6-9-2016

Remote Hospitals and Hospital Value Based Purchasing

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REMOTE HOSPITALS AND HOSPITAL VALUE BASED PURCHASING

By

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DISSERTATION

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy of Nursing

The University of New Mexico

Albuquerque, New Mexico

DEDICATION

I would like to dedicate this dissertation to my family, especially my husband and my children, who have made sacrifices so that I could complete this work.

ACKNOWLEDGEMENT

I would like to acknowledge the following people for their consultation and assistance:

Julie Sochalski PhD, RN, FAAN at the University of Pennsylvania,

Carrie Colla PhD and Ethan Burke MD at the Dartmouth Institute of Health Policy and Clinical Practice

Peter Hussey PhD at the Rand Corporation

Weatherbee Dorshow PhD at Earth Analytics

I would like to acknowledge the Robert Wood Johnson Foundation for their support and funding of my academic program.

I would like to especially acknowledge Dr Barbara Damron for her continued participation on my committee and input on my dissertation during her appointment as NM Cabinet Secretary of Higher Education.

I would also like to especially acknowledge my outside committee member Dr Andrew Ryan at the University of Michigan for his expert advice regarding Value Based Purchasing and health economics.

Remote Hospitals and Hospital Value Based Purchasing

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ABSTRACT

The purpose of this study is to identify remote hospitals and then assess their performance in the first three years of the Hospital Value Based Purchasing program. A definition for remote hospital was created using clinical outcome literature and travel time. The hospitals were then identified as those hospitals more than 60 minutes driving time from the next nearest hospital by using geographic information systems software (n = 127). The remote hospitals' payment adjustments and raw quality scores were be compared with non-remote hospitals. Remote hospitals have done well in the first three years improving their payments over time. However, little change is seen in the quality metrics used in the program. A review of economic theories relevant to hospital performance and behavior identified several hospital characteristics that may contribute to performance. None of the characteristics were predictive of success in the program.

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Significance

The United States (US) spent $2.8 trillion on health care in 2012 which is approximately 17.2% of the Gross Domestic Product (GDP) (Centers for Medicare and Medicaid Services [CMS], 2014). Spending is projected to reach $3.1 trillion in 2014, accounting for 18.3% of GDP. The US has ranked last or near last on every measure of population health among developed nations as assessed by the World Health Organization (WHO) every year since 2004 as cited by Davis et al (2014). Concerns regarding the high level of spending with little return in terms of health outcomes have created focused attention on the quality of healthcare in the US, especially since The Institute of Medicine (IOM, 2001) published *Crossing the Quality Chasm: A New Health System for the 21st Century,* which highlighted a lack of consistent quality in US healthcare delivery.

Since 1960 hospital care has accounted for the largest percentage of US healthcare spending; 32.1% in 2013 according to CMS. Hospital Value Based Purchasing (HVBP) is a pay for performance program which is mandated by Congress in the Affordable Care Act (ACA) of 2010 and implemented by CMS to create financial incentives for hospitals that improve the quality of their care and penalties for those that fail to do so. All hospitals that receive Medicare payments through the Inpatient Prospective Payment System (IPPS) are participants in the program. Hospitals designated as Critical Access Hospitals (CAHs) are not part of the IPPS. (The **Definitions** section (pp. 21) outlines specific details of CAHs and the IPPS).

The HVBP program creates a competitive environment in which each participating hospital is ranked against all other participating hospitals nationwide.

Hospitals ranked at the top receive a positive adjustment (a bonus) on subsequent Medicare payments while lower ranking hospitals suffer a negative adjustment (a penalty) on their payments from Medicare.

Previous research examining the relationship between the distance to health care services and patient outcomes has defined greater than 100 miles as the longest travel distance. Remote hospitals, defined here as IPPS hospitals that are more than 100 miles away from the next IPPS hospital, are in a unique position because they have faced little direct competition in the past due to their isolation. Especially in the Pacific Northwest, Alaska, and the Southwest, many of these hospitals provide healthcare for American Indian and Alaska Native reservations and communities. People served by these remote hospitals already travel significant distances to receive care (Hart, Larson, & Lishner, 2005). Distance in and of itself can be a barrier to care for patients and may place an untenable burden on family members of hospitalized patients (Agazio, 2003).

There are also remote hospitals which are too small to participate in the HVBP. As the program changes from year to year smaller hospitals may lack sufficient case numbers and therefore default back to standard Medicare payments. In the first year of the program, 2986 hospitals were eligible for payment adjustments. For the second year this number decreased by 256 to 2730. By the third year the number had increased to 3091. This raises numerous questions related to policy. Is the best outcome for these hospitals to remain open without financial accountability for quality measures? What would it mean for the community and the hospitals if these hospitals became Critical Access Hospitals (CAHs)? Should there be a separate program for small hospitals, which would include these remote hospitals, so that they can also be judged on quality? What

would happen if these hospitals closed; how far would people have to travel for care? How can access and quality be balanced in these sparsely populated regions? Can a federal policy be created to apply to all hospitals creating equity in the face of such great diversity of settings?

The ACA mandates that a small and rural hospital program be created two years after enacting the law however, details for the program have not yet been announced by CMS. The current HVBP program is being evaluated by CMS from a large scale perspective without evaluating the impact on specific small groups of hospitals. Payment adjustments, the top and bottom hospitals, and quality outcomes are being aggregated nationally. This research seeks to analyze the performance of remote hospitals through the lens of HVBP and the policy implications of this program for remote hospitals. As a whole this project will create a template or model for evaluating other groups of hospitals within the program.

Background

Quality of Healthcare

The first Federal agency focused on the quality of healthcare in the US was created in 1989 as the Agency for Health Care Policy and Research by Congress and housed within the department of Health and Human Services (HHS). It was renamed the Agency for Healthcare Research and Quality (AHRQ) in 1999. The National Quality Forum (NQF) was formed in 1999 as a non-profit non-partisan organization to advance quality in healthcare. NQF works with CMS and AHRQ to help determine and implement the use of quality measures by creating workgroups of experts and stakeholders from a cross section of the healthcare industry. Both non-profit and for profit healthcare quality

organizations have proliferated in recent years to provide education, accreditation, and assistance to healthcare organizations seeking to improve quality and attain standards set at the federal level.

Since 2003, AHRQ has published the *National Healthcare Quality Report* (NHQR) annually. This report characterizes national trends in healthcare quality in the form of Quality Indicators (QI) for processes of care and outcomes related to safety, timeliness of care, readmissions, complication, deaths, use of medical imaging, patient experience (satisfaction), volume of Medicare patients, and Medicare reimbursement. Many of these QI measures have been incorporated in various pay for performance programs for specified conditions such as acute myocardial infarction (AMI) and strokes. Currently these data are submitted to the agency electronically by hospitals. In 2005 AHRQ launched its hospitalcompare.hhs.gov website to allow the public to review aggregated QI for hospitals by zip code, city, or state.

In the private sector, The Institute for Healthcare Improvement (IHI) was founded in 1991 as a not for profit organization that works in conjunction with other groups to help identify and implement best practices on a national scale. The organization is best known for their 100,000 Lives patient safety campaign and most recently their Triple Aim campaign, which focuses on population health, individual experience, and cost efficiency. IHI has also grown, becoming an international organization working towards improved healthcare in nations around the world (IHI.org).

Over the past two decades, demonstration programs, voluntary programs, and mandatory programs for quality reporting have become common in healthcare. CMS introduced voluntary hospital quality reporting in 2003; beginning in 2004, hospitals

were required to report data on a core set of measures in order to receive their annual payment updates (Pham, Coughlan, & O'Malley, 2006). The effect of quality reporting on care processes and patient outcomes has been studied both independently and in conjunction with incentive payments. The research shows mixed results.

The first large scale quality reporting program for a specific procedure was the New York State Cardiac Surgery Reporting System (CSRS) which began publishing mortality rates for coronary artery bypass graft (CABG) surgery for hospitals and individual surgeons in NY state in 1991 (Jha & Epstein, 2006). At that time, there was considerable concern that surgeons and hospitals would turn away sicker patients, or even send them out of state, in order to improve their mortality rates (Steinbrook, 2006). However, over the first dozen years of the program, in most cases mortality rates dropped while out of state referrals decreased and the percent of high risk patients increased (Chassin, 2002). Among limitations of this program, the only reported outcome is mortality, and processes that potentially influence mortality are not captured (Chassin, 2002). Anecdotally, at least some of the hospitals with the greatest improvements in quality made significant changes to their processes (Chassin, 2002). Steinbrook (2006) pointed out that there is a risk for "gaming" of the system by assigning a higher risk score to patients. For example, Epstein (2006) reported that almost half of the reduction in risk-adjusted mortality in the initial years of the program could be attributed to an increase in severity of illness coding (i.e., upcoding), but that has been difficult to substantiate due to subsequent improvements in data auditing at the state level. Another weakness was that the system was designed to capture patients that received CABG but not patients who might have been candidates but were turned away due to high risk (Epstein, 2006).

Epstein cited studies on high risk patient avoidance by cardiac surgeons in response to the score cards and concluded that the evidence that quality reporting improved quality was weak.

Pham et al. (2006) conducted site visits to 36 hospitals in various regions across the US to assess organizational impact of quality reporting. They found that hospitals tended to focus on quality improvements in the areas that were being measured, often neglecting other aspects of care that were not being measured. There were few hospitals that began to focus on quality in areas that were not reported. Pham et al. also found that hospitals had to commit resources not only to improvements but also to reporting activities. By and large, the hospital administrators who felt that reporting improved the quality of care were primarily from hospitals that had not previously been engaged in measuring quality indicators.

Since CMS launched the hospitalcompare.hhs.gov website in 2005 the measures of processes and outcomes used to evaluate hospital quality have evolved. Process measure reporting involves the documentation that standards of care have been met for specified conditions and were the first measures to be publicly reported by CMS. Outcomes measures were added more recently to the website and report on mortality, length of stay, and readmission rates but may also include some efficiency or cost based measures. Werner and Bradlow (2006) assessed data from 2004 comparing hospital performance measures against mortality rates for specific conditions. They found that there was a statistically significant but small relationship between performance measures and mortality. In a subsequent study, Werner & Bradlow (2010) evaluated quality scores for hospitals between 2004 and 2006. They found that the greatest improvements in

process performance occurred in the hospitals that began with low baseline performance and that hospitals with high baseline performance tended to maintain their performance. The impact of improvement on process measures could not be conclusively linked with improvements in outcomes across all measures. They also note that improvements in process performance may not be entirely due to actual improvements in care but an improvement in the documentation of care and processes.

Ryan, Nallamothu, & Dimick (2012) evaluated 30-day mortality and process of care performance measures for three conditions based on Medicare data from 2000-2008: myocardial infarction, heart failure, and pneumonia. After accounting for a general decrease in mortality over that interval, they found for only one of those conditions (heart failure) a small but statistically significant decrease in mortality that could be linked to public reporting.

Pay for Performance

Public dissatisfaction with managed care along with new federal attention to quality in the late 1980's set the stage for changes in payment systems (Rodwin, 2010). The first pay for performance (P4P) program was the Quality Care Compensation System created by the private insurer U.S. Healthcare in 1987. Among other private payers and Medicaid programs P4P experiments appeared in limited numbers in the early 1990's (Rosenthal, Fernandopulle, Song, & Landon, 2004). These programs expanded and proliferated in the private sector in the early 2000's (Damberg, Sorbero, Lovejoy, Martsolf, Raaen, & Mandel, 2014) and continue to be a part of the reimbursement structure for many private insurance companies.

In 1999 the IOM published "*To Err is Human*." This groundbreaking report included an estimate that up to 98,000 Americans died in hospitals each year due to medical errors and brought concerns about hospital quality and safety to the forefront of public concern. Based on this report, the Leapfrog Group was formed to improve the safety of hospitals. The Leapfrog Group is made up of employers that use collective purchasing power and the recommendations of the group to purchase higher quality healthcare for their employees. Currently the Leapfrog Group maintains a website of hospital safety scores and the Hidden Surcharge Calculator for employers to assess the cost of errors in hospital charges. They have also created a P4P program called the Leapfrog Hospital Recognition Program which they license to health insurance plans.

The Premier Hospital Quality Incentive Demonstration (HQID) program served as the demonstration project for HVBP which became the permanent federal program under the ACA to incorporate P4P in the context of Medicare reimbursement. The HQID was a partnership between CMS and Premier Inc. (an organization of not-for-profit hospitals) that was initially authorized for the three fiscal years beginning October 1, 2003 and ending September 30, 2006. The demonstration was extended for an additional 3 years ending on September 30, 2009. This program provided incentive payments totaling $12 million annually to hospitals based on a combination of process and outcome measures (CMS.org, 2011). According to CMS, 216 hospitals that completed the demonstrations among which quality improved across measures a total of 18.65% in six years. However, this is an aggregate score reflecting both process and outcome measures. The improvement may demonstrate increased compliance with documentation of the desired processes of care and changes in the methods used for adjusted mortality rates. A

research review conducted by Petersen et al (2006) found significant evidence for "gaming" in the reporting of process measures, and improved compliance with documentation of care rather than improvements in care provided. Changes in the calculation of adjusted mortality rates are similar to the up-coding that occurred in the first years of the NY CSRS (Epstein, 2006). Ryan (2009) found that from 2000 to 2006, there was no significant decrease in 30–day mortality for AMI, heart failure, and pneumonia, further suggesting that patient outcomes did not actually improve only the documentation of care processes.

Research on quality improvement created by P4P has mixed results. In 2014 RAND Health published a review of VBP programs which included P4P programs (Damberg et al., 2014). This analysis included a literature review and expert panel discussion. The technical expert panel (TEP) included leaders who administer VBP programs, hospital leaders who implement these programs, and healthcare researchers. The study found limited research on the success of VBP programs. The literature that does exist shows mixed results in the areas of quality improvement and cost efficiency. Based on the TEP and limited literature they have identified six aspects of VBP programs that appear to lead to success: sizeable incentives, measure alignment either across programs or specific to the population served, provider engagement, performance targets that reward both achievement and improvement, and support for improvement. This RAND report also identified possible undesirable side effects of P4P which included gaming of data, ignoring quality of care in areas not being reported on, overtreatment of patients, and avoidance of sicker or socially more challenging patients. There were a limited number of studies to review that related to such unintended consequences of P4P.

They found only five publications evaluating the effect of P4P on quality measures not included in the incentive programs, but most of the studies were of small or short-duration programs. In some cases non-incentivized measures improved with incentivized measures and in other cases they declined. To date, this type of study has not been done on the CMS data. They also found no quality studies that showed a change in disparities and treatment of disadvantaged groups based due to P4P.

Notably missing from the literature are the strategies used for success and details regarding processes from those providers that are high achievers in P4P. Members of the TEP state that this is frequently shared at trade conferences but not published, which could be viewed as information that lacks credibility. The report concludes that continued quantitative analysis of VBP programs is necessary to monitor outcome. They also point out a need for qualitative research to better identify key components within organizations that lead to success in VBP programs.

Hospital Value Based Purchasing

The ACA describes HVBP in prescriptive detail. All hospitals paid under the IPPS, except those designated as CAH, are required to participate and face adjustment to their Medicare payments as long as they meet minimum case numbers. The ACA mandates that the program pertain to all payments to hospitals for discharges occurring after October 1, 2012 with benchmarking quality data being collected in 2010. The quality domains used change each year from FY 13 to FY 15 and included domains are presented in the Definitions section. For each performance measure a score is calculated for overall achievement and for improvement over the previous year or, in the case of the first year of a measure, the benchmarking period. Whichever score is higher, actual

performance or improvement, is used for each measure for the final calculation of the Total Performance Score (TPS). The hospitals are then ranked by TPS score. The measurement periods for each Fiscal Year (FY) of payment (October 1 through September 30) along with the relative weight of each domain are presented in Table 1.

There are also financial consequences for hospitals based on readmission rates and Hospital Acquired Infections (HAI); however in this study only the HVBP program will be evaluated. For FY13 hospital could receive an incentive or penalty adjustment based on the HVBP score of up to 1% on all Diagnosis Related Groups (DRGs) billed to Medicare. In FY 14 the percentage change increased to 1.25% and in FY15 the payment adjustment increased again to 1.5%. The ACA caps the adjustment at 2% in FY17.

The ACA requires that the amount of money distributed in incentive payments equals the amount of money withheld in penalties. In order to achieve this, a linear exchange function is applied which represents the relationship between a hospital's TPS and the amount of money they receive. The linear exchange function ensures a near perfect correlation between TPS and the size of the incentive. The adjustment factor Hospital payment adjustments follows a normal distribution, as seen in Figure 1.

In order to participate in HVBP, hospitals must meet minimum case numbers for each domain. In FY13 and FY14, they must meet the minimum case number for all of the domains in order to participate. However in FY15if the hospital meets case numbers for at least two of the four domains they are eligible to participate in HVBP. The weighting of the domains in which they do not have enough case numbers to qualify will be redistributed to the other domains in calculating the TPS. Although CAH are excluded

from HVBP at present, a pilot program beginning in May 2014 created a VBP scheme for these hospitals.

Remote Hospitals

For the purposes of this proposed research remote hospitals are defined as hospitals paid through the IPPS that are located 100 miles or more from the next hospital receiving IPPS payments. Thompson et al (2102) assessed mortality risk for hemodialysis patients relative to their distance from a dialysis center. They found that there was increased mortality risk in patients living more than 100 miles away from their dialysis center and defined these are remote patients. Goldberg et al (2014) also used 100 miles as their most remote distance in evaluating 5-year survival rates and likelihood of transplant for Veterans with liver failure. They found that increased distance from the transplant center decreased the likelihood of not only receiving and transplant but also being added to the transplant waiting list. Greater distances increased the risk of death and decreased access to care.

This study will look at the 25 hospitals identified by CMS as acute care hospitals which are located more than 100 miles away from the next nearest acute care hospital. Table 2 lists these hospitals, their location, and their distance from the next nearest hospital.

The hospitals were identified using the list of hospitals found at Data.Medicare.gov. The table was downloaded into Microsoft Excel where it was sorted by hospital type (acute care, Veteran's Administration, or CAH). The data were further cleaned to remove hospitals located in US Territories. Hospitals that were missing x,y coordinates were located using google maps and the coordinates were added to the table.

Acute care hospitals were separated from other types of hospitals. ArcGIS software was then used to map the hospitals in the United States. The "near tool" was used in ArcGIS to determine the distance between each hospital and the next nearest. The hospitals were then sorted and a map was created with only the 25 remote hospitals. The Cecil G Sheps Center for Health Services Research at the University of North Carolina provided a listing of hospital closures since 2010. There have been five hospitals that were paid through the IPPS that have closed since the beginning of 2013; none of which were located more than 100 miles from the next acute care hospital. Based on this process it is assumed that all remote hospitals are accounted for.

Purpose

The purpose of this study is to evaluate the performance of remote hospitals through the lens of Hospital Value Based Purchasing.

Research Questions

1. Does Firm Theory apply to remote hospitals?

2. Do nonprofit remote hospitals have higher quality scores than for profit remote hospitals?

3. Have any nonprofit remote hospitals with a reduced budget due to HVBP improved their quality scores? Have nonprofit remote hospitals receiving bonus payments improved their quality in subsequent years?

4. Does the comparative advantage theory of competition apply to remote hospitals?

5. Have quality measures improved among remote hospitals during the first 3 years of HVBP?

Specific Aims

1. Analyze the performance of remote hospitals during the first 3 years of HVBP in terms of TPS and each of the components included in the TPS. There will be a focus on year to year changes and revenue changes.

2. Assess the resources of each hospital that may influence their score or be impacted by changes in revenue due to HVBP.

3. Discuss the policy implications of the HVBP program for remote hospitals.

Hypotheses

1. Remote nonprofit hospitals will have higher measures of quality than remote for-profit hospitals.

2. Remote hospitals receiving reduced Medicare payments due to HVBP will have a decrease in their TPS in subsequent years and remote hospitals receiving bonus Medicare payments due to HVBP will increase their TPS in subsequent years.

3. Based on the Comparative Advantage Theory of Competition, remote hospitals that have more resources will have higher a TPS.

Theoretical Framework

From the perspective of a hospital-based nurse there are two major economic theories that, together, form a theoretical framework to evaluate various aspects of hospital performance using the criteria and measures of HVBP: the theory of the firm and the comparative advantage theory of competition.

The theory of the firm posits that firms emerge in markets in order to maximize profits and that all decision-making is driven by profit. Increasing the quality of a product leads to an increased price to the consumer and the possibility of increased profits

(Coase, 1937). Coase (1937) introduced the concept of transaction cost to firm theory, which implies that resources are allocated between internal production and outside contracting in a way which responds to market conditions to maximize profit. This concept is used to unite the assumptions that a) resource allocation is driven by market pricing and b) that the decision are made by management within the firm (Coase, 1937).

A hospital can be seen as a firm that produces a service: patient care. Various aspects of this production are achieved by internal resources and processes or through outside contracting. Services within the hospital from food service, laundry, and maintenance to laboratory testing, nurse staffing, and physician staffing can be managed internally or contracted to outside agencies. Purchasing and cost in a hospital are different from manufacturing in that the payment to the hospital is made by a third party insurer instead of the consumer (patient). HVBP rewards higher quality care with higher reimbursement rates. So although the cost to the consumer (patient) may remain the same, the quality measures can increase or decrease the earnings of a hospital through reimbursement in a way that is comparable to an increase or decrease in product pricing in manufacturing.

In his landmark work Newhouse (1970) created an economic model of the nonprofit hospital as a firm in which quantity and quality are the goals of the institution administrator instead of profits. There are several assumptions made by Newhouse. The first assumption is that hospital expenses are paid directly by the consumer. This assumption is obviously violated by the presence of health insurance, both private and public. The second assumption is that there is an ethical component to health care and patients as consumers have a “right” to care in the hospital. In the case of the nonprofit

hospital the administrator's performance cannot be judged in the usual sense of profitability, so they are instead judged on the quantity of care that is provided and the quality of that care. This leads to the third assumption which is that the relative importance of quality versus quantity is the same to the trustees of the hospital board, the administrator, and the medical staff providing the care.

In this model cost is used as a measure for quality. This is based on the assumption that increased quality comes at an increased cost. Quantity is measured simply as patient days. Newhouse (1970) concluded that although the hospital actually produces a variety of products in the variety of illnesses treated, the conclusions created by the model are the same whether multiple products or a single product are considered. The nonprofit hospital administrator will attempt to maximize quality and quantity with a bias toward quality along the demand curve as constrained by budget. Newhouse also concludes that although the budget may be different with the introduction of a third party payer, the conclusions made about the quality-quantity trade-offs remain the same.

Lakdawalla & Philipson (1998) conducted an analysis of nonprofit production as compared with for profit status in term of competition within industry. They tested their model with data from the long term care industry. In their model they discuss firms that are profit-deviators, or those firms that choose not to maximize profits, and separate profit deviators from nonprofit firms. They conclude that profit-deviators produce more long term output than profit maximizers. They also postulate that nonprofit firms have lower costs than for profits because in a mixed production environment there would be no benefit to nonprofit status if costs were higher than in a for profit firm (Lakdawalla & Philipson, 1998).

Malani, Philipson, & David (2003) evaluated three models of nonprofit firms related to hospitals. The altruism model predicts that nonprofit hospitals are driven by quality and therefore have higher costs and are less efficient than for profit hospitals. This contradicts the previous conclusions made by Lakdawalla & Philipson. Malani et al. argue that both the Newhouse and the Lakdawalla and Phillpson models ignore the tax benefits of nonprofit status and make the assumption that consumer preference for nonprofits does not exist. They also argue that the charitable donations in the Lakdawalla and Philipson model are negligible to hospital budgets.

Nonprofit hospitals often provide higher quality and often are larger in size than for-profit hospitals. A positive demand shock, such as a rapid increase in the number of patients and demand for services, would induce the entry of for-profit hospitals into a given market. A positive shock to labor supply, such as an increase in wages, would affect for-profit hospitals negatively while nonprofit hospitals would be less adversely affected. Prices are set by for-profit hospitals with nonprofit hospitals theoretically using excess earnings to increase quantity and quality (Malani et al., 2003).

Among the 25 remote hospitals identified in this study there are 12 nonprofit, 2 for profit, and 11 government-owned hospitals. Thus, the nonprofit version of firm theory should apply directly for almost half of remote hospitals. Of the 11 government owned hospitals, three are federally funded Indian Health hospitals and eight are locally funded such as county hospitals. The local government funded hospitals may also follow the nonprofit firm theory. The competitive firm theories do not necessarily apply to this group because of the nature of remoteness, but could apply to HVBP in general. By the nature of their geographic location, remote hospitals have not faced competition from

other hospitals in the past. HVBP created a competitive environment among all hospitals, pushing the remote hospitals into a market they had not previously experienced.

Hunt and Morgan (2001) proposed the comparative advantage theory of competition as an update on neoclassical competition theory. Under this theory, organizations that have better resources compared to their competitors have an advantage in the marketplace and superior performance. There are several key foundations to this model which apply quite well to hospitals.

The model states that demand for product is heterogeneous across the industry and dynamic with regard to consumer preferences. In the hospital market this would mean that nationally there is heterogeneity in the use of hospital services which is driven by consumer preference. This can be witnessed through the spending per Medicare beneficiary which is widely varied across regions for the same condition and episode of care, indicating that the number of services provided within a hospitalization vary (Reschovsky, Hadley, O'Malley, & Landon, 2014). The variability in hospital services used per patient has been associated with patient (consumer) preferences (Baker, Bundorf, & Kessler, 2014).

Information available for both consumers and administrators within the firm is not perfect and costly. In the hospital industry this means that neither patients nor hospital administrators have perfect quality data and that the data that is available comes at a significant price. Reporting quality data requires financial investment on the part of the hospital in terms of computer technology and staff to collect and submit data. There is also a cost to tax payers associated with maintaining reporting websites. Patients still find interpreting these results difficult (Huppertz & Carlson, 2010).

The motivation of the firm administrators is one of "constrained self-interest" and their objective is "superior financial performance", similar to the tenets of Newhouse's nonprofit firm model.

The role of the administrator is to create and implement strategies based on recognition and understanding. This requires hospital administrators to be able to recognize and understand all facets of patient care to form a base for their strategies.

Resources are heterogeneous and their mobility is not perfect. For the hospital industry this can apply to all of the resources required to provide patient care in the variability that exists in resource availability and the transport or movement of those resources. A clear example of this is the nursing staff which is that largest resource cost in the hospital. Nurses are not evenly distributed across the nation and because they are people with free will, they are not simple to relocate to areas of need (Buerhaus, Auerbach, Staiger, & Muench, 2013; Kovner, Corcoran, & Brewer, 2011; Siow, 2008). Resources are both tangible and intangible, including finances, property, legal, human capital, and organizational and informational knowledge.

The environment influences firm behavior and performance. Bayes (1986) included internal and external environmental factors in a study examining a variety of behaviors that were predictive of hospital size.

This study will determine if remote hospitals follow the model of the firm. From a theoretical standpoint, budget constraints will require a reduction in either quality or quantity in order to keep cost and revenue equal. Conversely, hospitals receiving a bonus payment have additional financial resources to move quality even higher. Using comparative advantage theory as a framework and publicly available information about

hospitals resources, for example size, staffing, and services provided, the resources will be compared to actual performance in HVBP.

Definitions

Case-Mix Index

The case-mix index is a modifier applied to a variety of hospital reporting and billing which accounts for the average severity of illness of patients treated by a single hospital. Each hospital has a unique case-mix index modifier.

Critical Access Hospital (CAH)

CAHs are hospitals that receive special funding from Medicare to ensure that there is access to emergency healthcare in rural areas. There are specific requirements for a hospital to qualify as a CAH. The hospitals must be in a rural area and located at least 35 miles from the next nearest hospital, have fewer than 25 beds, offer 24 hour, 7 day a week emergency care, and have an annual average length of stay for their patients of less than 96 hours. The focus of a CAH is to stabilize and then transfer patients to larger regional hospitals.

Diagnosis Related Groups (DRG)

Hospitalization of Medicare patients is paid for using a system of DRGs. The DRG represents the average cost of caring for a patient with a specific diagnosis. A single hospitalization may have more than one diagnosis requiring care. This additional care is billed through additional charges that are added to the DRG.

Disproportionate Share Hospitals (DSH)

The DSH adjustment to DRG payments is made to account for hospitals with a very high number of low income patients that rely on Medicaid and/or Medicare Part A

only to pay for their hospital expenses and for uncompensated care due to low income uninsured patients.

Inpatient Prospective Payment System (IPPS)

The IPPS is the system under which most hospitals are paid for Medicare patients. These are Medicare Part A payments made for inpatient stays. Rates are set using a calculation that includes cost of living adjustments and are based on the true costs of care. Each hospitalization is paid based on the DRG which is based on the average cost of treating a patient with that diagnosis. The base rate is made up of labor and nonlabor costs. The labor portion of the payment is adjusted for cost of living based on the location of the hospital. For Alaska and Hawaii the nonlabor portion is also adjusted for cost of living. Teaching hospitals and hospitals treating a large percentage of low income patients receive additional payment adjustments. If a hospitalization becomes unusually complicated and expensive relative to the DRG it is known as an outlier and additional adjustments are made to the DRG payment to account for the unexpected excessive cost (CMS.org).

Remote Hospitals

For the purpose of this study, remote hospitals are defined as acute care hospitals paid under the IPPS that are located 100 or more miles away from the next IPPS hospitals. This distance is based on the shortest distance between two points ("as the crow flies") and not actual driving distance.

SCIP

Surgical Care Improvement Project (SCIP)

Total Performance Score (TPS)

The TPS is the sum of weighted points earned for each domain in HVBP.

Quality Measures

Process Measures Domain

The process measures have been reported to CMS by hospitals since 2004 (Table 3). They are published by CMS in collaboration with the Joint Commission (TJC), AHRQ, and NQF. There are currently 13 process measures used in HVBP. Hospitals are awarded points based on the percentage of cases in which each of these processes was required and documented as completed. Two sets of points are awarded for each measure. Points are awarded for achievement based on how hospitals compare to all other hospitals. Points are also awarded for improvement based on how a hospital compares to its previous reporting period. All points are totaled and the higher score between the achievement score or the improvement score is used. The score is weighted (see Table 1 for weighting) and then added to the other measures for the TPS. Hospitals must have 10 cases in at least 3 process measures in order to qualify to participate in HVBP.

Outcome Domain

In FY14 hospitals must have enough qualifying cases in two of the three measures in order to participate in HVBP. For FY15 hospitals must have enough cases in at least 3 of the 5 measures (with mortality measures counting as three measures) in order to have the outcome measure included in the TPS.

Mortality Measure

Three measures of mortality were added to FY14 HVBP to measure the outcome of hospitalization for patients (Table 4). As with process measures, hospitals are awarded

achievement and improvement points based on the percentage of patients that survive 31 days or more following discharge from the hospital. Hospitals must have at least 10 cases (discharges) in 2 of the measures in order to qualify for HVBP in FY14.

AHRQ Measures PSI-90

The AHRQ Patient Safety Indicator (PSI-90) composite score was added to HVBP for FY15 (Table 5). This measure is based on eight measures of patient safety and is reported as a ratio. In this case, the lower the ratio the better the quality. The actual score for each measure involves a complex calculation which includes the observed rate of the event, the expected rate, and the population average. Additionally scores are also weighted based on the size of the hospital. Points are awarded for achievement and improvement with the higher score used for the TPS. Hospitals must have a minimum of 3 cases on any of the indicators in order to qualify with this measure.

Central Line Associated Blood Stream Infections (CLABSI)

The CLABSI measure is another outcome measure that was added to HVBP for FY15. As with the PSI-90, a lower number is better because the fewer infection the better the quality. Hospitals are awarded achievement and improvement points based on the percentage of patients with central venous catheters that contract blood stream infections. Hospitals must have at least one predicted CLABSI in order to qualify with this measure. This prediction is based on the national average infection rate. For example if the national average CLABSI rate is 0.01, the hospital would need 100 patients with a central line in order to have one predicted infection. If they have fewer than 100 patients with a central line, they do not qualify for this measure.

Efficiency Domain

Hospital efficiency is measured through Medicare Spending per Beneficiary (MSPB). This is calculated by dividing the hospital MSPB by the national average MSPB. These MSPBs include all charges accrued by a patient three days prior to and 30 post admission to an acute care hospital. The charges are adjusted to eliminate adjustments to DRG based on DSH, teaching hospital status, and local cost of living adjustments. The charges are also modified based on case-mix index to account for hospitals treating sicker patients. The hospital receives a score in which a lower number is better. The hospital must have at least 25 episodes of care in order to qualify to use this domain in their TPS.

Patient Experience of Care Domain

The patient experience of care domain is measured using the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey (Appendix A). This survey can be attached to the any of the surveys of patient satisfaction that hospitals currently use or by itself. The surveys can be distributed to a portion or all patients discharged from the hospital. The survey was written by CMS in conjunction with AHRQ and has been endorsed by NQF. They have been in use since 2006 and the results have been publicly reported since 2008. The survey itself consists of 32 questions in eight domains and demographic information about the patient. Available answers to most questions are never, sometimes, usually, and always. The score for each domain is based on the percentage of always answers. Scores are adjusted to account for mode of survey, such as telephone or mail, and for case-mix to account for comorbidities and illness of patients. Points are awarded for achievement and improvement. The patient experience of

care domain is weighted as 30% of the TPS FY13, FY14, and FY15. Hospitals must have at least 100 surveys collected during the measurement period in order to qualify for HVBP in FY13 and FY14 or use this domain in their TPS for FY15.

Methods

Data Sources

This study is based on data that are publicly available through a variety of internet sources. All hospitals registered with CMS are listed on the Data.Medicare.gov website in a table titled Hospital General Information. This table includes Provider ID, which is the CMS number under which hospitals are paid, address, and latitude and longitude coordinates for location. The complete table provides the type of hospital, for example CAH or Acute Care, if the hospital provides emergency services, and type of ownership. The data on ownership is questionable because a review of hospitals in New Mexico shows that there are errors in this category of information. Because there are only 25 hospitals in the study group, all information garnered from this table will be verified against hospital websites and other internet searches. Also available through the Data.medicare.gov website in the Hospital Compare archives are tables showing the performance of each hospital on each measure. The second source of data is the CMS tables published by CMS on their website which provide the payment adjustment factors for each hospital by Provider ID.

Additional information about each hospital can be attained from each hospital's individual website. Many hospitals post their size, staffing, and services provided on their websites. The American Hospital Directory (ahd.com) also provides information about size, services, discharges, and revenue.

Census tract data can be used to describe the populations served in general terms, such as average age, population density, and median income. This data is available through ArcGIS and easily downloaded into the program. Financial status of the hospital can also be described using Disproportionate Share Hospital (DSH) adjustment factors as a proxy for the number of low income patients served by the hospital. The DSH adjustment factor is available by Provider ID in the CMS Impact File.

Data Analysis

Once all of the data are gathered, sorted, and organized in Excel spreadsheets, analysis can begin. Hospital data will include census data such as age, income, and insurance status for the areas served by the hospital. It will also include the size of the hospital, the number of nurses employed, the number of specialty services offered, affiliation with other hospitals in a network, and other information that may be discovered during the research process that would indicate the resources of the hospital. For resources that are not easily quantifiable, a system will be created to assign scores to each hospital. The hospitals will then be described using descriptive statistics. Patterns and correlation between hospital ownership, performance, and improvement will be assessed. Patterns and correlation between hospital resources, performance, and improvement will also be assessed. The raw (un-weighted) quality data from each hospital will be reviewed for patterns of performance. The process of using ArcGIS to identify hospitals will be clearly described in Paper 2. The HVBP adjustment factors will also be mapped to show the changes over the first three years in performance. The changes in performance will also be graphed using MS Excel to evaluate patterns of

change. In depth discussion of the changes in TPS and within the measures will be discussed in Paper 3.

Chapter II: Paper 1

Chapter II will be a manuscript intended for publication reviewing the economic theories presented above, firm theory and comparative advantage theory of competition, and how they apply to the economics of hospitals. The concept of the hospital as a firm will be further described with a focus on literature that supports or contradicts this model. The success of a hospital based on its ability to compete with other hospitals will also be developed using the comparative advantage theory in light of the hospital's position as a firm.

Chapter III: Paper 2

Chapter III will be a second publication outlining the methods used to identify and evaluate remote hospital performance in the HVBP. This paper will specifically focus on the ArcGIS tool and the utility of mapping data. A key component of successfully using ArcGIS is the process of acquiring data and the methods used to clean and then verify the accuracy of such data. The purpose of this paper is to describe the steps of data preparations and then mapping.

Chapter IV: Paper 3

Chapter IV will be a third publication presenting the findings of this study. The performance of the remote hospitals over the course of the first 3 years of HVBP will presented with focus on changes in TPS and the individual measures that are combined in the TPS. The performance of each hospital will be compared to their available resources. Resources such as size, staffing, and services will be compared to performance in HVBP.

Chapter V: Discussion and Summary

Chapter V will begin with a summary of the three papers. This summary will be followed by a discussion of the policy implications of this program. Specific attention will be focused on the impact this program has on remote hospitals and the communities they serve. Policy alternatives will be presented and evaluated. In closing, a model for evaluating other groups of hospitals will be presented.

Table 1- Measurement Periods and Relative Weights

Fiscal Year	Patient Experience	Percent of TPS	Process Measures	Percent of TPS	Outcome Measures	Percent of TPS	Efficiency Measure	Percent of TPS
FY13	July 1, 2011-March 31, 2012	30%	July 1, 2011-March 31, 2012	70%	NA	NA	NA	NA
FY14	April 1, 2012-December 31, 2012	30%	April 1, 2012-December 31, 2012	45%	**Mortality** July 1, 2011-June 30, 2012	25%	NA	NA
FY15	January 1, 2014-December 31, 2014	30%	January 1, 2014-December 31, 2014	20%	**Mortality and AHRQ:** October 15, 2012 to June 30, 2013; **CLABSI:** February 1, 2013-December 31, 2013	30%	May 1, 2013 to December 31, 2013	20%

Table 2- Remote Hospitals as listed with CMS

Hospital Name	City	State	Beds	Distance in Miles to Next Hospital
MT EDGECUMBE HOSPITAL	SITKA	AK	27	176.7
BARTLETT REGIONAL HOSPITAL	JUNEAU	AK	57	176.7
CENTRAL PENINSULA GENERAL HOSPITAL	SOLDOTNA	AK	106	123.7
YUKON KUSKOKWIM DELTA REG HOSPITAL	BETHEL	AK	50	742.1
FAIRBANKS MEMORIAL HOSPITAL	FAIRBANKS	AK	152	513.3
KEEFE MEMORIAL HOSPITAL	CHEYENNE WELLS	CO	11	111.4
LOWER KEYS MEDICAL CENTER	KEY WEST	FL	167	113.7
ST LUKE'S MAGIC VALLEY RMC	TWIN FALLS	ID	224	146.2
CHIPPEWA COUNTY WAR MEMORIAL HOSPITAL	SAULT SAINTE MARIE	MI	82	119.8
PORTAGE HEALTH	HANCOCK	MI	36	101.4
BOZEMAN DEACONESS HOSPITAL	BOZEMAN	MT	86	111.0
NORTHERN MONTANA HOSPITAL	HAVRE	MT	49	153.8
ALTRU HOSPITAL	GRAND FORKS	ND	264	106.4
TRINITY HOSPITALS	MINOT	ND	251	119.9
P H S INDIAN HOSP AT BELCOURT-QUENTIN N BURDICK	BELCOURT	ND	46	119.9
GREAT PLAINS REGIONAL MEDICAL CENTER	NORTH PLATTE	NE	16	123.5
REGIONAL WEST MEDICAL CENTER	SCOTTSBLUFF	NE	184	105.3
GILA REGIONAL MEDICAL CENTER	SILVER CITY	NM	68	101.8
NORTHEASTERN NEVADA REGIONAL HOSPITAL	ELKO	NV	75	184.8
NYE REGIONAL MEDICAL CENTER	TONOPAH	NV	10	157.0
PHS INDIAN HOSPITAL AT ROSEBUD	ROSEBUD	SD	35	113.8
MEMORIAL HOSPITAL SWEETWATER COUNTY	ROCK SPRINGS	WY	99	105.6
WYOMING MEDICAL CENTER	CASPER	WY	188	147.0
CAMPBELL COUNTY MEMORIAL HOSPITAL	GILLETTE	WY	90	112.5
SHERIDAN MEMORIAL HOSPITAL	SHERIDAN	WY	88	112.5

Table 3- Process Measures

AMI-7a	Heart attack patients given fibrinolytic medication within 30 minutes of arrival.
AMI-8a	Heart attack patients given percutaneous coronary intervention (PCI) within 90 minutes of arrival .
HF-1	Heart failure patients given discharge instructions .
PN-3b	Pneumonia patients whose initial emergency room blood culture was performed prior to the administration of the first hospital dose of antibiotics.
PN-6	Pneumonia patients given the most appropriate initial antibiotic(s).
SCIP-Card-2	Surgery patients who were taking heart drugs called beta blockers before coming to the hospital, who were kept on the beta blockers during the period just before and after their surgery.
SCIP-VTE-1	Surgery patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries.
SCIP-VTE-2	Patients who got treatment at the right time (within 24 hours before or after their surgery) to help prevent blood clots after certain types of surgery.
SCIP–Inf–1	Surgery patients who are given an antibiotic at the right time (within one hour before surgery) to help prevent infection.
SCIP–Inf–2	Surgery patients who are given the right kind of antibiotic to help prevent infection.
SCIP–Inf–3	Surgery patients whose preventive antibiotics are stopped at the right time (within 24 hours after surgery).
SCIP–Inf–4	Heart surgery patients whose blood sugar (blood glucose) is kept under good control in the days right after surgery.
SCIP–Inf–9 (Added for FY14)	Surgery patients whose urinary catheters were removed on the first or second day after surgery.

Table 4- Mortality Measures

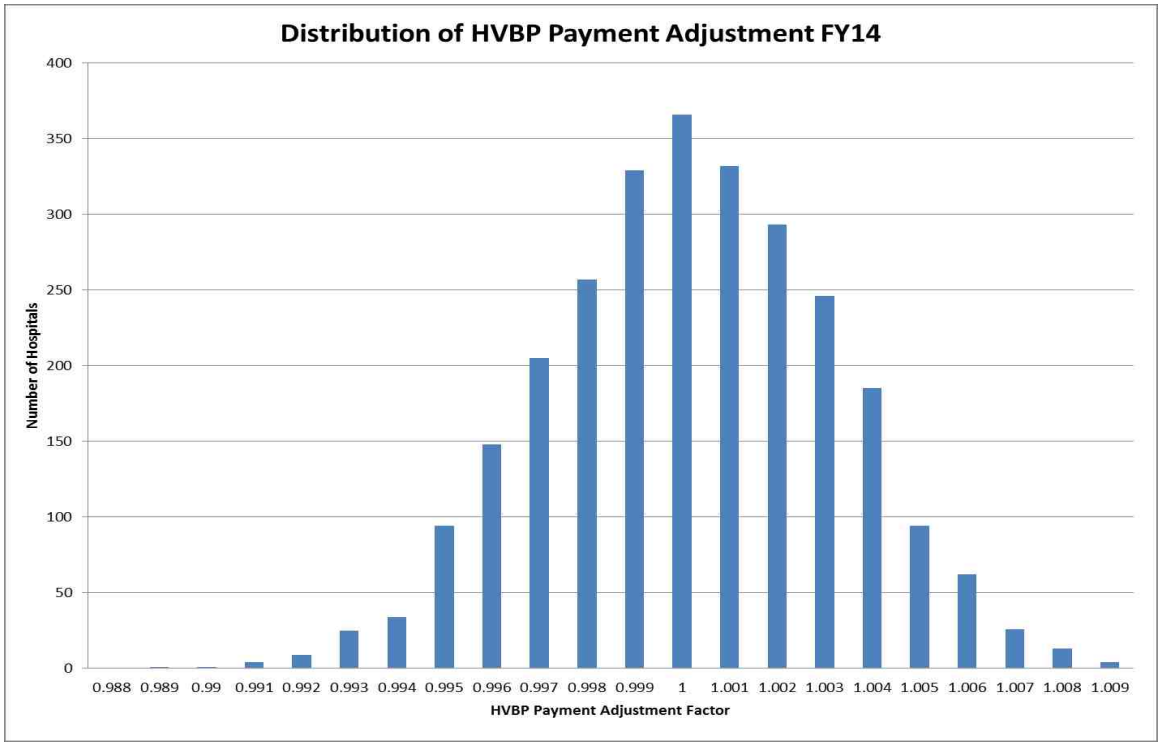
MORT-30-AMI	Acute Myocardial Infarction (AMI) 30-day mortality rate.
MORT-30-HF	Heart Failure (HF) 30-day mortality rate.
MORT-30-PN	Pneumonia (PN) 30-day mortality rate.

Table 5- Patient Safety Indicators (PSI-90)

PSI 03	Pressure Ulcer Rate
PSI 06	Iatrogenic Pneumothorax Rate
PSI 07	Central Venous Catheter-Related Bloodstream Infection Rate
PSI 08	Postoperative Hip Fracture Rate
PSI 12	Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate
PSI 13	Postoperative Sepsis Rate
PSI 14	Postoperative Wound Dehiscence Rate
PSI 15	Accidental Puncture or Laceration Rate

Figure 1- Distribution of Payment Adjustments

Note: An adjustment factor of 1.0 represents no change in reimbursement; values < 1.0 represent the percentage penalty and values > 1.0 the percentage bonus relative to baseline.



Chapter 2: Review of Relevant Economic Theories

The behavior of hospitals related to financial performance and quality of care provided has been studied by many health economists. Although theories have been put forth, none has been proven to predict quality outcomes and financial success based on hospital characteristics and resources. This paper adapts Hunt and Morgan's (1995) comparative advantage theory of competition as a framework for hospital economic behavior to synthesize the previously proposed theories. Resources not included in prior research will be discussed for consideration in a future model.

Comparative Advantage Theory of Competition

Hunt and Morgan's (1995) comparative advantage theory of competition posits that organizations or firms that have better resources compared with their competitors have an advantage in the marketplace and, therefore, will have superior financial performance. Resources are both tangible and intangible, including finances, property, legal, human capital, and organizational and informational knowledge. This theory builds on several economic theories of competition and resource allocation but draws little from comparative advantage theory of competition. as developed by David Ricardo (Ricardo, 1821). By addressing various aspects of competition they acknowledge that the behavior of the firm does not occur in a vacuum, but is reflective of the market environment. The key concepts of this model can be applied to hospitals.

The model states that demand for product is heterogeneous across the industry and dynamic with regard to consumer preferences. This implies that markets pertain to segments of an industry, not the industry as a whole and therefore the standard demand curve does not apply to the industry as a whole (Hunt & Morgan, 1995). Demand for

hospital services is heterogeneous on a national level and is driven by consumer preference. Medicare spending can be used to illustrate this characteristic. Spending per Medicare beneficiary is widely varied from one region to the next for the same condition and episode of care, indicating that the number of services provided within a hospitalization varies by location (Reschovsky et al., 2014). There are many factors that have been identified which influence the number of services provided during a hospitalization representing variation in both supply and demand (Skinner, 2011). Baker, Bundorf, & Kessler, (2014) analyzed data on mortality and spending, data on physicians, specialists, and availability of hospital beds, patient incomes, and survey data of self-reported health status and preferences for care. They found that supply factors predict 23% of the variation in spending and the health and income of patients explains another 12% of variation in spending. To a lesser degree, patient (consumer) preferences were also found to contribute 5% to the variation in spending(Baker et al., 2014). Even within local markets there is heterogeneity in consumer demand. Factors such as distance, quality, ownership type, and socioeconomic factors all influence the consumer in his or her choice of hospital (Brekke, Siciliani, & Straume, 2009; Halonen-Akatwijuka & Propper, 2012; Needleman, 2001; Romley & Goldman, 2011; Tay, 2003).

Information available for both consumers and administrators within a firm is not perfect and it is costly (Hunt & Morgan, 1995). Quality reporting by hospitals has created large sets of data for both administrators and consumers. Hospital administrators feel that only a limited number of measures are included in quality improvement programs and may not provide complete information (Pham et al., 2006). Both the way in which quality data is presented and the sheer volume of data may lead consumers to avoid using the

reports on quality or to make poor decisions (Schlesinger, Kanouse, Martino, Shaller, & Rybowski, 2013). Patients may also find interpreting these results difficult because in healthcare the quality of the product or outcome is not always obvious to the consumer (Chang et al., 2010; Easley & O'Hara, 1983; Huppertz & Carlson, 2010; Pauly, 1987). Patients may be able to judge some aspects of quality for themselves, such as hospital food or the friendliness of a healthcare provider, but they are generally unable to judge the quality of their medical care as related to provider knowledge or skill (Sloan, Picone, Taylor, & Chou, 2001).

In addition, information that is available comes at a significant price. Reporting quality data requires financial investment on the part of the hospital in terms of computer technology and staff to collect and submit data (Pham et al., 2006). There is also a cost to taxpayers associated with maintaining government agencies that collect and publish the data (e.g., through quality reporting websites).

Box 1
Theory of the Firm

The theory of the firm states that firms emerge in markets in order to maximize profits and that all decision making is driven by profit. Increasing the quality of a product leads to an increased price to the consumer and the possibility of increased profits. Coase (1937) is credited with introducing the concept of transaction cost to firm theory. Resources are allocated between internal production and outside contracting in a way which responds to market conditions and best maximizes

The motivation of the firm administrators is one of "constrained self-interest" (Hunt & Morgan, 1995). The constraint on self-interest is created by morals, ethics, and a

desire to balance the needs of the consumer with reward for the administrator. In other words, the administrator does not harm the consumer in the pursuit of maximum profit. The nature of the product of hospitals lends itself to an administration with at least some motivation to constrain self-interest. Although administrators have financial goals and seek to further their positions as leaders, they are in the business of healing and should be guided by moral and ethical imperatives in addition to bottom-line concerns (Schnoor, Heyde, & Ghanem, 2015). Thus, constrained self-interest is a key feature of the hospital firm.

The objective of the firm is "superior financial performance" (Hunt & Morgan, 1995). Superior financial performance replaces the idea of maximum financial performance from classical competition theory because maximum performance is a theoretical term that cannot be attained in practice. For-profit (FP) hospital administrators do seek to improve the financial performance of the hospital and produce returns for investors. Although not-for-profit (NFP) hospitals do not seek superior financial performance, this concept can still be applied by substituting superior quality and quantity of services for financial performance. Newhouse (1970) created an economic model of the NFP hospital as a firm in which quantity and quality are the goals of the institution administrator instead of profits. In the case of the nonprofit hospital, the administrator's performance cannot be judged in the usual sense of profitability; rather administrators are judged on the quantity of care that is provided and the quality of that care. NFP hospitals therefore have a preference for balance between quality and quantity (while maintaining financial viability) instead of profit to measure their performance (Chakravarty, Gaynor, Klepper, & Vogt, 2006; Malani et al., 2003).

The role of the administrator is to create and implement strategies based on recognition and understanding of the functions within the firm (Hunt & Morgan, 1995). This requires hospital administrators to be able to recognize and understand all facets of patient care to form a base for their strategies. In a sample of community hospitals from 1995-2000, Bazzoli, Chen, Zhao, & Lindrooth, (2008) found that not all quality measures suffered during financial downturns for the hospital. They suggest that hospital leaders focused cuts on areas not related to direct patient care in order to preserve their process measure compliance and quality. Hospital administrators may also choose to invest in nonclinical components of patient stays, such as improved food service, upscale design in patient rooms, and other amenities attractive to patients (Romley & Goldman, 2011). These strategies show an understanding of both patient demand and the resources needed to meet regulatory standards.

Resources are heterogeneous and their mobility is not perfect (Hunt & Morgan, 1995). This can apply to all of the resources required to provide patient care and the variability that exists not only in the availability of a resource but also the transport or movement of that resource. A clear example of this is the nursing staff which is the largest resource cost in the hospital. Nurses are not evenly distributed across the nation. They are people with free will, and it is not easy to induce them to relocate to areas of need (Buerhaus et al., 2013; Kovner et al., 2011; Siow, 2008). There are numerous hospital resources that can be described, including financial status (Bazzoli et al., 2008) and efficiency (Gan & Nighohossian, 2013), nonclinical infrastructure (Romley & Goldman, 2011), services offered (Bazzoli et al., 2007), electronic medical records

(Callen, 2014), belonging to a network (Chakravarty et al., 2006), and nurse staff characteristics (Aiken, 2002).

Bazzoli et al., (2007) found that hospitals with lower cash flow to total revenue had lower net assets in infrastructure and lower compliance with process based quality performance measures. Hospital characteristics which could be considered resources that were positively correlated to more infrastructure included the number of tertiary services, output as measured by patient days and births, the percentage of nursing staff who are RNs, and the hospital wage index. Resources that were positively correlated with quality process measures were patient days and the percentage of nurses who are RNs. Greater per-capita income in the community served by the hospital also correlated positively with quality process measure compliance (Bazzoli et al., 2007).

The environment influences, but does not dictate, firm behavior and performance (Hunt & Morgan, 1995). The local market can be considered the environment in which the hospital exists and must be included when considering the behavior and performance of a hospital. The decision surrounding ownership type and the structure of the market are both endogenous and created by internal decisions of hospital firms within the market (Malani et al., 2003; Robinson, 2001). Hospital decisions are in turn influenced by market conditions such as mixed ownership (Horwitz & Nichols, 2007; Malani et al., 2003) and consumer preferences (Needleman, 2001). Ownership type matters very little compared to other economic incentives especially when the decision to be NFP or FP may be based on the specific economic incentives of a particular market (Pauly, 1987). It is likely that FP hospitals select more profitable markets to enter (Sloan et al., 2001).

The specific market mix of NFP, FP, and government owned hospitals influences production behavior (Horwitz & Nichols, 2007), however, ownership type has less influence on performance when hospitals are in close proximity (Schlesinger & Gray, 2006). One tool that can account for market mix and proximity in measuring market share is the Herfindahl-Hirschman Index (HHI), which is a common economic measure of market competition. The HHI for a hospital can be calculated using some measure of hospital volume such as number of beds or annual discharges to assign an index score to each hospital which represents their share of the market (Garnick, Luft, Robinson, & Tetreault, 1987; Tay, 2003).

It is important to note that including comparative advantage in the name of this model is misleading. The comparative advantage theory first developed by David Ricardo in 1819 explained why it was beneficial for a nation to import a commodity from another country despite being able to produce that same product at a lower cost. This is because of the opportunity cost of diverting resources, such as labor and time, from a higher priced export item. They have footnoted that their use of this term is based on the Ricardo's assumption of heterogeneity and immobility of resources and the "comparative advantage" a firm has in how they use these resources. Their theory also contradicts Ricardo's prediction of production specialization and is designed to explain diversity within both markets and individual firms. They have created a model where comparative advantage in the resource utilization coupled with competitive advantage in the market results in superior performance. Despite the confusion created by using the phrase "comparative advantage" in the name of the theory, Hunt and Morgan have put forth

concepts that can be applied to describe and predict firm behavior in a competitive market.

Additional Resource and Market Factors

There are an infinite number of variables that could be considered hospital resources and contribute to market conditions. The factors listed in Table 1 take into account market factors and hospital characteristics that may influence the performance of a hospital but have not always been included in previous theories. Examples are listed of patient factors, market factors, and hospital factors.

Patient factors

Demographic characteristics such as the age, population density, education level, and income level of the community surrounding a hospital can influence the demand for services, the quality of services, and provide financial support through charitable giving for NFP hospitals (Needleman, 2001; Pauly, 1987). One theory for the existence of NFP firms is that there is a contract failure between the community and hospital. In this case the contract fails due to the perceived failure on the part of FP hospitals to deliver optimal levels of care in lieu of profits (Easley & O'Hara, 1983). This is similar to the concept of noncontractible quality. These are quality measures which cannot be contracted on by the consumer because they are not easily seen or measured from the patient perspective, but they are still valuable to the patient and tend to be costly for hospitals to maintain. Example of quality that cannot easily be measured include cleanliness, nutritiousness of meals, and skill of providers. Because noncontractible quality can be decreased to increase profits, it can encourage the entry of NFP hospitals into the market due to the preference of consumers to purchase this perceived quality (Malani et al., 2003). In the

altruistic model NFP follow the pricing set by FPs. In the noncontractible quality model the NFP are higher because consumers are willing to pay more for what they perceive to be quality (Malani et al., 2003). NFP should be the dominant type of ownership in markets where noncontractible quality is the consumer preference. But NFP status is less appealing for the firm as the industry becomes more profitable. Entry of a FP hospital into a market may be driven by consumer preference for availability of service and acceptance of increased cost related to that availability. FP hospital may not maintain excess capacity but choose to selectively ration and maintain optimal capacity for maximum profits. FP will succeed in markets where consumer preference is for availability of service not value as a function of quality related to cost (Holtmann, 1983).

An older population is likely to need more care and more services and to be insured by Medicare, meaning lower reimbursement to the hospital. Wealthier, privately insured patients mean higher reimbursement as well as increased charitable donations which can add significantly to the finances of the firm (Needleman, 2001; Pauly, 1987). Education attainment has been linked with health outcomes (Asada, Whipp, Kindig, Billard, & Rudolph, 2014) and should be included as factor that influences both quantity of service required and demand for quality of service. The demographics of the populations served both directly and indirectly affect the quality and profits of a hospital.

Market Factors

The market factors that influence hospital behavior in this model are market competition and ownership mix. The HHI can be used as a measure of market competition that influences which resources the hospital may choose as investments as well as the level of quality that they chose to provide (Brekke et al., 2009; Horwitz &

Nichols, 2007; Romley & Goldman, 2011; Tay, 2003). The number of hospitals in a market and the population density of the area served impacts the HHI of individual hospitals in both urban and rural settings (Horwitz & Nichols, 2007, 2011).

It is often believed that FP hospitals may underprovide quality and/or quantity of care (Chang et al., 2010) and consumers trust NFP hospitals to provide quality at reasonable cost (Pauly, 1987). NFPs offer comfort and implicit trust because of their lack of profit motive and implied quality (Needleman, 2001). Needleman (2001) found little evidence to support quality or cost differences between NFP and FP hospitals and Schlesinger & Gray (2006) found ownership type alone for hospitals is not an indicator of quality or cost of care. However, the market mix of NFP, FP, and government owned hospitals influences production behavior. Horwitz & Nichols (2007) found a strong relationship between hospital ownership type, the mix of ownership in the market, and the services provided by ownership type. The expectations that patients may have of hospitals based on their ownership type and the mix of ownership within a given market influence the behaviors of the hospitals in that market.

Hospital Factors

Hospital factors include infrastructure which exists due to previous investment and cash not related to patient care, such as capital investments, charitable contributions, and local government lump sum support. This is similar to the model used by Bazzoli et al. (2008) in which they used patient characteristics, hospital characteristics, and financial outcomes to predict quality process measures. Romley & Goldman (2011) use the term "revealed quality" to describe those hospital characteristics that patients attribute to quality. In healthcare factors related to quality as judged by the patients are not always

the factors that improve health outcomes (Easley & O'Hara, 1983; Sloan et al., 2001). Hospital infrastructure also includes attributes such as private rooms and the size of the hospital as described by the number of beds as well as high-tech equipment such as magnetic resonance imaging (MRI) machines and electronic medical records (EMR).

Network affiliation can be an asset to a hospital in terms of capital, expanded referral networks, and vendor negotiations for a variety of products from supplies to information technology. Greater than 80% of FP hospitals are part of a network while less than 60% of NFP hospitals are part of a network. Hospitals entering the market are generally smaller than existing hospitals and are more likely to be part of a network (Chakravarty et al., 2006). This becomes important when considering how the number of service lines a hospital has to offer.

Services vary in profitability and a hospital that is able to provide a higher number of profitable services will have a higher profit margin (Horwitz & Nichols, 2007). Building on the Newhouse model, output maximization in a mixed market the FP hospital will try to attract more profitable patients by offering those services over less profitable services. This impacts the volume of care NFP hospitals can provide if they are left with only low profit patients. The NFP hospitals then begin to offer those services to attract those patients back. In a mixed market with many FP hospitals, NFP hospitals are more likely to offer profitable services such as open-heart surgery and MRI scans. NFP are less likely to offer unprofitable services in a mixed market with a high number of FP hospitals, leaving those services such as HIV/AIDS treatment and emergency psychiatric care to government hospitals. For NFP hospitals there is a large negative relationship between the effect of profitability and the decision to offer a service in a low FP market

(Horwitz & Nichols, 2007). There may be market characteristics that attract FP hospital and a demand for high profitability services that were not included in this analysis.

New payment systems have also created a link between profit and quality where quality is no longer independent of profit. Pay for performance programs have created a financial incentive for hospitals to provide quality care. Although efficiency in care delivery and a good payer mix heavily influence profit margins, quality metrics now also influence payment rates. Hospital Value Based Purchasing (HVBP) is a federal pay for performance program that compares all hospitals that are paid under the Inpatient Prospective Payment System against each other. After just three years of the program, it is unclear if this national level of competition has an effect on hospital behavior and performance.

The largest and perhaps most neglected resource in previous theoretical models is nursing. Nursing resources directly influence the quality of care provided and a variety of nurse factors have been studied for their association to quality measures and patient outcomes. High quality nursing can add to the profit margin of a hospital by providing efficient care and attracting privately insured patients (Tuazon, 2007).

Factors that have previously been associated with improved quality include lower use of agency or temporary nursing staff (Aiken, Shang, Xue, & Sloane, 2012), the education level of RNs (Kutney-Lee, Sloane, & Aiken, 2013), and nurse to patient ratios (Martin, 2015). Skill mix, described as the number of RNs compared with other licensed and unlicensed nursing staff, may also influence the quality and cost of care. There is limited research associating quality and nursing years of experience. An Academic Search Complete database search using the terms *nurse*, *years of experience*, *quality*, and

outcomes from 2008 to 2015 resulted in 149 articles. Of these, only two (Aydin, Donaldson, Stotts, Fridman, & Brown, 2015; Rochefort, Buckeridge, & Abrahamowicz, 2015) specifically included years of experience as a factor affecting patient outcomes or quality of care. Aydin et al (2015) found a strong positive correlation between quality and years of experience. Rochefort et al (2015) only published their study proposal and results are pending.

Discussion

Economic models of hospital behavior have focused on a variety of factors which influence financial performance and the quality of care. Only one model (Bazzoli et al., 2007) included any nursing factors in their analysis and they only considered the percentage of nurses that were RNs. Market factors and hospital resources including multiple nursing factors have not been fully integrated into a single model. Studies have previously highlighted the role of nursing staffing ratios and RN education levels related to patient outcomes, but not tied these factors into economic performance models. Non-patient care nurse staffing, such as for unit-based educators, have been completely excluded from discussions of quality and performance. They may be relevant to both the practice ability of nurses as well as adherence with documentation of quality metrics. Although individual characteristics of nurse staffing have been studied, the incorporation of all of these factors has not been linked with other hospital factors in an attempt to describe hospital behavior, financial performance, and quality measures or patient outcomes.

Large scale databases do not contain these important characteristics of hospital nurses. The National Database of Nursing Quality Indicators (NDNQI) has some of this

data collected for some hospitals. However, participation in NDNQI is voluntary and the level of data reported is at the unit level, not aggregated at the hospital level. Data describing hospital nursing FTEs, education level, years of experience, and non-patient care RN staffing (educators, managers) would have to be collected in a new survey or on a small scale with hospitals willing to volunteer this information.

Conclusion

The comparative advantage theory of competition provides a modern view competition between firms and is easily adapted to hospitals as firms. This theory provides a starting point for synthesizing economic theories on hospital behavior. Nearly all theories of hospital behavior leave out characteristics of nurse staff as a measure of resources. As the largest single component of a hospital budget nursing resources are likely to have a significant impact on the behavior of hospitals in both financial performance and quality of care. Future studies are needed to devise measures and sampling techniques for assessing nursing resources and then incorporating them into economic models of hospital performance.

Table 1
Factors Influencing Hospital Behavior

Hospital Factors	Patient Factors	Market Factors
Nursing Resources	Age	Market competition
Skill mix	Income	Ownership Mix
Education	Education	FP/NFP/Government
Patient ratio	Population Density	
Experience		
Educational Support		
Service lines		
Network affiliation		
Capital investment/Charitable		
contributions		
Infrastructure		
MRI		
EMR		
Private rooms		
Number of Beds		

Chapter 3: Methods and Definition of Remote Hospitals

Rural, frontier, remote, urban, and sub-urban are some of the labels used to describe geographic areas and are often used in governmental policy for resource allocation and for characterizing populations by location of primary residence. In health care and health policy, non-urban populations are characterized or studied in terms of access to care and health outcomes using a variety of terms and definitions (e.g., rural, frontier, remote). Hospitals and other health care facilities are categorized by their geographic area which is generally defined by population. Classifying hospitals in terms of rural vs. urban locale may obscure important differences among rural communities in terms of access to hospitals. Up to this point hospitals have not been characterized by their distance from other hospitals. In this paper, the variation in terminology for rural classifications will be explored. Clinically relevant information linking travel time and distance to health outcomes will be coupled with a geographic analysis of hospital locations in the United States (US).

Classifications of Locale as Urban, Rural, or Frontier

Various agencies and organizations use concepts of population or population density, distance, and travel time to create definitions of urban, rural, and frontier. The variety of definitions reflects the variety of purposes for such classification schemes.

The US Census Bureau has three primary classifications of population in an area: Urbanized Areas (UAs), Urban Places Outside of UAs, and Rural Places and Territory. UAs have a population of at least 50,000 people in a continuously developed geographical area. UAs consist of at least one central place (e.g., municipality) together with adjacent areas that are densely settled ("urban fringe"). An "urban place" is densely

populated geographic area with a population of at least 2,500 people that is independently incorporated (or that has a community identity, even if not incorporated). Rural places and territories are geographic areas with a population of less than 2,500 people that are not UAs or urban places (US Department of Commerce Census Bureau, 1994).

Another classification scheme, designed by the US Department of Agriculture, is the Urban Influence codes. These were developed to categorize rural areas based on their proximity to metropolitan statistical areas (MSAs), as defined by the Office of Management and Budget, and to determine the influence of urban proximity on rural areas. All counties were initially grouped into MSA and non-MSA counties based on the presence or lack of at least one urban area in a county or equivalent jurisdiction(US Department of Agriculture, 2016).

Because of the broad nature of the term rural as defined by the Census Bureau, the term *frontier* has been developed to describe rural areas that are at a great distance from UAs and have a very low population density. The National Center for Frontier Communities (NCFC) has created a guide to compare the definition of frontier used by various organizations. The Consensus Development Project was convened by the NCFC and the Office of Rural Health Policy (ORHP), (a division of the Health Resources and Services Administration (HRSA) in the Department of Health and Human Services (HHS)), to create a matrix based on a point system that uses population density, distance to a market for services, and travel time to a market for services to identify frontier areas (Frontier Education Center, 1998). The ORHP and the USDA identify Frontier and Remote (FAR) areas in four levels based on travel time to population centers (Table 1).

The Affordable Care Act (ACA) defines Frontier Health Professional Shortage Areas as an area in which: "(A) with a population density less than 6 persons per square mile within the service area; and (B) with respect to which the distance or time for the population to access care is excessive." It goes on to define frontier counties as those in which the population is less than 6 people per square mile and frontier states as those in which 50% or more of the counties are frontier counties. The distance or travel time to access care which is considered "excessive" is not defined explicitly.

California's Office of Statewide Health Planning and Development uses the term *frontier* to describe medical service areas in which the population is less than 11 people per square mile with no UA in the area. However, the distance is not specified.

The Rural Health Research Center (RHRC) created Rural-Urban Commuting Area (RUCA) Codes which use information about commuting to and from employment together with the definition of UA and Urban Cluster (2,500 to 50,000 people with the same density as a UA) from the Census Bureau along with to define rural areas. Those areas identified as isolated rural areas are often considered frontier according to the NCFC.

The Center for Rural Health and the Office of Advancement of Telehealth Methodology for Designating Frontier Areas defined frontier areas by zip codes in which population centers that are not part of a large rural town and are more than 60 minutes or 60 miles to a short-term hospital that has at least 75 beds (Health, 2006).

The Department of Health and Human Services (HHS) defines frontier areas as those identified by the Secretary or US counties or county equivalents that have a

population of less than 6 people per square mile (Department of Health and Human Services & Centers for Medicare and Medicaid Services, 2005).

Rural Urban Continuum Codes (RUCC) were created by the USDA to describe counties as metropolitan or nonmetropolitan based on their population, degree of urbanization, and distance to metropolitan areas. There are nine designations as described in Table 2.

There are similarities between the methodologies used by different agencies to further define geographic areas considered to be rural. Some definitions are more explicit and detailed than other. Table 3 provides a summary comparison of these classifications.

Influence of Locale on Health Outcomes

Zhang, Tao, & Anderson (2003) conducted a secondary analysis of data 1994 National Health Interview Survey (N = 17,412) to examine access to health care by rural adults. They used the 1991 Area Resource File, a county-specific data set of health resources to examine access to and utilization of health care services. Based on county of residence, individuals were classified into one of 4 categories based on population (≥ 10,000 vs. < 10,000) and proximity to an MSA (adjacent, not adjacent). Among the subset of NHIS rural participants 18 to 64 years of age categorized as having poor general health status (n = 1664, 9.5%), Zhang et al. found that the hospital discharge rates among those from counties with population ≥ 10,000 and adjacent to a MSA (n = 419), 26.4% (i.e., 26.4 hospital discharges per 100 persons in poor health), was significantly higher ($p < .05$) than in any of the other three groups: 17.2% in counties of population ≥ 10,000 that were not adjacent to a MSA (n = 559); 15.3% in counties of population < 10,000 adjacent to MSA (n = 270); and 16.6% in counties of population < 10,000, not

adjacent to MSA (n = 416). The magnitudes of those differences were meaningful from a standpoint of access to hospital care as well as health policy and resource allocation (e.g., aggregate costs of hospitalization). In addition, the mean length of stay was 11.9 (SD = 4.65) days in the most rural group (population < 10,000, not adjacent to MSA) which was 5 to 6 days greater than any of the other groups. However, they reported that after weighting standard errors to account for the NHIS sampling design that the difference was not statistically significant. Even so, differences of the observed magnitudes in hospital discharge rates and lengths of stay suggest that distance to services may be a relevant consideration in addition to population for studying access and outcomes.

Hospital Definitions

The US healthcare market is composed of a variety of types of hospitals. Hospitals vary by ownership type: for-profit, non-profit, federal government, local governments, and religious organization to name a few. They also vary by payer classification. Except for military hospitals, the vast majority of hospitals participate and receive payments from Medicare and/or Medicaid and must follow the rules that the Centers for Medicare and Medicaid (CMS) puts forth. CMS has published a series of fact sheets available at CMS.gov to clarify the different payment categories into which hospitals may fit.

The Balanced Budget Act of 1997 created a special class of hospitals known as Critical Access Hospitals (CAHs) so that small rural hospitals that may struggle due to a low volume of patients can receive extra funding. These hospitals are financially supported because they provide critical access to acute care in rural areas. In order to qualify as a CAH the hospital must adhere to specific rules. They cannot have more than

25 acute care inpatient beds, they must be at least 35 miles away from another hospital, their average length of stay must be less than 96 hours, and they must have emergency services available at all times.

Most hospitals receiving reimbursement from Medicare or Medicaid fall under the Inpatient Prospective Payment System (IPPS) of the CMS. Hospitals in Maryland are not paid under the IPPS but are included in many CMS payment adjustment programs (Department of Health and Human Services & Centers for Medicare and Medicaid Services, 2015). CAHs are not paid under the IPPS and have not been included in CMS payment adjustment plans (Department of Health and Human Services & Centers for Medicare and Medicaid Services, 2015).

Hospitals that are paid under the IPPS must adhere to standard CMS Condition of Participation (CoPs). They are required to report quality metrics and are subject to payment reform strategies. Most inpatient Medicare stays are paid by diagnosis related groupings (DRGs). DRGs are determined based on a complex formula that considers average regional cost and length of stay for specific diagnoses. These payments are also adjusted by percentages for a number of variances each hospital may face. These include adjustments for quality measures, the wage index, and disproportionate share adjustments (to offset uncompensated care). CAHs generally transfer patients who are sicker or require specialized services to larger IPPS hospitals. IPPS hospitals will be the focus of this study; hence, for the remainder of this article, the term *hospital(s)* refers to IPPS hospital(s) (i.e., not CAH or military hospitals).

State Boundaries

For people living near a state line, the closest hospital may be in the neighboring state. However, except in emergencies, using a hospital in another state commonly is not an option due to insurance constraints. For instance, because Medicaid is a state funded program, it is generally required that Medicaid recipients seek care from within state boundaries (Familiesusa.org, 2002). Similarly, insurance networks for privately insured patients generally operate within state boundaries because of state regulation of health insurance (Cauchi, 2014). Traditional Medicare is a national program that is not restricted by state boundaries. In general Medicare part A covers hospitalization, part B covers outpatient care (including some ambulatory surgical services), and part D covers outpatient medications. Many Medicare beneficiaries either purchase additional part B coverage through a specific carrier or enroll in a Medicare Advantage program. Similar to private insurance, there are network restrictions associated with most of these supplemental plans and crossing state boundaries for non-emergency care may not be covered. For these reasons, in this analysis distance and driving time between hospitals was calculated on a state by state basis searching for the nearest hospitals within state boundaries.

Distance and Time to Treatment

From a clinical perspective distance and travel time can have a profound effect on health outcomes. Thompson et al (2102) assessed mortality risk for hemodialysis patients relative to their distance from a dialysis center. They found that there was increased mortality risk in patients living more than 100 miles away from their dialysis center and, for that reason, defined those as remote patients. Goldberg et al (2014) also used greater

than 100 miles as their most remote distance for evaluating 5-year survival rates and likelihood of transplant for Veterans with liver failure. They found that increased distance from the transplant center decreased the likelihood of receiving a transplant and even of being added to the transplant waiting list. Greater distances increased the risk of death and decreased access to care.

The golden hour of trauma was first described in the 1960's by Dr R Adams Cowley and refers to the dramatic improvement in outcomes if major trauma victims reach the operating room within one hour following a traumatic injury (Eisele, 2008). This phrase has also been applied to other acute medical conditions, such as acute myocardial infarctions, cerebral vascular accidents (CVA)/stroke, and heat stroke(Heled, Rav-Acha, Shani, Epstein, & Moran, 2004; Iqbal, 2011; Smalling, 2009).

For myocardial infarction with ST segment elevation (STEMI) it is recommended that the time from first medical contact (either the patient walks into the emergency department or emergency medical service (EMS) contact in the field) to the time that the cardiac muscle is re-perfused, also known as door-to-balloon time(Bates, 2009), be less than 90 minutes for patients that present to a facility with percutaneous coronary intervention (PCI) capabilities and less than 120 minutes for patients that transfer to a PCI capable facility(Yancy et al., 2013). As of 2011 only 39% of hospitals had PCI capability (Langabeer et al., 2013).

The best outcomes for CVA/stroke also occur when interventions are within 60 and 90 minutes of the event. Similar to myocardial infarction, ischemic strokes caused by a blood clot in a vessel in the brain are most successfully treated by removal of the clot

and reperfusion of the cerebral tissue. Administration of medication to dissolve the clot within 60 minutes of symptom onset yields the best outcomes (Iqbal, 2011).

Heat stroke occurs when someone accumulates more internal body heat that they can effectively dissipate. A victim of exertion heatstroke often pushes themselves in physical activity to the point of collapse. Effective treatment requires rapid recognition of the condition and outcomes are improved with initiation of cooling within one hour of collapse (Heled et al., 2004).

Based on the literature describing the importance of distance and time to access care, three groups of remote hospitals were identified for comparison. The first group consisted of hospitals that were 100 miles or more from the next hospital. The second and third group consisted of hospitals that were at least 90 or 60 minutes driving time away from the next nearest hospital. These measures do not necessarily reflect the distance and time that patients travel to access hospital care; they represent the distance and time that separates hospitals. This may be of particular relevance for outcomes for patients who require transfer to another facility for specialty services. It may also reflect the potential to impact access care if one of these hospitals should close.

Methods

The hospital general information table was downloaded from the data.medicare.gov website. This table includes the Medicare provider ID, hospital name, address, city, state, county, zip code, phone number, hospital type (ie: acute, CAH, VA), hospital ownership, and location by latitude and longitude (x,y coordinates). The table was converted to a Microsoft Excel Spreadsheet for sorting and editing. The table was first sorted by hospital type so that the acute care hospitals could be separated into a new

spreadsheet. The single x,y coordinate column was separated into two columns as required by the mapping software. The hospitals were then sorted by state and those located in US territories outside the continental US, Hawaii, and Alaska were removed from the table. The table was then re-sorted by each column to find and correct the missing data. For example, the Whiteriver Indian Hospital in Whiteriver Arizona did not have x,y coordinates listed. The hospital was located on google maps and x,y, coordinates were entered into the table.

GIS Analysis

A new map was created in ArcGIS 10.3 using the USA states basemap available through ArcGIS online. The hospital table created in Excel was then added to the map and the x,y coordinates plotted in order to add the hospital locations.

A new road network was created using Here Streetmap Premium from ESRI (2015 Q1 release). This map contains roads, speed limits, one ways, and other features that can be used to determine driving distances and travel times. The hospitals were loaded onto the network and then driving distance and driving time were determined using an OD Cost Matrix network analysis. This function is based on analyzing the distance and drive time between an “origin” and two or more “destinations”. Each state was processed individually to determine distances between hospitals only within a state’s boundaries. The result was a separate list for each state of distances and times from each hospital to every other hospital in the state. A summary analysis of each state’s data table created a list of only the nearest hospital to each facility. By combining these lists, a national list of driving distance and driving time can be created for each hospital to the next nearest within-state hospital. Hospitals were classified into three groups based on

their proximity of driving distance: distance greater than 100 miles, travel time greater than 60 minutes, and travel time greater than 90 minutes. These hospital lists were then added to the map and the symbology was changed for each set of hospitals so that they could be identified on the map. The final map is seen in Figure 1.

Results

There are 30 hospitals located 100 miles or more by driving distance from the next nearest within-state hospital (range: 101.5 to 324.2 miles). This includes two hospitals in Alaska and Hawaii listed without distances cannot be accessed from the next nearest hospital by roads. The travel time between each hospital and the next nearest hospital ranges from 93 to 480 minutes. Of the 30 hospitals, 23 (76.7%) are located in the Western region of which 16 (53.3% of the total) are in the Mountain division of the Western region as defined by the Census Bureau.

The picture of remoteness changes if driving time between hospitals is used. Not including the hospitals that cannot be reached by roads, there are 125 hospitals that are more than 60 minutes away from the next nearest hospital. The travel time ranges from 60 to 480 minutes, and the distance ranges from 31.9 to 322.3 miles. There are 51 hospitals that are more than 90 minutes away from the next nearest hospital. They range in travel time from 90 to 480minutes and travel distance from 53.4 to 322.3 miles. Of the hospitals that are 60 minutes or more away from the next nearest hospital, 64 (51.2%) are located in the Western region and 45 (36% of the total) are in the mountain division of the Western region. Another 35 (28%) are in the Midwest region. The map in Figure 1 shows these hospitals and describes them by distance and travel time to the next nearest

hospital. Figure 2 is a map of all of the IPPS hospitals in the US for comparison. A list of the hospitals by name, city, and state is available in Appendix B.

Discussion

When describing a population there are numerous definitions of rural, frontier, and remote that can be used. Access to a hospital is one factor that is used to determine the rurality of a population. The hospitals themselves have not been described in relation to their proximity to each other, although hospital density has been described in relation to competition and hospital behavior (Garnick et al., 1987; Schlesinger & Gray, 2006; Tay, 2003). This paper seeks to create a definition of remoteness for hospital based in clinical practice. All of the hospitals located 100 miles or more from the next hospital are also 60 minutes or more apart. In essence, the distance can be accounted for and incorporated into the travel time measure. Patient outcomes in cases of trauma, stroke, myocardial infarction, and heat stroke are improved when definitive care is received within one hour. Based on this clinical measure, it seems most appropriate to use the 60 minute travel time between hospitals to identify and describe a facility as remote.

Not all of the hospitals identified here are remote are located in rural counties as defined by RUCC. For example, the hospital in Cumberland Maryland in Allegany County, which is classified as RUCC 3, metro less than 250,000 people is about 65 minutes away by car from the nearest in-state hospital due to mountain roads.

It is important to note the exclusion of CAHs in this analysis. It would be a mistake to assume that access to acute care does not exist in closer proximity to these remote hospitals. However this was necessary because the purpose of this study was to define remote IPPS hospitals as a specific classification of hospital to be used in future

research. Further analysis is required to better understand the relationships between the CAHs and the IPPS hospitals to which they transfer their more acutely ill patients. In terms of payment reform models it is necessary to exclude the CAHs since they generally follow different payment formulas.

Deeper examination is required to fully understand the difference in service provided by CAHs and remote hospitals, especially those that are small enough to qualify as a CAH. Comparison of the services provided at remote hospitals and the quality of the care they provide may provide insight into their decision to remain an IPPS hospital. This would also provide information about health care in rural communities.

In this analysis, the assumption was made that transfers do not occur across state lines. In reality, transfers for tertiary and trauma care do occur across states lines. Identifying the hospitals that are remote within their state creates a starting point for analyzing transfer patterns. Further analysis is also needed in terms of their resources, finances, patient outcomes, and networking patterns.

Conclusion

Remote hospitals among those participating in IPPS are best identified as those that are 60 minutes or more from the next nearest in-state IPPS hospital. They can provide definitive care for a variety of complex medical conditions. However, there are going to be situations in which patients are transferred to a distant facility. It is important to be able to identify these hospitals so that future research can focus on the care they provide and the environment in which they operate. An examination of the extent to which remoteness by this definition affects reimbursement penalties or incentives under Hospital Value Based Purchasing will be covered in a separate manuscript.

Table 1

ORHP/USDA criteria for Frontier and Remote (FAR)

	Population	Time to UA ≥50,000 people	Time to UA 25,000-49,999 people	Time to UA 10,000-24,999 people	Time to UA 2,500-9,999 people
Level 1	≤ 50,000	≥ 60 minutes			
Level 2	≤ 25,000	≥ 60 minutes	≥ 45 minutes		
Level 3	≤ 10,000	≥ 60 minutes	≥ 45 minutes	≥30 minutes	
Level 4		≥ 60 minutes	≥ 45 minutes	≥30 minutes	≥ 15 minutes

Table 2

2013 Rural-Urban Continuum Codes

Code	Code Description
	Metro Counties
1	Population: 1 million or more
2	Population: 250,000 to 1 million
3	Population: fewer than 250,000
	Non-metro counties
4	Urban population: 20,000 or more, adjacent to a metro area
5	Urban population: 20,000 or more, not adjacent to a metro area
6	Urban population: 2,500 to 19,999, adjacent to a metro area
7	Urban population: 2,500 to 19,999, not adjacent to a metro area
8	Urban population: less than 2,500, adjacent to a metro area
9	Urban population: less than 2,500, not adjacent to a metro area

Table 3- Summary Table of Rural Classification Methodology

Agency/ Organization	Naming Scheme	Rural/Frontier Classification	Geographic Area	Population	Other Criteria
US Census Bureau	N/A	Rural	not specified	<2,500	
US Department of Argriculture (USDA)	Urban Influence Codes	non-metro	county	not specified	no MSA (metro area) in the county
USDA	RUCC	non-metropolitan Codes 4-9	county	<2,500 to > 20,000	adjacent/non-adjacent to metro area
Office of Rural Health Policy (ORHP) & USDA	FAR	level 1-4	not specified	<50,000	travel time and distance to UAs of varying size
Affordable Care Act (ACA)	N/A	frontier	square mile	<6	and "excessive" travel time/distance to healthcare
California Office of Statewide Health Planning & Development	N/A	frontier	square mile	<11	no UA "in the area"
Rural Health Research Center (RHRC)	RUCA	code 10	census tract	N/A	based on commuting patterns to UAs
Center for Rural Health and Office of Advancement of Teleheath Methodology	N/A	frontier	zip code	N/A	>60 minutes or 60 miles to a hospital with >75 beds
Health and Human Services (HHS)	N/A	frontier	square mile	<6	assigned by county

Figure 1
Remote Hospitals by Distance and Travel Time

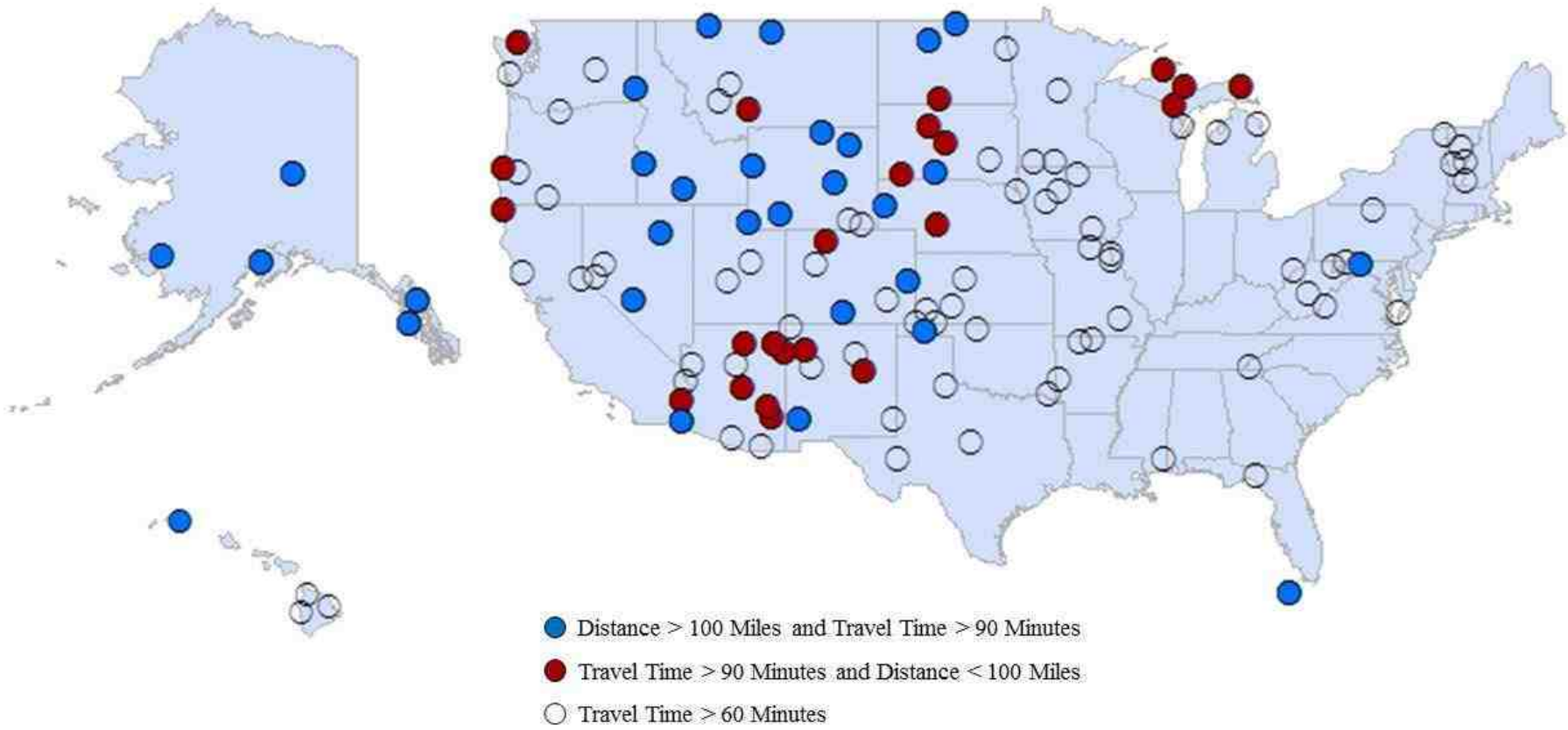
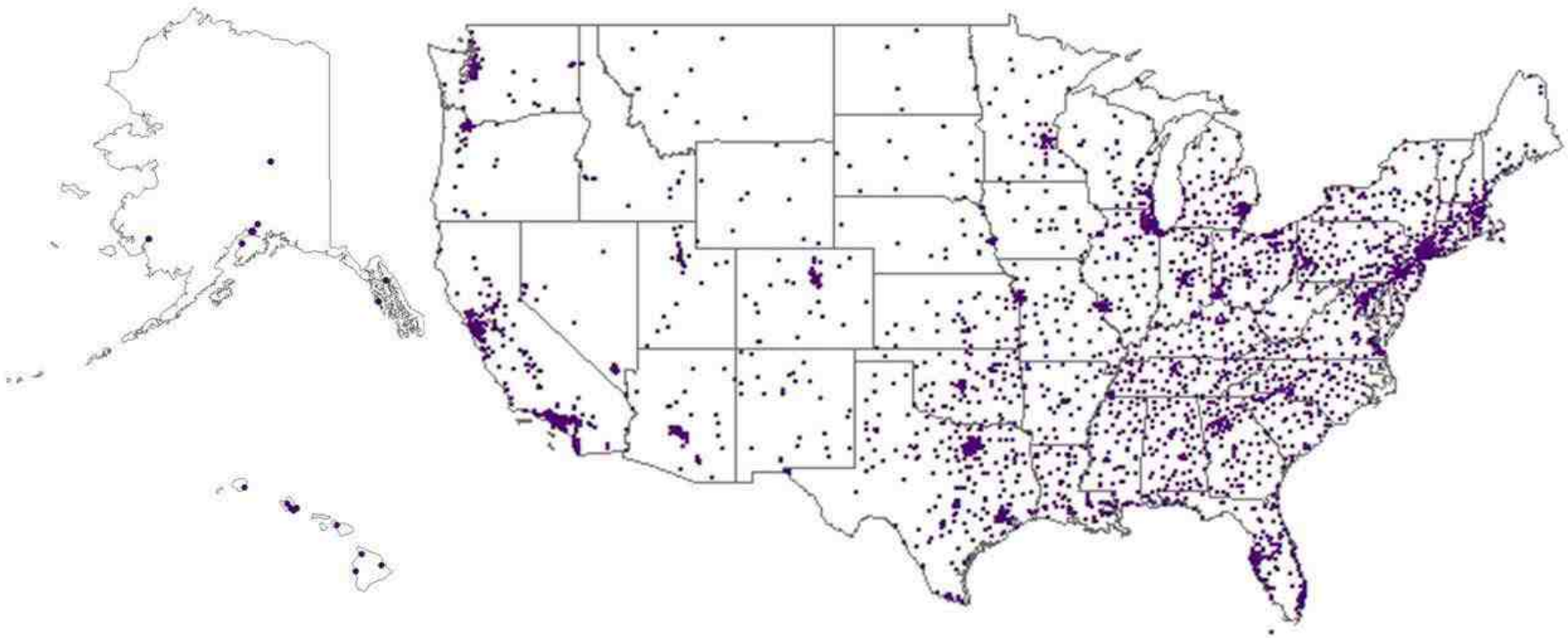


Figure 2
All IPPS Hospitals in the US



Chapter 4: Results of Hospital Value Based Purchasing Analysis

Hospital Value Based Purchasing (HVBP) is a pay for performance (P4P) program mandated by the Affordable Care Act (ACA) of 2010. HVBP is the primary mechanism under the ACA to incorporate P4P in the context of Medicare reimbursement. The overall purpose is to provide financial incentives and penalties for hospitals to improve the quality of care they deliver. Over 3500 hospitals in the United States are required to participate in the program. HVBP ranks all hospitals based on quality scores for processes and outcomes of care. This potentially puts each hospital in competition with every other hospital in the program. Large scale analysis of the program does not provide information that is useful to hospital administrators or policy makers in improving patient outcomes and hospital quality. This is why it is important to analyze and understand how unique sets of hospitals fare in the program and determine factors that lead to failure and success.

Literature Review

Public dissatisfaction with managed care along with new federal attention to quality in the late 1980's set the stage for changes in payment systems (Rodwin, 2010). The first pay for performance (P4P) program was the Quality Care Compensation System created by the private insurer U.S. Healthcare in 1987. Subsequently, P4P experiments appeared in limited numbers in the early 1990's among other private payers and in some state Medicaid programs (Rosenthal et al., 2004). These programs expanded and proliferated in the private sector in the early 2000's (Damberg, et al, 2014) and continue to be a part of the reimbursement structure for many private insurance companies.

The Premier Hospital Quality Incentive Demonstration (HQID) program served as the demonstration project for HVBP. The HQID was a partnership between CMS and Premier Inc. (an organization of not-for-profit hospitals) that was initially authorized for three years (2003—2006) and subsequently extended for an additional 3 years ending in 2009. HQID provided incentive payments totaling $12 million annually to hospitals based on a combination of process and outcome measures (CMS.gov, 2011). According to CMS, the 216 hospitals that participated in the demonstration improved quality over the six years of the demonstration. However, the metric used by CMS was an aggregate score based on all process and outcome measures and thus could not, for example, distinguish improved outcomes from improvements in documentation of care or changes in methods for estimating adjusted mortality rates. A research review conducted by Petersen et al (2006) found significant evidence for "gaming" or manipulation in the reporting of process measures, as well as overall improved compliance with documentation of care rather than improvements in care provided. Changes in the calculation of adjusted mortality rates are similar to the up-coding that occurred in the first years of the New York CABG (coronary artery bypass graft) surgery reporting system (NY CSRS) (Epstein, 2006). Ryan (2009) found no significant decrease in 30–day mortality for acute myocardial infarction, heart failure, and pneumonia from 2000 to 2006, suggesting that patient outcomes did not actually improve over that interval.

Research on quality improvement created by P4P has had mixed results in the areas of quality improvement and cost efficiency. In 2014 RAND Health published a review of value-based purchasing (VBP) programs including P4P programs (Damberg et al., 2014). That analysis incorporated expert opinion from a technical expert panel (TEP)

of VBP program administrators, hospital leaders who implement these programs, and healthcare researchers. Based on the TEP and a limited number of studies, Damberg et al. identified five aspects of VBP programs that appear to be associated with success: 1) sizeable incentives, 2) similar measure across VBP programs unless specific population are better served by other measures, 3) provider engagement, 4) incentives for both achievement and improvement, and 5) support for providers in management of the quality data.

This RAND report also identified possible undesirable side effects of P4P which included "gaming" of data, ignoring quality of care in areas not being reported on, overtreatment of patients, and avoidance of sicker or socially challenged patients. There were 21 studies reviewed that related to such unintended consequences of P4P (e. g., Beaulieu & Horrigan, 2005; Glickman et al., 2007 as cited in Damberg er al, 2014), but no significant unintended effects of P4P were found in any of the studies. Five of the studies reviewed by Damberg et al. evaluated possible spillover effects of P4P on quality measures not included in the incentive programs (e. g., Mullen, Frank, & Rosenthal, 2010, as cited in Damberg et al, 2014), but most of the studies were of small-scale or short-duration programs, and no net beneficial spillover was found (i.e., non-incentivized measures improved in some cases and in others they declined). To date, this type of study has not been done on CMS P4P data. Damberg et al. found no quality studies that showed a reduction in health disparities or improved care outcomes for disadvantaged groups attributable to P4P.

Notably missing from the literature are the strategies used for success and details regarding processes from providers who are high achievers in P4P. Members of the

Damberg et al. (2014) TEP stated that anecdotal information is frequently shared at trade conferences, but there are no reliable published data in this area. Damberg et al. concluded that continued quantitative analysis of VBP programs is necessary to monitor outcome. They also point out a need for qualitative research to better identify key components that program administrators and other key personnel believe contribute to success in VBP programs.

Hospital Value Based Purchasing Program (HVBP)

The ACA prescribes the HVBP in detail. All hospitals paid under the Inpatient Prospective Payment System (IPPS), except those designated as Critical Access Hospitals (CAHs), are required to participate and face adjustment to their Medicare payments as long as they meet minimum case numbers. The ACA mandated that the program would apply to all payments to hospitals for discharges occurring after October 1, 2012 based initially on benchmarking quality data collected in 2010. The first three years of the program include domains made up of processes of care measures, mortality measures, outcome measures, and an efficiency measure. The quality domains included in scoring change for each year from FY 13 to FY 15. For each performance measure, the raw score is assigned points. Points are awarded for achievement based on how a given hospital compares with all other hospitals and for improvement in how the hospital compares to its previous reporting period or, in the case of the first year of a measure, the benchmarking period. The higher score for each measure (i.e., for achievement or improvement) is used in calculating the domain score. Each domain score is weighted and then added together to create the TPS. The hospitals are then ranked by TPS score. Program details can be found in Appendix C.

For FY13 hospital could receive an incentive or penalty adjustment based on the HVBP score of up to 1% on all Diagnosis Related Groups (DRGs) billed to Medicare. In FY 14 the percentage change increased to 1.25% and in FY15 the payment adjustment increased again to 1.5%. The ACA caps the adjustment at 2% in FY17. (There are also financial consequences for hospitals based on readmission rates and Hospital Acquired Infections (HAI); however, in this study only the HVBP program will be evaluated.)

The ACA requires that the total amount paid out in incentive payments equal the total withheld in penalties. To that end, a linear exchange function is applied that represents the relationship between a hospital's TPS and the amount of money they receive. The linear exchange function ensures a near perfect correlation between TPS and the size of the incentive or penalty.

In order to participate in HVBP, hospitals must meet minimum case numbers for each domain. In FY13 and FY14, they had to meet the minimum case number for all of the domains in order to participate. However, in FY15 if the hospital met case numbers for at least two of the four domains they were eligible to participate in HVBP. (Domains in which they do not have enough case numbers to qualify were weighted and redistributed to the other domains in the TPS.)

Process Measures Domain

Hospitals have been reporting process measures to CMS annually since 2004 These measures are also used by the Joint Commission, the Agency for Healthcare Research and Quality, and the National Quality Forum. There are currently 13 process measures used in HVBP. The raw score is based on the number of cases in which each

process was required and documented was completed. Hospitals must have 10 cases in at least 3 process measures in order to qualify to participate in HVBP.

Outcome Domain

In FY14 hospitals had to have enough qualifying cases in two of the three outcome measures (only the mortality measures were included in the outcome domain in FY14) in order to participate in HVBP. For FY15 hospitals had to have enough cases in at least 3 of the 5 measures (with each mortality measures counting as an individual measure) in order to have the outcome measure included in the TPS. These measures report on adverse events, therefore a lower value is an indication of better quality.

Mortality Measure

Three measures of mortality were added to FY14 HVBP to measure the outcome of hospitalization for patients. Hospitals are awarded achievement or improvement points based on the percentage of patients that survive 31 days or more following discharge from the hospital. Hospitals must have at least 10 cases (discharges) in two of the measures in order to qualify for HVBP. Mortality is reported using a risk adjusted mortality measure which is the ratio of predicted deaths to expected deaths (CMS, 2014). The predicted death value is calculated using a hierarchical linear regression model that includes actual deaths, patient risk factors, and hospital specific effects or case mix. The expected death value is based on the national performance of hospitals with the same case mix. This value is then multiplied by the crude national ratio of observed deaths to expected deaths. These values are calculated by CMS to assure consistency and accuracy, and also because hospitals do not have access to the national data on which the calculations are based (CMS, 2007).

AHRQ Measures PSI-90

The AHRQ Patient Safety Indicator (PSI-90) composite score was added to HVBP for FY15. This measure is based on eight measures of patient safety and is reported as a ratio; the lower the ratio the better the quality. Similar to mortality rates, scoring for each measure involves a complex calculation by CMS which includes the observed rate of the event, the expected rate, and the population average. Additionally scores are also weighted based on the size of the hospital. Hospitals must have a minimum of 3 cases on any of the indicators in order to qualify with this measure.

Central Line Associated Blood Stream Infections (CLABSI)

The CLABSI measure is another outcome measure that was added to HVBP for FY15 and reported as HAI-1. Hospitals are awarded achievement and improvement points based on the percentage of patients with central venous catheters that contract blood stream infections. Hospitals must have at least one predicted CLABSI in order to qualify with this measure. This prediction is based on the national average central line infection rate. For example if the national average CLABSI rate is 0.01, the hospital would need 100 patients with a central line in order to have one predicted infection. If they have fewer than 100 patients with a central line, they do not qualify for this measure.

Patient Experience of Care Domain

The patient experience of care domain is measured using the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. This survey can be used by itself or attached to any other survey of patient satisfaction a hospital uses. The surveys can be distributed to a portion or all patients discharged from the hospital. The survey was developed by CMS and AHRQ; it has been endorsed by the NQF. The survey

has been in use since 2006, and the results have been publicly reported since 2008. The survey itself consists of 32 questions in eight domains together with demographic information about the patient. Most questions are scaled by estimated frequency of occurrence (*never, sometimes, usually, always*). The score for each domain is based on the percentage of items rated as *always*. Scores are adjusted to account for mode of survey, such as telephone or mail, and for case-mix to account for comorbidities and illness of patients. The experience of care domain was weighted as 30% of the TPS in FY13, FY14, and FY15. Hospitals must have at least 100 surveys collected during the measurement period in order to qualify for HVBP in FY13 and FY14 or use this domain in their TPS for FY15.

Efficiency Domain

Hospital efficiency is measured through Medicare Spending per Beneficiary (MSPB). This is calculated by dividing the hospital MSPB by the national average MSPB. These MSPBs include all charges accrued by a patient three days prior to and 30 post admission to an acute care hospital. The charges are adjusted to eliminate adjustments to DRG based on Disproportionate Share Hospital (DSH) payments, teaching hospital status, and local cost of living adjustments. The charges are also modified based on case-mix index to account for hospitals treating sicker patients. The hospital receives a score in which a lower number is better. The hospital must have at least 25 episodes of care in order to qualify to use this domain in their TPS. This factor is only included in the TPS for FY15.

Methods

In this study remote hospitals are defined as hospitals that are 60 minutes or more driving time from the next nearest hospital (N = 127) and constituted the sampling frame. Of the 127 remote hospitals, 90 (71%) had enough cases to receive a penalty or bonus adjustment in all three years of the HVBP program. Among non-remote hospitals 2582 out of 3271 hospitals (2014 CMS file) (79%) received penalties or bonuses in all three years of the HVBP program. Table 1provides a summary of these hospitals. A complete list of the remote hospitals and how many years they qualified to participate in the program can be found in Appendix D. Figure 1 is a map of the 90 hospitals which participated in all three years of HVBP. The percent adjustment that each hospital experienced each year was downloaded from CMS.gov (website). The HVBP total performance scores, the domain scores, and the quality scores that compose each domain were downloaded from the Hospital Compare archives (www.medicare.gov/hospitalcompare). The hospital characteristics of ownership type/profit status, number of beds, and DSH adjustment (FY15) as a proxy for patient socioeconomics were also obtained from CMS.gov databases.

Data Analysis

Data were compiled in Microsoft Excel and analyzed using IBM SPSS Statistics (version 23). Repeated measures analysis of variance (ANOVA) ($p<.05$, Bonferroni correction) was used to compare changes over the three year period in payment adjustment, TPS, and the raw scores for each of the performance measures for the remote hospital group, the non-remote hospital group and variance between the two groups. A multiple regression analysis was used to compare the payment adjustments with hospital

factors for each of the three years for the remote hospital group. Non-profit hospitals were used as the reference category for the ownership type.

Results

The results of the repeated measures ANOVA for payment adjustments for are presented in Table 2. For remote hospitals the mean change from negative to positive adjustments to payments is statistically significant ($p < .05$) with a very large effect size of 37.6%. The average of payment adjustments made within the program must equal 0%, however this analysis only included hospitals that were eligible for adjustment in all three years so the mean adjustment is slightly different from zero in the non-remote hospital group. For non-remote hospitals the mean change from negative to positive adjustments to payments is statistically significant ($p < .05$) with a medium effect size of 1.7%. There is a significant difference ($p < .05$) in mean payment adjustments over time between the two groups, with a medium effect size of 3.4%.

The results of the repeated measures ANOVA for TPS for remote and non-remote hospitals are presented in Table 3. The decrease in the remote hospitals mean TPS is statistically significant ($p < .05$) with a large effect size of 17.2%. The decrease in the non-remote hospitals mean TPS is also significant ($p < .05$) with a very large effect size of 40.9%. There is a significant difference ($p < .05$) between the mean TPS over time between the two group ($p < .05$) with a small effect size of 1.7%.

The results of the repeated measures ANOVA for performance measures for remote hospitals and the comparison of the remote to non-remote hospitals are presented in Tables 4. Within the remote hospital group there are statistically significant difference for three process measures, SCIP Inf-1 ($p < .05$, effect size 8.5%), SCIP Inf-2 ($p < .05$,

effect size 5.4%), and SCIP INF-9 (P <.05, effect size 17.4%). There was only a statistically different change in outcome measures for 30-day mortality for AMI (p< .05, effect size 7.2%). Unfortunately this represented an increase in the raw mortality score of .004. For the non-remote hospital group all of the measures except SCIP VTE-1 changed significantly over time (p < .05) with very small to medium effect sizes (ranging from .3% to 9.8%). When compared to non-remote hospitals there were statistically significant differences for SCIP Inf-1 (p< .05, effect size 0.3%) and SCIP Inf-2 (P<.05, effect size 0.4%). It is worth noting that very small effect sizes may be a results of the sample size and may not represent meaningful differences between the groups or even within the non-remote hospital group.

The results of the multiple regression model analyzing the influence of hospital characteristics on positive payment adjustment are presented in Table 5. The hospital characteristics used only predict 10.3% of increase payments at best (FY15). None of the characteristics were a statistically significant predictor of positive payment adjustment for more than one year. Only the regression model for FY15 was significant and bed size was the most significant predictor of success. More interesting is that these characteristics taken as a whole increased predictability of success for each year, from 1.5% in FY13 to 2.3% in FY14 and 10.3% in FY15. This suggests that certain characteristics may help hospitals adapt to the HVBP program and be predictive of success.

Discussion

There are a variety of factors to consider when assessing the impact of HVBP. One factor to consider is the impact on hospitals and their payments. This can be assessed through the payment adjustment percentage that hospitals receive. From a financial

perspective, hospitals are performing well if they receive a positive payment adjustment and conversely they are performing poorly if their payments are negatively adjusted. Remote hospitals performed less well in FY 14 than in FY 13, but overall improved over the 3 year period with a positive change in the mean payment adjustment of 0.26%. The non-remote hospitals performed the best in FY13 and decreased in FY14. They improved in FY15 but still decreased 0.046% during the three year period.

While payments increased for the remote hospitals during the study period, the TPS for remote hospitals decreased by 13.3%. For non-remote hospitals the TPS decreased by 27.2%. Comparing the TPS to the payment adjustment a 13.9% difference in TPS accounted for a 0.306% difference in payment. Comparing these variations is confounded by the changing percentage available for adjustment each year and the changes in domains and their weighting in each of the three years of the program.

Another factor to consider is the quality of care received by patients. The changes from one year to the next are minimal and not always indicative of improvement. A very small difference in score can results in a very large difference in points awarded. Even a decrease in the raw score can result in an increase in points awarded for a particular measure. Particularly in a small hospital, a single patient can dramatically change the number of points awarded. For example, in the remote hospital group there was a the large increase in points awarded for the outcome measures (16.06 from FY14 to FY15) which does not correlate to a statistically significant decrease in mortality, the only outcome measures used in both years. In fact, there was a statistically significant increase in mortality for acute myocardial infarctions in the remote hospital group. Without firsthand knowledge of each hospital it is also difficult to determine if the improvements

in SCIP Inf-1, SCIP Inf-2, and SCIP Inf-9 are actually an improvement in the administration of the right antibiotic at the right time and the removal of urinary catheters on time in surgical patients or simply an improvement in documentation practices. It is likely a combination of practice change and documentation changes which may or may not improve the overall care delivered from the clinical perspective.

Of the hospital factors assessed in this study, none of them were a consistent predictor of performance. In only one year was hospital ownership a statistically significant predictor. Likewise, in only one year the size of the hospital was a statistically significant predictor of performance. However, the factors together increased nearly ten-fold in their predictive power over three years. This suggests that certain characteristics may enable hospitals to be more adaptive to this program in order to be successful. It is important to note that the characteristics used were limited and there may be other hospital characteristics and resources that have a greater influence on performance. The inverse relationship of bed size to payment adjustment may indicate that smaller hospitals adapt easier to the program although it could also represent a bias in the formula.

The FY 15 TPS also includes new measures such as the efficiency measure. All of the hospitals included in this study received an efficiency score. The average efficiency score for the non-remote hospitals was 0.92 and the average efficiency score for the non-remote hospitals was 0.992, which indicates that the remote hospitals provide care at a lower cost. This efficiency metric accounts for 20% of the TPS and also explains some of the overall performance differences between the remote and non-remote hospitals. In FY 15 the process measures also only account for 20% of the TPS. Even significant improvement in these measures is unlikely to result in significant payment increases.

Another factor to note with this program is the variation in the measurement periods used for the domains to determine the TPS for each fiscal year. The measurements used for FY15 come from four different measurement periods (Appendix C). Different patient encounters are being used for single score and changes made within an organization will not be reflected in every component of the TPS.

Conclusion

The improved performance of this unique group of hospitals has many implications. First, this group of remote hospitals that are far from the usual supply of resources has performed better than the average US hospital in this program. Overall they are succeeding from a financial perspective. However, their improved financial performance in light of minimal increases in quality measures indicates that nationally quality is not significantly improving. The primary purpose of this program is to drive quality, which it has failed to do. This is not surprising considering that the HQID on which this program was based also failed to produce results in the area of improved patient outcomes (Jha, Joynt, Orav, & Epstein, 2012; Ryan, 2009). Continued analysis of this program is required as it moves forward to assess the impact on both hospital finances and patient outcomes. In depth analysis of specific types of hospitals is necessary to understand the program effects, quality improvement, and best practices moving forward.

Table 1- Hospitals Summary of Location, Size, Distance, and Travel Time

Census Bureau Region	Number of Hospitals	Range in Number of Beds	Mean Number of Beds	Range in distance (miles)	Mean Distance	Range in Travel Time	Mean Travel Time (min)
			Remote Hospitals				
Mountain West	45	7-406	56	31-247.2	67.74	60.4-248.1	97.6
West North Central	27	8-216	60	49.19-168.87	58.24	60.4-182.1	73.4
Pacific West	19	26-172	51	46-312.5	66.6	62.7-479.9	85.6
South Atlantic	10	26-300	107	43.87-136.18	48.53	62.6-169-2	70.6
West South Central	9	26-160	45	42.9-111.17	63.16	60-120.1	70.5
East North Central	8	34-349	94	45.16-94.39	71.2	64.9-132.1	92.7
New England	4	64-352	91	42.79-55.06	50.5	60.1-68.2	62.6
Middle Atlantic	2	63-287	175	46.98-48.18	47.58	60.1-62.64	61.4
East South Central	1	36	N/A	38.49	N/A	64.04	N/A
			Non-Remote Hospitals				
Mountain West	191	1-688	174	.01-52.97	9.4	.03-58	14.3
West North Central	243	3-1212	165	.02-54.7	13.5	.05-59	18.6
Pacific West	386	6-851	202	.14-45.1	6.7	.4-58.3	11.7
South Atlantic	572	3-2334	220	.07-55.3	12.7	.2-59.5	18.9
West South Central	543	1-1048	145	.004-57.1	11.5	.007-59.38	15.8
East North Central	503	6-1251	182	.02-55.8	9.8	.03-59.8	15.4
New England	138	17-1216	191	.11-42.9	9.7	.3-59.6	16.7
Middle Atlantic	377	4-1991	242	.03-43.2	8.6	.13-48.4	14.8
East South Central	316	1-1231	159	.05-42.3	16	.11-22.1	22.1

*excludes 2 remote and 2 non-remote hospitals that were not mapped

Table 2- Repeated Measures ANOVA of Payment Adjustments for Remote and Non-Remote Hospitals in Hospital Value-Based Purchasing

Remote Hospitals	***2013***	***2014***	***2015***
Mean adjustment	-0.08%	-0.16%	0.18%
p-value (model)	**0.000**		
within subjects effect size of time	**37.6%**		
n *(3 years reported)*	90		
Remote Hospitals	2013	2014	2015
Mean adjustment	0.006%	-0.024%	-0.04%
p-value (model)	**0.000**		
within subjects effect size of time	**1.7%**		
n *(3 years reported)*	2582		
within subjects group*time interaction effect size	**3.4%**		

$p < .05$ shown in bold

Table 3- Repeated Measures ANOVA of Total Performance Scores for Remote and Non-Remote Hospitals in Hospital Value-Based Purchasing

Remote Hospitals	***2013***	***2014***	***2015***
Mean Total Performance Score	50.112	41.784	43.451
p-value (model)	**0.000**		
within subjects effect size of time	**17.2%**		
n *(3 years reported)*	90		
Remote Hospitals	2013	2014	2015
Mean Total Performance Score	54.764	46.806	39.859
p-value (model)	**0.000**		
within subjects effect size of time	**40.9%**		
n *(3 years reported)*	2582		
within subjects group*time interaction effect size	**1.7%**		

$p < .05$ shown in bold

Table 4- Repeated Measures ANOVA of Process and Outcome Measures for Remote and Non-Remote Hospitals and a Comparison of Remote and Non-remote Hospitals

	Mean scores Remote Hospitals						*Mean scores Non-remote Hospitals*						*Remote vs Non-remote*	
	n	2013	2014	2015	p-value	effect size	n	2013	2014	2015	p-value	effect size	p-value	group*time effect size
SCIP-Inf-1	87	0.972	0.972	0.984	**0.003**	**8.5%**	2519	0.981	0.984	0.987	**0.00**	**1.8%**	**0.015**	**0.3%**
SCIP-Inf-2	87	0.978	0.979	0.987	**0.002**	**5.4%**	2517	0.982	0.984	0.988	**0.00**	**2.9%**	0.178	0.1%
SCIP-Inf-3	87	0.968	0.968	0.975	0.158	2.5%	2513	0.97	0.973	0.977	**0.00**	**3%**	0.672	0.0%
SCIP-Inf-4	17	0.944	0.96	0.964	0.072	18.7%	1075	0.957	0.962	0.968	**0.00**	**4.5%**	0.537	0.1%
SCIP-Inf-9	86		0.933	0.966	**0.000**	**17.4%**	2494		0.954	0.97	**0.00**	**9.8%**	**0.001**	**0.4%**
AMI-8	26	0.91	0.915	0.939	0.265	6.1%	1266	0.942	0.954	0.961	**0.00**	**3.7%**	0.362	0.2%
SCIP-Card-2	80	0.951	0.957	0.966	0.087	4.7%	2397	0.96	0.97	0.973	**0.00**	**1%**	0.899	0.0%
SCIP-VTE-1	90	0.959	0.969		0.077	3.5%	2573	0.979	0.98		0.88	0%	0.692	0.0%
SCIP-VTE-2	90	0.953	0.962	0.966	0.128	8.8%	2563	0.969	0.973	0.978	**0.00**	**0.3%**	0.932	0.0%
PN-3b	89	0.965	0.969	0.972	0.100	2.1%	2548	0.974	0.977	0.979	**0.00**	**1.5%**	0.744	0.0%
PN-6	88	0.936	0.937	0.944	0.576	0.7%	2554	0.955	0.96	0.963	**0.00**	**1.7%**	0.738	0.0%
HF-1	87	0.879	0.893	0.905	0.174	2.2%	2560	0.926	0.935	0.947	**0.00**	**1.4%**	0.822	0.0%

Table 4 (cont.)

	Mean scores Remote Hospitals						*Mean scores Non-remote Hospitals*						*Remote vs Non-remote*	
	n	2013	2014	2015	p-value	effect size	n	2013	2014	2015	p-value	effect size	p-value	group*time effect size
MORT-30-AMI	85		0.852	0.856	0.012	7.2%	2541		0.854	0.855	0.012	0.3%	0.077	0.1%
MORT-30-HF	90		0.88	0.878	0.301	1.2%	2581		0.878	0.879	0.00	3.6%	0.403	0.0%
MORT-30-PN	90		0.878	0.878	0.959	0.0%	2580		0.882	0.884	0.00	0.6%	0.522	0.0%

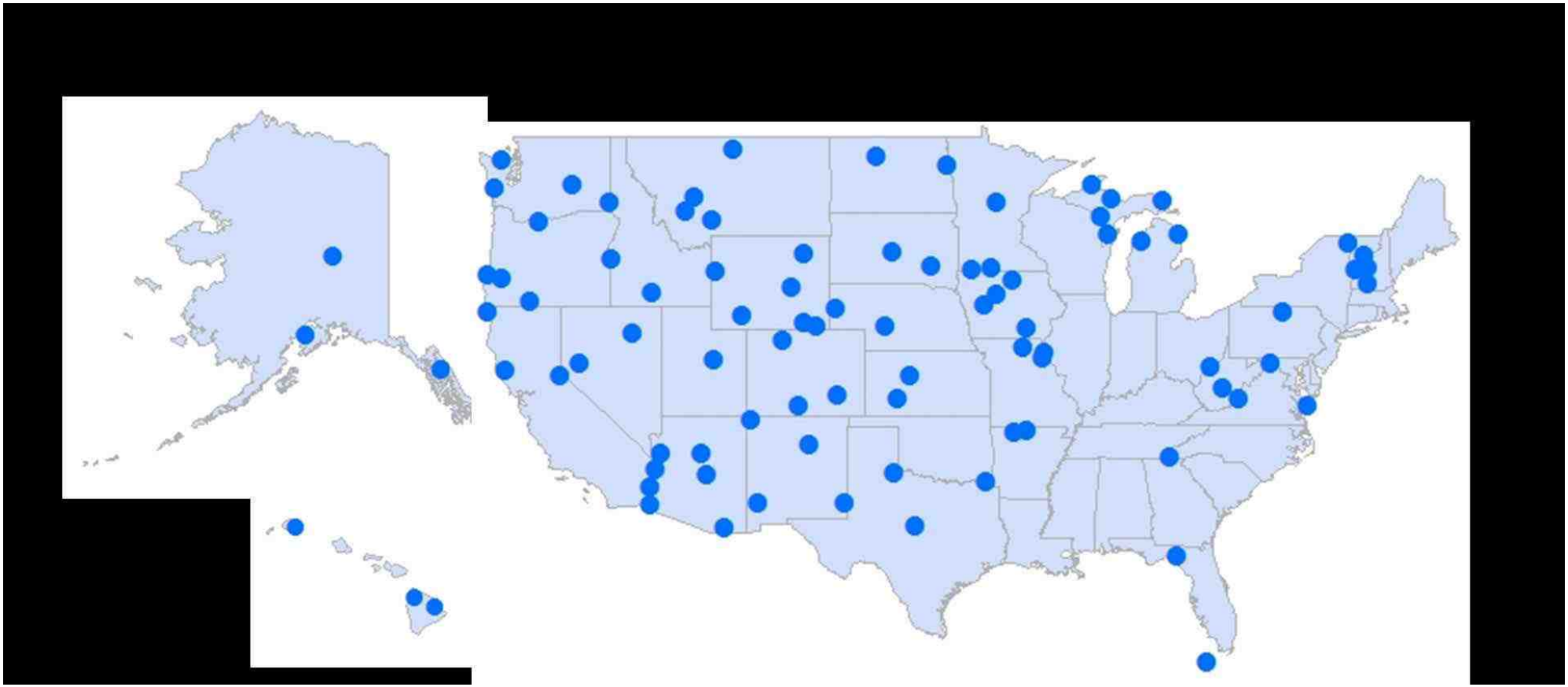
SCIP Inf-1: pre-operative antibiotic at the right time, SCIP Inf-2: right pre-operative antibiotic given, SCIP Inf-3: peri-operative antibiotics stopped at the right time, SCIP Inf-4: cardiac surgery patients with good blood sugar control, SCIP Inf-9: urinary catheters removed by second post-operative day, AMI 8a: heart attack patients received percutaneous coronary intervention within 90 minutes, SCIP Card 2: surgery patients were kept on their beta blockers, SCIP VTE-1: surgery patients were ordered blood clot prevention, SCIP VTE-2: patients received treatment to prevent blood clots at the right time, PN-3b: pneumonia patients had blood cultures drawn prior to antibiotic administration, PN-6: Pneumonia patients received the right antibiotics, HF-1: heart failure patients received discharge instructions, MORT-30-AMI: 30 day mortality for heart attack patients, MORT-30-HF: 30 day mortality rate for heart failure, MORT-30-PN: 30 day mortality rate for pneumonia. SCIP Inf-9, SCIP VTE-1, and the mortality measures only have 2 years of reporting. None of the hospitals have reported on AMI-7a: heart attack patients given fibrinolytic medication within 30 minutes. $p < .05$ shown in bold.

Table 5- Regression Analysis for Variables Predicting HVBP Payments in Remote Hospitals (N=90)

	FY 2013			*FY 2014*			*FY 2015*		
Variable	B	SE B	β	B	SE B	β	B	SE B	β
Constant	-.021	.059		-.064	.064		.469	.094	*
Number of Beds	.043	.069	.118	-.057	.076	-.143	-.233	.111	**-.384**
DSH Factor	-647.41	423.68	-.294	166.43	464.88	.069	59.37	678.18	.016
For-Profit	-.043	.091	-.52	-.027	.100	-.029	-.163	.146	-.116
Government owned	-.092	.068	-.147	-.178	.075	-.257	-.94	.109	-.089
R^2		.059			.067			.143	
Adjusted R^2		.015			.023			.103	
F		1.33			1.522			**3.55**	

p < .05 shown in bold; non-profit hospitals are the reference category for ownership type

Figure 1



Chapter 5: Summary of Research

Improving the quality and value of hospital care and outcomes for patients has been a focus for hospitals, regulators, and insurers for nearly 30 years (Damberg et al., 2014; Rodwin, 2010; Rosenthal et al., 2004). Despite the lack of improvement in outcomes during the six years of the Premier Hospital Quality Improvement Demonstration (HQID) (Ryan, 2009), Hospital Value Based Purchasing (HVBP) closely mimics the HQID and was written into law in the Affordable Care Act with the intent of improving quality and value. Large scale analysis of the program has primarily been based on comparing hospitals on payment adjustments, total performance scores, and achievement or improvement points awarded or by grouping hospitals into large categories, such as small urban, small rural, or safety net hospitals (Government Accountability Office, 2015).

This study was designed to 1) define the remote hospitals as a unique group of hospitals using mapping software and clinical evidence for the best patient outcomes related to distance and time to treatment, 2) evaluate the performance of the remote hospitals compared to non-remote hospitals and assess if quality and outcomes have improved during the first three years of HVBP, and 3) evaluate the influence of hospital characteristics on performance in HVBP.

Hospital economic behavior has been studied for nearly five decades with interest in the comparison of not-for-profit (NFP) and for-profit hospitals beginning with Newhouse's landmark model of the NFP hospital as a firm (Newhouse, 1970). However, none of the current models of hospital economic behavior have been shown to be accurate when subjected to large scale testing. Few models have been created which

include nursing resources. One model which does includes nursing only included the percentage of nursing staff who were RNs and did not treat nursing as a major contributing resource or influencing factor in hospital performance (Bazzoli et al., 2007). In Chapter 2 several theories that describe hospital and firm behavior are reviewed and synthesized. The comparative advantage theory of competition (Hunt & Morgan, 1995) provides a framework for this review and is adapted to hospitals. The concepts reviewed include resources, quality output, and financial performance. HVBP is a program based on quality output with financial rewards. The analysis of remote hospitals and their performance in HVBP includes a model which treats hospital resources as a factor for performance.

There is no single economic model that describes the performance and behavior of hospitals. This paper suggests nursing factors which have been previously neglected as a possible key to predicting hospital performance. A manuscript describing this review of theories and discussing the lack of nursing as a significant hospital factor for performance will be submitted to *Nursing Economic$*. The nursing resources and factors considered here include nurse to bed ratios, hospital based nurse educators, years of experience, and education level.

Remote hospitals occupy a unique position in HVBP. Isolated hospitals which have not had competition from nearby hospitals in the past are now competing with every other IPPS hospital in the country. Chapter 3 of this study describes how Geographic Information Systems (GIS) was used to map all Inpatient Prospective Payment System (IPPS) hospitals and then determine the next nearest hospital to each one. Using clinical evidence for best patient outcomes, remote hospitals were defined as those hospitals that

are 60 minutes or more driving time from the next nearest IPPS hospital. This is a deviation from the original proposal for this study. Originally the distance between hospitals was determined using straight line distances (as the crow flies). This method identified 30 hospitals that were 100 miles or more apart. The realities of hospital access are much better described using driving times to account for the variety of road conditions that exist in rural America. Therefore, the methodology used to identify remote hospitals was altered from the original proposal. A manuscript describing the techniques used and the identification of these hospitals will be submitted to *The Journal for Rural Health*.

The first three years of HVBP have not created substantial improvements in quality and outcomes for patients. Remote hospitals have done well in the program, increasing their payments over time and as a group receiving a bonus payment in the third year. However, mortality rates have remained stagnant and in the case of acute myocardial infarction have increased. So although this program did not adversely affect this group of hospitals new to competition, it did not improve patient outcomes either. None of the hospital characteristics that were considered in this study consistently influenced the performance in HVBP. However, the influence of the hospital characteristics on performance increased by ten-fold over the three year period, with hospital size being the greatest factor of influence. These results are presented in Chapter four and the manuscript will be submitted to a journal such as *Health Services Research* for publication.

A definition for remote hospitals (n = 127) was created by using GIS and clinical evidence. In this study, I found that remote hospitals were competitive with non-remote

hospitals in the first three years of the HVBP program. However, I also found that quality and outcomes did not improve for patients. None of the hospital characteristics analyzed were strong predictors of success in the program. However, comparisons are complicated by the addition of several new metrics in the third year which could not be included in the analysis.

Identifying remote hospitals is only the first step in analyzing their role in rural America and how rural Americans access care. Each paper raises questions and some of these questions persist throughout the work as a whole.

This study originally proposed to answer five questions related to hospital economic behavior and hospital value based purchasing. The ANOVA and regression analyses directly answered two of the questions: have quality measures improved and do non-profit hospitals have higher quality than non-profit hospitals. The question of comparative advantage theory of competition applying to remote hospitals was partially answered through the regression analysis of hospital characteristics. Because the analysis conducted used ANOVA and mean scores, the question of improvement in response to penalties and bonuses was not addressed for individual hospitals. Aspects of firm theory were shown to apply to hospitals however the lack of a definitive model describing hospital behavior and economic performance shows the complexity of answering this question.

Limitations

There are numerous limitations to this study and three manuscripts. IPPS hospitals are not the only hospitals providing acute care in rural America, but because Critical Access Hospitals are not subject to HVBP incentives and penalties, they could not be included in

an analysis focused on the impact of HVBP, limiting the assessment of distance to hospitals only within state lines is a limitation because, especially in emergencies, transfers of care across state lines may occur and for some individuals, the nearest hospital may be in another state. No assessment of services provided at the remote hospitals was conducted to determine how capable they are of treating specific acute conditions, because those data are not included in the CMS datasets the were used for this study. Due to these limitations, more questions are raised than can be answered regarding the transfer patterns of patients in rural areas between CAHs, remote IPPS hospitals, and tertiary care centers both within and outside of state boundaries.

Data from the fourth year of HVBP data have been released but were not included in this analysis. Additional measures now have more than one year of data for comparison. The large sample size of the non-remote hospitals may lead to statistically significant changes in raw quality scores over time which are too small to be practically meaningful. The variation in scores over time may also suffer from overall improvement. As all hospitals improve their scores, the variability decreases and very small differences in the raw scores may account for large difference in points earned and payment adjustments.

Future Research

HVBP needs to continue to be monitored for the next several years for the overall impact on the quality of care provided by hospitals. Over the next several years the measurement periods coalesce for all the measures, so that the scores are all for the same time period and patient encounters. The program needs to be looked at as a whole and also for specific groups of hospitals to monitor for bias and advantage. At the same time,

the analysis undertaken in this dissertation suggests that HVBP per se may not produce sensitive enough indicators for comparing performance of remote hospitals as a subset of all rural hospitals.

There is a significant amount of work to be done in completing the description of remote hospitals. First the hospitals need to be described in terms of the services that they provide, specifically interventional cardiology services, labor and delivery services and other specialized care services (e.g., stroke). Actual transfer patterns between CAHs and remote hospitals and between remote hospitals and other hospitals, including hospitals across states lines, need to be mapped and analyzed. The frequency and reasons that transfers from a CAH bypasses the nearest IPPS hospital for a larger regional hospital is especially important to understand. Developing a new or better theory or model of hospital behavior and performance might lead to identification of factors more relevant to predicting hospital success than those analyzed in the present study.

Recommendations

Continued monitoring of raw quality scores will be needed in coming years in order to truly assess if this program has an appreciable effect on quality and patient outcomes. New measures of hospital resources need to be included in analysis to determine factors that predict not only success in this program but the ability of a hospital to provide high quality care that is of high value. Evaluating the performance of specialized groups of hospitals and not just the entire group is also necessary to provide insight into strengths and weaknesses of the program.

Conclusions and Policy Implications

Hospitals in the US vary greatly in size, resources, and geography. The complexity of the HVBP program reflects the difficulty of creating a national one-size-fits-all program to drive quality improvement and value in hospital care. Whether other metrics might better reflect quality and value is a something that will require further analysis and wider discussion. Hospitals need to be held to quality standards, but what is quality and how is it measured are questions that have yet to be answered with industry consensus.

The remote hospital group is a key component of further network analysis. First it is necessary to look at the services provided by each hospital and determine if it is a hospital that is referred to or referred from for key conditions such as acute myocardial infarction, stroke, and trauma. Next, these hospitals can become part of a larger network analysis focused on referral patterns between remote hospitals and from critical access hospitals. These details are crucial to understanding access to acute care and future policy development for rural America.

HVBP is a very complex program that is constantly evolving and changing. The current CMS rule (42 CFR Part 412) proposes annual changes to the metrics used in HVBP through 2021. Although it is understandable to remove metrics that have "topped out" or reached a point where further improvement is unlikely, it also creates a moving target for hospitals. This requires that resources be dedicated to complying with the program, which diverts resources from patient care. In addition, the frequent changes to the program complicate year to year comparisons of quality improvement. Alignment of measurement periods is also necessary so that changes made within hospitals for quality

improvement are reflected in all components in a single year of HVBP. This alignment is slowly taking place and can be seen in the proposed rules for coming years.

It is also important to consider specialized groups of hospitals and evaluate their performance in this program to ensure that negative bias has not crept into the program. In the case that a specific group is performing poorly, it becomes necessary to determine what characteristics these hospitals possess in order to either reevaluate the program or assist hospitals in improving their care environments. As the policy develops and evolves it must not become biased towards a specific group of hospitals.

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Appendix A

HCAHPS Survey

SURVEY INSTRUCTIONS

- You should only fill out this survey if you were the patient during the hospital stay named in the cover letter. Do not fill out this survey if you were not the patient.
- Answer all the questions by checking the box to the left of your answer.
- You are sometimes told to skip over some questions in this survey. When this happens you will see an arrow with a note that tells you what question to answer next, like this:

  ☐ Yes
  ☑ No ➔ ***If No, Go to Question 1***

You may notice a number on the survey. This number is used to let us know if you returned your survey so we don't have to send you reminders.
Please note: Questions 1-25 in this survey are part of a national initiative to measure the quality of care in hospitals. OMB #0938-0981

Please answer the questions in this survey about your stay at the hospital named on the cover letter. Do not include any other hospital stays in your answers.

YOUR CARE FROM NURSES

1. During this hospital stay, how often did nurses treat you with courtesy and respect?

[1] ☐ Never
[2] ☐ Sometimes
[3] ☐ Usually
[4] ☐ Always

2. During this hospital stay, how often did nurses listen carefully to you?

[1] ☐ Never
[2] ☐ Sometimes
[3] ☐ Usually
[4] ☐ Always

3. During this hospital stay, how often did nurses explain things in a way you could understand?

[1] ☐ Never
[2] ☐ Sometimes
[3] ☐ Usually
[4] ☐ Always

4. During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it?

[1] ☐ Never
[2] ☐ Sometimes
[3] ☐ Usually
[4] ☐ Always
[9] ☐ I never pressed the call button

YOUR CARE FROM DOCTORS

5. During this hospital stay, how often did doctors treat you with courtesy and respect?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

6. During this hospital stay, how often did doctors listen carefully to you?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

7. During this hospital stay, how often did doctors explain things in a way you could understand?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

THE HOSPITAL ENVIRONMENT

8. During this hospital stay, how often were your room and bathroom kept clean?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

9. During this hospital stay, how often was the area around your room quiet at night?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

YOUR EXPERIENCES IN THIS HOSPITAL

10. During this hospital stay, did you need help from nurses or other hospital staff in getting to the bathroom or in using a bedpan?

1 ☐ Yes
2 ☐ No ➔ **If No, Go to Question 12**

11. How often did you get help in getting to the bathroom or in using a bedpan as soon as you wanted?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

12. During this hospital stay, did you need medicine for pain?

1 ☐ Yes
2 ☐ No ➔ **If No, Go to Question 15**

13. During this hospital stay, how often was your pain well controlled?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

14. During this hospital stay, how often did the hospital staff do everything they could to help you with your pain?

1 ☐ Never
2 ☐ Sometimes
3 ☐ Usually
4 ☐ Always

15. During this hospital stay, were you given any medicine that you had not taken before?

[1] ☐ Yes
[2] ☐ No ➔ **If No, Go to Question 18**

16. Before giving you any new medicine, how often did hospital staff tell you what the medicine was for?

[1] ☐ Never
[2] ☐ Sometimes
[3] ☐ Usually
[4] ☐ Always

17. Before giving you any new medicine, how often did hospital staff describe possible side effects in a way you could understand?

[1] ☐ Never
[2] ☐ Sometimes
[3] ☐ Usually
[4] ☐ Always

WHEN YOU LEFT THE HOSPITAL

18. After you left the hospital, did you go directly to your own home, to someone else's home, or to another health facility?

[1] ☐ Own home
[2] ☐ Someone else's home
[3] ☐ Another health facility ➔ **If Another, Go to Question 21**

19. During this hospital stay, did doctors, nurses or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?

[1] ☐ Yes
[2] ☐ No

20. During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?

[1] ☐ Yes
[2] ☐ No

OVERALL RATING OF HOSPITAL

Please answer the following questions about your stay at the hospital named on the cover letter. Do not include any other hospital stays in your answers.

21. Using any number from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible, what number would you use to rate this hospital during your stay?

[0] ☐ 0 Worst hospital possible
[1] ☐ 1
[2] ☐ 2
[3] ☐ 3
[4] ☐ 4
[5] ☐ 5
[6] ☐ 6
[7] ☐ 7
[8] ☐ 8
[9] ☐ 9
[10] ☐ 10 Best hospital possible

22. Would you recommend this hospital to your friends and family?

[1] ☐ Definitely no
[2] ☐ Probably no
[3] ☐ Probably yes
[4] ☐ Definitely yes

UNDERSTANDING YOUR CARE WHEN YOU LEFT THE HOSPITAL

23. During this hospital stay, staff took my preferences and those of my family or caregiver into account in deciding what my health care needs would be when I left.

[1] ☐ Strongly disagree
[2] ☐ Disagree
[3] ☐ Agree
[4] ☐ Strongly agree

24. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.

[1] ☐ Strongly disagree
[2] ☐ Disagree
[3] ☐ Agree
[4] ☐ Strongly agree

25. When I left the hospital, I clearly understood the purpose for taking each of my medications.

[1] ☐ Strongly disagree
[2] ☐ Disagree
[3] ☐ Agree
[4] ☐ Strongly agree
[5] ☐ I was not given any medication when I left the hospital

ABOUT YOU

There are only a few remaining items left.

26. During this hospital stay, were you admitted to this hospital through the Emergency Room?

[1] ☐ Yes
[2] ☐ No

27. In general, how would you rate your overall health?

[1] ☐ Excellent
[2] ☐ Very good
[3] ☐ Good
[4] ☐ Fair
[5] ☐ Poor

28. In general, how would you rate your overall mental or emotional health?

[1] ☐ Excellent
[2] ☐ Very good
[3] ☐ Good
[4] ☐ Fair
[5] ☐ Poor

29. What is the highest grade or level of school that you have completed?

[1] ☐ 8th grade or less
[2] ☐ Some high school, but did not graduate
[3] ☐ High school graduate or GED
[4] ☐ Some college or 2-year degree
[5] ☐ 4-year college graduate
[6] ☐ More than 4-year college degree

30. Are you of Spanish, Hispanic or Latino origin or descent?

[1] ☐ No, not Spanish/Hispanic/Latino
[2] ☐ Yes, Puerto Rican
[3] ☐ Yes, Mexican, Mexican American, Chicano
[4] ☐ Yes, Cuban
[5] ☐ Yes, other Spanish/Hispanic/Latino

31. What is your race? Please choose one or more.

[1] ☐ White
[2] ☐ Black or African American
[3] ☐ Asian
[4] ☐ Native Hawaiian or other Pacific Islander
[5] ☐ American Indian or Alaska Native

32. What language do you <u>mainly</u> speak at home?

[1] ☐ English
[2] ☐ Spanish
[3] ☐ Chinese
[4] ☐ Russian
[5] ☐ Vietnamese
[6] ☐ Portuguese
[9] ☐ Some other language (please print): _____

THANK YOU

Please return the completed survey in the postage-paid envelope.

[NAME OF SURVEY VENDOR OR SELF-ADMINISTERING HOSPITAL]

[RETURN ADDRESS OF SURVEY VENDOR OR SELF-ADMINISTERING HOSPITAL]

Appendix B

Remote Hospitals

Name	City	State	Time (Min)	Distance (MI)
Fairbanks Memorial Hospital	Fairbanks	AK	479.85	322.342034
St Alphonsus Medical Center	Ontario	OR	262.70	257.946787
Northeastern Nevada Regional Hospital	Elko	NV	248.13	255.018815
Regional West Medical Center	Scottsbluff	NE	182.13	174.18522
Bartlett Regional Hospital	Juneau	AK	334.29	171.193487
Mt Edgecumbe Hospital	Sitka	AK	334.29	171.193487
St Johns Medical Center	Jackson	WY	182.38	161.757734
Nye Regional Medical Center	Tonopah	NV	155.09	161.604798
Yuma Regional Medical Center	Yuma	AZ	153.48	155.865145
Central Peninsula General Hospital	Soldotna	AK	281.73	144.558007
Berkeley Medical Center	Martinsburg	WV	153.37	140.469304
Lower Keys Medical Center	Key West	FL	169.20	126.67612
Wyoming Medical Center	Casper	WY	121.78	122.275365
San Luis Valley Regional Medical Center	Alamosa	CO	121.07	119.46853
St Luke's Magic Valley Rmc	Twin Falls	ID	116.13	118.721286
St Joseph Regional Medical Center	Lewiston	ID	130.57	115.930392
Memorial Hospital Of Texas County	Guymon	OK	120.12	114.666384
Gila Regional Medical Center	Silver City	NM	116.57	112.685864
Northern Montana Hospital	Havre	MT	108.53	112.681057
Keefe Memorial Hospital	Cheyenne Wells	CO	125.97	112.145689
P H S Indian Hosp At Belcourt	Belcourt	ND	118.54	105.36309
Trinity Hospitals	Minot	ND	130.00	105.36309
Phs Indian Hospital At Rosebud	Rosebud	SD	103.88	103.726832
Campbell County Memorial Hospital	Gillette	WY	97.16	103.318533
Sheridan Memorial Hospital	Sheridan	WY	110.69	103.318533
Evanston Regional Hospital	Evanston	WY	104.62	101.52335
Memorial Hospital Sweetwater County	Rock Springs	WY	92.67	101.52335
P H S Indian Hospital At Browning	Browning	MT	144.26	100.918304
Portage Health	Hancock	MI	132.12	97.361818
Great Plains Regional Medical Center	North Platte	NE	106.87	96.46
Chippewa County War Memorial Hospital	Sault Sainte Marie	MI	105.02	92.7184352
Yampa Valley Medical Center	Steamboat Springs	CO	106.78	90.7012759
Palo Verde Hospital	Blythe	CA	90.44	90.3948678

Bozeman Deaconess Hospital	Bozeman	MT	97.56	87.1909444
Bay Area Hospital	Coos Bay	OR	131.98	87.0109276
Avera St Mary's Hospital	Pierre	SD	101.81	82.6458177
Phs Indian Hospital At Eagle Butte	Eagle Butte	SD	155.06	82.6458177
Pecos County Memorial Hospital	Fort Stockton	TX	83.11	82.5774909
Phs Indian Hospital At Pine Ridge	Pine Ridge	SD	104.28	80.7897204
Dickinson County Memorial Hospital	Iron Mountain	MI	96.94	80.4653789
Marquette General Hospital	Marquette	MI	98.23	80.4653789
Altru Hospital	Grand Forks	ND	77.72	76.3584683
Sutter Coast Hospital	Crescent City	CA	94.11	75.1125909
Tuba City Regional Health Care Corporation	Tuba City	AZ	115.80	75.0718678
Mercy Medical Center-North Iowa	Mason City	IA	87.49	74.4518307
Mena Regional Health System	Mena	AR	84.78	74.0582992
Lea Regional Medical Center	Hobbs	NM	84.86	73.9373243
Castleview Hospital	Price	UT	81.09	72.064124
Mid Coast Hospital	Brunswick	OR	74.56	71.3637295
Sierra Vista Regional Health Center	Sierra Vista	AZ	77.29	70.6962546
Childress Regional Medical Center	Childress	TX	70.47	69.6483267
Payson Regional Medical Center	Payson	AZ	101.80	69.0474442
Olympic Medical Center	Port Angeles	WA	95.28	68.7475808
Avera Queen Of Peace	Mitchell	SD	78.38	68.1822127
Mercy Medical Center	Dubuque	OR	75.65	67.8753358
St James Healthcare	Butte	MT	70.68	67.7497221
St Peter's Hospital	Helena	MT	65.46	67.7497221
Samaritan Hospital	Moses Lake	WA	78.65	67.5889034
Standing Rock Indian Health Service Hospital	Fort Yates	ND	103.58	67.2800137
Sky Lakes Medical Center	Klamath Falls	OR	85.57	66.5938024
Blessing Hospital	Quincy	IL	88.56	66.4122128
Mt Graham Regional Medical Center	Safford	AZ	119.15	65.2093822
San Carlos Indian Hospital	San Carlos	AZ	119.53	65.2093822
Alpena Regional Medical Center	Alpena	MI	76.64	65.1904478
Share Memorial Hospital	Alva	OK	73.52	65.1480612
Alta Vista Regional Hospital	Las Vegas	NM	64.02	64.9417466
Guadalupe County Hospital	Santa Rosa	NM	95.75	64.94
Arkansas Valley Regional Medical Center	La Junta	CO	82.15	64.8018877
Crownpoint Healthcare Facility	Crownpoint	NM	114.14	64.0611845
Valley View Hospital Association	Glenwood Springs	CO	72.57	61.7052764
Essentia Health St Joseph's Medical Center	Detroit Lakes	MN	72.93	61.5156946
Hilo Medical Center	Hilo	HI	79.10	60.4375245
Sevier Valley Medical Center	Richfield	UT	66.04	60.3931167

St Anthony Regional Hospital & Nursing Home	Carroll	IA	73.38	60.0726734
Trinity Regional Medical Center	Fort Dodge	IA	73.50	60.0726734
Sanford Worthington Medical Center	Worthington	MN	66.25	59.9350238
Ottumwa Regional Health Center	Ottumwa	IA	73.41	59.9071123
Hays Medical Center	Hays	KS	65.85	59.8438237
South Lyon Medical Center	Yerington	NV	64.66	59.5871556
Sells Indian Health Service Hospital	Sells	AZ	64.38	59.535997
Dhhs Usphs Indian Health Services	San Fidel	NM	65.49	59.2556598
Brownwood Regional Medical Center	Brownwood	TX	64.82	58.6234026
Murphy Medical Center Inc	Murphy	NC	78.11	58.4512102
Siouxland Surgery Center Lp	Dakota Dunes	SD	66.94	58.1890701
Ukiah Valley Medical Center/Hospital D	Ukiah	CA	70.77	58.1461891
Morton County Hospital	Elkhart	KS	73.20	57.9753223
Southwest Medical Center	Liberal	KS	66.83	57.9753223
Banner Churchill Community Hospital	Fallon	NV	64.88	57.2260004
Barton Memorial Hospital	South Lake Tahoe	CA	74.26	56.9448828
Northeast Regional Medical Center	Kirksville	MO	64.41	56.9161481
Mary Hitchcock Memorial Hospital	Lebanon	NH	68.20	56.7897056
Hannibal Regional Hospital	Hannibal	MO	68.70	56.2869313
Rutland Regional Medical Center	Rutland	VT	64.47	55.3308652
Havasu Regional Medical Center	Lake Havasu City	AZ	62.41	53.512903
Chinle Comprehensive Health Care Facility	Chinle	AZ	163.64	53.4153278
Fort Defiance Indian Hospital	Fort Defiance	AZ	154.50	53.4153278
Western Plains Medical Complex	Dodge City	KS	61.55	53.1432856
Bay Area Med Ctr	Marinette	WI	76.75	53.12049
Mayo Clinic Health System-Fairmont	Fairmont	MN	60.80	53.0817279
Southeast Health Center Of Reynolds County	Ellington	MO	65.08	52.5490054
Riverside Shore Memorial Hospital	Nassawadox	VA	75.06	51.8294399
Doctor's Memorial Hospital Inc	Perry	FL	69.56	51.0689679
Bob Wilson Memorial Grant County Hospital	Ulysses	KS	60.39	50.7414217
Flagstaff Medical Center	Flagstaff	AZ	76.99	50.4761496
Champlain Valley Physicians Hospital Medical Ctr	Plattsburgh	NY	60.06	49.6971462
Baxter Regional Medical Center	Mountain Home	AR	61.50	49.3184746
North Arkansas Regional Medical	Harrison	AR	60.41	49.3184746

Center				
Garrett County Memorial Hospital	Oakland	MD	64.75	49.0409433
Western Maryland Regional Medical Center	Cumberland	MD	64.97	49.0409433
Cheshire Medical Center	Keene	NH	60.14	48.8450457
Camden Clark Medical Center	Parkersburg	WV	62.63	48.8171733
Kona Community Hospital	Kealakekua	HI	62.67	48.67
North Hawaii Community Hospital	Kamuela	HI	63.77	48.6720318
Soldiers And Sailors Memorial Hospital	Wellsboro	PA	62.64	48.4625343
Grays Harbor Community Hospital	Aberdeen	WA	65.35	47.4644806
Cheyenne Regional Medical Center	Cheyenne	WY	71.02	47.2064
Ivinson Memorial Hospital	Laramie	WY	71.08	47.2064
Lewisgale Hospital Alleghany	Low Moor	VA	71.70	46.713291
Munson Medical Center	Traverse City	MI	64.90	46.5831495
Summersville Regional Medical Center	Summersville	WV	67.15	45.2462091
Mccurtain Memorial Hospital	Idabel	OK	60.05	44.2474205
Central Vermont Medical Center	Barre	VT	60.79	44.1361403
Kingman Regional Medical Center	Kingman	AZ	60.99	39.9261445
George County Hospital	Lucedale	MS	64.14	39.7062843
Northern Navajo Medical Center	Shiprock	NM	60.44	31.9318393

Appendix C

Process Measures

AMI-7a	Heart attack patients given fibrinolytic medication within 30 minutes of arrival.
AMI-8a	Heart attack patients given percutaneous coronary intervention (PCI) within 90 minutes of arrival.
HF-1	Heart failure patients given discharge instructions.
PN-3b	Pneumonia patients whose initial emergency room blood culture was performed prior to the administration of the first hospital dose of antibiotics.
PN-6	Pneumonia patients given the most appropriate initial antibiotic(s).
SCIP-Card-2	Surgery patients who were taking heart drugs called beta blockers before coming to the hospital, who were kept on the beta blockers during the period just before and after their surgery.
SCIP-VTE-1	Surgery patients whose doctors ordered treatments to prevent blood clots after certain types of surgeries.
SCIP-VTE-2	Patients who got treatment at the right time (within 24 hours before or after their surgery) to help prevent blood clots after certain types of surgery.
SCIP–Inf–1	Surgery patients who are given an antibiotic at the right time (within one hour before surgery) to help prevent infection.
SCIP–Inf–2	Surgery patients who are given the right kind of antibiotic to help prevent infection.
SCIP–Inf–3	Surgery patients whose preventive antibiotics are stopped at the right time (within 24 hours after surgery).
SCIP–Inf–4	Heart surgery patients whose blood sugar (blood glucose) is kept under good control in the days right after surgery.
SCIP–Inf–9 (Added for FY14)	Surgery patients whose urinary catheters were removed on the first or second day after surgery.

Mortality Measures

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.

PSI-90

PSI 03	Pressure Ulcer Rate
PSI 06	Iatrogenic Pneumothorax Rate
PSI 07	Central Venous Catheter-Related Bloodstream Infection Rate
PSI 08	Postoperative Hip Fracture Rate
PSI 12	Postoperative Pulmonary Embolism or Deep Vein Thrombosis Rate
PSI 13	Postoperative Sepsis Rate
PSI 14	Postoperative Wound Dehiscence Rate
PSI 15	Accidental Puncture or Laceration Rate

Measurement Periods and Relative Weights

Fiscal Year	Patient Experience	Percent of TPS	Process Measures	Percent of TPS	Outcome Measures	Percent of TPS	Efficiency Measure	Percent of TPS
FY13	July 1, 2011- March 31, 2012	30%	July 1, 2011- March 31, 2012	70%	NA	NA	NA	NA
FY14	April 1, 2012- December 31, 2012	30%	April 1, 2012- December 31, 2012	45%	**Mortality** July 1, 2011- June 30, 2012	25%	NA	NA
FY15	January 1, 2014- December 31, 2014	30%	January 1, 2014- December 31, 2014	20%	**Mortality and AHRQ:** October 15, 2012 to June 30, 2013; **CLABSI:** February 1, 2013- December 31, 2013	30%	May 1, 2013 to December 31, 2013	20%

Appendix D

Remote Hospitals Ranked by Years of HVBP Participation and State

Name	City	State	Travel Time (Minutes)	Distance (Miles)	Beds	Participation (Years)
Fairbanks Memorial Hospital	Fairbanks	AK	479.85	312.51	118	3
Bartlett Regional Hospital	Juneau	AK	334.29	165.97	45	3
Central Peninsula General Hospital	Soldotna	AK	281.73	140.15	46	3
Baxter Regional Medical Center	Mountain Home	AR	61.50	47.81	160	3
North Arkansas Regional Medical Center	Harrison	AR	60.41	47.81	112	3
Yuma Regional Medical Center	Yuma	AZ	153.48	151.11	406	3
Havasu Regional Medical Center	Lake Havasu City	AZ	62.41	51.88	162	3
Sierra Vista Regional Health Center	Sierra Vista	AZ	77.29	68.54	88	3
Flagstaff Medical Center	Flagstaff	AZ	76.99	48.94	245	3
Kingman Regional Medical Center	Kingman	AZ	60.99	38.71	196	3
Payson Regional Medical Center	Payson	AZ	101.80	66.94	37	3
Ukiah Valley Medical Center/Hospital D	Ukiah	CA	70.77	56.37	45	3
Palo Verde Hospital	Blythe	CA	90.44	87.64	51	3
Barton Memorial Hospital	South Lake Tahoe	CA	74.26	55.21	63	3
Sutter Coast Hospital	Crescent City	CA	94.11	72.82	49	3
San Luis Valley Regional Medical Center	Alamosa	CO	121.07	115.82	47	3
Arkansas Valley Regional Medical Center	La Junta	CO	82.15	62.82	53	3
Yampa Valley Medical Center	Steamboat Springs	CO	106.78	87.93	36	3
Lower Keys Medical Center	Key West	FL	169.20	122.81	135	3
Doctor's Memorial	Perry	FL	69.56	49.51	44	3

Hospital Inc.						
Hilo Medical Center	Hilo	HI	79.10	58.59	142	3
North Hawaii Community Hospital	Kamuela	HI	63.77	47.19	33	3
Wilcox Memorial Hospital	Lihue	HI	NA	NA	72	3
St Anthony Regional Hospital & Nursing Home	Carroll	IA	73.38	58.24	50	3
Ottumwa Regional Health Center	Ottumwa	IA	73.41	58.08	85	3
Mercy Medical Center-North Iowa	Mason City	IA	87.49	72.18	185	3
Trinity Regional Medical Center	Fort Dodge	IA	73.50	58.24	103	3
St Joseph Regional Medical Center	Lewiston	ID	130.57	112.39	99	3
St Luke's Magic Valley RMC	Twin Falls	ID	116.13	115.10	158	3
Blessing Hospital	Quincy	IL	88.56	64.39	169	3
Hays Medical Center	Hays	KS	65.85	58.02	106	3
Western Plains Medical Complex	Dodge City	KS	61.55	51.52	56	3
Alpena Regional Medical Center	Alpena	MI	76.64	63.20	92	3
Marquette General Hospital	Marquette	MI	98.23	78.01	210	3
Chippewa County War Memorial Hospital	Sault Sainte Marie	MI	105.02	89.89	80	3
Dickinson County Memorial Hospital	Iron Mountain	MI	96.94	78.01	91	3
Munson Medical Center	Traverse City	MI	64.90	45.16	349	3
Portage Health	Hancock	MI	132.12	94.39	34	3
Sanford Worthington Medical Center	Worthington	MN	66.25	58.11	45	3
Essentia Health St Joseph's Medical Center	Detroit Lakes	MN	72.93	59.64	137	3
Mayo Clinic Health System- Fairmont	Fairmont	MN	60.80	51.46	56	3
Hannibal Regional	Hannibal	MO	68.70	54.57	87	3

Hospital						
Northeast Regional Medical Center	Kirksville	MO	64.41	55.18	103	3
St James Healthcare	Butte	MT	70.68	65.68	83	3
Northern Montana Hospital	Havre	MT	108.53	109.24	210	3
St Peter's Hospital	Helena	MT	65.46	65.68	101	3
Bozeman Deaconess Hospital	Bozeman	MT	97.56	84.53	81	3
Murphy Medical Center Inc.	Murphy	NC	78.11	56.67	54	3
Altru Hospital	Grand Forks	ND	77.72	74.03	216	3
Trinity Hospitals	Minot	ND	130.00	102.15	202	3
Great Plains Regional Medical Center	North Platte	NE	106.87	93.51	68	3
Regional West Medical Center	Scottsbluff	NE	182.13	168.87	118	3
Mary Hitchcock Memorial Hospital	Lebanon	NH	68.20	55.06	352	3
Cheshire Medical Center	Keene	NH	60.14	47.35	92	3
Northern Navajo Medical Center	Shiprock	NM	60.44	30.96	59	3
Lea Regional Medical Center	Hobbs	NM	84.86	71.68	141	3
Gila Regional Medical Center	Silver City	NM	116.57	109.25	56	3
Alta Vista Regional Hospital	Las Vegas	NM	64.02	62.96	44	3
Northeastern Nevada Regional Hospital	Elko	NV	248.13	247.24	61	3
Banner Churchill Community Hospital	Fallon	NV	64.88	55.48	39	3
Champlain Valley Physicians Hospital Medical Center	Plattsburgh	NY	60.06	48.18	287	3
McCurtain Memorial Hospital	Idabel	OK	60.05	42.90	75	3
Bay Area Hospital	Coos Bay	OR	131.98	84.36	172	3
Sky Lakes Medical Center	Klamath Falls	OR	85.57	64.56	98	3

Mid Columbia Hospital	The Dalles	OR	74.56	69.19	43	3
St Alphonsus Medical Center	Ontario	OR	262.70	250.08	46	3
Mercy Medical Center	Roseburg	OR	75.65	65.80	139	3
Soldiers And Sailors Memorial Hospital	Wellsboro	PA	62.64	46.98	63	3
Avera St Mary's Hospital	Pierre	SD	101.81	80.12	60	3
Avera Queen Of Peace	Mitchell	SD	78.38	66.10	88	3
Brownwood Regional Medical Center	Brownwood	TX	64.82	56.83	117	3
Childress Regional Medical Center	Childress	TX	70.47	67.52	37	3
Castleview Hospital	Price	UT	81.09	69.87	49	3
Riverside Shore Memorial Hospital	Nassawadox	VA	75.06	50.25	127	3
Lewisgale Hospital Alleghany	Low Moor	VA	71.70	45.29	87	3
Rutland Regional Medical Center	Rutland	VT	64.47	53.64	90	3
Central Vermont Medical Center	Barre	VT	60.79	42.79	64	3
Grays Harbor Community Hospital	Aberdeen	WA	65.35	46.02	105	3
Samaritan Hospital	Moses Lake	WA	78.65	65.53	49	3
Olympic Medical Center	Port Angeles	WA	95.28	66.65	78	3
Bay Area Med Ctr	Marinette	WI	76.75	51.50	95	3
Summersville Regional Medical Center	Summersville	WV	67.15	43.87	40	3
Camden Clark Medical Center	Parkersburg	WV	62.63	47.33	300	3
Berkeley Medical Center	Martinsburg	WV	153.37	136.18	146	3
Memorial Hospital Sweetwater County	Rock Springs	WY	92.67	98.43	58	3
Ivinson Memorial Hospital	Laramie	WY	71.08	45.77	66	3
Cheyenne Regional Medical Center	Cheyenne	WY	71.02	45.77	170	3
Campbell County Memorial Hospital	Gillette	WY	97.16	100.17	66	3
St Johns Medical Center	Jackson	WY	182.38	156.82	46	3

Wyoming Medical Center	Casper	WY	121.78	118.54	169	3
Mena Regional Health System	Mena	AR	84.78	71.80	39	2
Fort Defiance Indian Hospital	Fort Defiance	AZ	154.50	51.79	50	2
Tuba City Regional Health Care Corporation	Tuba City	AZ	115.80	72.78	70	2
Mt Graham Regional Medical Center	Safford	AZ	119.15	63.22	45	2
Valley View Hospital Association	Glenwood Springs	CO	72.57	59.82	47	2
Kona Community Hospital	Kealakekua	HI	62.67	47.19	65	2
Southwest Medical Center	Liberal	KS	66.83	56.21	64	2
George County Hospital	Lucedale	MS	64.14	38.49	36	2
Siouxland Surgery Center Lp.	Dakota Dunes	SD	66.94	56.41	40	2
Evanston Regional Hospital	Evanston	WY	104.62	98.43	31	2
Yukon Kuskokwim Delta Reg Hospital	Bethel	AK	NA	NA	34	1
Chinle Comprehensive Health Care Facility	Chinle	AZ	163.64	51.79	60	1
Memorial Hospital Of Texas County	Guymon	OK	120.12	111.17	45	1
Pecos County Memorial Hospital	Fort Stockton	TX	83.11	80.06	26	1
Sevier Valley Medical Center	Richfield	UT	66.04	58.55	26	1
Sheridan Memorial Hospital	Sheridan	WY	110.69	100.17	66	1
Mt Edgecumbe Hospital	Sitka	AK	334.29	165.97	26	0
San Carlos Indian Hospital	San Carlos	AZ	119.53	63.22	8	0
Sells Indian Health Service Hospital	Sells	AZ	64.38	57.72	14	0
Keefe Memorial Hospital	Cheyenne Wells	CO	125.97	108.72	10	0

Bob Wilson Memorial Grant County Hospital	Ulysses	KS	60.39	49.19	20	0
Morton County Hospital	Elkhart	KS	73.20	56.21	27	0
Garrett County Memorial Hospital	Oakland	MD	64.75	47.54	26	0
Western Maryland Regional Medical Center	Cumberland	MD	64.97	47.54	200	0
Southeast Health Center Of Reynolds County	Ellington	MO	65.08	50.95	21	0
PHS Indian Hospital At Browning	Browning	MT	144.26	97.84	27	0
PHS Indian Hosp At Belcourt	Belcourt	ND	118.54	102.15	27	0
Standing Rock Indian Health Service Hospital	Fort Yates	ND	103.58	65.23	12	0
Crownpoint Healthcare Facility	Crownpoint	NM	114.14	62.11	25	0
DHHS US PHS Indian Health Services	San Fidel	NM	65.49	57.45	7	0
Guadalupe County Hospital	Santa Rosa	NM	95.75	62.96	10	0
Nye Regional Medical Center	Tonopah	NV	155.09	156.67	10	0
South Lyon Medical Center	Yerington	NV	64.66	57.77	14	0
Share Memorial Hospital	Alva	OK	73.52	63.16	36	0
PHS Indian Hospital At Eagle Butte	Eagle Butte	SD	155.06	80.12	8	0
PHS Indian Hospital At Pine Ridge	Pine Ridge	SD	104.28	78.32	45	0
PHS Indian Hospital At Rosebud	Rosebud	SD	103.88	100.56	35	0