An Exploratory Study of The Factors Affecting Hospital Performance: Safety, Clinic Care, Patient Experience, Efficiency and Cost

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An Exploratory Study of The Factors Affecting Hospital Performance: Safety, Clinical Care, Patient Experience, Efficiency and Cost

by

Shevon Lewis

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ACCEPTANCE

This dissertation was prepared under the direction of the *SHEVON LEWIS* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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DEDICATION

In loving memory of my angel brother, ***Awe Taurean Lewis***, who supported me in the pursuit of higher education S.I.P **(2/15/2017).**

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"*being confident of this, that he who began a good work in you will carry it on to completion until the day of Christ Jesus.*

When we notice evidence of transformation in our lives, it gives us confidence that God's grace and love are at work in our hearts.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CC	Clinical Care
CMI	Case Mix Index
CMS	Center For Medicare and Medicaid Services
DV	Dependent Variable
DRG	Diagnosis- related group
EC	Efficiency and Cost
FFS	Free for Service
HCAHPS	Hospital Consumer Assessment of Health Providers and Systems surveys
IV	Independent Variable
MSPB	Medicare Spending Per Beneficiary
PE	Patient Experience
TI	Teaching Intensity
VBP	Value Base purchasing

ABSTRACT

An Exploratory Study of The Factors Affecting Hospital Performance: Safety, Clinical Care, Patient Experience, Efficiency and Cost

by

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Healthcare systems have interrelated, collaborative, and interdependent elements from the human aspects to facilities geared towards providing people with medical care. This dissertation explores healthcare reform in the context of hospital value-based purchasing programs. Hospital performance is a byproduct of a hospital's characteristics, demonstrated through organizational behavior—a key driver towards an institution's overall success and sustainability. Hospital value-based purchasing (VBP) program is a Centers for Medicare & Medicaid services (CMS) initiative that rewards acute-care hospitals with incentivized payments for the quality care provided to Medicare beneficiaries ((HHS), 2017). The program adopts a philosophy of measurement and promotes an appraisal mechanism to provide equitable reimbursement for patient care; however, the program has had a marginal influence on hospital performance. The study aimed to assess hospital performance 'VBP program' and provide a prescriptive guide to decision-makers. Secondary data from 2,786 acute care hospitals across the united states, which offers inpatient services to Medicare beneficiaries, has been used. Statistical significance was measured by applying bivariate and multivariate regression. The findings showed that teaching intensity, hospital size, and case mix index had an impact on hospital performance**.**

INDEX WORDS: Hospital performance, Business performance, Organizational Structure, Safety, Clinical Care, Patient Experience, Efficiency and Cost; Teaching Intensity, Hospital Size, Case Mix Index, Value Base Purchasing, Value Base Care, Healthcare Reform, Centers for Medicare and Medicaid Services

I CHAPTER 1: INTRODUCTION

I.1 Hospital Value-Based Purchasing and Quality Healthcare

The cost and quality of healthcare have always been a source of contention. The healthcare system in the United States of America have been characterised by sharply rising costs and lower quality compared with other industrialized countries (Kavanagh K., 2012). Disparities in needs among people due to the recurrence of infectious diseases and the rise in chronic diseases increases the need for specialized treatment and long-term care. Defining the quality of medical care seems to be almost as elusive as variations in health needs or resources that do not explain satisfactorily significant variations per population rates of use of services (Lohr, 1988). Discussions on healthcare reform should highlight the need for population-based approaches in ensuring consistent quality care for chronic patients, which have become increasingly popular and funding for pilot projects to test alternative ways of advancing greater returns on healthcare spending (Greenberg, Dudley, & Ferris, 2010).

Healthcare advancements by contributors have advanced access to health insurance, innovation in medical research, disease control, technology, and performance-based rewards. “Pay-for-performance” is an umbrella term for initiatives aimed at improving the quality, efficiency, and overall value of healthcare (James, 2012). Value-based purchasing (VBP) has been a widely favored strategy in the improvement of the US healthcare system, which originated during the 1990s among large employers and business coalitions (Chee, Ryan, & Wasfy, 2016). VBP began with the Deficit Reduction Act of 2005 as a subset of the Centers for Medicare and Medicaid Services (CMS) Hospital Inpatient Quality Reporting (IQR) program (Raso, 2013) and was signed into law as part of the Patient Protection and Affordable Care Act of 2010 and implemented in 2012. The program aimed at incentivization of inpatient providers to deliver high value, as opposed to high-volume, healthcare (Blumenthal, 2013). Value-Based Purchasing Scores track hospital performance in four quality measures (Waldron, 2019):

- Clinical Care (25%)
- Efficiency and Cost Reduction (25%)
- Patient and Caregiver-Centered Experience of Care/Care Coordination (25%)
- Safety (25%)

Hospitals payment are based on three factors (Waldron, 2019):

- Achievement points: How well a hospital performs on each of the selected measures
- Improvement points: How much it has improved on each measure compared to the baseline period
- Consistency points: Rewards hospitals that have scores above the national 50th percentile in all eight dimensions of the HCAHPS survey

I.2 Statement of the Problem

The institutionalization of the Value-Based Purchasing (VBP) program in hospitals across the United States has had major consequences for how hospitals function and operate. Statistics have shown that the quality of healthcare has declined, but costs have risen, which may be a direct consequence of a high rate of competition in order to obtain insurance financing. The purpose of this study was to assess hospital performance ‘Value-Based Purchasing Program’ and to provide a prescriptive guide to decision-makers through the analysis of existing operating system practices in hospitals across the United States.

The U.S. healthcare system operates as a combination of different health insurance programs. It is only recently that legislation has enacted the provision of healthcare coverage for nearly all citizens (The U.S. Health Care System: An International Perspective, 2016); even so, many Americans today are still without health insurance making access to adequate healthcare challenging. Reports have stated that in 2014, 283.2 million people in the U.S., 89.6 percent had some type of health insurance, with 66 percent of workers covered by a private health insurance plan. Among the insured, 115.4 million people, 36.5 percent of the population, received coverage through the U.S. government in 2014 through Medicare (50.5 million), Medicaid (61.65 million), and/or Veterans Administration or other military care (14.14 million) (people may be covered by more than one government plan). Conversely, nearly 32.9 million people in the U.S. had no health insurance at the end of 2014 (The U.S. Health Care System: An International Perspective, 2016). Only 2019 saw what can be described as a marginal change with a population of 330 million of which 242 million have health insurance, mainly from employment-based plans, and estimates that the number of people without health insurance will increase from 30 million in 2019 to 35 million in 2029 (Federal Health Insurance Coverage for People under the age of 65: 2019 to 2029).

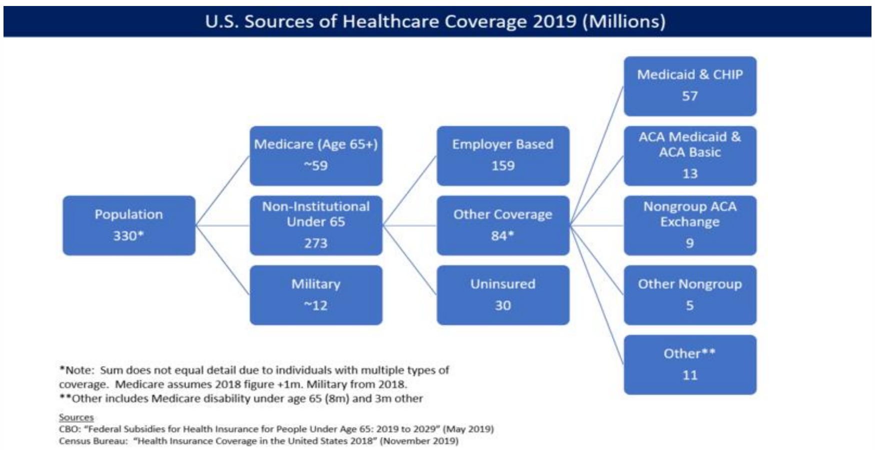

Figure 1: US Sources of Healthcare Coverage of 2019

Accompanying the ghastly prediction of health insurance coverage, reports from numerous media outlets and politically motivated media, paints a contradictory picture of success, on one hand; while, on the other, medical technical advances and desperation, led by allegations of high medical care costs, defined in The Guardian article Millions of Americans – as many as 25% of the population – are delaying getting medical help because of skyrocketing costs (Sainato, 2019). Other contributing factors have been identified such as the ageing of populations, increased public demand and expectations, personal income growth, rising prices of physician and hospital services (e.g., labour costs), and inefficiencies in the organization and payment of care (Corinna Sorenson, 2013). Dr. F. Randy Vogenberg underscored the role of consumerism and populism in the current approach to healthcare as he pointed out that both are rooted in a labor-group movement directed against big business and machine-based politics to champion the 'common person', and consumerism increases the consumption of goods is economically beneficial, and that consumers should be protected from inferior, dangerous, and unfair pricing of goods. (Vogenberg, 2019). Both consumerism and populism are at the core of the hospital value-based purchasing program, which emphasizes the need to provide quality services to patients with a focus on value for money, especially in the light of cost increases.

As the healthcare system concentrated on a more customer-centric approach, the implementation of the hospital VBP program as a strategy of medical management appeared prudent to encourage the provision of higher quality patient care. However, as stated earlier, the differences in medical needs vary, resulting in physicians concentrating on delivering complex services with a desire to do so in large volumes. Higher care intensity does not necessarily result in higher quality of care and can even be harmful (James, 2012). A study by Meyer, 2005 funded by The Commonwealth Fund, found that top-performing hospitals are distinguished from others in the following ways:

• they develop the right culture for quality to flourish.

• they attract and retain the right people to promote quality.

• they devise and update the right in-house processes for quality improvement; and

• they give staff the right tools to do the job (Meyer, 2005) .

It is, therefore, essential to analyse the current state of Hospital Performance against Value-based Purchasing.

I.3 Research question and Objectives

What factors affect hospital performance?

- To examine the factors that contribute to hospital performance.
- To assess whether value-based purchasing improves hospital performance.
- To provide a guide to healthcare decision-makers and business associates.
- To add to the body of knowledge on VBP and healthcare reform.

I.4 Motivation for study

High cost, Low quality. Compared to other developed nations, the U.S. healthcare services only recently in the last eight years transitioned to a patient-centered approach. As such, the introduction of the Value-based Hospital Program was a reasonable attempt to achieve patient satisfaction. However, there are considerable disadvantages to the program spearheaded by the Centers of Medicare and Medicaid Services.

Organizational Inefficiencies. Primary care doctors and nurses are crucial to hospital performance and patient care. *Short staffing* of these personnel can lead to devaluation of care provided. Value-based purchasing program serve acute-care institutions that often handle large volumes of diverse patients that require specified treatment and care. Another factor to be considered is *lengthy hospital stays*, or *delayed discharges* which can result in putting urgent care and inbound patients at risk. *High readmission rates* Robert Wood Johnson Foundation, avoidable readmissions often occur because inpatient care quality and care coordination is poor (Becker, 2016). *Poor communication* is at the root of poor patient flow, long stays and high readmission rates. Inadequate communication between health care teams, such as communication between physicians, nurses and other medical staff has an impact on the bottom line (Becker, 2016).

Healthcare Access. Americans today are still without health insurance making access to healthcare challenging. Those who have health insurance may be subjected to cost cutting measures imposed by insurers as not all healthcare plans meet the needs of patients which poses a problem in accessing valuable healthcare.

II CHAPTER 2: LITERATURE REVIEW

The purpose of the research was to provide a comprehensive review of the literature and industry practices in hospital performance in relation to value-based purchasing programs. In reviewing Value-Based Purchasing (VBP) literature and its effects on hospital performance (HP), the study included publications from over 15 years from 2008 to 2019. The relevance of the timeline should be noted as it parallels the trajectory of the establishment of VBP program in hospitals across the United States, through the Centers for Medicare and Medicaid Services (CMS), signed into law as part of the 2010 patient protection and affordable care act **(**BLUMENTHAL, 2013**)**. The search span across various health related keywords with strong emphasis on the following: value-based purchasing in hospitals, incentivized performance, patient care, patient experience, patient safety, U.S hospitals, patient outcome, clinical care, hospital performance, nursing care, physician/doctor care and efficiency and cost.

II.1 Process of Thematic Categorization

The process of synthesis entailed selecting articles relevant to the study's aim and purpose and a classification exercise developed from emerging themes found throughout the literature. The primary source of investigation was hospital value-based purchasing related journals such as the Journal of Community Health, Journal of Hospital Medicine, and Health Affairs in which the Georgia State University Library databases was leveraged through the use of JSTOR, SAGE Journal, EBSCOhost, Wiley InterScience and Google Scholar. Table 1. below provides the working definition that guided the flow of literature review.

Table 1: Definition of Thematic Areas

Themes	Definition
Value in Healthcare	In Healthcare, value is defined as the patient health outcomes achieved per dollar spent (Porter, What is Value in Health Care, 2010). • Safety: the prevention of harm to patients. • Patient Experience: the sum of all interactions, shaped by an organization's culture that influence patient perceptions, across the continuum of care. • Clinical Care: The clinical consultation is when the diagnosis is made correctly or incorrectly. • Efficiency and Cost: cost of care associated with a specific level of quality of care.
The Donabedian Model	A conceptual model that provides a framework for examining health services and evaluating quality of health care.
Incentive Reform	"Pay-for-performance" is an umbrella term for initiatives aimed at improving the quality, efficiency, and overall value of health care.
Value-Based Purchasing Programs	The Hospital Value-Based Purchasing (VBP) Program is a Centers for Medicare & Medicaid Services (CMS) initiative that rewards acute-care hospitals with incentive payments for the quality care provided to Medicare beneficiaries.
Impact of Value-based Purchasing Programs	An indication of the improvement of quality of care, e.g. FY 2019 increase 38.1 from FY 2018 37.4.

II.2 Value in Healthcare

In any field, improving performance and accountability depends on having a shared goal that unites the interests and activities of all stakeholders. In most fields, the preeminent goal is value. In healthcare, the days of business as usual are over. Around the world, healthcare systems have struggled with rising costs and uneven quality despite the hard work of well-intentioned, well-trained clinicians (Porter M. E., 2013). Value as the key concept in healthcare systems plays a key role in medical practice and an increased importance of patient centeredness (Marzorati & Pravettoni, 2017). The concept of value refers to the output achieved relative to the cost incurred in which, value is defined as the patient health outcomes achieved per dollar spent (Porter, 2010). Despite the overarching significance of value in health care, access to care is a basic requirement of any healthcare system, but access per se does not constitute value and it has not been the central focus (Porter, 2010). We must move away from a supply-driven healthcare system organized around what physicians do and toward a patient-centered system organized around what patients need (Marzorati & Pravettoni, 2017).

The success of traditional systems depends on the ability to decompose and recompose elements of the system (Rouse, 2008). Consider the large number of players or "agents" involved in the healthcare system, and recent attempts to reform healthcare have tended, in effect, to pursue the lowest acceptable cost of health care for the American population (Rouse, 2008), which made the reformation of healthcare a necessary component. Therefore, it is reasonable to assume that each type of agent seeks to serve its interests and provide its customers with quality products and services (Rouse, 2008), hence the justification for incentive programs as value-based purchases. However, the failures to adopt value as the central goal in health care and to measure value are arguably the most serious failures of the medical community (Porter, 2010). The current delivery system was not organized around value for patients. However, it rewards those who shift costs, bargain away, capture someone else’s revenues, and bill for more services, not those who deliver the most value (Porter, 2009).

One of the central issues in designing a VBP program is the definition of value (Tompkins, Higgins, & Ritter, 2009). In the healthcare market, value to the purchaser is quality in relation to the cost of care: value can increase by improving the quality of services in return for the same payments made to providers or by lowering the payments made for the same quality of care. It is therefore prudent to look at the various value-based measures of performance to understand the impact each has on hospital performance.

II.3 The Donabedian Model

The model proposed by Avedis DONABEDIAN has been a widely accepted method to design the main dimensions of healthcare quality, define by Structure-Process-Outcomes. (El Haj, Lamrini, & Rais, 2013); which takes into consideration all challenges that healthcare institutions have to face due to their poorly designed processes (El Haj, Lamrini, & Rais, 2013). Donabedian, 2005 three components approach for evaluating the quality of care underpins measurement for improvement. The three components are structure, process, and outcomes:

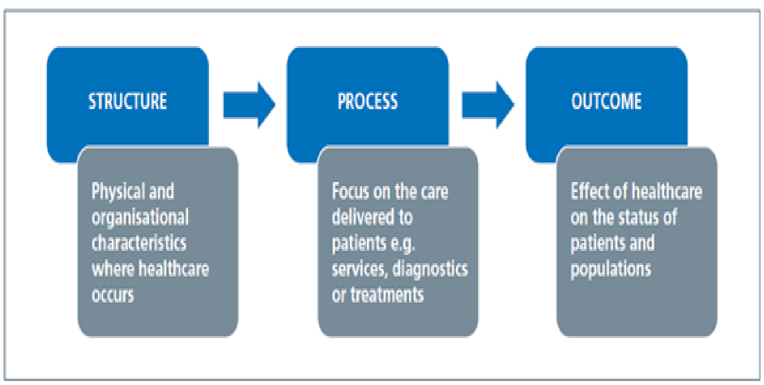

Figure 2: Donabedian Model

Donabedian believed that structure measures have an effect on process measures, which in turn affect outcome measures (Academy, 2012). The model focuses on the measurement of quality and highlights the follow:

Structure measures. these reflect the attributes of the service/provider such as staff to patient ratios and operating times of the service. (access issue for patients to receive appropriate care - if there is a shortage in medical/administrative staff, equipment shortage, lack of space, time, funding/financial issues).

Process measures. Reflects the way systems and processes work to deliver a desired outcome. (If there is an issue in the process, this can affect diagnosis, treatment example wrong medication etc., and other services such respect to patients, privacy adherence.)

Outcome measures. these reflect the impact on the patient and demonstrate the end result of your improvement work and whether it has ultimately achieved the aim(s) set. (This speaks to the following results: Objective measures such as blood work showing infection – clinical care, Subjective measures such as a patient quality of life after treatment/hospital discharge and group level such as population statistics).

The Donabedian model is a measuring tool.

Avedis Donabedian has been conscious that it is important to assess the quality of care and services offered to "Patients" in order to improve the healthcare quality (El Haj, Lamrini, & Rais, 2013).

II.4 Reform

Healthcare in general, more specifically healthcare provided by hospitals in the United States of America has been fraught with a myriad of complex, interrelated, entrenched, and not easily resolved problems (Bond, 2013). Some of the problems of the American healthcare system are knowledge asymmetry, agency problems, lack of price transparency, and biased selection of patients (Bond, 2013). The challenges with healthcare have been given recurrent attention in various mediums and generally recognized by the various stakeholders (Bond, 2013). In this regard, patience, private insurers, employees, and Medicare have continued to make the call for the establishment of further incentives. These incentives are geared towards enhancing the quality of care, decreasing utilization, and improving overall (Bond, 2013). This call for incentives can be arguably well intentioned to ameliorating healthcare for all stakeholders.

At this juncture, the point must be vehemently made that while incentives can be a huge impetus for stakeholders' positive action, it is not without challenges. Incentives have been shown to affect response from payers, patients, and the various health care workers (Bond, 2013). Notwithstanding, the design and application of incentives to a complex and heterogeneous healthcare system have challenges. Healthcare comprises various stakeholders, with varying levels of power and sensibilities to incentives, thus being an effective motivating force toward a particular behavior. To be more specific, the incentive that works for doctors might be repulsive for the insurer. What incites the patient towards a particular behavior might be counter to Medicare. The suite of incentives must be tailored to the various stakeholders. Even more jarring has been achieving optimality; these differently tailored incentives have coexisted and had complementarity in the healthcare ecosystem (Bond, 2013). A tall, challenging, and arguably elusive ask.

The challenge to design and implement the incentives is not the only problem. An even greater problem is that incentives might create the opposite of the desired outcome and result in a distortion of the market (Bond, 2013). Using an analogy of candy and kids', mom gives the kid candy if he promises to behavior, it works beautifully in first couple of instances. However, what happens when the kid demands more candy, something thing else in addition to candy, tires of candy and can get candy at his friend's house without having to behave. The previously described scenario though simplistic illustrate the challenge with incentives and raises the issue of sustainability. In addition, in the literature it was delineated that:

> The marginal impact of an incentive for any actor in the health care system will depend in part on its relationship to existing salary and wealth. Thus, reason would suggest that a $5,000 bonus payout would be far more meaningful to a nurse making $60,000 than to a physician making $200,000 (Bond, 2013).

Intricately linked to this argument is that even though an existing incentive is to have 20% of executive pay based on performance. Any binding or definitive guidelines are absent in terms of safe maximums or conversely effective minimums for the various workers in health care (Bond, 2013)Another undesirable challenge with potentially deleterious impact is that incentives would often to be synchronized. The performance at an individual level, group level, and wider health care level has often been linked to being more explicit. This raises whether the incentive will be paid when an individual target has been realized vis-à-vis when the tied triggers require all targets at the various levels for any incentive to be paid (Bond, 2013). The respective impact of the absence of an incentive linkage to individual performance can be frustrating, while the linkage of incentives to the wider organizational performance can be demotivating (Bond, 2013).

Moreover, as previously alluded to in the metaphor with the kid and candy, demotivation is likely to set in when incentive mechanisms call for continuous advancement. Considering that, observations of the healthcare system's existing incentives delineate that gains in quality and cost tend to overtime. Furthermore, it must highlight that mechanisms that focus on improvement over time tend to be skewed towards the healthcare workers. In contrast, fluctuations in the number may be skewed in favor of the hospital or healthcare network, which is usually in charge of receiving and issuing incentives (Bond, 2013). Another negative impact of incentive reform is that it raises ethical dilemmas. An incentive may become so effective that it causes selection bias in the healthcare system. Selection bias because patients who are deemed less non-compliant or are less than healthy by exclusion, so that incentive-linked targets are not negatively affected. The aforesaid quintessence is portrayed by the success of the health maintenance organization (HMO) model. According to this model, whereby the provider takes the risk for most of the care, most of the patients are employed persons and their families that benefit from insurance, so there is an exclusion of highly complex and highly risky patients (Bond, 2013). Also, in the new ACO model, which is analogous to the HMO model as it concerns shard risk and reward, strong financial rewards may induce health workers to be complicit in selection bias.

Solutions to these problems have included projects such the Acute Care Episode (ACE) demonstration project in which provider bonuses were capped 25 percent of physicians' Medicare rate in order that the incentives would reward clear cost savings instead of growing or reducing the volume of patients (Bond, 2013). Another possible solution is to exclude some team members from the incentive system. These team members could therefore be designated as conflict-of-interest mediators and be used at the integrated system level (Bond, 2013).

Incentives based solely on financial terms may not be effective and have limited appeal (Flodgren et al, 2011). Seeing that financially driven incentives may eclipse intrinsic motivation, erode the social relationship with patients and retard teamwork optimality because of envy and competition. Non-financial incentives may have a reward and recognition facet, but lifestyle and work flexibility have tremendous appeal. Organizational justice also has been showed to be related to favorable performance. Therefore, incentive reform could be more positively impactful if it incorporated both financial and non-financial elements (Bond, 2013). It must be acknowledged that incentives in the American health care has undergone progressive reform, but even further reform is required. Incentive reform in the American healthcare system cannot be seen as a destination but instead as a continuous journey in order to increase the likelihood of widespread positive impacts among the various stakeholders.

II.5 Value-Based Purchasing Programs

There are numerous VBP pay-for-performance programs both internationally and within the United States, encompassing a wide variety of healthcare delivery settings, and implemented by both commercial insurance companies and by the Centers for Medicare and Medicaid Services (Chee, Ryan, & Wasfy, 2016). Originally, there are 5 original value-based programs; their goal is to link provider performance of quality measures to provider payment:

- End-Stage Renal Disease Quality Incentive Program (ESRD QIP)
- Hospital Value-Based Purchasing (VBP) Program
- Hospital Readmission Reduction Program (HRRP)
- Value Modifier (VM) Program (also called the Physician Value-Based Modifier or PVBM)

There are other types of value-based programs that are geared towards measuring other areas in healthcare.

Hospital Acquired Conditions (HAC) Reduction Program (Centers for Medicare & Medicaid Services, 2020).Hospitals are rewarded ‘based on the quality of care provided to Medicare patients, not just the quantity of services provided’ (Centers for Medicare & Medicaid Services, 2020).

The program:

- Withholds participating hospitals’ Medicare payments by a percentage specified by law (2%).
- Uses the estimated total amount of those reductions to fund value-based incentive payments to hospitals based on their performance in the program.
- Applies the net result of the reduction and the incentive as a claim-by-claim adjustment factor to the base operating Medicare severity diagnosis-related group (MS-DRG) payment amount for Medicare fee-for-service claims in the fiscal year associated with the performance period (Centers for Medicare & Medicaid Services, 2020).

According to the 2016 study, on the state of value-based purchasing program, despite the wide implementation of VBP programs their impact has been marginal thus far (Chee, Ryan, & Wasfy, 2016). This sentiment was further reinforced by the 2016 review of the literature that stated “eleven studies focused on hospitals, mainly on the Centers for Medicare and Medicaid Services HQID program, with 6 studies having good quality and showing modestly positive results” (Chee, Ryan, & Wasfy, 2016).

II.6 The Impact of Value-based Purchasing Programs

As previously outlined, Value-Based Purchasing are programs (public or private) that link financial reimbursement to performance on measures of quality (i.e., structure, process, outcomes, access, and patient experience) and cost or resource use (Damberg et al., 2014).

Healthcare has reoriented towards quality and value, incorporating health outcomes and the resources allocated to achieve those outcomes. With healthcare consuming almost one-fifth of the U.S. economy, the burden of healthcare expenditures continues to crowd out funds for other society essentials such as education, infrastructure, and social security programs (Chee, Ryan, & Wasfy, 2016). The overarching goal of this VBP by Medicare is to influence the health service offered by the hospital care provider towards high value instead of mainly high volume. Although the published evidence from pay-for-performance (P4P) programs implemented by private-sector payers between 2000 and 2010 showed mostly modest results in improving performance, 3–10 public and private payers have continued to experiment with the use of financial incentives as a policy lever to drive improvements in care (Damberg, et al., 2014).

Damberg et al., review the effects of value-based purchasing programs by examining three broad areas, but for the purpose of this study only two will be addressed, namely.

- Environmental scan of existing value-based purchasing programs: publicly available for 129 VBP programs (91 P4P programs, 27 ACOs, and 11 bundled payment programs) sponsored by private health plans, regional collaboratives, Medicaid agencies or states, and the federal government.

- Review of the published evaluation literature on value-based purchasing: examined the peer-reviewed published literature for studies that evaluated the impact of P4P, ACO, or VBP-type bundled payment programs.

The study results indicated that there exist inconsistencies across programs and that the goals specified by VBP program sponsors were not quantified (Damberg et al., 2014). The absence of quantifiable goals for many programs makes it difficult to determine whether programs have successfully met their goals (Damberg et al., 2014). Their review of the literature showed a relatively narrow set of measures included in VBP programs that are used as the basis for differential payments. The measures vary somewhat by the health care settings in which they are being deployed and the type of VBP model (Damberg et al., 2014).

Another noteworthy aspect of Damberg et al. study is a popularly identified challenge is that the metrics used by the VBP only address a facet of the provision of the health service (Damberg et al., 2014). In addition, it has been advanced that the performance indicators aligned to these metrics have not evolved over the decade in response to changing realities (Damberg et al., 2014). There is also the inherent issue that there is no universal agreement on what constitutes quality or value (Damberg et al., 2014). Closely related to the previously outlined is that some of these metrics are not easily quantifiable. Some of the metrics are outside of the control of the hospital. A case in point the metric of patient outcome, while there are steps that can and should be taken by the hospital towards securing the likelihood of a positive outcome for a patient. Those mentioned above can be distinguished from the fact that lifestyle behaviors such as diet, exercise, and smoking significantly impact patient outcomes and even patient safety (Damberg et al., 2014). There is also a disparity between what Medicare would describe as a positive patient experience vis-à-vis what the patients themselves would describe as a positive.

Nonetheless, the main thrust of the VBP influence the health service offered by the hospital care provider towards high value instead of mainly high volume. In the last two years steps have been taken to improve the program's performance through streamlining various aspects such as that of measuring the Safety domain. In addition, the Medicare Payment Advisory Commission (MEDPAC) has released a recommendation to Congress that would create a new Hospital Value Incentive Program (HVIP) that would merge two programs (Brown, 2018). HVIP would aim to avoid the disparities in payment adjustments that arise from serving different patient populations. With the proposed regulations for 2019, CMS is starting to implement this recommendation. HVIP would have four main areas:

- Readmissions
- Mortality
- MSPB
- Overall patient experience (Brown, 2018).

Overall, while there have been efforts to streamline the program, the fact remains that 'under VBP, organizations have the potential for upside or downside reimbursement' (Brown, 2018). 'If organizations fail to meet these thresholds for the measures, they will receive a penalty' (Brown, 2018), which puts hospitals under pressure and may potentially hinder hospital performance.

II.7 Rationale

It is imperative to look at different aspects of hospital care, specifically; teaching intensity, hospital size, and Case Mix Index, and how each impacted the four measures: safety, clinical care, patient experience, and efficiency and cost. The Donabedian model of the structure, process, and outcome shapes our logic of the quality-of-care process in this study. Hospital size and Case Mix index fall under the model's structural component; Teaching intensity falls under the process component, and all dependent variables (safety, clinical care, patient experience, and efficiency and cost) fall under the outcome component of the model.

II.8 Outcomes

Model 1 –Safety

Safety is the foundation of good patient care (Vincent, 2010). The IOM defined safety as "the prevention of harm to patients (Mitchell, 2008). Emphasis is placed on the system of care delivery that (1) prevents errors; (2) learns from the errors that do occur; and (3) is built on a culture of safety that involves health care professionals, organizations, and patients (Mitchell, 2008)

Medicine has been an inherently risky enterprise; the hopes of benefit and cure are always linked to the possibility of harm (Vincent, 2010)

Patient safety is a problem when hospital care does not yield less readmission, which means that patients are at a higher risk. Lowering hospital readmission rates has become a primary target for the Centers for Medicare & Medicaid Services. However, studies of the relationship between adherence to the recommended hospital care processes and readmission rates have inconsistent and inconclusive results (Stefan et al., 2012). Dangerous treatments were one form of harm. However, hospitals could also be secondary sources of harm, in which patients acquired new diseases simply from being in the hospital (Vincent, 2010).

Model 2 – Clinical Care (Mortality)

Literature often refers to the quality of care provided when referring to clinical care. The key dimensions of quality of health care are individual patients, access, and effectiveness. The clinical consultation speaks to the accuracy of a diagnosis, which is crucial to patient safety (Caldwell, 2019). Modernization of the healthcare system as a result of physicians are under pressure to see more and more patients and to fulfill management perquisites for measuring incentive rewards (Caldwell, 2019). Healthcare providers have recognized that clinical consultations are a crucial profitable mechanism for their business and have sought to enhance the clinical consultation process and prevent misdiagnosis with substantial patient satisfaction and experience (Caldwell, 2019)

In this study Clinical Care represents the mortality rate at a given facility. In healthcare settings, volume can improve clinical quality across a wide range of procedures and conditions (Gaynor et al.2005, Hannan 1999, Luft et al. 1990). Clinical process scores in the study assess whether “what is known to be ‘good’ medical care has been applied.” This process measures whether or not a healthcare provider gives the recommended care to patients with a particular condition (Bonfrer et al., 2018). One hypothesis is that teaching hospitals, which care for many of the sickest and most vulnerable patients, have continued to employ appropriate readmission policies that optimize patient survival irrespective of potential financial penalties (Shahian et al., 2020). Also, hospitals performing higher numbers of certain surgical operations have demonstrated significantly lower operative mortality and morbidity, presumably through increased experience and selective referral patterns (Luft, Hunt, and Maerki 1987; Dudley et al. 2000; Birkmeyer et al. 2002). As such, it was deemed prudent to measure the impact that value-based purchasing had on clinical care as hospitals aim to maintain the standard.

Model 3 - Patient Experience

Patient experience encompasses the range of interactions that patients have with healthcare system, including their care from health plans, and from doctors, nurses, and staff in hospitals, physician practices, and other health care facilities (Agency for Healthcare Research and Quality). Patient experience has been consistently and positively associated with other quality outcomes including patient safety and clinical effectiveness across a wide range of studies, and healthcare facilities providing high-quality clinical care tend to have better experiences reported by patients (Ahmed, Burt, & Roland, 2014). However, Quality is a multi-dimensional concept, and a single indicator does not (and should not) reflect quality in other domains (Ahmed, Burt, & Roland, 2014).

There has been an increasing acknowledgement that patient experience is now a top priority for healthcare leaders. However, in the 2009 Health Leaders Media Patient Experience Leadership Survey 3 discovered that when it comes to defining patient experience, there are widely divergent views within the healthcare industry (Wolf, Niederhauser, Marshburn, & LaVela, 2014). The terms patient experience, patient perspective, patient reports, patient perception and patient satisfaction are often used interchangeably, but patient experience, the most commonly used (Ahmed, Burt, & Roland, 2014) for the purpose of this paper we will adopt the definition of the Beryl Institute's current definition for patient experience – "the sum of all interactions, shaped by an organization's culture that influence patient perceptions, across the continuum of care" (Wolf, Niederhauser, Marshburn, & LaVela, 2014).

In measuring patient experience various factors must be considered for example, doctor–patient communication could be evaluated by external raters viewing videotapes of consultations to score the quality of the interaction, and access to primary care can be measured by using 'mystery shopper' approaches to measure the proportion of times a request for a particular appointment time could be met (Ahmed, Burt, & Roland, 2014). All measurements have their limitations, as in the case of patient experience, a multi-dimensional indicator that speaks highly to the quality of care and services in order to determine the overall performance of the hospital.

Model 4 – Efficiency and Cost

The AQA defines efficiency of care as the cost of care associated with a specific level of quality of care (Russo and Adler). The Medicare Spending Per Beneficiary (MSPB) Measure shows whether Medicare spends more, less, or about the same for an episode of care ("episode") at a specific hospital compared to all hospitals nationally. This measure evaluates hospitals' costs compared to the costs of the national median (or midpoint) hospital. This measure takes into account important factors like patient age and health status (risk adjustment) and geographic payment differences (payment-standardization).

Healthcare systems capable of ensuring equitable and efficient services are essentials for a general and continuous improvement of the population's health status (Asandului, Roman, & Fatulescu, 2014). Our health care system is characterized by high and rising healthcare costs as well as gaps in quality, safety, equity, and access (Fraser, Encinosa, & Glied, 2008). Most of the current hospital performance measures do not identify the relationship between quality and cost of care and, therefore, are not health care efficiency measures, as a result measurements of physician efficiency do not identify the relationship between quality and cost of care (Russo and Adler). According to the American Quality Alliance (AQA), cost of care is a measure of the total health care spending, which includes the total use of resources and unit prices for health care services provided to a patient or a population over time (Russo and Adler). In rewarding hospitals for differential value — quality combined with cost — it is crucial to create definitive characteristics, even though health value may in fact have varied agility.

II.9 Assessment of Quality of Care - Structure & Process

Teaching Intensity

Historically, teaching hospitals have been pioneers in innovation in medicine, and there is no reason to assume that they cannot face the challenges presented by value-based purchasing programs. However, there does exist the perception that the individual health practitioners working in the health care system, and particularly the junior members of teams, are more likely to undermine rather than build patient safety (Cook et al., 1998). Senior medical practitioners are seen as leaders and key determinants of the quality and safety of medical services (Scott, 2009). Contemporary application of safety science and quality improvement methods is moving towards redesigning systems by reviewing, adapting and changing healthcare processes, technology and environments to prevent, minimize or recover errors that could lead to patient harm (Erbault et al., 2003; Glickman et al., 2007).

This study defines “junior doctor” as a newly qualified medical practitioner who has recently graduated from medical school (1 to 3 years postgraduate) and is employed in a clinical post under the supervision of a senior medical specialist located at a hospital or general practice. Junior doctors’ currency of training brings contemporary and up-to-date knowledge of standards of “best practice” and less deviation from such standards (e.g. Choudhry et al., 2005). Junior doctors are in an ideal position to ask questions, identify and understand deviation from optimal practice because of their contemporary scientific knowledge. Their unique insights and capabilities are a valuable and untapped resource (e.g. junior doctors have better contemporary knowledge of innovative health care technologies and support tools) (Agents for Change, 2011; Brown et al., 2012; Swanwick, 2012). Hence, the researcher hypothesizes that teaching hospital help improve a hospital’s safety.

Clinical care in teaching hospitals is more expensive which garners more scrutiny. Although they serve vital roles in education, research and management of complex diseases and care of vulnerable population, debate continues as to whether teaching hospital deliver better outcomes for common conditions (Shahian, Liu, Meyer, Torchiana, & Normand, 2014). Shahian 2014 study, aimed to determine the association between risk mortality and teaching intensity for 3 common conditions. The result of study determined that teaching hospitals had very favorable performance in quality (Shahian, Liu, Meyer, Torchiana, & Normand, 2014). As previously argued teaching hospitals are better equipped financially, technologically, and academically to provide clinical care. Hence, it was deemed by the researcher an important variable to assess the association with teaching intensity, as incentive reward depends on clinical care outcomes.

Delivering patient-centered care is an important component of a high-quality health care system (Tsai, Orav, & Jha, 2015). Teaching intensity is assumed to have a positive effect on patient experience because of a variety of factors such as the initial interaction with interns, accessibility to quality care (up to date to technology and best practices etc.) and diversification of staff knowledge (residents).

Hospital Size

The organizational behavior literature has consistently identified size as the most important organizational characteristic predicting innovation adoption among organizations. For instance, Damanpour [16], following a study of 57 libraries, observed that larger facilities adopted more technology than smaller facilities. This is because larger organizations tend to have more financial resources that they can devote to implementing new technologies. Lacking such resources, smaller organizations are forced to make difficult tradeoffs in their investment choices and often forgo implementation of expensive technologies. A similar logic can be extended in the context healthcare in that larger hospitals, by virtue of their larger resource endowments, can adopt more health care information technology than smaller hospitals (Hikmet et. al., 2007).

Smaller hospitals often lack the technology, staffing, infrastructure, and resources necessary to implement patient safety practices (Klingner, Moscovice, Tupper, & Coburn, 2009). The higher the volume of hospital occupancy the more learning occurs, and the better the performance (Theokary & Ren, 2011). Thus, hospital size plays an important role in determining patient safety.

Hospitals complement and amplify the effectiveness of many other parts of the health system, providing continuous availability of services for acute and complex conditions (World Health Organization - Hospitals, 2020). However, there is the belief that larger hospitals lead to lower average costs and better clinical outcomes through the exploitation of economies of scale (Giancotti, Guglielmo, & Mauro, 2017). Hospital functions vary according to health-care delivery organizations and each hospital's unique position in the system (World Health Organization - Hospitals, 2020). In many countries, the hospital sector has been involved in a massive reform process marked by financial restructuring of existing hospitals, mergers and closures of several small hospitals (Giancotti, Guglielmo, & Mauro, 2017). Hence, they need to maintain oversight of all ongoing health and health system reforms and ensure policies and incentives are coherent and aligned (World Health Organization - Hospitals, 2020). In addition, the logic behind hospital size and customer fulfillment is that larger hospital due to the availability of more resources have the structural and organizational processes in place to contribute to exceptional patient experience. For instance, technology adoption facilitates care models that improves patient experience. Hospitals and clinics nationwide are adding newfangled technologies rarely seen before in healthcare settings, building them right into their facilities. In doing so, they are enabling the change from provider-centered to patient-centered care, giving patients not only a better experience but better outcomes, too (Arndt, 2017).

Case Mix Index

In an effort to refine the present Medicare reimbursement methodology and to reduce health care costs, the Health Care Finance Administration (HCFA) of the federal government's Department of Health and Human Services has developed a reimbursement ceiling that includes an adjustment factor for hospital case mix. "Case mix is a way of defining a hospital's 'product' or output by identifying clinically homogeneous groups of patients that utilize similar bundles' of treatments, tests, and services. Case mix is a practice of coding that is administratively useful for partitioning patient services and determining resource allocation." The reason for using a case factor is to link the medical complexity of a hospital's Medicare case mix and its resultant demand hospital resources to the level of Medicare reimbursement (Doremus and Michenzi, 1983). Overall, a higher CMI indicates that a hospital treats a more complex set of patients. Insurers such as Medicare use DRGs (Diagnosis Related Group) to reimburse hospitals and higher DRGs correspond to higher reimbursement rate (Ganju, Gupta, & Matreja, 2016)

The logic dictates that a hospital performing more complex cases should receive a higher reimbursement rate than a hospital doing fewer complex cases. This is the reason CFOs and other financial employees at hospitals work hard to drive up their hospital’s CMI. As such, it is important to document exactly what happens in each case accurately. One critical component of documentation in a hospital’s surgical areas is the detail surrounding medical devices used in each case. If medical devices used in procedures are undocumented, this can result in inaccurate reporting of CMI and adversely impact reimbursement rate down the line (Why Case Mix Index Matters To Your Hospital And How To Maximize It, 2017). Hospitals executing more difficult procedures tend to be larger in nature. A debate can be that case mix index positively impacts patient safety as per the previous statement regarding procedure execution. Larger hospitals more resources- and so their survival rate will be higher.

In Deloitte's 2016 report the value of patient experience: Hospitals with better patient-reported experience perform better financially, we found that higher patient experience scores are associated with higher hospital profitability and that this association is strongest for aspects of patient experience most likely to be associated with better clinical care (in particular, nurse staffing engagement), (Betts & Balan-Cohen, 2016).

II.10 Hypotheses

Model 1 – Safety

H1- Teaching intensity influences Safety

H2- Hospital Size influences Safety

H3- Case Mix Index Influences Safety

Model 2 – Clinical Care

H4- Teaching Intensity influences Clinical Care

H5- Hospital Size influences Clinical Care

H6- Case Mix Index influences Clinical Care

Model 3 – Patient Experience

H7- Teaching Intensity influences Patient Experience

H8- Hospital Size influences Patient Experience

H9- Case Mix Index Influences Patient Experience

Model 4 – Efficiency and Cost

H10- Teaching Intensity influences Efficiency and Cost

H11- hospital size influences Efficiency and Cost

H12- Case Mix Index Influences Efficiency and Cost

III CHAPTER 3: RESEARCH DESIGN & METHODOLOGY

III.1 Research Design

The Centers for Medicare and Medicaid Services (CMS) is the U.S. federal agency that works with state governments to manage the Medicare program, and administer Medicaid and the Children's Health Insurance program. CMS offers many great resources for researchers who are looking for health data. For example:

- CMS Statistics is a yearly reference booklet that people can download on the CMS website. It has summary information about health care expenses and use.
- The Medicare and Medicaid Statistical Supplement has detailed statistics on Medicare, Medicaid, and other CMS programs. It has 115 tables and 67 charts that detail health expenditures for the entire U.S. population.
- Hospital Compare is an online tool created by CMS that helps users find information about the quality of care at over 4,000 Medicare-certified hospitals across the United States.
- The CMS Data Navigator lets users search across all CMS programs using a menu-driven search application. Users can specify a particular type of data, or search for all available data types (Centers for Medicare and Medicaid Services, 2020).

CMS requires Medicare managed care program providers to retain records for 10 years. This requirement is available at 42 CFR 422.504 on the Internet. Providers/suppliers should maintain a medical record for each Medicare beneficiary that is their patient. Remember that medical records must be accurately written, promptly completed, accessible, properly filed and retained. Using a system of author identification and record maintenance that ensures the integrity of the authentication and protects the security of all record entries is a good practice (Medical Record Retention and Media Formats for Medical Records , 2012). To address the research question: "What factors affect hospital performance? The study explores the data behind CMS ratings to examine the significance of VPB. The research design summary is explained in Table 2.

Table 2: Research design Summary (adapted from Mathiassen, 2017)

Component	Definition	Specification
Title	The title expresses the essence of the research design, with emphasis on C	An Exploratory Study of The Factors Affecting Hospital Performance: Safety, Clinical Care, Patient Experience, Efficiency and Cost
P	The problem setting represents people's concerns in a real-world problematic situation.	The quality of healthcare has declined while cost have risen.
A	The area of concern represents somebody of knowledge in the literature that relates to P.	Healthcare reform and the outcomes, structure, and process of Medicare's value base purchasing program
F	The conceptual framing helps structure collection and analyses of data from P to answer RQ; FA draws on concepts from A, whereas FI draws on concepts independent of A.	Donabedian model of quality and care
M	The method details the approach to empirical inquiry, specifically to data collection and analysis.	Exploration of Secondary data from CMS
RQ	The research question relates to P, opens for research into A, and helps ensure the research design is coherent and consistent.	What factors affect hospital performance?
C	Contributions influence P and A, and possibly also F and M.	Prescriptive guide for policy makers, hospital administrators, medical, business professionals and researchers. Add to the body of knowledge in healthcare reform and VBP.

III.2 Dependent variables

Safety (Healthcare Associated Infections). To be incentivized by Center of Medicare and Medicaid Services, all hospitals participating in the Value based Purchasing program have to report all data surrounding patients with infections to the Centers for Disease Control and Prevention (CDC), National Healthcare Safety Network (NHSN). This measure provides essential data to display the number of times a patient from a particular hospital contracts an infection during the course of their medical treatment when compared to like hospitals. “The safety domain is comprised of six healthcare associated infections (HAI) measures and one perinatal care measure that are weighted together at a twenty percent of the total performance score.

Clinical Care (Mortality). This measure are estimates of deaths within a 30-day period of hospital admissions in regard to medical conditions such as, heart attack (AMI), heart failure (HF), pneumonia (PN), Chronic obstructive pulmonary disease (COPD), stroke, and surgical procedures such as coronary artery bypass graft (CABG). A 30-day window is used for this measure compared to the number of inpatient deaths to allow for a more reliable measure as hospital stays may vary across patients and hospital. “The clinical care domain comprises of three mortality measures and one surgical complication measure that are weighted together at twenty five percent of the total performance score.

Patient Experience (Person and community engagement). This means of data collection methodology is used to measure patients’ perception of their hospital experience. To aid with the measure data is collected from providing to patients the HCAHPS patient survey also called the CAHPA hospital survey or Hospital CAHPS. The survey is given to random patients upon discharge. The survey asks key questions in regard to communication with hospital staff, responsiveness of hospital staff, cleanliness of hospital environment and quietness of hospital environment and transition of care. “The patient experience domain is comprised of eight dimensions of hospital consumer assessment of healthcare providers and systems (HCAHPS) patient experience survey that are weighted together at twenty of the total performance score.”

Efficiency & Cost. Efficiency and cost reduction domain comprise of one Medicare spending measure (Medicare spending per Beneficiary-MSPB) that is weighted at twenty five percent of the total performance score.

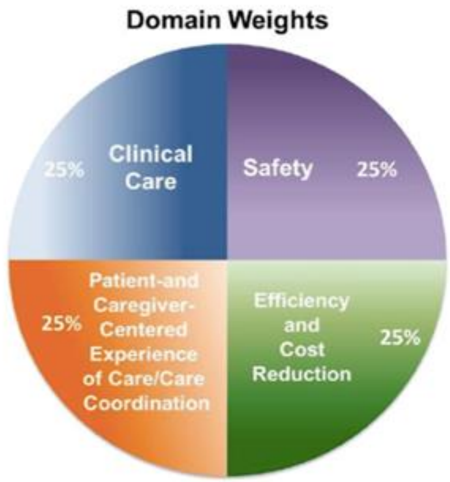

Figure 3: Understanding the Value Based Purchasing Measures

Table 3: Measures

Measures

Domain	Measure ID	Measure Name
Clinical Care	MORT-30-AMI	Acute Myocardial Infarction (AMI) 30-Day Mortality Rate
	MORT-30-HF	Heart Failure (HF) 30-Day Mortality Rate
	MORT-30-PN	Pneumonia (PN) 30-Day Mortality Rate
	THA/TKA	Elective Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) Complication Rate
Person and Community Engagement	HCAHPS	Communication with Nurses
	HCAHPS	Communication with Doctors
	HCAHPS	Responsiveness of Hospital Staff
	HCAHPS	Communication about Medicines
	HCAHPS	Cleanliness and Quietness of Hospital Environment
	HCAHPS	Discharge Information
	HCAHPS	Overall Rating of Hospital
	HCAHPS	Care Transition
Safety	CLABSI	Central Line-Associated Bloodstream Infection
	CAUTI	Catheter-Associated Urinary Tract Infection
	CDI	*Clostridium difficile* Infection
	MRSA	Methicillin-Resistant *Staphylococcus aureus* Bacteremia
	SSI	Surgical Site Infection (SSI): • Colon Surgery • Abdominal Hysterectomy
	PC-01	Elective Delivery Prior to 39 Completed Weeks Gestation
Efficiency and Cost Reduction	MSPB	Medicare Spending per Beneficiary

III.3 Independent Variables

Teaching Intensity. looked at the role junior doctors played in administering health care to patients. The study assessed the ratio between the number of interns/residents to the number of beds in a hospital, as Centers for Medicare & Medicaid Services (CMS) identifies teaching hospitals by an intern-to-bed ratio greater than 0.

Hospital Size. is based on the number of beds; specifically, hospitals were classified as small (less than 100 beds), medium (100–399 beds) or large (400+beds) (Gabriel et. Al). The hospital size is measured using the number of beds at the hospital (Sharma et al., 2015).

Case Mix Index. derived from the CMS impact file to measure the severity of illness of patients admitted to hospitals. Case mix index generally can be defined as the number and types of patients treated, classified by diagnoses. Diagnosis-related groups (DRGs) present a patient classification scheme that belongs to case mix measures originally developed in the United States in the 1970s. They are currently designed on the basis of principle diagnosis, secondary diagnosis, surgical or medical procedure, age, sex and discharge status of the patient treated (Hensen, Fürstenberg, Luger, & Steinhoff, 2005)

Control Variable

The researcher used geography and proprietary rights as control invariants at the hospital level, including location, ownership, and region. The regions included: Northeast, West, South, and Midwest. Hospital ownership types exist on a continuum that is more complex than simple private or public distinction. Hospital ownership ranges from public (government owned), to quasi-public (nonprofit), to private (for-profit hospitals) (Ibrahim, Jeffcott, & Davis, 2013). Healthcare is one of the few industries where public and private institutions compete with one another (Goldstein and Noar, 2005). For-profit (purely private) hospital ownership is usually defined as being owned by stockholders with profitability as the driving force with less political oversight than nonprofit and government hospitals. Conversely, government (purely public) hospitals are regulated by a governmental body, driven by survival, and overseen by political regulations (Goldstein and Noar, 2005). Nonprofit (quasi-public) hospital ownership is defined as private hospitals that choose to follow governmental regulations by choice rather than requirement (Goldstein and Noar, 2005). There are practical differences in behavior between the two hospital types. Nonprofit hospitals are less concerned about market value information and place less emphasis on costs of healthcare inputs and odds of hospital bill payment by patients (Goldstein and Noar, 2005). Despite these practical differences, there has been growing concern that the level of community benefit that nonprofit hospitals provide justifies their tax exemptions are few differences between nonprofit and for-profit hospitals (Young et al., 2013). Nonprofit hospitals and private for-profit hospitals tend to have more autonomy in decision making than their government and nonprofit counterparts because the latter are dictated by strict government rules and regulations (Johansen and Zhu, 2013). However, some private hospitals self-select to follow all governmental regulations to ensure they have the safest environment possible (Goldstein and Noar, 2005).

III.4 Data Collection, Cleaning and Preparation

To test my hypotheses, we collected secondary data from 2, 786 U. S acute care hospitals who provide inpatient services to Medicare patients. Exclusively, secondary data was retrieved from the Center for Medicare and Medicaid Services, Hospital Compare Database and Provider of Services (POS) and impact files. The files included 2018 Hospital Value Based Purchasing (HVBP)- Total performance scores; and 2018 Final rule and correction notice data file.

After lots of trial and error and assessing of variables, I decided to use the most recent data which is 2018. Additionally, 2018 was a good starting point for us, as the Center for Medicare and Medicaid services improved their data collection delivery parameters, making data more succinct and user friendly. It was only logical to proceed with analyzing this available data.

All data generated had at least two common identifiers, which were the provider identification number and measure identification or measure name. This made it very unassuming to eyeball the data and pinpoint certain characteristics based on location. From the 2018 Hospital value base purchasing total performance score file, I elected to use the weighed scores for safety, clinical care, person and community engagement (patient experience) and efficiency and cost. From the 2018 Final rule and correction notice data file, I elected, the resident to bed ratio variable, CMIV35 (Case mix index, software version 35, most up to date software), bed variable, location, ownership and region variables. Vlookup on this data to select only hospitals who participate in the Medicare value-based purchasing program.

For categorical variables, Region, location, and hospital ownership dummy variables **(Tables 4-Table 6)** were created. From the FY 2018 IPPS Impact file region was coded as follows: 1= New England; 2= Middle Atlantic; 3= South Atlantic; 4= East North; 5= East South Central; 6= West North Central; 7= West South Central; 8= Mountain; 9= Pacific; 40= Puerto Rico. I performed an IF function in excel and a grouping exercise to align the data provided for Region with the US Census Regions and Divisions map, please see **Figure (4) below**. To validate my data, I created filters in excel for all variables to make sure all data was group correctly.

All variables were separated into their own files. All files were imported and saved in SPSS format. These data files were then merged for analysis in SPSS. In this study we apply univariate, bivariate and multivariate analysis to explore the factors that affect hospital performance.

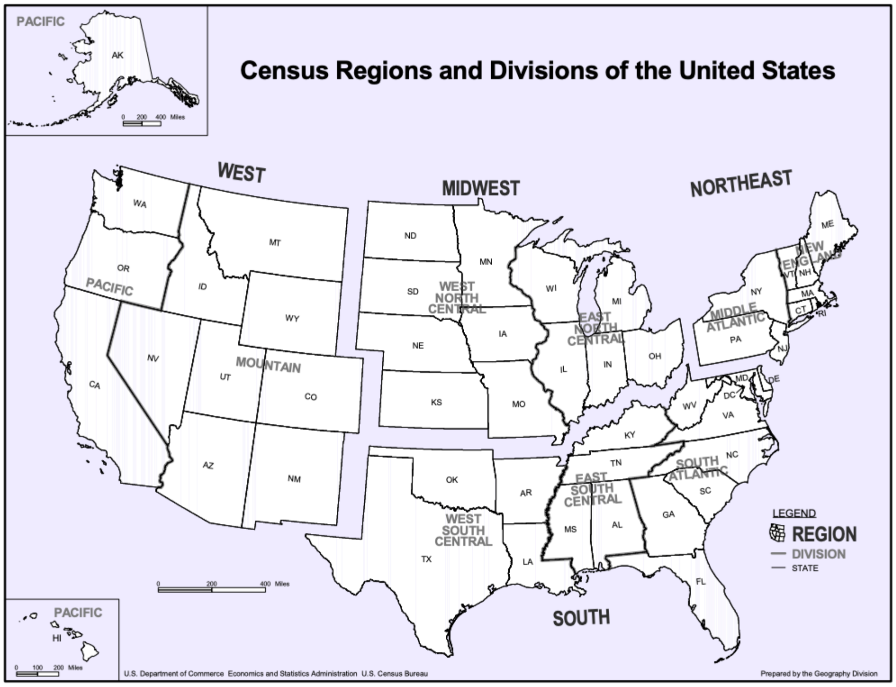

Figure 4: Census Regions and Divisions of the U.S.

Schemers

Table 4: Dummy Variables
REGION

	D- Region 1 NE	D- Region 2 South	D- Region 3 Midwest	D-Region 4 West		
Puerto Rico	0	0	0	0	Base Case	
Northeast	1	0	0	0		
South	0	1	0	0		
Midwest	0	0	1	0		
West	0	0	0	1		

Table 5: Dummy Variables

LOCATION

	D-Urban	D-Rural	
Urban	0	0	Base Case
Rural	0	1	

Table 6: Dummy Variables

HOSPITAL OWNERSHIP

	D-HO 1	D-HO 2	
Government	0	0	Base Case
Private	1	0	
Nonprofit	0	1	

III.5 Research Models

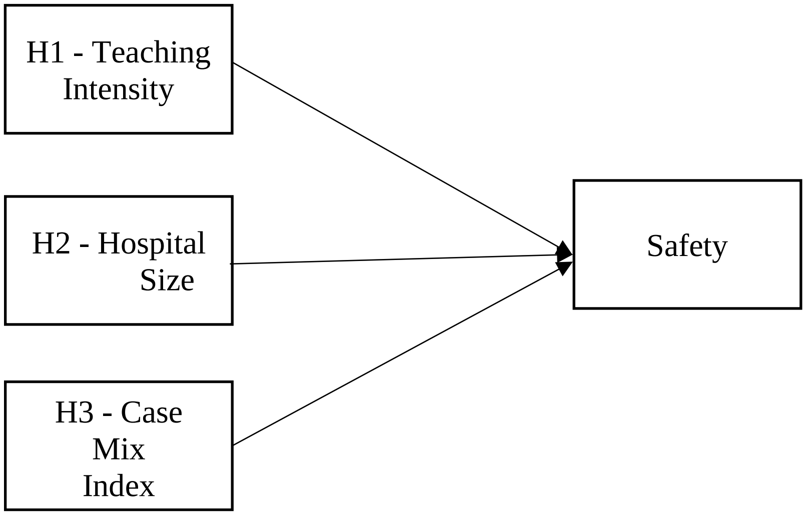

Figure 5: Model 1

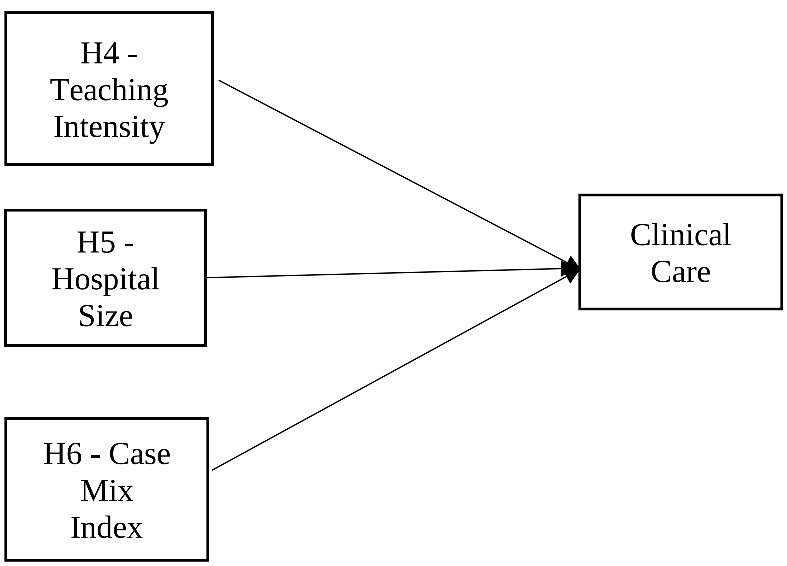

Figure 6: Model 2

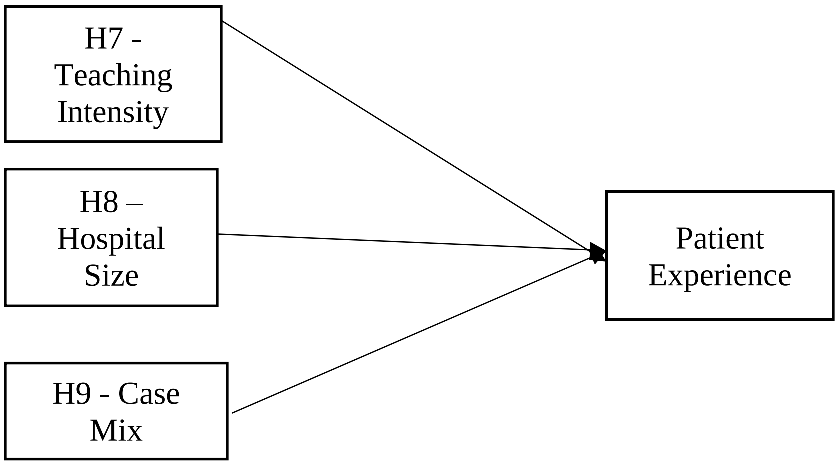

Figure 7: Model 3

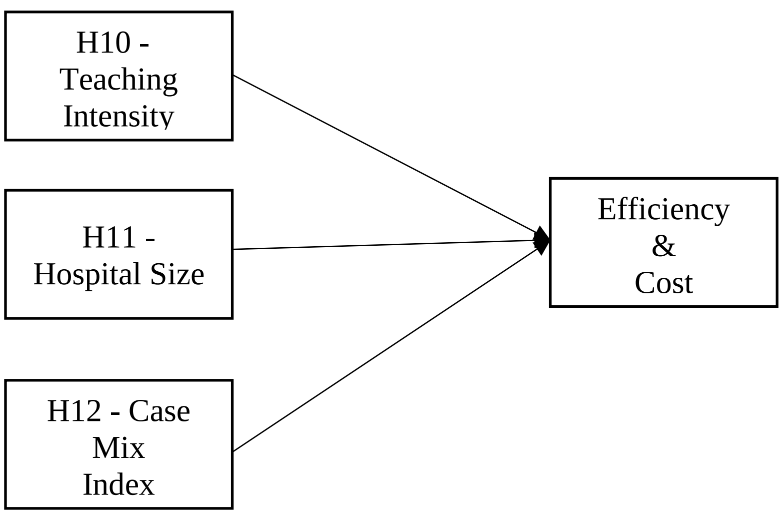

Figure 8: Model 4

IV CHAPTER 4: ANALYSIS AND RESULTS

The goal of this study was to investigate the historical context of Hospital Value-Based Purchasing. The study hypothesized that hospital safety, clinical care, patient experience, and efficiency and cost (dependent variables) are individually influenced by several stand-alone factors (independent variables), as well as these same factors combined. These factors include, teaching intensity, hospital size and case mix index. The following sections provided descriptive statistics for all variables, bivariate regression results demonstrating the predictive nature of each independent variable for each dependent variable, and multiple linear regression and multiple hierarchical regression results, demonstrating the combined predictive nature of each independent variable for each dependent variable. Region, location, and hospital ownership were assessed for their relationship to dependent variables (bivariate regression). This was done by regressing each dependent variable on Region, location, and hospital ownership combined.

Significant results are reported at $p \leq 0.05$. For the bivariate regressions, false-discovery rate (FDR) was applied to account for multiple comparisons of the dependent variable across several bivariate regressions. Correction was applied for bivariate regression results for dependent variables and control variables, with a separate correction applied to the bivariate regression results for dependent variables and independent variables. FDR-corrections are designed to control the proportion of "discoveries" (rejected null hypotheses) that are false (Type I error) (Benjamin & Hochberg, 1995) Each multiple linear regression model was treated as an independent model; therefore, no FDR correction was applied.

IV.1 Univariate Analysis

Table 4 exhibits and summarizes descriptive statistics on the dependent variables used in this study. The dataset for all dependent variables except clinical care are slightly skewed to the right, being that the arithmetic mean of all these three datasets are greater than the median. Dependent variable, clinical care, has an approximate symmetric distribution since the measures of central tendency (mean and median) are relatively close.

Portrayed in Table 5, The datasets for all independent variables except case mix index are positively skewed (right tail, is longer and flatter). The data for independent variable, case mix index, has an approximate symmetric distribution since it is measure of central tendency are comparatively close. Please see histograms in figures 9-15 as a guide for the distributions.

Table 7: Descriptive Statistics for Continuous DVs (DV1, DV2, DV3, and DV4)

Descriptive Statistics

		Safety	Clinical Care	Patient Experience	Efficiency and Cost
N	Valid	2572	2709	2776	2785
	Missing	214	77	10	1
Mean		11.06599	13.85072	9.11554	5.35099
Median		10.41667	13.75000	8.00000	2.50000
Std. Deviation		5.625063	5.000120	5.062714	7.120720
Skewness		.574	-.038	1.510	1.757
Std. Error of Skewness		.048	.047	.046	.046
Kurtosis		.419	.064	2.927	3.080
Std. Error of Kurtosis		.097	.094	.093	.093
Minimum		.000	.000	1.000	.000
Maximum		33.333	33.333	33.333	33.333

Table 8: Descriptive Statistics for Continuous IVs (IV1, IV2 and IV3)

Descriptive Statistics

		Teaching Intensity	HospitalSize	Case Mix Index
N	Valid	2785	2786	2779
	Missing	1	0	7
Mean		.01241	269.00	1.60746
Median		.00000	198.50	1.58740
Std. Deviation		.078821	241.656	.292215
Skewness		9.404	2.651	.747
Std. Error of Skewness		.046	.046	.046
Kurtosis		106.269	12.008	2.073
Std. Error of Kurtosis		.093	.093	.093
Minimum		.000	10	.894
Maximum		1.297	2449	3.530

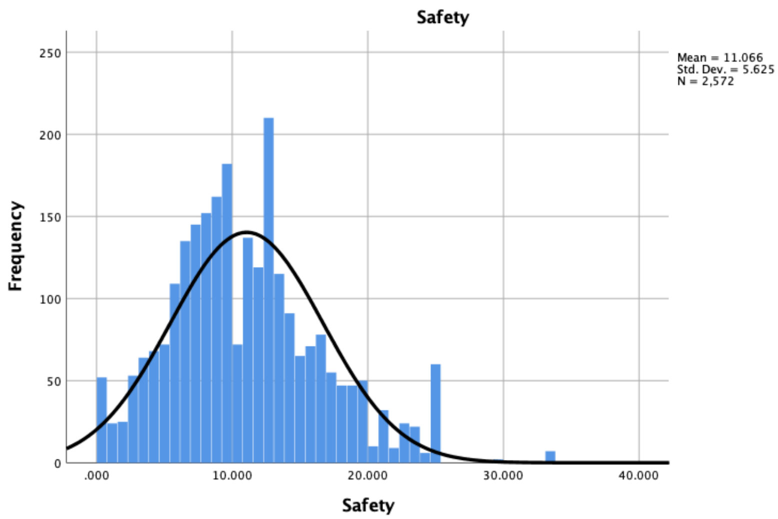

Figure 9: Histogram - Safety

DV1: Safety

The Safety domain is the dependent variable which comprises of two measure scores (Healthcare associated infections and PC-01/ Percent of mothers whose deliveries were scheduled too early (1-2 weeks early), when a scheduled delivery was not medically necessary), (Safety domain scores, 2020). The sample size for this domain was N= 2,786 of which 2,572 were valid in this study. The average value of safety scores reported to the Center for Medicare and Medicaid services were 11.065 with a standard deviation of 5.625 (M= 11.065, SD= 5.625); minimum .000, maximum 3.333. The skewness calculated was 0.574 meaning that our data is moderately skewed to the right since our distribution is between 0.5 and 1. This construct is positively kurtosed (leptokurtosed) 0.419 and close to zero, so, therefore, this is a normal distribution. Alternatively, the kurtosis was divided by its standard error (0.419/0.097) = 4.319; since the result is greater than 1.96 this also proves that the distribution is indeed a normal distribution.

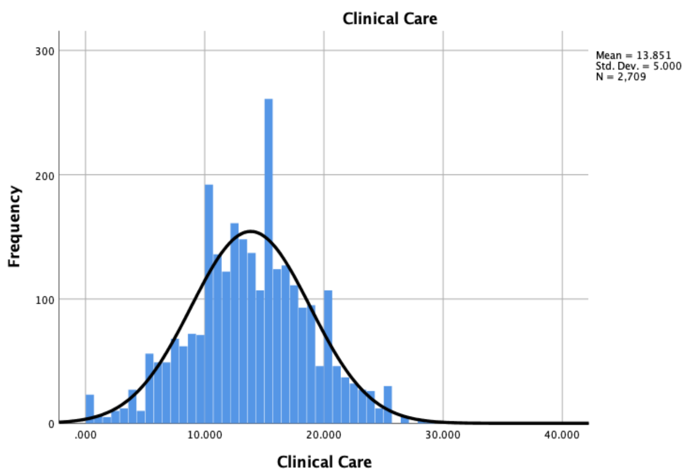

Figure 10: Histogram – Clinical Care

DV2: Clinical Care

The Clinical Care domain is the dependent variable which comprises of four mortality measures (domain measures assess estimates of deaths in the 30 days after entering the hospital for a specific condition (reported as the "survival" rate; therefore, higher percentage rates are favorable), (Clinical Outcomes domain, 2020).The sample size for this domain was N= 2,786 of which 2,709 were valid in this study. The average value of clinical care scores reported to the

Center for Medicare and Medicaid services were 13.850 with a standard deviation of 5.00 (M= 13.850, SD= 5.00); minimum .000, maximum 3.33. The skewness calculated was -0.038 meaning that our data is highly skewed to the left since our distribution is less than -1. The kurtosis statistic for clinical care is 0.06 (mesokurtic), therefore, this is a normal distribution is close to zero. Alternatively, the skew and kurtosis statistics for this construct are not greater than twice their standard error. Data distribution is depicted in **Figure 10.**

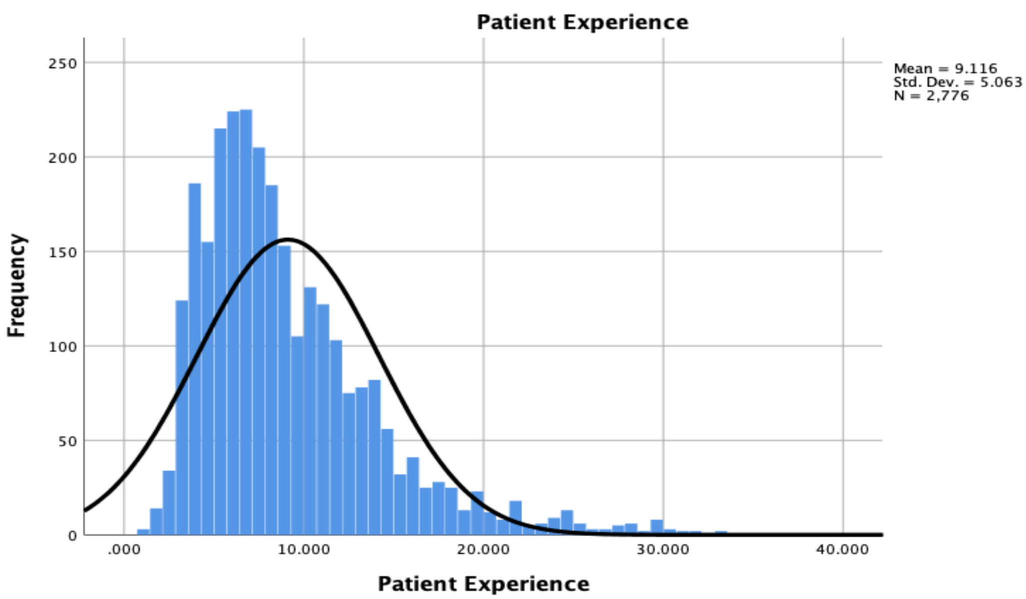

Figure 11: Histogram – Patient Experience

DV3: Patient Experience

The Patient Experience domain is the dependent variable which comprises of eight measure scores (standardize survey that ask patients about their experiences during recent hospital stay) (Person and community engagement domain, 2020).

The sample size for this domain was N= 2,786 of which 2,776 were valid in this study. The average value of patient experience scores reported to the Center for Medicare and Medicaid services were 9.11 with a standard deviation of 5.06 (M= 9.11, SD= 5.06); minimum .00, maximum 3.33. The skewness calculated was 1.51 meaning that our data is highly skewed to the right since our distribution is greater than 1. This construct is positively kurtosed (leptokurtosed) 2.93 and has a normal distribution. This was determined by dividing the kurtosis by its standard error (2.93/0.09) = 32.56; A normal distribution is present since the kurtosis is less than 3. Data distribution is depicted in **Figure 11**.

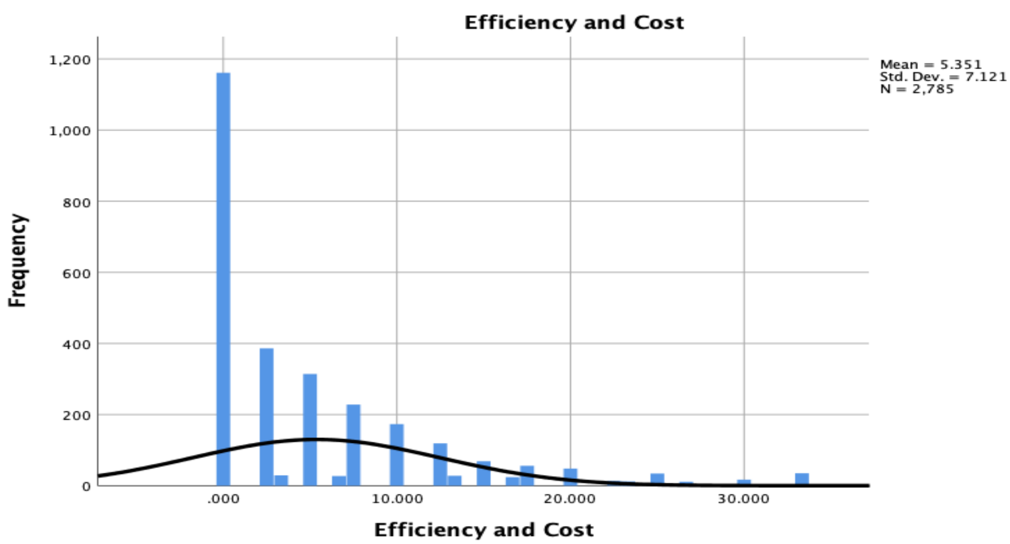

Figure 12: Histogram – Efficiency and Cost

DV4: Efficiency and Cost

The efficiency and cost domain is the dependent variable whose measure is based on an assessment of payment for services provided to a beneficiary during a spend- per-beneficiary episode (Efficiency and cost reduction domain, 2020).

The sample size for this domain was N= 2,786 of which 2,785 were valid in this study. The average value of efficiency and cost scores reported to the Center for Medicare and Medicaid services were 5.35 with a standard deviation of 7.12 (M= 5.35, SD= 7.12); minimum .00, maximum 3.33.

The skewness calculated was 1.76 meaning that our data is highly skewed to the right since our distribution is greater than 1. This construct is positively kurtosed (leptokurtosed) 3.08 and has somewhat of a flat normal distribution. Data distribution is depicted in **Figure 12**.

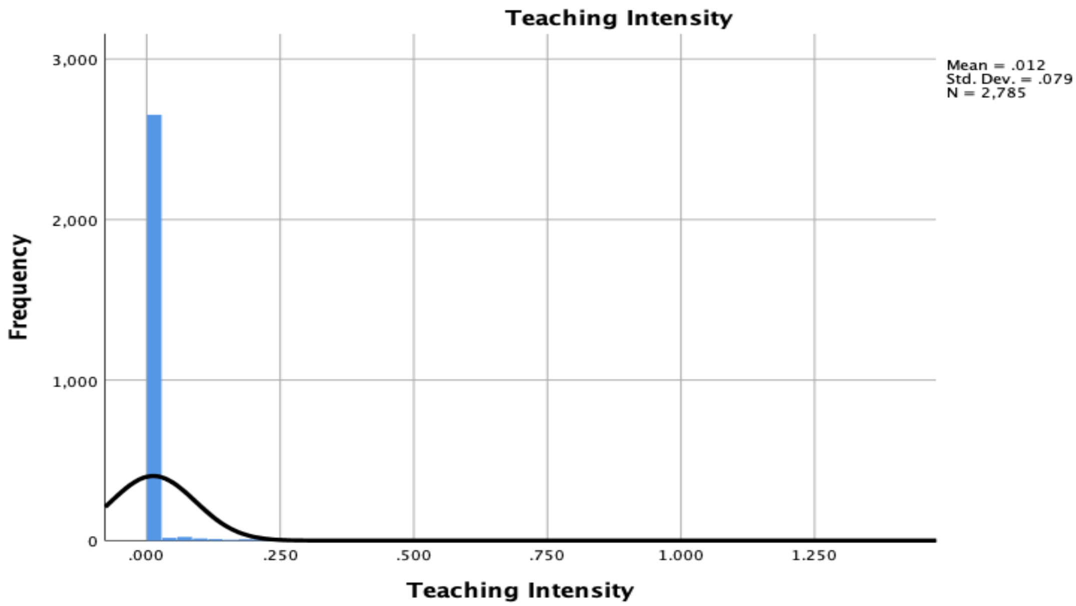

Figure 13: Histogram – Teaching Intensity

IV1: Teaching Intensity

The sample size for the teaching intensity construct was N= 2,786 of which 2,785 were valid in this study. The average value of teaching intensity scores reported to the Center for Medicare and Medicaid services were 0.01 with a standard deviation of 0.08 (M= 0.01, SD= 0.08); minimum .00, maximum 1.30. The skewness calculated was 9.40 meaning that our data is highly skewed to the right since our distribution is greater than 1. This construct is positively kurtosed (leptokurtosed) 106.27 which is high and significant. Alternatively, the kurtosis was divided by its standard error (106.27/.09) = 1,180.78. There is a statistically significant amount of skew associated with this distribution because the Z value is greater than the absolute value of 1.96. In conclusion the distribution is not normal. Data distribution is depicted in **Figure 13**.

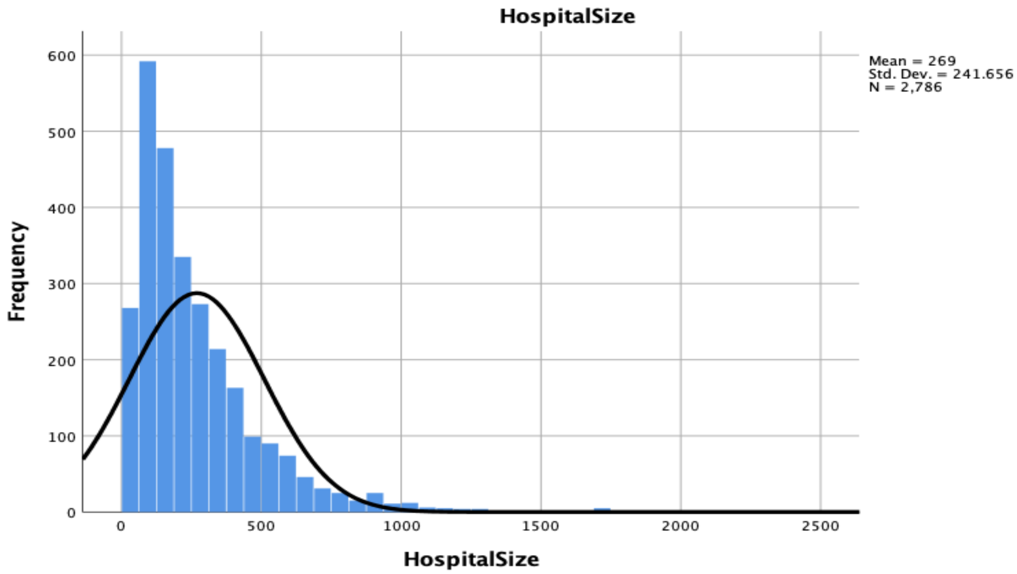

Figure 14: Histogram – Hospital Size

IV2: Hospital Size

The sample size for the teaching intensity construct was N= 2,786 of which all cases were valid in this study. The average value of the number of beds reported to the Center for Medicare and Medicaid services was 269 with a standard deviation of 241.66 (M= 269, SD= 241.66); minimum 10, maximum 2,449. The skewness calculated was 2.65 meaning that our data is positively skewed to the right since our distribution is greater than 1. This construct is positively kurtosed (leptokurtosed) 12.01, which is high and significant. With a kurtosis on more than 3 it can conclude that our dataset tails are heavier than that of a normal distribution.

Alternatively, the kurtosis was divided by its standard error (12.01/.09) = 133.44. There is a statistically significant amount of skew associated with this distribution because the Z value is greater than the absolute value of 1.96. Therefore, it can be concluded that this distribution is not normal. Data distribution is depicted in **Figure 14**.

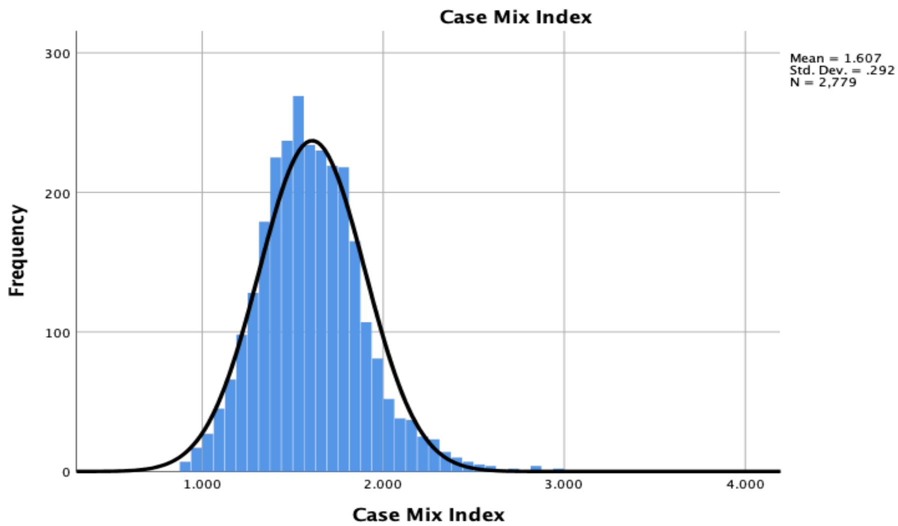

Figure 15: Histogram – Case Mix Index

IV3: Case Mix Index

The sample size for the teaching intensity construct was N= 2,786 of which 2,779 were valid in this study. The average value of case mix index scores reported to the Center for Medicare and Medicaid services were 1.61 with a standard deviation of 0.29 (M= 1.61, SD= 0.29); minimum 0.89, maximum 3.53. The skewness calculated was 0.75 moderately skewed to the right since our distribution is between 0.5 and 1. This construct is positively kurtosed (leptokurtosed) 2.07. Since the kurtosis is less than 3, in conclusion this distribution is normal. Data distribution is depicted in **Figure 15**.

Bivariate Analyses

Below, figure 16, 17, 18, and 19 shows the models that discuss the relationship between variables assessed with Bivariate analyses and Tables 9-12 exhibits the results of this study.

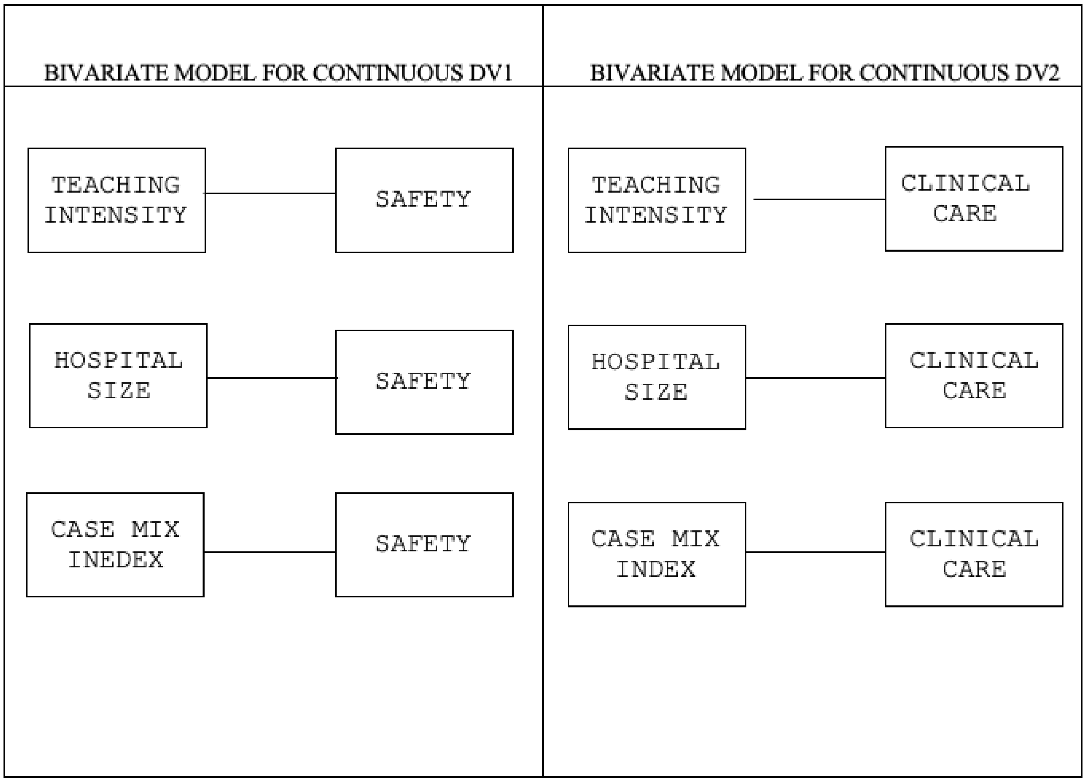

Figure 16: Bivariate Model DV1 & DV2

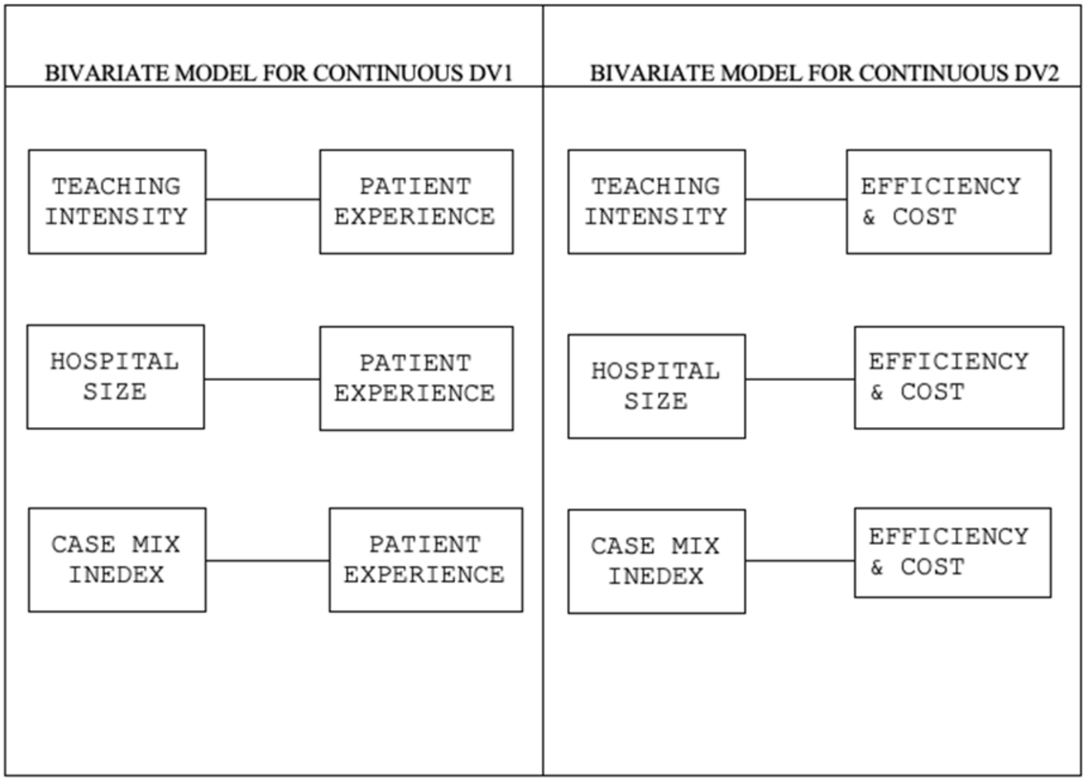

Figure 17: Bivariate Model DV3 & DV4

Table 9- Bivariate Simple Regression with DV1 and IV1-IV3

Simple Regression #	Independent Variable	R^2 (%)	PVAL	β	F
1	Teaching Intensity	0.40	0.001	-.063	10.239
2	Hospital Size	8.7	0.000	-.295	244.724
3	Case Mix Index	9.3	0.000	-.304	261.836

Table 10- Bivariate Simple Regression with DV2 and IV1-IV3

Simple Regression #	Independent Variable	R^2 (%)	PVAL	β	F
1	Teaching Intensity	0.20	0.020	0.045	5.430
2	Hospital Size	3.20	0.000	0.179	89.197
3	Case Mix Index	5.40	0.000	0.232	153.169

Table 11- Bivariate Simple Regression with DV3 and IV1-IV3

Simple Regression #	Independent Variable	R^2 (%)	PVAL	β	F
1	Teaching Intensity	3.00	0.006	-0.520	7.619
2	Hospital Size	8.60	0.000	-0.294	262.033
3	Case Mix Index	2.30	0.000	-0.152	65.521

Table 12- Bivariate Simple Regression with DV4 and IV1-IV3

Simple Regression #	Independent Variable	R^2 (%)	PVAL	β	F
1	Teaching Intensity	-	0.416	-0.015	0.661
2	Hospital Size	8.10	0.000	-0.284	245.024
3	Case Mix Index	6.40	0.000	-0.253	189.641

Table 13 All hypothesized relations at Alpha 5%

		β	P	SUPPORTED
H1	Teaching Intensity positively influence Safety	-0.063	0.001	Y
H2	Hospital size positively influence Safety	-0.295	0.000	Y
H3	Case Mix Index positively influence Safety	-0.304	0.000	Y
H4	Teaching Intensity positively influence Clinical Care	0.045	0.020	Y
H5	Hospital size positively influence Clinical Care	0.179	0.000	Y
H6	Case Mix Index positively influence Clinical Care	0.232	0.000	Y
H7	Teaching Intensity positively influence Patient Experience	-0.520	0.006	Y
H8	Hospital size positively influence Patient Experience	-0.294	0.000	Y
H9	Case Mix Index positively influence Patient Experience	-0.152	0.000	Y
H10	Teaching Intensity positively influence Efficiency and Cost	-0.015	0.416*	N
H11	Hospital size positively influence Efficiency and Cost	-0.284	0.000	Y
H12	Case Mix Index positively influence Efficiency and Cost	-0.253	0.000	Y

HYPOTHESIS SUPPORT (*$p \leq .05$)

Effect of Teaching Intensity on Safety

H1 suggest that there is a negative correlation between teaching intensity and safety (β= -.063, P=.001, F =10.239). Simple regression analysis was used to test this hypothesis. The amount of variance in safety scores that are accounted for or explained by teaching intensity is .4% (R^2 = 0.004) **(Table 9)**

Effect of Hospital Size on Safety

H2 suggest that there is a strong negative correlation between hospital size and safety (β= -.295, P=.000, F =244.724). Simple regression analysis was used to test this hypothesis. The amount of variance in safety scores that are accounted for or explained by hospital size is 8.7 % (R^2 = 0.087) **(Table 9).**

Effect of Case Mix Index on Safety

H3 suggest that there is a statistically strong negative correlation between case mix index and safety (β= -.304, P=.000, F =261.836). Simple regression analysis was used to test this hypothesis. The amount of variance in safety scores that are accounted for or explained by the case mix index is 9.3% (R^2 = 0.093) **(Table 9).**

Effect of Teaching Intensity on Clinical Care

H4 suggest that a positive correlation exist between teaching intensity and clinical care (β= .045, P=.020, F = 5.430). Simple regression analysis was used to test this hypothesis. The amount of variance in clinical care scores that are accounted for or explained by teaching intensity is .2% (R^2 = .002) **(Table 10).**

Effect of Hospital Size on Clinical Care

H5 suggest that a statistically notable correlation exist between hospital size and clinical care (β= .179, P=.000, F = 89.197). Simple regression analysis was used to test this hypothesis. The amount of variance in clinical care scores that are accounted for or explained by hospital size is 3.2% (R^2 = .032) **(Table 10).**

Effect of Case Mix Index on Clinical Care

H6 suggest that a statistically essential correlation exist between case mix index and clinical care (β= .232, P=.000, F = 153.169). Simple regression analysis was used to test this hypothesis. The amount of variance in clinical care scores that are accounted for or explained by case mix index is 5.4 % (R^2 = .054) **(Table 10).**

Effect of Teaching Intensity on Patient Experience

H7 suggest that a statistically negative correlation exist between teaching intensity and patient experience (β= -.52, P=.006, F = 7.619). Simple regression analysis was used to test this hypothesis. The amount of variance in patient experience scores that are accounted for or explained by teaching intensity is 3 % (R^2 = .003) **(Table 11).**

Effect of Hospital Size on Patient Experience

H8 suggest that a strong negative correlation exist between hospital size and patient experience (β= -.294, P=.000, F = 262.033). Simple regression analysis was used to test this hypothesis. The amount of variance in patient experience sores that are accounted for or explained by hospital size is 8.6 % (R^2 = .086) **(Table 11).**

Effect of Case Mix Index on Patient Experience

H9 suggest that a statistically negative correlation exist between case mix index and patient experience (β= -.152, P=.000, F = 65.521). Simple regression analysis was used to test this hypothesis. The amount of variance in patient experience sores that are accounted for or explained by case mix index is 2.3 % (R^2 = .023) **(Table 11).**

Effect of Teaching Intensity on Efficiency and Cost

H10 suggest that a robust negative correlation exist between teaching intensity and efficiency and cost (β= -.015, P=.416, F = .661). Simple regression analysis was used to test this hypothesis. The amount of variance in efficiency and cost scores that are accounted for or explained by teaching intensity is 0 % (R^2 = .000) **(Table 12).**

Effect of Hospital Size on Efficiency and Cost

H11 suggest that a significant negative correlation exist between hospital size and efficiency and cost (β= -.284, P=.000, F = 245.024). Simple regression analysis was used to test this hypothesis. The amount of variance in efficiency and cost scores that are accounted for or explained by hospital size is 8.1% (R^2 = .081) **(Table 12).**

Effect of Case Mix Index on Efficiency and Cost

H12 suggest that a significant negative correlation exist between case mix index and efficiency and cost (β= -.253, P=.000, F = 189.641). Simple regression analysis was used to test this hypothesis. The amount of variance in efficiency and cost scores that are accounted for or explained by case mix index is 6.4% (R^2 = .064) **(Table 12).**

Bivariate Results

Bivariate regression results indicate that teaching intensity, hospital size and CMI are significant predictors of safety, clinical care, patient experience and efficiency and cost. More intense teaching, larger hospitals and higher CMI all negatively predict lower safety scores. The same is true for patient experience. Conversely, an increase on these variables predicts a higher level of clinical care. Efficiency and cost results present a mixed narrative, with teaching intensity not associated with efficiency and cost, and larger hospitals and higher case index predicting lower efficiency and cost.

IV.2 Multivariate Analyses

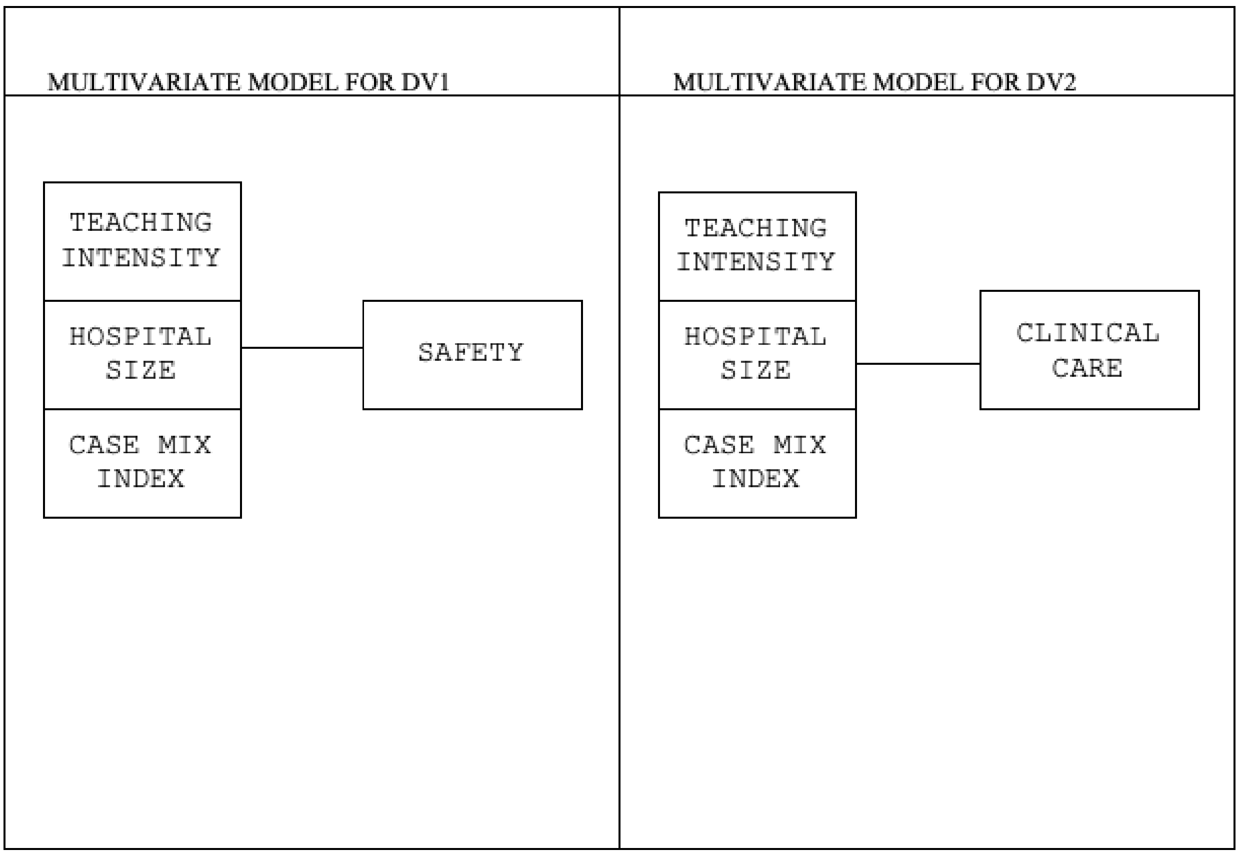

Figure 18: Multivariate model, all IVS on DV1 & all IVS on DV2

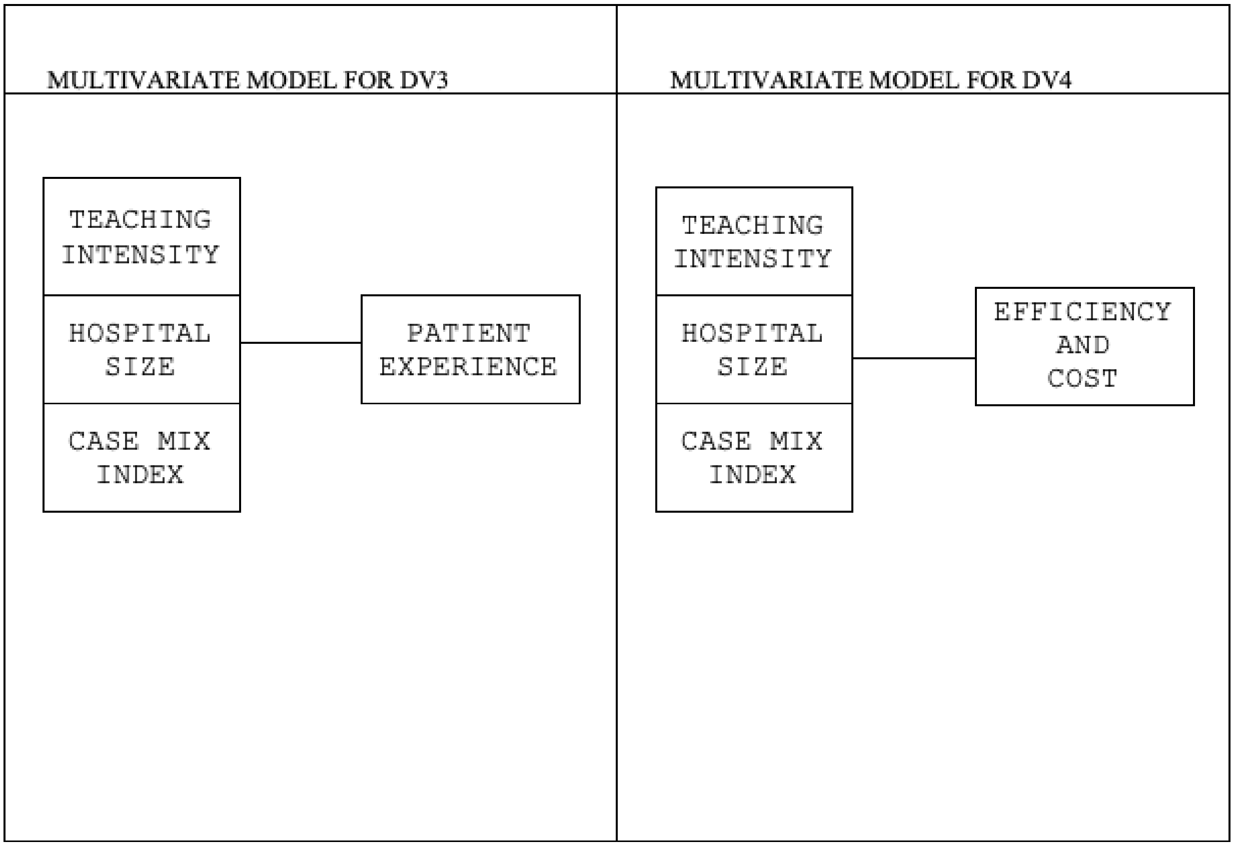

Figure 19: Multivariate model, all IVS on DV3 & all IVS on DV4

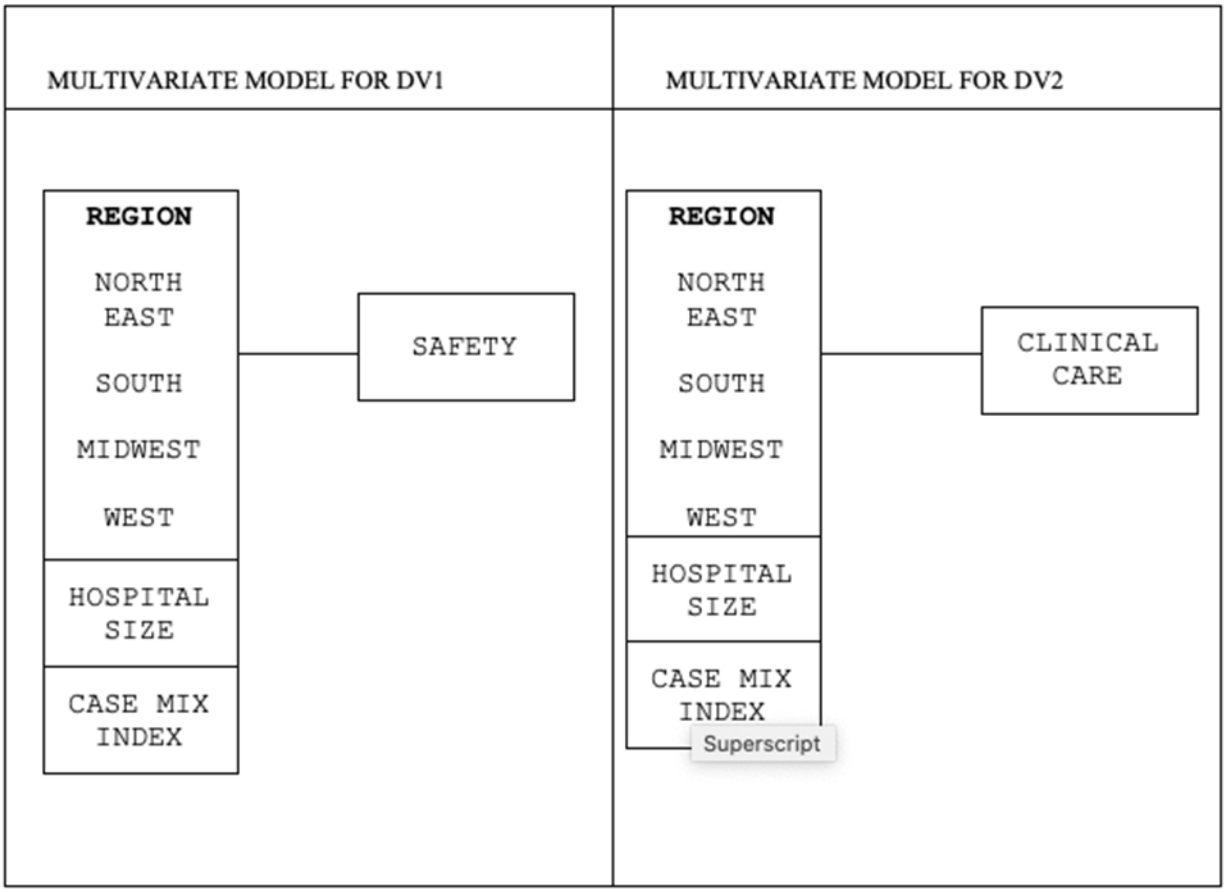

Figure 20: Hierarchical Multiple Regression, Safety and Clinical Care

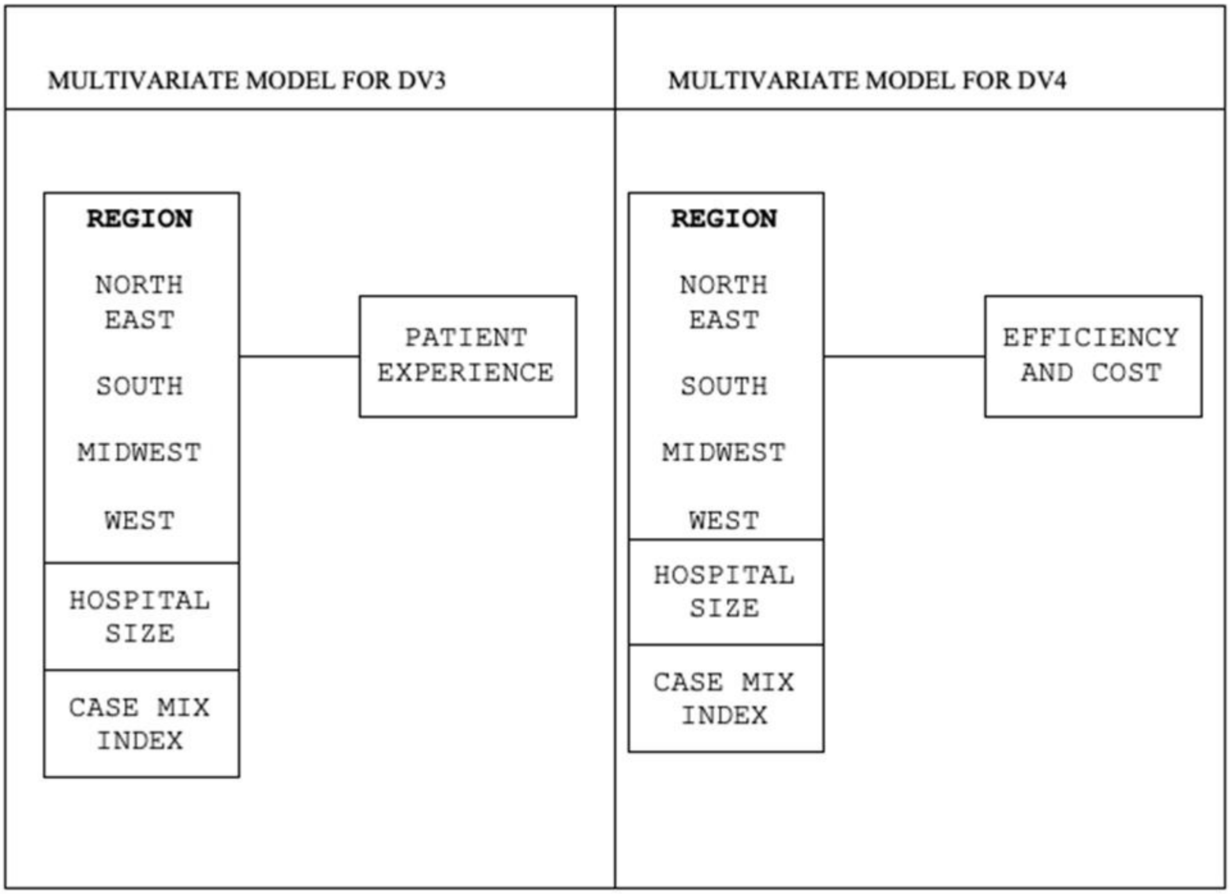

Figure 21: Hierarchical Multiple Regression, Patient experience and Efficiency and Cost

Diagnostic, Multiple Regression Model

Illustrated in **Table 15** is the multicollinearity among independent variables and dependent variables. The variance inflation factor assessed whether variables have a strong linear relationship. If **VIF > 2.5,** then it indicates strong collinearity among variables. This diagnostic was run to ensure that there was not a high degree of multicollinearity in the regressions. A high degree of multicollinearity causes and unstable regression and also inflates the standard error. The variables used in this study all exhibits a VIF below 2.5. There are no interrelating characteristics among variables. As part of the assumptions testing for a multiple linear regression, the dataset was used to test for multicollinearity. The data included 2,786 US acute care scores submitted to Medicare. The proposed multiple line regression would test hypotheses.

Table 14: Multicollinearity on IVs and DVs

Variable	Teaching Intensity (VIF)	Hospital Size (VIF)	Case Mix Index (VIF)
Safety	1.038	1.396	1.418
Clinical Care	1.034	1.436	1.448
Patient Experience	1.037	1.400	1.417
Efficiency & Cost	0.097	1.401	1.418

VIF > 2.5

The tolerance statistic among variables (VIF = 1.038 for safety and teaching intensity; 1.40 for Patient experience and hospital size; 1.448 for Clinical care and case mix and 0.097 for Efficiency and Cost and Teaching intensity) signifies that a very low level of multicollinearity was present, all results generated below the VIF threshold of 2.5 therefore no collinearity was found between variables and as a result no variables will be removed from our model.

Multivariate Results

Multiple linear regression results between dependent variables (Safety, Clinical Care, Patient Experience and Efficiency and Cost) and independent variables (Teaching Intensity, Hospital Size and Case Mix Index). Model fit is indicated under the r^2 column. Coefficients for each independent variable are list per model.

Table 15: Multiple Linear Regression on DVs and IVs

Dependable Variable	R^2	Teaching Intensity (β)	Hospital Size (β)	Case Mix Index (β)
Safety	0.118	0.001*	-0.187*	-0.206*
Clinical Care	0.057	0.001*	0.074*	0.191*
Patient Experience	0.086	-0.011*	-0.295*	0.007*
Efficiency & Cost	0.097	0.042*	-0.213*	-0.147*

*significant at $p \leq 0.05$

For Safety scores, only hospital size and CMI remain significant when all independent variables are included in the same model. An increase in hospital size predicts a decrease in safety scores. For Clinical care, teaching intensity is also a non-significant predictor. Meanwhile, larger hospitals and higher CMI both predict a higher level of clinical care. For patient experience, teaching intensity is also non-significant and so is CMI. Only hospital size is predictive of patient experience, with larger hospitals indicating a lower score on patient experience. Efficiency and cost are the only multivariate model in which all predictors are significant. A higher level of teaching intensity is predictive of a higher level of efficiency and cost. Conversely, a larger hospital and higher CMI are predictive of lower efficiency and cost (Please see Appendix 3)

Table 16: Multivariate Hierarchical Regression: Safety

Variable	β
DRegion1NE	β = -0.032
DRegion2S	β = 0.011
DRegion3MW	β = 0.013
DRegion4W	β = 0.055*
Location	β = -0.057*
DPrivate	β = 0.01
DNonProfit	β = 0.005
Teaching Intensity	β = 0.001
Case Mix Index	β = -0.21*
HospitalSize	β = -0.167*
Final Model (1) $R^2 = 12.9\%$	

* statistically significant at 5% level

Table 17: Hierarchical Regression DV 1 (Safety)

	Model 0	Model 1
(Constant)	12.58	19.711
Region		
DRegion1NE	-0.15	-0.38
DRegion2S	0.113	0.149
DRegion3MW	0.344	0.171
DRegion4W	0.773	1.199
Location		
Rural 1/Urban 0	-2.158	-0.733
Ownership		
DPrivate	0.442	0.144
DNonProfit	-0.147	0.057
Teaching Intensity		0.051
Case Mix Index		-4.339
Hospital Size		-0.004
R^2	0.033	0.129
ΔR^2	-	0.096
F	12.413	37.439
ΔF	-	25.026

Where:

$$\Delta F = \frac{(R^2_2 - R^2_1) / (k_2 - k_1)}{(1-R^2_2) / (N - k_2 - 1)}$$

F is statistically significant at 1% level (Appendix 3, table 78, F distribution critical values)

R^2_1 is the value of R^2 for the first (smaller) model, R^2_2 is the value of R^2 for the second (larger) model, k_1 is the number of independent variables in the first model and k_2 is the number of independent variables in the second model (Miles & Shelvin, 2001, p. 37).

Multivariate Hierarchical Regression: Safety

All Independent variables were entered manually in the following order (Control Variables), Region (DRegion1NE, DRegion2S, DRegion2MW, DRegion4W), Location (Rural) and Hospital Ownership (DPrivate and DNonProfit). The hierarchical multiple regression in model 0, displayed, Region, Location and Hospital ownership contributed considerably to the regression model, F (7, 2529) = 12.413, * p = .000) and accounted for 3.3% of the variation in Safety (Appendix MHR Table 1-2). Introducing the independent variables in model 1 (Teaching intensity, Case Mix Index and Hospital size) explained an additional 12.9% of variation in Safety and this change in R^2 was significant F (10,2526) = 37.44, *p = .000.

The statistically significant variables were Region- West, Location, Case Mix Index and Hospital size. With case mix index generating the most intense beta value (β = –.210, B = -4.339, *p = .000). Hospital size exhibited the second strongest beta (β =-.167, B = -.004, *p = .000); Location results (β = -.057, B = -733, * p = .005); Region (West) results (β = .055, B = 1.199, * p = .014).

The variables that were not statistically significant and which were not good predictors of safety were Teaching intensity (β = .001, B = .051, p = .969); Hospital ownership- DNonProfit (β = .005, B = .057, p = .856); Hospital Ownership- DPrivate (β = .010, B = .144, p = .702); Midwest Region- DRegion3MW results (β = .013, B = .171, p = .640); South Region- DRegion2S (β = .011, B = .149, p = .696) and North East Region- DRegion1NE (β = -.032, B = -.380, p = .271), (From appendix MHR- Table 6).

Table 18: Multivariate Hierarchical Regression: Clinical Care

Variable	β
DRegion1NE	β = -.017
DRegion2S	β = -.136*
DRegion3MW	β = -.027
DRegion4W	β = -.043*
Location	β = .093*
DPrivate	β = .117*
DNonProfit	β = .135*
Teaching Intensity	β = 007
Case Mix Index	β = .134*
HospitalSize	β = .075*
Final Model (1) R^2 = 9.6%	

* statistically significant at 5% level

Table 19: Hierarchical Regression DV 2 (Clinical Care)

	Model 0	Model 1
(Constant)	13.708	9.337
Region		
DRegion1NE	-0.367	-0.175
DRegion2S	-1.765	-1.634
DRegion3MW	-0.44	-0.31
DRegion4W	-0.653	-0.851
Location		
Rural 1/Urban 0	-1.784	-1.036
Ownership		
DPrivate	1.399	1.468
DNonProfit	1.568	1.418
Teaching Intensity		0.481
Case Mix Index		2.311
HospitalSize		0.002
R^2	0.066	0.096
ΔR^2	-	0.03
F	26.828	28.137
ΔF	-	1.309

Where:

$$\Delta F = \frac{(R^2_2 - R^2_1) / (k_2 - k_1)}{(1-R^2_2) / (N - k_2 - 1)}$$

F is statistically significant at 1% level (Appendix 3, table 78, F distribution critical values)

R^2_1 is the value of R^2 for the first (smaller) model, R^2_2 is the value of R^2 for the second (larger) model, k_1 is the number of independent variables in the first model and k_2 is the number of independent variables in the second model (Miles & Shelvin, 2001, p. 37).

Multivariate Hierarchical Regression: Clinical Care

All Independent variables were entered manually in the following order (Control Variables), Region (DRegion1NE, DRegion2S, DRegion2MW, DRegion4W), Location (Rural) and Hospital Ownership (DPrivate and DNonProfit). The hierarchical multiple regression in model 0, displayed, Region, Location and Hospital ownership contributed significantly to the regression model, *F* (7, 2660) = 26.83, * *p* = .000) and accounted for 6.6% of the variation in Clinical Care (appendix MHR- Table 7). Introducing the independent variables in model 1 (Teaching intensity, Case Mix Index and Hospital size) explained an additional 9.6% of variation in Clinical Care and this change in R^2 was significant F (10, 2657) = 28.14, **p* = .000.

The statistically significant variables were Region- South, Region- West, Location, Hospital ownership (DPrivate, DNonProfit); Case Mix Index and Hospital size. With Region- South generating the most intense beta value (β = –.136, B = -1.634, **p* = .000). Region- West exhibited the second strongest beta (β = -.043, B = -.851, **p* = .055); Location results (β = .93, B = 1.036, * *p* = .000); Hospital Ownership (DPrivate) results (β = .117, B = 1.468, * *p* = .000); Hospital Ownership (DNonProfit) results (β = .135, B = 1.418, * *p* = .000); Case Mix Index results (β = .134, B = 2.311, * *p* = .000); Hospital Size (β = .075, B = .002, * *p* = .001).

The variables that were not statistically significant and which were not good predictors of Clinical Care were Region- North East (β = -.017, B = .175, *p* = .582); Region- Midwest (β = -

.027, B = -.310, *p* = .354); Teaching Intensity (β = .007, B = .481, *p* = .707 (appendix MHR-Table 12).

Table 20: Multivariate Hierarchical Regression: Patient Experience

Variable	β
DRegion1NE	β = -.017
DRegion2S	β = -.136*
DRegion3MW	β = -.027
DRegion4W	β = -.043*
Location	β = .093*
DPrivate	β = .117*
DNonProfit	β = .135*
Teaching Intensity	β = 007
Case Mix Index	β = .134*
HospitalSize	β = .075*
Final Model (1) R^2 = 9.6%	

* statistically significant at 5% level

Table 21: Hierarchical Regression DV 3 (Patient Experience)

	Model 0	Model 1
(Constant)	7.34	6.69
Region		
DRegion1NE	0.771	-1.33
DRegion2S	3.186	3.707
DRegion3MW	2.27	2.631
DRegion4W	0.711	0641
Location		
Rural 1/Urban 0	1.626	0.988
Ownership		
DPrivate	-1.035	-1.455
DNonProfit	-0.086	-0.086
Teaching Intensity		1.192
Case Mix Index		1.45
HospitalSize		-0.007
R^2	0.088	0.166
ΔR^2	-	0.078
F	37.768	54.187
ΔF	-	16.419

Where:

$$\Delta F = \frac{(R^2_2 - R^2_1) / (k_2 - k_1)}{(1-R^2_2) / (N - k_2 - 1)}$$

F is statistically significant at 1% level (Appendix 3, table 78, F distribution critical values)

R^2_1 is the value of R^2 for the first (smaller) model, R^2_2 is the value of R^2 for the second (larger) model, k_1 is the number of independent variables in the first model and k_2 is the number of independent variables in the second model (Miles & Shelvin, 2001, p. 37).

Multivariate Hierarchical Regression: Patient Experience

All Independent variables were entered manually in the following order (Control Variables), Region (DRegion1NE, DRegion2S, DRegion2MW, DRegion4W), Location (Rural) and Hospital Ownership (DPrivate and DNonProfit). The hierarchical multiple regression in model 0, displayed, Region, Location and Hospital ownership contributed significantly to the regression model, F (7, 2723) = 37.77, * p = .000) and accounted for 8.8% of the variation in Patient Experience (appendix MHR- Table 13, Table 14). Introducing the **independent** variables in model 1 (Teaching intensity, Case Mix Index and Hospital size) explained an additional 16.6% of variation in Patient Experience and this change in R^2 was significant F (10, 2720) = 54.19, *p = .000.

The statistically significant variables were Region- North East, South, Midwest, Location, Hospital ownership (DPrivate); Case Mix Index and Hospital size. With hospital size generating the most intense beta value (β = –.326, B = -.007, *p = .000). Hospital ownership (DPrivate) with the second strongest beta (β = -.115, B = -1.455, *p = .000); Location results (β = .088, B = .988, * p = .000); Case Mix Index results (β = .84, B = 1.450, * p = .000); Region- North East results (β = .125, B = 1.330, * p = .000); Region- South (β = .305, B = 3.707, * p = .000); Region- Midwest (β = .225, B = 2.631 * p = .000).

The variables that were not statistically significant and which were not good predictors of Patient Experience were Region- West (β = .033, B = .641, p = .125); Hospital Ownership

(DNonProfit) (β = -.008, B = -.086, *p* = .745); Teaching Intensity (β = .019, B = 1.192, *p* = .302 (appendix MHR- Table 18).

Table 22:Multivariate Hierarchical Regression: Efficiency and Cost

Variable	β
DRegion1NE	β = -.332*
DRegion2S	β = -.374*
DRegion3MW	β = -.226*
DRegion4W	β = -.084*
Location	β = .145*
DPrivate	β = -.139*
DNonProfit	β = -.004
Teaching Intensity	β = -.005
Case Mix Index	β = -.166*
HospitalSize	β = -.165*
Final Model (1) R^2 = 20.6%	

* statistically significant at 5% level

Table 23: Hierarchical Regression DV 4 (Efficiency and Cost)

	Model 0	Model 1
(Constant)	9.028	17.269
Region		
DRegion1NE	-4.823	-5.011
DRegion2S	6.364	6.454
DRegion3MW	3.644	-3.77
DRegion4W	-2.78	-2.368
Location		
Rural 1/Urban 0	3.946	2.317
Ownership		
DPrivate	-2.263	-2.509
DNonProfit	-0.327	-0.057
Teaching Intensity		-0.411
Case Mix Index		-4.054
HospitalSize		-0.005
R^2	0.134	0.206
ΔR^2	-	0..072
F	60.164	70.897
ΔF	-	10.733

Where:

$$\Delta F = \frac{(R^2_2 - R^2_1) / (k_2 - k_1)}{(1-R^2_2) / (N - k_2 - 1)}$$

F is statistically significant at 1% level (Appendix 3, table 78, F distribution critical values)

R^2_1 is the value of R^2 for the first (smaller) model, R^2_2 is the value of R^2 for the second (larger) model, k_1 is the number of independent variables in the first model and k_2 is the number of independent variables in the second model (Miles & Shelvin, 2001, p. 37).

Multivariate Hierarchical Regression: Efficiency and Cost

All Independent variables were entered manually in the following order (Control Variables), Region (DRegion1NE, DRegion2S, DRegion2MW, DRegion4W), Location (Rural) and Hospital Ownership (DPrivate and DNonProfit). The hierarchical multiple regression in model 0, displayed, Region, Location and Hospital ownership contributed significantly to the regression model, *F* (7, 2733) = 60.164, * *p* = .000) and accounted for 13.4% of the variation in Efficiency and Cost **(**appendix MHR- Table 19, Table 20). Introducing the independent variables in model 1 (Teaching intensity, Case Mix Index and Hospital size) explained an additional 20.6% of variation in Efficiency and Cost and this change in R^2 was significant F (10, 2730) = 70.897, **p* = .000.

The statistically significant variables were Region- North East, South, Midwest, West; Location, Hospital ownership (DPrivate); Case Mix Index and Hospital size. With the South region generating the most intense beta value (β = –.374, B = -6.454, **p* = .000). North East region with the second strongest beta (β = -.332, B = -5.011, **p* = .000); Midwest region (β = -.145, B = 2.317, * *p* = .000); Region- West (β = -0.84, B = -2.368, * *p* = .000); Location results (β = .125, B = 1.330, * *p* = .000); Hospital Ownership (DPrivate) (β = -.139, B = -2.509, * *p* = .000); Case mix index (β = -.166, B = -4.054 * *p* = .000), Hospital Size (β = -.165, B = -.005 * *p* = .000)..

The variables that were not statistically significant and which were not good predictors of Efficiency and Cost were Hospital Ownership (DNonProfit) (β = -.004, B = -.057, p = .876); Teaching Intensity (β = -.005, B = -.411, *p* = .798) **(appendix MHR-Table 24).**

IV.3 Result Summary

These results demonstrate a robust relationship between teaching intensity, hospital size and CMI and our variables of interest. In the following section discussed the significance of our results and provide an interpretation. Also discussed was the practical implications, limitations of the study and suggestions for future directions.

V Chapter 5: Discussion

V.1 Discussion: Bivariate Analysis

In this section, a bivariate analysis was conducted, and the relationship between each IV (teaching intensity, hospital size, and case mix index) on each DV (safety, clinical care, patient experience, and efficiency and cost) was evaluated to determine disparities between the two variables and whether results supported the existing literature.

IV1: Teaching Intensity

The analysis shows evidence that Teaching Intensity was a statistically significant predictor of Safety (DV1), Clinical care (DV2), and Patient experience (DV3). However, this did not hold for efficiency and cost (DV4). Results suggested that there was no association between teaching intensity and efficiency and cost.

First, it was argued that teaching intensity influences safety. Teaching hospitals are considered innovators, forward-thinkers, and have up-to-date best practice standards, as medical residents are trained using the latest knowledge and concepts. Subsequently, this supports hospital teaching as a significant positive predictor of patient safety. Positive collaboration and teamwork in the healthcare system has proven to have successful outcomes on healthcare quality. Teamwork has become a major focus in healthcare. The impetus for this new interest in teamwork is the Institute of Medicine (IOM) report titled “To Err is Human: Building a Safer Health System”:

> …which details the high rate of preventable medical errors, many of which are the result of dysfunctional or nonexistent teamwork. The report suggests that teamwork requires effective patient management because of the increased specialization of tasks, the increased complexity and risks associated with treatment options, and the need to ensure appropriate healthcare outcomes and patient safety. As the report states:

> …beyond their cost in human lives, preventable medical errors exact other significant tolls, total costs of between $17 billion and $29 billion per year, loss of trust in the health-care system by patients and diminished satisfaction by both patients and health professionals (Piollon, 1999).

Results revealed that teaching intensity has a significant and negative influence on Safety (DV1). Surprisingly, this finding does not agree with the literature (β= -.063, P=.001). As per the results, it is understood that the more medical residents that are being trained at a given hospital, patient safety is negatively impacted. It can be speculated that, instead of providers focusing on patients, the focus may be diverted in an effort to impart knowledge while the actual care of patients suffer. Further, it can also be speculated that in a teaching system perhaps the frequency of medical residents around patients may increase the possibility of infections, simply from proximity. Additionally, it can be assumed that there are weakened safety protocols at these medical facilities and although teaching hospitals provide highly specialized care, distinct guidelines have not been established to mitigate against patients' risk of contracting infections.

Second, it was argued that teaching intensity influences clinical care. The literature review supports the notion that teaching hospitals have lower mortality rates than non-teaching hospitals, which is further supported by the findings of this study. Iterating that teaching hospitals are said to be early adopters of technology and offer care that provides better outcomes; these hospitals are often more experienced in the treatment of various conditions (Datz, 2017).

The third argument was that teaching intensity influences patient experience. Today, most teaching hospitals provide twenty-four-hour accessibility. Accessibility is one of the first steps to creating satisfactory patient experience. Results revealed that teaching intensity has a significant and negative influence on patient experience (DV3). Interestingly, this finding does not agree with the literature (β= -.52, P=.006).

Previous literature highlights that teaching intensity boosts patient experience. Communication with nurses and doctors, responsiveness of hospital staff, communication about medication, hospital cleanliness and quietness, discharge information, care transition, and hospital overall rating all play a vital role interfacing with this measure. Newly trained medical residents are usually the first in line to encounter and have any interaction with the patients.

Based on findings, it is understood that the higher the number of medical residents being trained at a given hospital, patient experience is negatively impacted. It can be speculated that the goal of healthcare providers is not to ensure that patients have a value-based experience during hospital visits or stay but rather the focus is on teaching medical residents (junior doctors). It can be presumed that hospitals with inexperienced trainees or shortage of senior staff results in more disintegrated patient experience and decreased quality of care. Further, it can also be speculated that teaching hospitals are larger and more solvent in nature, thus the focus is not on providing a customer- centric environment but rather exemplary medical/treatment outcomes.

Finally, the results interpreted that teaching intensity does not influences efficiency and cost. This result is supported by previous literature pointing out that teaching medical residents negatively impact productivity of other hospital output, thereby raising cost or reducing revenue (Grosskopf et al., 2001).

IV2: Hospital Size

First, results revealed hospital size has a significant and negative influence on safety (DV1). Astonishingly, this finding does not support the literature (β= -.187, P=.000). As per results, it is understood for every unit increase in hospital size, safety is being impacted negatively. It can be speculated that the larger a hospital's capacity the less likely it is providers will adhere to safety protocols, thus increasing the risk of patient infections. It can also be presumed hospitals that are stretched beyond its capacity can cause frustration among physicians having a negative impact on their productivity, which in turn impacts incentivization. Further, it can be speculated that infections can easily be contracted from patient to patient due to overcrowding. Having a safety culture to mitigate incidents that can be associated with patient injuries and even cause death is a critical component of any healthcare facility.

Second, results revealed hospital size has a significant and positive influence on clinical care. Like teaching hospitals, larger hospitals are generally considered to be heavily invested in advanced technology, which in turn contributes to mitigating risk associated with clinical care/mortality which is supported by the literature.

Third, results revealed hospital size has a significant and negative influence on patient experience. Patient satisfaction has been seen as a key criterion when evaluating hospitals and is one of the main focus of the current healthcare reform. There has been a large strand of literature aimed at identifying the relationship between hospital structure and patient satisfaction in developed countries. Most of these studies have shown higher staff-to-patient ratio and better hospital environments were associated with higher patient rates (Linlin et al., 2019).

Interestingly, findings ($\beta = -.295$, $P = .000$) does not agree with previous literature. As per results it can be understood for every unit increase in hospital size, patient experience is being impacted negatively. This can be as a result of a very slow hospital system, meaning, as patients go from one area to the next there is a lack of service within the hospital system. Leaders need to optimize strategic alignment to allow a smoother and more efficient workflow which in turn can have a positive impact on the patient experience. Additionally, satisfactory patient experience is one that involves a reasonable amount of communication between medical staff and patients. It can be hypothesized that in larger hospitals, providers are thinly stretched and will find it difficult to maintain the degree of contact required for the proper transmission of information between the provider and the patient, as well as between the provider and the health care administrators. Relevant information may be lost during the process, which may result in a delay in care delivery. Also, confidentiality may be compromised as well as misdiagnosis of care, or providers may be faced with complex decisions on whose life to save when not everyone can be saved (triage approach).

Finally, results suggest hospital size has a significant and negative influence on efficiency and cost. Hospital size has long been an area of discussion and debate in the U.S. healthcare industry. Questions have consistently focused on cost management or efficiency in large versus small hospitals. A persistent question among researchers is whether efficiencies are associated with larger facilities through economies of scale or if there are alternate scenarios that play a significant part in hospital efficiency and cost (Coyne et al.,2009). The results are consistent with earlier publications.

IV3: Case Mix Index

Case Mixed Index considers the severity of the patient's condition and subsequent treatment. This means that the more advanced a hospital is in terms of innovation and processes; the more they are equipped to promote quality safety measures. An increase in survival rate, provide satisfactory patient experience and increase efficiency and cost. Providers make it their duty to report their CMI as this is a strong indicator of how well their institution is performing financially.

Results revealed case mix index has a significant and negative influence on safety and efficiency and cost (DV1 and DV4). Surprisingly, this finding for DV1 does not support the literature. As per the results, it is understood that the more severe cases handled by a hospital and the variety of patients that are being dealt with, negatively impacts patient safety (β= -.0206, P=.000). Based on the above discussion on hospital size and safety the same speculation for findings on case mix index and safety can be used to explain the outcomes. In addition, the literature supports efficiency and cost findings, with the case mix index having a significant and negative influence on safety. The more severe cases are handled by a hospital, the more resources are being used by that facility.

Finally, results revealed more severe cases handled by a hospital and the variety of patients that are being dealt with, positively impacts clinical care and patient experience, these two findings are supported by the literature.

V.2 Discussion: Multivariate Analysis

As a means of assessing the stability of bivariate findings a multivariate analysis on IVs and DVs was conducted. Hence an evaluation was completed measuring the relationship between all IVs (teaching intensity, hospital size, and case mix index) on each DV (safety, clinical care, patient experience, and efficiency and cost) allowing for an inference on whether the results back up existing literature.

Multivariate analysis presents a more unambiguous result among variables. Using multivariate analysis helped identify certain characteristics among constructs quickly. This analysis gave an overview of the associations between two or more variables.

In examining the influence above and beyond the first group of independent variables (teaching intensity, hospital size and case mix index) and to statistically control for three variables (Region, location, and hospital ownership) a hierarchical linear regression was carried out. This test examined whether adding variables significantly enhanced the model's capability to predict the criterion variable.

Multivariate Analysis: Safety

Results supported teaching intensity (IV1) has a statistically positive impact on safety which is supported by previous literature. On the other hand, both the hospital size and the case mix index have significant and negative impacts on safety, as can be seen in Table 16, and the same speculations from bivariate safety results can be used to justify this result, since this is not confirmed by the literature. (Hospital size: β= -.187, P=.000) (Case Mix Index β= -.0206, P=.000).

Recall from the hierarchical analysis were four IVs that were statistically significant predictors of safety: Region-West, location, case mix index and hospital size. The findings supported the literature that rural hospitals in the western region that handle patients with severe conditions produced better safety scores than hospitals in other regions. In December 2018, the Leapfrog group conducted an annual hospital evaluation recognizing hospitals for excellence in hospital quality, patient safety and efficiency in which seventeen rural hospitals in California received awards (The 118 'Top Hospitals' in the US, according to The Leapfrog Group, 2018).

The IVs, Teaching intensity, hospital ownership (private and nonprofit) and the Midwest, south and northeast regions were not significant predictors of safety. All listed IVs have a negative association with safety. Results indicated that private and nonprofit hospital scores were lower as opposed to government owned, rural medical facilities. This result is substantiated since value-based purchasing is a Centers of Medicare and Medicaid services, government run program.

Multivariate Analysis: Clinical care

The multivariate analysis showed that teaching intensity, hospital size and case mix index all have significant and positive impact on clinical care. This finding is supported in the previous literature.

In reference to the hierarchical analysis, four IVs were statistically significant predictors of clinical care: Region-West and South; location, case mix index, and hospital ownership. Results indicated that rural hospitals in the western and southern regions have the lowest mortality scores. This is no surprise as Florida and California were the top two hospitals rewarded as announced by Health Leaders media report for FY 2018. The IVs, Teaching intensity and region Northeast and Midwest are not significant predictors of clinical care (The 118 'Top Hospitals' in the US, according to The Leapfrog Group, 2018).

Multivariate Analysis: Patient Experience

The multivariate analysis showed that teaching intensity and hospital size had a statistical and negative impact on patient experience. This can be seen in Table 16 and this can draw upon the same speculations from the bivariate findings as it relates to safety since this finding is not supported in the literature (Teaching Intensity: β= -.011, P=.000) (Hospital Size β= -.295, P=.000). In addition, case mix index exhibited a statistical and positive impact on patient experience. This finding is supported by previous literature.

As per the hierarchical analysis, five IVs were statistically significant predictors of patient experience: Region-Northeast, South, Midwest; location and hospital ownership- Private, case mix index, and hospital size. Results revealed that rural, private hospitals in the northeast, south, and Midwest region had more satisfactory patient experience scores. Public hospitals are funded by the Government and are guided by governmental rules and regulations, while private hospitals are not bound by the same and offer more personalized care and treatment to their patients. Moreover, private hospitals have more money to maintain patients and offer the best quality of service than their counterparts.

Numerous comparative studies have suggested the differences in healthcare services provided by private hospitals result in higher rates of patient satisfaction. Results of this study shows that patients prefer to visit private over public hospitals because of multiple factors such as improved technology, reduced wait time and delay in treatment, sterile environment, and personalized care from physician and nurses (Irfan & Ijaz, 2011). In systems where private hospitals are not funded by public financing, they are more directed towards earning profits by focusing on service quality, hence, patients search for private care only because of perceptions of better facilities and excellence (Fatima, Malik, & Shabbir, 2018). The IVs, Teaching intensity, and Region-western and hospital ownership (nonprofit) are not significant predictors of patient experience. Although the Western region delivered on having favorable safety and clinical care scores, it is patient experience scores being impacted negatively. This can be as a result of government owned healthcare facilities. Previous studies have also indicated that patients select private hospitals only because they are not satisfied with public healthcare providers. They are compelled to spend more money in order to get desired service quality (Fatima, Malik, & Shabbir, 2018).

Multivariate Analysis: Efficiency and cost

The multivariate analysis showed that hospital size and case mix index had a statistical and negative impact on efficiency and cost (Hospital Size: $\beta = -.213$, $P = .000$) (Case Mix Index $\beta = -.147$, $P = .000$). This finding is supported by the literature. In addition, the results from teaching intensity revealed a statistical and positive impact on efficiency and cost. This finding is not supported in the literature. It can be speculated that healthcare administrators plan and budget medical residents teaching and training in accordance with efficient usage of resources (teaching intensity decreases efficiency and cost). Another factor to be considered is the allocation of insufficient time for medical training that can lead to an over utilization of resources. For example, overtime and unplanning trainings of medical residents may maximize associated cost.

In reference to hierarchical analysis, there were five IVs that were statistically significant predictors to efficiency and cost: Region-Northeast, South, Midwest, and West; location and hospital ownership- Private, case mix index, and hospital size. Results suggested throughout all regions, there were satisfactory efficiency and cost results. These results are more prevalent among hospitals that handle and treat severe medical conditions.

The IVs, Teaching intensity, and hospital ownership (nonprofit) were not significant predictors of Efficiency and cost. Through the analysis of the study, it was observed that teaching intensity had a negative impact on efficiency and cost. Again, this can be based on the result of physicians spending more time and resources training residents than attending patients.

V.3 Discussion Summary

The findings endorsed the starting assumptions. The study was aimed at exploring and making a comparative review of bivariate and multivariate data processing. The comparison between bivariate and multivariate approach in this study revealed a smaller number of significant independent variables with multivariate analysis. As a researcher, the bivariate and multivariate methods must be used as complementary methods, as they are not equivalent in all cases.

Based on the Bivariate analysis (Tables 9-12) all relationships between all independent variables (IV 1- IV3) with dependent variables (DV 1- DV4) were statistically significant except for the relationship between Teaching intensity and efficiency and cost (DV1 and DV4). In assessing the collective effect of independent variables, after conducting multivariate analysis predictably all relationships were statistically significant. As a result, the research question was answered, and the null hypotheses was rejected.

The motivations for this study were high cost-low quality in healthcare, organizational inefficiencies, and healthcare access. The U.S. healthcare delivery system has endured numerous changes over the past few decades in an effort to making healthcare affordable for all.

Healthcare accessibility. As per the findings, hospital size has a significant and positive influence on clinical care, implying that the larger a hospital the greater the survival rate of patients. This shows that accessibility to healthcare for acute and complex conditions is vital to achieving the best outcomes for citizens. The U.S. healthcare system must be able to accommodate citizens for entry into the care system without barriers. Ideally, all hospitals (government, private etc.) should be competent in terms of its structure, process, and outcomes; striving to allow access and deliver quality of care for all. The impetus is on policy makers to design and implement national healthcare programs that will allow access to all citizens no matter race or socio-economic status.

Organizational Inefficiencies. Successful patient experience and safety measures are related to major efficient clinical processes and outcomes. Organizational inefficiencies impede the entire healthcare delivery process. Long hospital stays, poor collaboration among medical staff and hospital administrators as well as shortage of staff aid in impeding proper patient care. As per the findings, hospital size negatively correlates with safety and patient experience. It is with urgent need for policy makers to implement clear, strategic alignments for healthcare sustainability and to seal loopholes that are experienced during inpatients care.

High Cost- Low Quality. Patient experience assessments can expose major system issues, such as delays in returning test results and communication deficiencies that can have wide impacts on quality, safety, and overall performance. The study showed that teaching hospitals have a statistical negative correlation with patient experience. While teaching hospitals have the best in innovation and more financial resources available the focus of quality seems to be diminishing. As opposed to other industrialized countries the US has an imbalance healthcare system, where high cost- low quality is prevalent across all States. The economic and social benefits are obvious, and there is a need to concentrate even more on investing and enhancing quality in order to build faith in the healthcare system which, can be achieved only through access to high-quality, people-centered health services for all (Wilson, Hartl, & Palan, 2018).

V.4 Practical implication

This research has contributed as an empirical model for hospital performance that assesses healthcare institutions and patients' scores with respect to quality maintenance; moreover, it presents findings that allow for successful implementation and sustainability of value-based care and operations within the healthcare system. Subsequently, this study is beneficial to policymakers, hospital administrators, medical professionals, and researchers; it can also be useful for any business association. Additionally, this study adds to the body of knowledge by evaluating each measure of the value-based purchasing program and learning about other factors that influence quality care, the structure, process, and outcome. This research also highlights that government-owned hospitals can successfully increase their customer fulfillment measures by addressing elements that can produce immediate and improved patient satisfaction.

V.5 Limitation and future research

Further research can be conducted to address data gathering approaches and accuracy. Notwithstanding the limitations of researchers and industry experts in carrying out timely studies reflecting emerging medical changes and program adjustments, the gaps identified in the literature demonstrate that there are critical areas of VBP programs that still need to be evaluated. Public reporting on value-based purchasing systems use measures of quality based on averages or rankings of observed quality scores (Blumenthal, 2013). These methods provide a limited amount of information on how well hospitals are performing (Med-dings and McMahon 2008). A method that provides information about how closely each hospital approaches its own best possible quality scores (alternatively, best possible outcomes) could provide additional information, especially to payers (Unruh & Hofler, 2016).

Furthermore, over the years, the measures of the value-based purchasing program have been modified frequently. This does not allow for a consistent performance assessment of hospitals. Also, the value-based purchasing measure should not be the same across hospitals as each hospital has its own characteristics. Possibly, medical facilities should be grouped according to their characteristics and, on this basis, be incentivized accordingly. For this incentive specifically (VBP), only the results of Medicare patients should be accounted for in the patient experience measure. The HCAHPS (hospital consumer assessment of healthcare providers and systems) survey is not restricted to Medicare beneficiaries. The random sample selection should consist of only Medicare recipients, as unbiased selection may inflate patient experience scores. In order to refine the program, it will be extremely advantageous to know how their overall hospital visit impacts this group Medicare beneficiaries (Hospital Patient - Survey of patients' experiences (HCAHPS), 2020).

The efficiency and cost measure needs to be revised. Currently, efficiency and cost are measured by the Medicare Spending Per Beneficiary (MSPB), which shows how much Medicare spends on a particular episode per patient. These only measures cost, that pinpoints to the limitation of the VBP program, which fails to measure efficiency or at the very least define efficiency in a measurable manner. A more suitable tool, such as applying a cost performance index (CPI), would be more favorable. The CPI is one of the key indicators of the earned value management system. This index can be applied to evaluate the value of care. Output measured: the amount of completed work for every unit of cost spent.

The current study is focused on healthcare and a government-run program; however, future studies can be done to evaluate similar private sector programs in other industries. In addition, an exploratory qualitative study assessing reward programs would be value-added to the body of existing literature.

V.6 Conclusion

An exploratory analysis was paramount to this research as the identification of gaps in the body of literature emphasized the need for the applied methodology. Multiple value-based purchasing programs run concurrently within hospitals that may have impacted hospital performance in areas yet to be recognized.

As mentioned in the literature review the concept of value in the health care system plays a key role in medical practice. The concept of value refers to the output achieved relative to the cost incurred in which, value is defined as the patient health outcomes achieved per dollar spent (Porter, 2010). In measuring hospital performance value-based purchasing uses the following six strategies: 1) collecting information and data on quality, 2) selective contracting with high-quality plans or providers, 3) partnering with plans or providers to improve quality, 4) promoting Six-Sigma quality - streamlining quality control, 5) educating consumers on quality issues, and 6) rewarding or penalizing plans or providers through use of incentives or disincentives ((Maio, Goldfarb, & Carter, 2003).

In reviewing the literature and industry practices in hospital performance in relation to value-based purchasing programs the following gaps were identified:

Data Quality Assurance. Value-based purchasing measures result from the collection of data by hospitals. Data quality is vital to incentives and disincentives management and distribution. The body of the literature lacks studies on hospital data collection procedures and reporting techniques. A review and assessment of data quality management in hospital information gathering would serve to identify inconsistencies across hospital reporting and promote standardization, as recommended in limitation this should done by grouping hospitals according to their characteristics. Basic questions remain about whether value-based purchasing have improved quality and efficiency for Medicare (Ryan, 2013); given the lack of research-based support for data quality assurance, this raises questions about the mechanism used to determine a hospital's chances of being unfairly incentivized or penalized.

Studies on selection of plans and providers. There is a lack of transparency in selecting plans and providers who participate in value-based purchasing programs. Limited academic and technical research that addresses the selection process should be of concern. Research is needed to determine whether participating insurance plans are helpful to patients. Lack of research in this area can serve as evidence of a lack of awareness of how patient care is influenced by insurance schemes and their relationships with providers. Health insurers, like other insurance schemes, seek to save a dollar at every turn, and while the value in care is promoted as the basis for VBP programs, financial rewards are still a heavily motivating factor in hospital data reporting.

Multiple Value-Based Purchasing Programs. After years of small-scale pilot projects, demonstrations, and experiments, the Affordable Care Act mandated that Medicare payment to hospitals and physicians must depend, in part, on metrics of quality and efficiency (Ryan, 2013). However, VBP involve many programs that operate simultaneously. The literature does not speak to the monitoring of these programs that raises the question of how the programs affect each other. The monitoring of each program and the overall impact on hospital performance would support and promote VBP programs, as monitoring optimizes hospital operations through structural management; thus, promotes the achievement of the VBP objective, which is financial incentives to improve quality and efficiency (Ryan, 2013).

As U.S. health care systems moved toward a value-based and patient-centred approach in response to high costs and low-quality health care, accompanying scholarly and sectoral publications have followed. Literature on hospital Value-Based Purchasing programs concentrate on broadening readers' awareness of VBP programs, reviewing performance measures, assessing hospital operations, highlighting impacts of VBP programs, and reviewing and recommending policy reforms to meet emerging needs of the medical community. One can argue that the relatively narrow scope that the body of literature covers could be attributed to the complexities of value-based purchasing programs. Readjustments to VBP programs in hospitals pose a challenge for academics and industry experts to study and produce relevant content across the wide range of VBP programs.

The purpose of this study was to understand the factors that influence hospital performance, i.e., safety, clinical care, patient experience, efficiency and cost as measured by teaching intensity, hospital size and the case mix index. The findings showed that there exists a significant impact on hospital performance, which correlates with previous studies. The literature has made it clear that while rewards can significantly boost quality patient care, stakeholders must understand and agree that quality care will not be achieved without obstacles and openness to reforming policies and practices.

APPENDICES

Appendix 1

Table 25: Correlation between variables in this study.

		Safety	Clinical Care	Patient Experience	Efficiency and Cost	Teaching Intensity	HospitalSize	Case Mix Index	Region	Location (Rural or Urban)	Hospital Ownership
Safety	Pearson Correlation	1	-.115**	.177**	.201**	-.063**	-.295**	-.304**	.023	.170**	-.034
	Sig. (2-tailed)		.000	.000	.000	.001	.000	.000	.249	.000	.087
	N	2572	2495	2562	2571	2572	2572	2566	2566	2566	2543
Clinical Care	Pearson Correlation	-.115**	1	-.033	-.102**	.045*	.179**	.232**	-.043*	-.192**	.134**
	Sig. (2-tailed)	.000		.088	.000	.020	.000	.000	.025	.000	.000
	N	2495	2709	2699	2708	2708	2709	2706	2706	2706	2671
Patient Experience	Pearson Correlation	.177**	-.033	1	.263**	-.052**	-.294**	-.152**	.002	.189**	-.007
	Sig. (2-tailed)	.000	.088		.000	.006	.000	.000	.904	.000	.700
	N	2562	2699	2776	2775	2775	2776	2769	2769	2769	2738
Efficiency and Cost	Pearson Correlation	.201**	-.102**	.263**	1	-.015	-.284**	-.253**	.169**	.215**	.025
	Sig. (2-tailed)	.000	.000	.000		.416	.000	.000	.000	.000	.199
	N	2571	2708	2775	2785	2784	2785	2778	2778	2778	2748
Teaching Intensity	Pearson Correlation	-.063**	.045*	-.052**	-.015	1	.145**	.181**	.120**	-.070**	-.077**
	Sig. (2-tailed)	.001	.020	.006	.416		.000	.000	.000	.000	.000
	N	2572	2708	2775	2784	2785	2785	2779	2779	2779	2747
HospitalSize	Pearson Correlation	-.295**	.179**	-.294**	-.284**	.145**	1	.533**	-.067**	-.258**	.072**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	2572	2709	2776	2785	2785	2786	2779	2779	2779	2748
Case Mix Index	Pearson Correlation	-.304**	.232**	-.152**	-.253**	.181**	.533**	1	.161**	-.358**	.107**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000
	N	2566	2706	2769	2778	2779	2779	2779	2779	2779	2741
Region	Pearson Correlation	.023	-.043*	.002	.169**	.120**	-.067**	.161**	1	-.008	-.115**
	Sig. (2-tailed)	.249	.025	.904	.000	.000	.000	.000		.673	.000
	N	2566	2706	2769	2778	2779	2779	2779	2779	2779	2741
Location (Rural or Urban)	Pearson Correlation	.170**	-.192**	.189**	.215**	-.070**	-.258**	-.358**	-.008	1	-.090**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.673		.000
	N	2566	2706	2769	2778	2779	2779	2779	2779	2779	2741
Hospital Ownership	Pearson Correlation	-.034	.134**	-.007	.025	-.077**	.072**	.107**	-.115**	-.090**	1
	Sig. (2-tailed)	.087	.000	.700	.199	.000	.000	.000	.000	.000	
	N	2543	2671	2738	2748	2747	2748	2741	2741	2741	2748

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

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

Appendix 2

Simple Regression Model 1

Table 26

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.063[a]	.004	.004	5.614983

a. Predictors: (Constant), Teaching Intensity

Table 27

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	322.805	1	322.805	10.239	.001[b]
	Residual	81027.062	2570	31.528		
	Total	81349.867	2571			

a. Dependent Variable: Safety
b. Predictors: (Constant), Teaching Intensity

Table 28

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	11.124	.112		99.151	.000
	Teaching Intensity	-4.325	1.352	-.063	-3.200	.001

a. Dependent Variable: Safety

Table 29

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.295[a]	.087	.087	5.375998

a. Predictors: (Constant), HospitalSize

Table 30

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7073.389	1	7073.389	244.742	.000[b]
	Residual	74276.478	2570	28.901		
	Total	81349.867	2571			

a. Dependent Variable: Safety

b. Predictors: (Constant), HospitalSize

Table 31

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	13.001	.163		79.813	.000
	HospitalSize	-.007	.000	-.295	-15.644	.000

a. Dependent Variable: Safety

Table 32

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.304[a]	.093	.092	5.352163

a. Predictors: (Constant), Case Mix Index

Table 33

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7500.457	1	7500.457	261.836	.000[b]
	Residual	73447.455	2564	28.646		
	Total	80947.912	2565			

a. Dependent Variable: Safety
b. Predictors: (Constant), Case Mix Index

Table 34

Coefficients[a]						
Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	21.342	.644		33.143	.000
	Case Mix Index	-6.293	.389	-.304	-16.181	.000

a. Dependent Variable: Safety

Simple Regression Model 2

Table 35

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.045[a]	.002	.002	4.996908

a. Predictors: (Constant), Teaching Intensity

Table 36

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	135.584	1	135.584	5.430	.020[b]
	Residual	67566.347	2706	24.969		
	Total	67701.932	2707			

a. Dependent Variable: Clinical Care

b. Predictors: (Constant), Teaching Intensity

Table 37

Coefficients[a]						
Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	13.817	.097		142.324	.000

Teaching Intensity	3.009	1.291	.045	2.330	.020

a. Dependent Variable: Clinical Care

Table 38

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.179[a]	.032	.032	4.920632

a. Predictors: (Constant), Hospital Size

Table 39

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2159.704	1	2159.704	89.197	.000[b]
	Residual	65543.549	2707	24.213		
	Total	67703.253	2708			

a. Dependent Variable: Clinical Care
b. Predictors: (Constant), HospitalSize

Table 40

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	12.856	.141		90.862	.000
	HospitalSize	.004	.000	.179	9.444	.000

a. Dependent Variable: Clinical Care

Table 41

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.232[a]	.054	.053	4.865979

a. Predictors: (Constant), Case Mix Index

Table 42

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3626.695	1	3626.695	153.169	.000[b]
	Residual	64024.639	2704	23.678		
	Total	67651.334	2705			

a. Dependent Variable: Clinical Care
b. Predictors: (Constant), Case Mix Index

Table 43

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.420	.528		14.061	.000
	Case Mix Index	4.007	.324	.232	12.376	.000

a. Dependent Variable: Clinical Care

Simple Regression Model 3

Table 44

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.052[a]	.003	.002	5.048988

a. Predictors: (Constant), Teaching Intensity

Table 45

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	194.227	1	194.227	7.619	.006[b]
	Residual	70690.086	2773	25.492		
	Total	70884.313	2774			

a. Dependent Variable: Patient Experience
b. Predictors: (Constant), Teaching Intensity

Table 46

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	9.152	.097		94.316	.000
	Teaching Intensity	-3.351	1.214	-.052	-2.760	.006

a. Dependent Variable: Patient Experience
b.

Table 47

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.294[a]	.086	.086	4.840182

a. Predictors: (Constant), HospitalSize

Table 48

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6138.734	1	6138.734	262.033	.000[b]
	Residual	64987.504	2774	23.427		
	Total	71126.238	2775			

a. Dependent Variable: Patient Experience
b. Predictors: (Constant), HospitalSize

Table 49

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.772	.138		78.334	.000
	HospitalSize	-.006	.000	-.294	-16.187	.000

a. Dependent Variable: Patient Experience

Table 50

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.152[a]	.023	.023	4.996847

a. Predictors: (Constant), Case Mix Index

Table 51

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1635.949	1	1635.949	65.521	.000[b]
	Residual	69087.789	2767	24.968		
	Total	70723.738	2768			

a. Dependent Variable: Patient Experience
b. Predictors: (Constant), Case Mix Index

Table 52

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.342	.532		25.067	.000
	Case Mix Index	-2.635	.326	-.152	-8.094	.000

a. Dependent Variable: Patient Experience

Simple Regression Model 4
Table 53

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.015[a]	.000	.000	7.121887

a. Predictors: (Constant), Teaching Intensity

Table 54

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33.547	1	33.547	.661	.416[b]
	Residual	141106.602	2782	50.721		
	Total	141140.150	2783			

a. Dependent Variable: Efficiency and Cost
b. Predictors: (Constant), Teaching Intensity

Table 55

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	5.367	.137		39.275	.000
	Teaching Intensity	-1.393	1.712	-.015	-.813	.416

a. Dependent Variable: Efficiency and Cost

Table 56

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.284[a]	.081	.081	6.827771

a. Predictors: (Constant), HospitalSize

Table 57

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11422.623	1	11422.623	245.024	.000[b]
	Residual	129739.148	2783	46.618		
	Total	141161.771	2784			

a. Dependent Variable: Efficiency and Cost
b. Predictors: (Constant), HospitalSize

Table 58

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7.605	.194		39.283	.000
	HospitalSize	-.008	.001	-.284	-15.653	.000

a. Dependent Variable: Efficiency and Cost

Table 59

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.253[a]	.064	.064	6.896473

a. Predictors: (Constant), Case Mix Index

Table 60

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9019.573	1	9019.573	189.641	.000[b]
	Residual	132030.296	2776	47.561		
	Total	141049.869	2777			

a. Dependent Variable: Efficiency and Cost
b. Predictors: (Constant), Case Mix Index

Table 61

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	15.270	.732		20.869	.000
	Case Mix Index	-6.168	.448	-.253	-13.771	.000

a. Dependent Variable: Efficiency and Cost

Appendix 3

Multivariate Analysis

Table 62

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.343[a]	.118	.117	5.280030

a. Predictors: (Constant), Case Mix Index, Teaching Intensity, Hospital Size

Table 63

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9522.642	3	3174.214	113.858	.000[b]
	Residual	71425.270	2562	27.879		
	Total	80947.912	2565			

a. Dependent Variable: Safety
b. Predictors: (Constant), Case Mix Index, Teaching Intensity, Hospital Size

Table 64

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	19.227	.688		27.940	.000
	Teaching Intensity	.075	1.295	.001	.058	.954
	HospitalSize	-.004	.001	-.187	-8.510	.000
	Case Mix Index	-4.250	.457	-.206	-9.301	.000

a. Dependent Variable: Safety

Multivariate Analysis # 2

Table 65

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.240[a]	.057	.056	4.857819

a. Predictors: (Constant), Case Mix Index, Teaching Intensity, Hospital Size

Table 66

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3888.448	3	1296.149	54.925	.000[b]
	Residual	63762.886	2702	23.598		
	Total	67651.334	2705			

a. Dependent Variable: Clinical Care
b. Predictors: (Constant), Case Mix Index, Teaching Intensity, Hospital Size

Table 67

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	8.144	.573		14.218	.000
	Teaching Intensity	.100	1.276	.001	.078	.938
	HospitalSize	.002	.000	.074	3.319	.001
	Case Mix Index	3.298	.389	.191	8.477	.000

a. Dependent Variable: Clinical Care

Multivariate Analysis # 3

Table 68

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.293[a]	.086	.085	4.834836

a. Predictors: (Constant), Case Mix Index, Teaching Intensity, Hospital Size

Table 69

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6090.104	3	2030.035	86.844	.000[b]
	Residual	64633.634	2765	23.376		
	Total	70723.738	2768			

a. Dependent Variable: Patient Experience
b. Predictors: (Constant), Case Mix Index, Teaching Intensity, Hospital Size

Table 70

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.576	.556		19.033	.000
	Teaching Intensity	-.687	1.184	-.011	-.580	.562
	HospitalSize	-.006	.000	-.295	-13.735	.000
	Case Mix Index	.124	.375	.007	.331	.741

a. Dependent Variable: Patient Experience

Multivariate Analysis #4

Table 71

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.312[a]	.097	.096	6.775126

a. Predictors: (Constant), Case Mix Index, Teaching Intensity, HospitalSize

Table 72

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13716.793	3	4572.264	99.609	.000[b]
	Residual	127333.076	2774	45.902		
	Total	141049.869	2777			

a. Dependent Variable: Efficiency and Cost

b. Predictors: (Constant), Case Mix Index, Teaching Intensity, Hospital Size

Table 73

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.763	.776		16.456	.000
	Teaching Intensity	3.777	1.659	.042	2.277	.023
	Hospital Size	-.006	.001	-.213	-9.972	.000
	Case Mix Index	-3.586	.524	-.147	-6.844	.000

a. Dependent Variable: Efficiency and Cost

Multi Collinearity

Table 74

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	19.227	.688		27.940	.000		
	Teaching Intensity	.075	1.295	.001	.058	.954	.963	1.038
	HospitalSize	-.004	.001	-.187	-8.510	.000	.717	1.396
	Case Mix Index	-4.250	.457	-.206	-9.301	.000	.705	1.418

a. Dependent Variable: Safety

Table 75

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	8.144	.573		14.218	.000		
	Teaching Intensity	.100	1.276	.001	.078	.938	.967	1.034
	HospitalSize	.002	.000	.074	3.319	.001	.696	1.436
	Case Mix Index	3.298	.389	.191	8.477	.000	.690	1.448

a. Dependent Variable: Clinical Care

Table 76

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	10.576	.556		19.033	.000		
	Teaching Intensity	-.687	1.184	-.011	-.580	.562	.964	1.037
	HospitalSize	-.006	.000	-.295	-13.735	.000	.714	1.400
	Case Mix Index	.124	.375	.007	.331	.741	.706	1.417

a. Dependent Variable: Patient Experience

Table 77

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	12.763	.776		16.456	.000		
	Teaching Intensity	3.777	1.659	.042	2.277	.023	.964	1.037
	HospitalSize	-.006	.001	-.213	-9.972	.000	.714	1.401
	Case Mix Index	-3.586	.524	-.147	-6.844	.000	.705	1.418

a. Dependent Variable: Efficiency and Cost

Table 78- F Distribution Critical Values

	Area in One Tail				
	0.005	0.01	0.025	0.05	0.10
Degrees of Freedom	Area in Two Tails				
	0.01	0.02	0.05	0.10	0.20
1	**63.657**	31.821	**12.706**	6.314	3.078
2	**9.925**	6.965	**4.303**	2.920	1.886
3	**5.841**	4.541	**3.182**	2.353	1.638
4	**4.604**	3.747	**2.776**	2.132	1.533
5	**4.032**	3.365	**2.571**	2.015	1.476
6	**3.707**	3.143	**2.447**	1.943	1.440
7	**3.499**	2.998	**2.365**	1.895	1.415
8	**3.355**	2.896	**2.306**	1.860	1.397
9	**3.250**	2.821	**2.262**	1.833	1.383
10	**3.169**	2.764	**2.228**	1.812	1.372
11	**3.106**	2.718	**2.201**	1.796	1.363
12	**3.055**	2.681	**2.179**	1.782	1.356
13	**3.012**	2.650	**2.160**	1.771	1.350
14	**2.977**	2.624	**2.145**	1.761	1.345
15	**2.947**	2.602	**2.131**	1.753	1.341
16	**2.921**	2.583	**2.120**	1.746	1.337
17	**2.898**	2.567	**2.110**	1.740	1.333
18	**2.878**	2.552	**2.101**	1.734	1.330
19	**2.861**	2.539	**2.093**	1.729	1.328
20	**2.845**	2.528	**2.086**	1.725	1.325
21	**2.831**	2.518	**2.080**	1.721	1.323
22	**2.819**	2.508	**2.074**	1.717	1.321
23	**2.807**	2.500	**2.069**	1.714	1.319
24	**2.797**	2.492	**2.064**	1.711	1.318
25	**2.787**	2.485	**2.060**	1.708	1.316
26	**2.779**	2.479	**2.056**	1.706	1.315
27	**2.771**	2.473	**2.052**	1.703	1.314
28	**2.763**	2.467	**2.048**	1.701	1.313
29	**2.756**	2.462	**2.045**	1.699	1.311
30	**2.750**	2.457	**2.042**	1.697	1.310
31	**2.744**	2.453	**2.040**	1.696	1.309
32	**2.738**	2.449	**2.037**	1.694	1.309
34	**2.728**	2.441	**2.032**	1.691	1.307
36	**2.719**	2.434	**2.028**	1.688	1.306
38	**2.712**	2.429	**2.024**	1.686	1.304
40	**2.704**	2.423	**2.021**	1.684	1.303
45	**2.690**	2.412	**2.014**	1.679	1.301
50	**2.678**	2.403	**2.009**	1.676	1.299
55	**2.668**	2.396	**2.004**	1.673	1.297
60	**2.660**	2.390	**2.000**	1.671	1.296
65	**2.654**	2.385	**1.997**	1.669	1.295
70	**2.648**	2.381	**1.994**	1.667	1.294
75	**2.643**	2.377	**1.992**	1.665	1.293
80	**2.639**	2.374	**1.990**	1.664	1.292
90	**2.632**	2.368	**1.987**	1.662	1.291
100	**2.626**	2.364	**1.984**	1.660	1.290
200	**2.601**	2.345	**1.972**	1.653	1.286
300	**2.592**	2.339	**1.968**	1.650	1.284
400	**2.588**	2.336	**1.966**	1.649	1.284
500	**2.586**	2.334	**1.965**	1.648	1.283
750	**2.582**	2.331	**1.963**	1.647	1.283
1000	**2.581**	2.330	**1.962**	1.646	1.282
2000	**2.578**	2.328	**1.961**	1.646	1.282
Large	**2.576**	2.326	**1.960**	1.645	1.282

Multivariate Hierarchical Regression Tables

MHR- Table 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.182[a]	.033	.031	5.529533

a. Predictors: (Constant), DNonProfit, Location, DRegion1NE, DRegion4W, DRegion2S, DPrivate, DRegion3MW

MHR- Table 2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2656.829	7	379.547	12.413	.000[b]
	Residual	77326.039	2529	30.576		
	Total	79982.868	2536			

a. Dependent Variable: Safety

b. Predictors: (Constant), DNonProfit, Location, DRegion1NE, DRegion4W, DRegion2S, DPrivate, DRegion3MW

MHR- Table 3

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	12.580	.450		27.979	.000
	DRegion1NE	-.150	.352	-.013	-.427	.670
	DRegion2S	.113	.392	.008	.288	.773
	DRegion3MW	.344	.375	.026	.919	.358
	DRegion4W	.773	.510	.036	1.515	.130
	Location	-2.158	.258	-.168	-8.377	.000
	DPrivate	.442	.392	.031	1.129	.259
	DNonProfit	-.147	.330	-.012	-.444	.657

a. Dependent Variable: Safety

MHR- Table 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.359[a]	.129	.126	5.251346

a. Predictors: (Constant), HospitalSize, DRegion2S, Teaching Intensity, DRegion4W, DPrivate, Location, DRegion3MW, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 5

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10324.280	10	1032.428	37.439	.000[b]
	Residual	69658.588	2526	27.577		
	Total	79982.868	2536			

a. Dependent Variable: Safety

b. Predictors: (Constant), HospitalSize, DRegion2S, Teaching Intensity, DRegion4W, DPrivate, Location, DRegion3MW, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 6

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	19.711	.818		24.103	.000
	DRegion1NE	-.380	.345	-.032	-1.102	.271
	DRegion2S	.149	.381	.011	.391	.696
	DRegion3MW	.171	.364	.013	.468	.640
	DRegion4W	1.199	.487	.055	2.462	.014
	Location	-.733	.260	-.057	-2.824	.005
	DPrivate	.144	.377	.010	.382	.702
	DNonProfit	.057	.317	.005	.181	.856
	Teaching Intensity	.051	1.325	.001	.039	.969
	Case Mix Index	-4.339	.488	-.210	-8.883	.000
	HospitalSize	-.004	.001	-.167	-7.357	.000

a. Dependent Variable: Safety

MHR- Table 7

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.257[a]	.066	.063	4.826687

a. Predictors: (Constant), DNonProfit, DRegion4W, Location, DRegion1NE, DRegion2S, DPrivate, DRegion3MW

MHR- Table 8

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4375.017	7	625.002	26.828	.000[b]
	Residual	61969.782	2660	23.297		
	Total	66344.799	2667			

a. Dependent Variable: Clinical Care
b. Predictors: (Constant), DNonProfit, DRegion4W, Location, DRegion1NE, DRegion2S, DPrivate, DRegion3MW

MHR- Table 9

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	11.925	.385		30.952	.000
	DRegion1NE	-.367	.314	-.035	-1.171	.242
	DRegion2S	-1.765	.341	-.146	-5.173	.000
	DRegion3MW	-.440	.333	-.038	-1.323	.186
	DRegion4W	-.653	.448	-.033	-1.458	.145
	Location	1.784	.213	.161	8.361	.000
	DPrivate	1.399	.327	.111	4.275	.000
	DNonProfit	1.568	.277	.149	5.670	.000

a. Dependent Variable: Clinical Care

MHR- Table 10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.309[a]	.096	.092	4.751717

a. Predictors: (Constant), HospitalSize, DRegion3MW, DRegion4W, Teaching Intensity, DPrivate, Location, DRegion2S, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 11

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6352.894	10	635.289	28.137	.000[b]
	Residual	59991.904	2657	22.579		
	Total	66344.799	2667			

a. Dependent Variable: Clinical Care

b. Predictors: (Constant), Hospital Size, DRegion3MW, DRegion4W, Teaching Intensity, DPrivate, Location, DRegion2S, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 12

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	8.301	.689		12.039	.000
	DRegion1NE	-.175	.318	-.017	-.550	.582
	DRegion2S	-1.634	.344	-.136	-4.753	.000
	DRegion3MW	-.310	.334	-.027	-.926	.354
	DRegion4W	-.851	.443	-.043	-1.920	.055
	Location	1.036	.225	.093	4.605	.000
	DPrivate	1.468	.325	.117	4.515	.000
	DNonProfit	1.418	.275	.135	5.164	.000
	Teaching Intensity	.481	1.280	.007	.376	.707
	Case Mix Index	2.311	.415	.134	5.570	.000
	HospitalSize	.002	.000	.075	3.286	.001

a. Dependent Variable: Clinical Care

MHR- Table 13

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.297[a]	.088	.086	4.794826

a. Predictors: (Constant), DNonProfit, DRegion4W, Location, DRegion1NE, DRegion2S, DPrivate, DRegion3MW

MHR- Table 14

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6078.110	7	868.301	37.768	.000[b]
	Residual	62602.741	2723	22.990		
	Total	68680.851	2730			

a. Dependent Variable: Patient Experience

b. Predictors: (Constant), DNonProfit, DRegion4W, Location, DRegion1NE, DRegion2S, DPrivate, DRegion3MW

MHR- Table 15

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	7.340	.339		21.660	.000
	DRegion1NE	.771	.299	.073	2.574	.010
	DRegion2S	3.186	.328	.262	9.719	.000
	DRegion3MW	2.270	.319	.194	7.126	.000
	DRegion4W	.711	.434	.036	1.639	.101
	Location	1.626	.211	.145	7.709	.000
	DPrivate	-1.035	.322	-.082	-3.219	.001
	DNonProfit	-.086	.272	-.008	-.315	.753

a. Dependent Variable: Patient Experience

MHR- Table 16

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.408[a]	.166	.163	4.588646

a. Predictors: (Constant), HospitalSize, DRegion3MW, DRegion4W, Teaching Intensity, DPrivate, Location, DRegion2S, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 17

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11409.422	10	1140.942	54.187	.000[b]
	Residual	57271.428	2720	21.056		
	Total	68680.851	2730			

a. Dependent Variable: Patient Experience
b. Predictors: (Constant), HospitalSize, DRegion3MW, DRegion4W, Teaching Intensity, DPrivate, Location, DRegion2S, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 18

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	6.690	.681		9.821	.000
	DRegion1NE	1.330	.295	.125	4.505	.000
	DRegion2S	3.707	.321	.305	11.555	.000
	DRegion3MW	2.631	.311	.225	8.451	.000
	DRegion4W	.641	.417	.033	1.536	.125
	Location	.988	.216	.088	4.571	.000
	DPrivate	-1.455	.311	-.115	-4.671	.000
	DNonProfit	-.086	.263	-.008	-.326	.745
	Teaching Intensity	1.192	1.155	.019	1.032	.302
	Case Mix Index	1.450	.387	.084	3.743	.000
	HospitalSize	-.007	.000	-.326	-15.216	.000

a. Dependent Variable: Patient Experience

MHR- Table 19

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.365[a]	.134	.131	6.655858

a. Predictors: (Constant), DNonProfit, DRegion4W, Location, DRegion1NE, DRegion2S, DPrivate, DRegion3MW

MHR- Table 20

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18657.014	7	2665.288	60.164	.000[b]
	Residual	121073.109	2733	44.300		
	Total	139730.123	2740			

a. Dependent Variable: Efficiency and Cost

b. Predictors: (Constant), DNonProfit, DRegion4W, Location, DRegion1NE, DRegion2S, DPrivate, DRegion3MW

MHR- Table 21

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	9.028	.469		19.254	.000
	DRegion1NE	-4.823	.414	-.319	-11.643	.000
	DRegion2S	-6.364	.454	-.368	-14.033	.000
	DRegion3MW	-3.644	.441	-.219	-8.263	.000
	DRegion4W	-2.780	.601	-.099	-4.621	.000
	Location	3.946	.292	.247	13.492	.000
	DPrivate	-2.263	.445	-.126	-5.089	.000
	DNonProfit	-.327	.376	-.022	-.870	.384

a. Dependent Variable: Efficiency and Cost

MHR- Table 22

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.454[a]	.206	.203	6.374278

a. Predictors: (Constant), HospitalSize, DRegion3MW, DRegion4W, Teaching Intensity, DPrivate, Location, DRegion2S, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 23

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28806.335	10	2880.633	70.897	.000[b]
	Residual	110923.789	2730	40.631		
	Total	139730.123	2740			

a. Dependent Variable: Efficiency and Cost

b. Predictors: (Constant), HospitalSize, DRegion3MW, DRegion4W, Teaching Intensity, DPrivate, Location, DRegion2S, Case Mix Index, DNonProfit, DRegion1NE

MHR- Table 24

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	17.269	.941		18.349	.000
	DRegion1NE	-5.011	.409	-.332	-12.258	.000
	DRegion2S	-6.454	.444	-.374	-14.534	.000
	DRegion3MW	-3.770	.431	-.226	-8.743	.000
	DRegion4W	-2.368	.579	-.084	-4.092	.000
	Location	2.317	.300	.145	7.728	.000
	DPrivate	-2.509	.431	-.139	-5.820	.000
	DNonProfit	-.057	.364	-.004	-.156	.876
	Teaching Intensity	-.411	1.604	-.005	-.256	.798
	Case Mix Index	-4.054	.536	-.166	-7.561	.000
	HospitalSize	-.005	.001	-.165	-7.878	.000

a. Dependent Variable: Efficiency and Cost

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