 307,* 1513-1516.

doi:10.1001/jama.2012.362

Bijl, R. (2011). Never waste a good crisis: Towards social sustainable development. *Social Indicators Research, 102,* 157-168. doi:10.1007/s11205-010-9736-y

Blackwell, G. (2008). The future of IT in healthcare. *Informatics for Health & Social Care, 33,* 211-326. doi:10.1080/17538150802598860

Blumenthal, D. (2011). Wiring the health system-origins and provisions of a new federal program. *New England Journal of Medicine, 365,* 2323-2329. doi:10.1056/NEJMsr1110507

Blumenthal, D., & Dixon, J. (2012). Health-care reforms in the USA and England: Areas for useful learning, *The Lancet, 380,* 1352-1357. doi:10.1016/S0140-6736(12)60956-8

Blumenthal, D., & Tavenner, M. (2010). The "meaningful use" regulation for electronic health records. *The New England Journal of Medicine, 363,* 501-504. doi:10.1056/NEJMp1006114

Boonstra, A., & Broekhuis, M. (2010). Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Services Research, 10,* 231-255. doi:10.1186/1472-6963-10-231

Borzekowski, R. (2009). Measuring the cost impact of hospital information systems: 1987-1994, Journal *of Health Economics, 28,* 938-949. doi:10.1016/j.jhealeco.2009.06.004

Bradley, R. V., Pratt, R. E., Byrd, T., Outlay, C. N., & Wynn, J. E. (2012). Enterprise architecture, IT effectiveness and the mediating role of IT alignment in U.S. hospitals. *Information Systems Journal, 22*, 97-127. doi:10.1111/j.1365-2575.2011.00379.x

Brubaker, L. Picano, E., Breen, D.J., Marti-Bonmati, L., & Semelka, R.C (2011). Health care systems of developed non-U.S. nations: Strengths, weaknesses, and recommendations for the United States: Observations from internationally recognized imaging specialists. *American Journal of Roentgenology, 196,* 30-36. doi:10.2214/AJR.10.5321

Buntin, M. B., Burke, M. F., Hoaglin, M. C., & Blumenthal, D. (2011). The benefits of health information technology: A review of the recent literature shows predominantly positive results. *Health Affairs, 30,* 464-471. doi:10.1377/hlthaff.201l.0178

Burton, L. J., & Mazerolle, S. M. (2011). Survey instrument validity part I: Principles of survey instrument development and validation in athletic training education research. *Athletic Training Education Journal, 6*, 27-35. Retrieved from http://nataej.org

Caldeira, M., Serrano, A., Quaresma, R., Pedron, C, & Romão, M. (2012). Information and communication technology adoption for business benefits: A case analysis of an integrated paperless system, *International Journal of Information Management, 32*,196-202. doi:10.1016/j.ijinfomgt.2011.12.005

Cao, Q., Gan, Q., & Thompson, M.A. (2013). Organizational adoption of supply chain management system: A multi-theoretic investigation. *Decision Support Systems, 55*, 720-727. doi:10.1016/j.dss.2013.02.003

Case, J. & Light, G. (2011). Emerging methodologies in engineering education research. *Journal of Engineering Education, 100,* 186-210. doi:10.1002/j.2168-9830.2011.tb00008.x

Centers for Medicare and Medicaid Services. (2007). *Regulations and Guidance. CMS manual systems.* Retrieved from http://www.cms.gov

Centers for Medicare and Medicaid Services. (2011). *CMS Data Compendium 2011 Edition Table VI.I* [Data file]. Retrieved from www.cms.gov

Centers for Medicare & Medicaid Services. (2012a). *Hospitals* [Data file]. Retrieved from http://www.cms.gov

Centers for Medicare and Medicaid Services. (2012b). *NHE summary including share of GDP, CY 1960-2010* [Data file]. Retrieved from http://www.cms.gov

Centers for Medicare and Medicaid Services. (2014a). *Cost Reports* [Data file]. Retrieved from www.cms.gov

Centers for Medicare and Medicaid Services. (2014b). *Hospital compare* [Data file] Retrieved from www.medicare.gov

Centers for Medicare and Medicaid Services. (2014c). *Medicare financial management manual Chap. 8* [Data file] Retrieved from www.cms.gov

Centers for Medicare and Medicaid Services. (2014d). *Regulations and guidance-manuals paper-based manuals* [Data file] Retrieved from www.cms.gov

Cetin, A., Aksu, M., & Ozer, G. (2012). Technology investments, performance and the effects of size and region in Turkish hospitals. *Service Industries Journal, 32*, 747-771. doi:10.1080/02642069.2010.529433

Chandra, C., Kumar, S., & Ghildayal, N. S. (2011). Hospital cost structure in the USA: What's behind the costs? A business case. *International Journal of Health Care Quality Assurance, 24*, 314-328. doi:10.1108/09526861111125624

Chazan-Cohen, R., Halle, T. G., Barton, L. R., & Winsler, A. (2012). Supporting optimal child development through Early Head Start and Head Start programs: Reflections on secondary data analyses of FACES and EHSREP. *Early Childhood Research Quarterly,* 708-715. doi:10.1016/j.ecresq.2012.09.002

Chen, H., Chiang, R. L., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly, 36*, 1165-1188. Retrieved from http://misq.org

Cokley, K., & Awad, G. H. (2013). In defense of quantitative methods: Using the "master's tools" to promote social justice. *Journal for Social Action in Counseling and Psychology*, *5*(2), 26-41.Retrieved from http://www.psysr.org

Collum, T., Menachemi, N., & Sen, B. (2016). Does electronic health record use improve hospital financial performance? Evidence from panel data. *Health Care Management Review*, on-line publication. doi:10.1097/HMR.0000000000000068

Conlan, T. J., & Posner, P. L. (2011). Inflection point? Federalism and the Obama administration. *Publius. The Journal of Federalism, 4*(1), 421-446. doi:10.1093/publius/pjr020

Cresswell, K., & Sheikh, A. (2013). Organizational issues in the implementation and adoption of health information technology innovations: An interpretative review, *International Journal of Medical Informatics, 82*, 73-86. doi:10.1016/j.ijmedinf.2012.10.007

Cromwell, I., Peacock, S.J., & Mitton, C. (2015). 'Real-world' health care priority setting using explicit decision criteria: A systematic review of the literature. *BMC Health Services Research, 15,* 164-175. doi:10.1186/s12913-015-0814-3

Cukier, K., & Mayer-Schoenberger, V. (2013). The rise of big data. *Foreign Affairs, 92*, 27-40. doi:10.2469/dig.v43.n4.65

Cutler, D.M., & Ly, D.P. (2011). The (paper) work of medicine: Understanding international medical costs. *The Journal of Economic Perspectives, 25*(2), 3-25. doi:10.1257/jep.25.2.3

Cutler, D., Wikler, E., & Basch, P. (2012). Reducing administrative costs and improving the health care system. *The New England Journal of Medicine, 367,* 1875-1878. doi:10.1056/NEJMp1209711

Das, S., Yaylacicegi, U., & Menon, N. (2011). The effect of information technology investments in healthcare: A longitudinal study of its lag, duration, and economic value. *IEEE Transactions on Engineering Management, 58,* 124-140. doi:10.1109/TEM.2010.2048906

Ding, D.X. (2014). The effect of experience, ownership and focus on productive efficiency: A longitudinal study of U.S. hospitals, *Journal of Operations Management, 32,* 1-14. doi:10.1016/j.jom.2013.10.002

Doonan, M. T., & Tull, K. R. (2010). Health care reform in Massachusetts: Implementation of coverage expansions and a health insurance mandate. *Milbank Quarterly, 88,* 54-80. doi:10.1111/j.1468-0009.2010.00589.x

Dykman, C. A., & Davis, C. K. (2012). Addressing resistance to workflow automation. *Journal of Leadership, Accountability and Ethics, 9,* 115-123. Retrieved from http://www.na-businesspress.com

Emmanuel, E., Tandem, N., Altman, S., Armstrong, S., Berwick, D., de Brantes, F., & ... Spiro, T. (2012). A systemic approach to containing health care spending. *New England Journal of Medicine, 367,* 949-954. doi:10.1056/NEJMsb1205901

Fareed, N., Ozcan, Y., & DeShazo, J. (2012). Hospital electronic medical record enterprise application strategies: Do they matter? *Health Care Management Review, 37,* 4-13. doi:10.1097/HMR.0b013e318239f2ff

Federal Business Opportunities. (2014). Notice of intent to sole source to HIMSS Analytics. Retrieved from

https://www.fbo.gov/index?s=opportunity&mode=form&id=51c5de87203e4d53e8ef50613f759a94&tab=core&_cview=1

Ferguson, T., & Johnson, R. (2011). A world upside down? Deficit fantasies in the great recession. *International Journal of Political Economy*, *40*, 3-47. doi:10.2753/IJP0891-1916400101

Fichman, R. G., Kohli, R., & Krishnan, R. (2011). The role of information systems in healthcare: Current research and future trends. *Information Systems Research, 22,* 419-428. doi:10.1287/isre.1110.0382

Fineberg, H.A. (2012). A successful and sustainable health system: How to get there from here. *New England Journal of Medicine, 366,* 1020-1027. doi:10.1056/NEJMsa1114777

Gabow, P., Halvorson, G., & Kaplan, G. (2012). Marshaling leadership for high value health care: An Institute of Medicine discussion paper. *Journal of the American Medical Association, 308,* 239-240. doi:10.1001/jama.2012.7081

Ghani, K. R., Zheng, K., Wei, J. T., & Friedman, C. P. (2014). Harnessing big data for health care and research: Are urologists ready? *European Urology*, *66,* 975-977. doi:10.1016/j.eururo.2014.07.032

Goh, J., Gao, G., & Agarwal, R. (2011). Evolving work routines: A model of successful adaptation to information technology in healthcare. *Information Systems Research, 22,* 565-585. doi:10.1287/isre/1110.0365

Guindo, L. A., Wagner, M., Baltussen, R., Rindress, D., van Til, J., Kind, P., & Goetghebeur, M. M. (2012). From efficacy to equity: Literature review of decision criteria for resource allocation and healthcare decision making. *Cost Effective Resource Allocations, 10*, 1173-1186. doi: 10.1186/1478-7547-10-9

Gulyaev, S.A., & Stonyer, H R. (2002) Making a map of science: General systems theory as a conceptual framework for tertiary science education, *International Journal of Science Education, 24*, 753-769. doi:10.1080/09500690210126504

Gusmano, M. (2011). Do we really want to control health care spending? *Journal of Health Politics, Policy and Law, 36,* 495-500. doi:10.1215/03616878-1271153

Hamel, M.B., Blumenthal, D., Stremikis, K., & Cutler, D. (2013). Health care spending: A giant slain or sleeping? *New England Journal of Medicine, 369,* 2551-2557. doi:10.1056/NEJMhpr1310415

Hanson, B. G. (2014). *General systems theory: Beginning with wholes*. Washington, DC: Taylor & Francis

Healthcare Information Management Systems Society Analytics. (2011). *Essentials of the U.S. Hospital IT Market HIMSS*. [Data file]. Retrieved from http://www.himssanalytics.org

Healthcare Information Management Systems Society Analytics. (2012). *About HIMSS*. Chicago, IL. Retrieved from http://www.himss.org

Healthcare Information Management Systems Society Analytics. (2014). *About us*. Chicago, IL. Retrieved from http://www.himssanalytics.org

Hikmet, N., Banerjee, S., & Burns, M.B. (2012). State of content: Healthcare executive's role in information technology adoption. *Journal of Service Science and Management, 5*, 124-131. doi:10.4236/jssm.2012.52016

Himmelstein, D. U., Jun, M., Busse, R., Chevreul, K., Geissler, A., Jeurissen, P., ... & Woolhandler, S. (2014). A comparison of hospital administrative costs in eight nations: US costs exceed all others by far. *Health Affairs, 33*, 1586-1594. doi:10.1377/hlthaff.2013.1327

Himmelstein, D., Wright, A., & Woolhandler, S. (2010). Hospital computing and the costs and quality of care: A national study. *The American Journal of Medicine, 123*, 40-46. doi:10.1016/j.amjmed.2009.09.004

Hung, S., Hung, W., Tsai, C., & Jiang, S. (2010). Critical factors of hospital adoption on CRM system: Organizational and information system perspectives. *Decision Support Systems, 48*, 592-603. doi:10.1016/j.dss.2009.11.009

Institute of Medicine. (2013). Best care at lower cost. The path to continuously learning health care in America. Washington, DC: The National Academies Press.

Iveroth, E., Fryk, P., & Rapp, B. (2012). Information technology strategy and alignment issues in health care organizations. *Health Care Management Review, 38*, 188-200. doi:10.1097/HMR.0b013e31826119d7

Jaana, M., Tamim, H., Paré, G., & Teitelbaum, M. (2011). Key IT management issues in hospitals: Results of a Delphi study in Canada. *International Journal of Medical Informatics, 80*, 828-840. doi:10.1016/j.ijmedinf.2011.07.004

James, B. C., & Savitz, L. A. (2011). How Intermountain trimmed health care costs through robust quality improvement efforts. *Health Affairs, 30,* 1185-1191. doi:10.1377/hlthaff.2011.0358

Jiang, C., Han, T., Titus, G., Liberatore, M. (2010). Differences in IT effectiveness among firms: An empirical investigation. *World Academy of Science, Engineering and Technology, International Science Index, 4*(7), 186-195. Retrieved from http://www.waset.org

Jiwani, A., Himmelstein, D., Woolhandler, S., & Kahn, J.G. (2014). Billing and insurance-related administrative costs in United States' health care: Synthesis of micro-costing evidence. *BMC Health Services Research, 14,* 556-775. doi:10.1186/s12913-014-0556-

Jones, S. S., Heaton, P. S., Rudin, R. S., & Schneider, E. C. (2012). Unraveling the IT productivity paradox- Lessons for health care. *The New England Journal of Medicine, 366,* 2243-2245. doi:10.1056/NEJMp1204980

Kahn, K. L., Rubenstein, L. V., Draper, D., Kosecoff, J., Rogers, W. H., Keeler, E. B., & Brook, R. H. (1990). The effects of the DRG-based prospective payment system on quality of care for hospitalized Medicare patients: An **i**ntroduction to the **s**eries**.** *Journal of the American Medical Association**, 264,*** 1953-1955. doi:10.1001/jama.1990.03450150053030

Kaine, G., & Cowan, L. (2011). Using general systems theory to understand how farmers manage variability. *Systems Research & Behavioral Science, 28,* 231-244.

doi:10.1002/sres.1073

Kaplan, B., & Harris-Salamone, K. D. (2009). Health IT success and failure: Recommendations from literature and an AMIA workshop. *Journal of American Medical Informatics Association, 163*, 291-299. doi:10.1197/jamia.M2997

Karsh, B., Weinger, M. B. Abbott, P. A., & Wears, R. L. (2010). Health information technology: Fallacies and sober realities. *Journal of the American Medical Informatics Association, 17*, 617-623. doi:10.1136/jamia.2010.005637

Kazley, A.S., & Diana, M. L. (2011). Hospital computerized provider order entry adoption and quality: An examination of the United States. *Health Care Management Review, 36*, 86-94. doi:10.1097/HMR.0b013e3181c8b1e5

Keehan, S. P., Sisko, A. M., Truffer, C. J., Poisal, J. A., Cuckler, G. A., Madison, A. J., ... & Smith, S. D. (2011). National health spending projections through 2020: Economic recovery and reform drive faster spending growth. *Health Affairs, 30*, 1594-1605. doi:10.1377/hlthaff.2011.0662

Kefalas, A. G. (2011). On systems thinking and the systems approach. *The Journal of General Evolution, 67*, 343-371. doi:10.1080/02604027.2011.585911

Kellermann, A.L., & Jones, S.S. (2013). What it will take to achieve the as-yet-unfulfilled promises of health information technology. *Health Affairs, 32, 163-68.* doi:10.1377/hlthaff.2012.0693

Kim, S., Tannera, A.H., Foster, C.B., & Kim, S.Y. (2014). Talking about health care: News framing of who is responsible for rising health care costs in the United

States. *Journal of Health Communication,* doi:10.1080/10810730.2014.914604

Kivinen, T. & Lammintakanen, J. (2013). The success of a management information system in health care: A case study from Finland. *International Journal of Medical Informatics, 82,* 90-97. doi:10.1016/j.ijmedinf.2012.05.007

Koh, H. C., & Tan, G. (2011). Data mining applications in healthcare. *Journal of Healthcare Information Management, 19,* 64-72. Retrieved from http://www.himss.org

Kuhlmann, E., & Annadale, E. (2012). Researching transformations in healthcare services and policy in international perspective: An introduction. *Current Sociology, 60,* 401-414. doi:10.1177/0011392112438325

Lai, Y. J., Lin, C. L., Lin, M. C., Lee, S. T., Sung, F. C., Chang, Y. J., & Kao, C. H. (2013). Population-based cohort study on the increase in the risk for type 2 diabetes mellitus development from nonapnea sleep disorders. *Sleep Medicine, 14,* 913-918. doi:10.1016/j.sleep.2013.03.024

Lapointe, L., Mignerat, M., & Vedel, I. (2011). The IT productivity paradox in health: A stakeholder's perspective. *International Journal of Medical Informatics, 80,* 102-115. doi:10.1016/j.ijmedinf.2010.11.004

Lee, J., McCullough, J. S., & Town, R. J. (2013). The impact of health information technology on hospital productivity. *RAND Journal of Economics, 44,* 545-568. doi:10.1111/1756-2171.12030

Lee, S. M., Lee, D., & Schniederjans, M. J. (2011). Supply chain innovation and organizational performance in the healthcare industry. *International Journal of Operations & Production Management, 31*, 1193-1214. doi:10.1108/01443571111178493

Leidner, D.E., Preston, D., & Chen, D. (2010). An examination of the antecedents and consequences of organizational IT innovation in hospitals. *Journal of Strategic Information Systems, 19,* 154-170. doi:10.1016/j.jsis.2010.07.002

Leleu, H., Moises, J., & Valdmanis, V.G. (2014). How do payer mix and technical inefficiency affect hospital profit? A weighted DEA approach, *Operations Research for Health Care, 3,* 231-237. doi:10.1016/j.orhc.2014.06.002

Lenz, R., Peleg, M, & Reichert, M. (2012). Healthcare process support: Achievements, challenges, current research. *International Journal of Knowledge-Based Organizations, 2*(4), 1-16. Retrieved from http://www.igi-global.com

Liese, A. D., Barnes, T. L., Lamichhane, A. P., Hibbert, J. D., Colabianchi, N., & Lawson, A. B. (2013). Characterizing the food retail environment: Impact of count, type, and geospatial error in 2 secondary data sources. *Journal of Nutrition Education and Behavior, 45,* 435-442. doi:10.1016/j.jneb.2013.01.021

Lluch, M. (2011). Healthcare professionals' organisational barriers to health information technologies: A literature review. *International Journal of Medical Informatics. 80,* 849-862. doi:10.1016/j.ijmedinf.2011.09.005

Madapusi, A., & D'Souza, D. (2012). The influence of ERP system implementation on the operational performance of an organization, *International Journal of Information Management, 32*, 24-34. doi:10.1016/j.ijinfomgt.2011.06.004.

Manchikanti, L., Benyamin, R.M., Falco, F.J. & Hirsch, J.A. (2014). Metamorphosis of medicine in the United States: Is information technology a white knight or killer whale? *Pain Physician, 17*, E663-E670. Retrieved from www.painphysicianjournal.com

Marciarille, A. M., (2011). Healing Medicare hospital recidivism: Causes and cures. *American Journal of Law & Medicine, 37*, 41-80. Retrieved from http://www.aslme.org

Marmor, T., & Oberlander, J. (2012). From HMOs to ACOs: The quest for the holy grail in U.S. health policy. *Journal of General Internal Medicine, 27*, 1215-1258. doi:10.1007/s11606-012-2024-6

Marshall, R. E., & Farahbakhsh, K. (2013). Systems approaches to integrated solid waste management in developing countries. *Waste Management, 33*, 988-1003. doi: 10.1016/j.wasman.2012.12.023

Martin, A. B., Lassman, D., Washington, B., & Catlin, A. (2012). Growth in U.S. health spending remained slow in 2010: Health share of gross domestic product was unchanged from 2009. *Health Affairs, 31*, 208-219. doi:10.1377/hlthaff.2011.1135

McGowan, J.J., Cusack, C.M., & Bloomrosen, M. (2012). The future of health IT innovation and informatics: A report from AMIA's 2010 policy meeting, *Journal of the American Medical Informatics Association, 19*, 460-467. doi:10.1136/amiajnl-2011-000522

Melin, U., & Axelsson, K. (2013). Implementing healthcare information systems: Mirroring a wide spectrum of images of an IT project. *Health Policy and Technology, 3,* 26-35. doi:10.1016/j.hlpt.2013.11.001

Michelman, J. E., & Kim, K. K. (1990). An examination of factors for the strategic use of information systems in the healthcare industry. *MIS Quarterly, 14*, 201-215. doi:10.2307/248778

Miller, A.R., & Tucker, C. (2014). Health information exchange, system size and information silos. *Journal of Health Economics, 33*, 28-42. doi:10.1016/j.jhealeco.2013.10.004

Mithas, S., Tafti, A., Bardhan, I., & Mein Goh, J. (2012). Information technology and firm profitability: Mechanisms and empirical evidence. *MIS Quarterly, 36*, 205-22. Retrieved from http://misq.org

Montgomery, E. G., & Oladapo, V. (2014). Talent management vulnerability in global healthcare value chains: A general systems theory perspective. *Journal of Business Studies Quarterly, 5*, 173-189. Retrieved from http//:www.jbsq.org

Moores, T.T. (2012). Towards an integrated model of IT acceptance in healthcare. *Decision Support Systems, 53*, 507-516. doi.org/10.1016/j.dss.2012.04.014

Moses III, H., Matheson, D.M., Dorsey, E., George, B.P., Sadoff, D., & Yoshimura, S. (2013). The anatomy of health care in the United States. *Journal of the American Medical Association, 310,* 1947-1964. doi:10.1001/jama.2013.281425

Mukhopadhyay, T., Singh, P. B., & Kim, S. H. (2011). Learning curves of agents with diverse skills in information technology-enabled physician referral systems. *Information Systems Research, 22,* 586-605. doi:10.1287/isre.1110.0359

Nathans, L., Oswald, F., & Nimon, K. (2012). Interpreting multiple linear regression: A guidebook of variable importance. *Practical Assessment, Research & Evaluation, 17*(9), 1-19. Retrieved from http://pareonline.net

Neumeier, H., Berner, E. S., Burke, D. E., & Azuero, A. (2015). Hospital budget increase for information technology during phase 1 meaningful use. *The Health Care Manager*, *34*, 157-165. doi:10.1097/HCM.0000000000000055

O'Malley, A. (2011). Tapping the unmet potential of health information technology. *The New England Journal of Medicine*, *364*, 1090-1091. doi:10.1056/NEJMp1011227

Oshima, L, E., & Emanuel, E. J. (2013). Shared decision making to improve care and reduce costs. *The New England Journal of Medicine, 368*, 6-8. doi:10.1056/NEJMp1209500

Otto, P., & Nevo, D. (2013).Electronic health records: A simulation model to measure the adoption rate from policy interventions. *Journal of Enterprise Information Management, 26*, 165-182. doi:10.1108/17410391311289613

Palinkas, L.A., Aarons, G.A., Horwitz, S., Chamberlain, P., Hurlburt, M., & Landsverk, J. (2011). Mixed method designs in implementation research. *Administration and Policy in Mental Health and Mental Health Services Research, 38,* 44-53. doi:10.1007/s10488-010-0314-z

Paul, R., & Elder, L. (2013). *Critical thinking: Tools for taking charge of your learning and your life.* [E-reader version]. Retrieved from https://www.criticalthinking.org/pages/criticalthinking-distinguishing-between-inferences-and-assumptions/484

Payne, T. H., Bates, D. W., Berner, E. S., Bernstam, E. V., Covvey, H. D., Frisse, M. E.,...Ozbolt, J. (2012). Healthcare information technology and economics. *Journal of the American Medical Informatics Association 20,* 212-217. doi:10.1136/amiajnl-2012-000821

Pedhazuer, E. J. (1997). *Multiple regression in behavioral research: Explanation and prediction.* Fort Worth, TX: Harcourt Brace College Publishers.

Perkins, B. (2010). Designing high-cost medicine. *American Journal of Public Health, 100*, 223-233. doi:10.2105/AJPH.2008.155838

Peterson, M. A. (2011). It was a different time: Obama and the unique opportunity for health care reform. *Journal of Health Politics, Policy and Law, 36*, 429-436. doi:10.1215/03616878-1271054

Petter, S., DeLone, W., & McLean, E. R. (2013). Information systems success: The quest for the independent variables. *Journal of Management Information Systems, 29*(4), 7-62. doi:10.2753/MIS0742-1222290401

Pfister, R., Schwarz, K. A., Carson, R., & Janczyk, M. (2013). Easy methods for extracting individual regression slopes: Comparing SPSS, R, and Excel. *Tutorials in Quantitative Methods for Psychology*, *9*, 72-78. doi:10.1027/1618-3169.55.2.73

Porra, J., Hirschheim, R., & Parks, M. S. (2005). The history of Texaco's corporate information technology function: A general systems theoretical interpretation. *MIS Quarterly, 29*, 721-746. doi:10.2307/25148707

Pouvreau, D. (2014). On the history of Ludwig von Bertalanffy's general systemology and on its relationship to cybernetics. *International Journal of General Systems, 43*, 172-245. doi:10.1080/03081079.2014.883743

Preacher, K. J. (2015). *A primer on interaction effects in multiple linear regression.* Retrieved from www.quantpsy.org

Radnor, Z. J., Holweg, M., & Waring, J. (2012). Lean in healthcare: The unfilled promise? *Social Science & Medicine, 74*, 364-371. doi:10.1016/j.socscimed.2011.02.011

Research and Data Assistance Center. (2013). Introduction to Medicare Cost Reports. Retrieved from http://www.resdac.org/sites/resdac.org/files/Introduction%20to%20Medicare%20Cost%20Reports%20%28Slides%29.pdf

Restuccia, J. D., Cohen, A. B., Horwitt, J. N., & Shwartz, M. (2012). Hospital implementation of health information technology and quality of care: are they related? *BMC Medical Informatics and Decision Making, 12*, 109-117. doi:10.1186/1472-6947-12-109

Reynolds, C. J., & Wyatt, J. C. (2011). Open source, open standards, and health care information systems. *Journal of Medical Internet Research, 13*, e24. doi:10.2196/jmir.1521

Riazi, A. M., & Candlin, C. N. (2014). Mixed-methods research in language teaching and learning: Opportunities, issues and challenges. *Language Teaching, 47*, 135-173. doi:10.1017/S0261444813000505

Richardson, K. (2011). Effect of prospective payment system on acute care delivery in a hospital setting. *The Journal of Global Health Care Systems, 1*, 1-9. Retrieved from http://jghcs.info/index.php/j

Robert, G., Greenhalgh, T., MacFarlane, F., & Peacock, R. (2010). Adopting and assimilating new non-pharmaceutical technologies into health care: A systematic review. *Journal of Health Services Research & Policy*, *15*(4), 243-250. doi:10.1258/jhsrp.2010.009137

Rovai, A.P., Baker, J.D., & Ponton, M.K. (2014). *Social Science Research Design and Statistics: A Practitioner's Guide to Research Methods and IBM SPSS Analysis.* Retrieved from http://www.watertreepress.com

Rozin, P., Hormes, M., Faith, M. S., & Wansink, B. (2012). Is meat male? A quantitative multimethod framework to establish metaphoric relationships. *Journal of Consumer Research, 39*, 629-643. doi:10.10o86/664970

Salzberg, C. A., Jang, Y., Rozenblum, R., Zimlichman, E., Tamblyn, R., & Bates, D. W. (2012). Policy initiatives for health information technology: A qualitative study of U.S. expectations and Canada's experience. *International Journal of Medical Informatics, 81*, 713-722. doi:10.1016/j.ijmedinf.2012.07.007

Schansberg, D, E. (2011). Envisioning a free market in health care. *Cato Journal, 31*, 27-58. Retrieved from http://www.cato.org

Schlomer, B. J., & Copp, H. L. (2014). Secondary data analysis of large data sets in urology: Successes and errors to avoid. *The Journal of Urology, 191*, 587-596. doi:10.1016/j.juro.2013.09.091

Schryen, G. (2013). Revisiting IS business value research: What we already know, what we still need to know, and how we can get there. *European Journal of Information Systems, 22*, 139-169. doi:10.1057/ejis.2012.45

Schultze, U., & Avital, M., (2011). Designing interviews to generate rich data for information systems research. *Information and Organization, 21*, 1-16. doi:10.1016/j.infoandorg.2010.11.001

Seddon, P. B., & Scheepers, R. (2012). Towards the improved treatment of generalization of knowledge claims in IS research: Drawing general conclusions from samples. *European Journal of Information Systems, 21*, 6-21. doi:10.1057/ejis.2011.9

Setia, P., Setia, M., Krishnan, R., & Sambamurthy, V. (2011). The effects of the assimilation and use of IT applications on financial performance in healthcare organizations. *Journal of the Association for Information Systems, 12*, 274-298. Retrieved from http://aisel.aisnet.org

Simon, M. K., & Goes, J. (2013). *Dissertation and scholarly research: Recipes for success*. Seattle, WA: Dissertation Success, LLC.

Simon, G. L., Wee, B. S., Chin, A., Tindle, A. D., Guth, D., & Mason, H. (2013). Synthesis for the interdisciplinary environmental sciences: Integrating systems approaches and service learning. *Journal of College Science Teaching, 42*(5), 42-49. Retrieved from www.nsta.org

Sisko, A. M., Truffer, C. J., Keehan, S. P., Poisal, J. A., Clemens, M. K., & Madison, A. J. (2010). National health spending projections: The estimated impact of reform through 2019. *Health Affairs, 29*, 1933-1941. doi:10.1377/hlthaff.2010.0788

Soilkki, K. K., Cassim, N., & Anis, M. K. (2014). An evaluation of the factors influencing the performance of registered nurses at the national referral hospital in Namibia. *Australian Journal of Business and Management Research, 4*, 47-62. Retrieved from http://www.ajbmr.com

Spaulding, T.J., Furukawa, M.F., Raghu, T.S., & Vinze, A. (2013). Event sequence modeling of IT adoption in healthcare. *Decision Support Systems, 55*, 428-437. doi.10.1016/j.dss.2012.10.002

Stiefel, R. H. (2012). The cost of regulating healthcare technology. *Biomedical Instrumentation & Technology, 46*, 58-60. doi:10.2345/0899-8205-46.1.58

Stürmer, T., Wyss, R., Glynn, R.J., & Brookhart, M.A. (2014).Propensity scores for confounder adjustment when assessing the effects of medical interventions using nonexperimental study designs. *Journal of Internal Medicine. 275*, 570-580. doi:10.1111/joim.12197

Swanson, R. C., Cattaneo, A., Bradley, E., Chunharas, S., Atun, R., Abbas, K. M., & Best, A. (2012). Rethinking health systems strengthening: Key systems thinking tools and strategies for transformational change. *Health Policy and Planning, 27*, 54-61. doi:10.1093/heapol/czs090

Symonds, J. E., & Gorard, S. (2010). Death of mixed methods? Or the rebirth as a craft. *Evaluation and Research in Education, 23*, 121-136. doi:10.1080/09500790.2010.483514

Szczerba, R. J., & Huesch, M. D. (2012). Why technology matters as much as science in improving healthcare. *BMC Medical Informatics and Decision Making, 12*, 103. doi:10.1186/1472-6947-12-103

Thakur, R., Hsu, S.H., & Fontenot, G. (2011). Innovation in healthcare: Issues and future trends. *Journal of Business Research, 65*, 562-569. doi:10.1016/j.jbusres.2011.02.022

Thomas, E., & Magilvy, J. K. (2011). Qualitative rigor or research validity in qualitative research. *Journal for Specialists in Pediatric Nursing, 16,* 151-155. doi:10.1111/j.1744-6155.2011.00283.x

Turner, T. L., Balmer, D. F., & Coverdale, J. H. (2013). Methodologies and study designs relevant to medical education research. *International Review of Psychiatry, 25,* 301-310. doi:10.3109/09540261.2013.790310

Uncles M.D., & Kwok, S. (2013). Designing research with in-built differentiated replication. *Journal of Business Research, 66,* 1398-1405. doi:10.1016/j.jbusres.2012.05.005

VanDeValk, L. J., & Constas, M. A. (2011). A methodological review of research on leadership development and social capital: Is there a cause and effect relationship? .*Adult Education Quarterly, 61,* 73-90. doi:10.1177/0741713610380443

von Bertalanffy, L. (1972). The history and status of general systems theory. *Academy of Management Journal, 15,* 407-426. doi:10.2307/255139

Wang, N., Liang, H., Zhong, W., Xue, Y., & Xiao, J. (2012). Resource structuring or capability building? An empirical study of the business value of information technology. *Journal of Management Information Systems, 29,* 325-367. doi:10.2753/MIS0742-1222290211

Washburn, T. (2012). A correlational analysis of online learning and the transformational leadership style. *The Business Review, Cambridge, 20*, 56-61. Retrieved from http://www.jaabc.com

Williams, C. D. (2013). Share: Bridging the interoperability gap between EHRs. *Journal of Arkansas Medical Society, 110,* 84-85. Retrieved from http://www.arkmed.org

Wisdom, J., Cavaleri, M., Onwuegbuzie, A., & Green, C. (2012). Methodological reporting in qualitative, quantitative, and mixed methods health services research articles. *Health Services Research, 47*, 721-745. doi:10.1111/j.1475-6773.2011.01344.x

Wolf, L., Harvell, J., & Jha, A. K. (2012). Hospitals ineligible for federal meaningful-use incentives have dismally low rates of adoption of electronic health records. *Health Affairs, 31*, 505-513. doi:10.1377/hlthaff.2011.0351

Wu, I., & Kuo, Y. (2012). A balanced scorecard approach in assessing IT value in healthcare sector: An empirical examination. *Journal of Medical Systems, 36*, 3583-3596. doi:10.1007/s10916-012-9834-2

Yang, Z., Kankanhalli, A., Ng, B., & Lim, J. (2013). Analyzing the enabling factors for the organizational decision to adopt healthcare information systems, *Decision Support Systems, 55*, 764-776. doi:10.1016/j.dss.2013.03.002

York, R. (2012). Residualization is not the answer: Rethinking how to address multicollinearity. *Social Science Research, 41*, 1379-1386. doi:10.1016/j.ssresearch.2012.05.014

Young, R. A., & DeVoe, J. E. (2012). Who will have health insurance in the future? An updated projection. *Annals of Family Medicine, 10*, 156–162. doi:10.1370/afm.1348

Younis, M. Z., Barhem, B., Hamidi, S., Inungu, J., Prater, G. S., & Okeefe, A. (2009). The case for regulatory reform in the business and healthcare environments. *Journal of Health and Human Services Administration, 32*, 324-341. Retrieved from http://www.spaef.com

Zhang, N. J., Seblega, B., Wan, T., Unruh, L., Agiro, A., & Miao, L. (2013). Health information technology adoption in U.S. acute care hospitals. *Journal of Medical Systems, 37*, 9907. doi:10.1007/s10916-012-9907-2

Zhivan, N., & Diana, M. (2012). U.S. hospital efficiency and adoption of health information technology. *Health Care Management Science, 15*, 37-47. doi:10.1007/s10729-011-9179-2

Zohar, D., & Polachek, T. (2014). Discourse-based intervention for modifying supervisory communication as leverage for safety climate and performance improvement: A randomized field study. *Journal of Applied Psychology, 99*, 113-124. doi:10.1037/a0034096

Appendix A: Permission to Use HIMSS Data


## Usage Agreement and Application for the Dorenfest Institute for H.I.T. Research and Education Database

**1. The Database**

The Dorenfest Institute for H.I.T. Research and Education Database includes a variety of detailed historical data about information technology (IT) use in hospitals and integrated delivery networks. This data includes the entire library of Dorenfest 3000+Databases™ and Dorenfest Integrated Healthcare Delivery System Databases™ for the period 1986 through 2003 (hereinafter referred to at the 'Database'), and 2004 through 2009 data from the HIMSS Analytics™ database.

Access to and use of this Database at no charge is restricted to universities, students under university license, and U.S. federal, state, and local governments, and governments of other countries that will be using the data for research purposes. Potential users ('Licensees') to this Database must read this Usage Agreement and complete and submit the Application for Access to The Dorenfest Institute for H.I.T. Research and Education Database included within this Usage Agreement.

The Database will be available to the Licensee via a secured Web site.

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