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Length of Stay and Reimbursement Rates for Medicare Patients

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Abstract

Length of Stay and Reimbursement Rates for Medicare Patients With Hypertension

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MSA, Central Michigan University, 2011

BS, Ferris State University, 1997

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Medicare reimbursement rates across the United States have varied by as much as 49-130% across healthcare facilities. Geographic adjustments and severity of medical diagnoses attribute to some dissimilarity; however, the source of longer hospitalization and higher re-admission rates among Medicare patients requires financial consistency. The research encompassed (N = 3000) patients with hypertension as the focus for the study because this is a critical group of Medicare patients with a chronic disease that has been identified as a silent killer. The principal goal that drove this research study was to explain the variations in length of stay for Medicare patients with hypertension. The theoretical framework was the epidemiological triad model composed of person, place, and time variables. A secondary data set was acquired from the Healthcare Cost and Utilization Project Nationwide database of the National Inpatient Sample for the duration of 2011 - 2013. A multiple logistic regression analysis was conducted to determine if there was a correlation between length of stay and reimbursement rates for hypertensive Medicare patients. The findings of this research study provided an analytical explanation for the forces that have been driving Medicare patients' LOS, and rate of reimbursement. The research study yielded variations in the rate of reimbursement for a government entity in medical charges by illustrating the utilization of geographic price variations. The findings revealed that the categorical variable LOS and reimbursement rates for Medicare hypertensive patients had a significant correlation, and with higher reimbursement rates that were associated with longer hospital duration. The findings of the research study may inform Medicare decision-makers to eliminate geographic price variation and provide greater consistency in the rate of reimbursement, as well as a uniformity in length of stay across all regions of the United States.

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Dedication

I first would like to thank God for making it this far! This dissertation is dedicated to my one and only child John who continues to motivate me, and provide continual encouragement that I can do whatever I put my mind to. It never ceases to amaze me how much he believes in me.

Acknowledgments

I would like to sincerely thank the greatest chair on this side of heaven, Dr. James Rohrer for constantly pushing me toward academic success during the completion of my dissertation. I would like to also thank him for the countless sessions of guidance, his immediate responses to emails, and his unlimited availability as my chair. I feel that I was one of the more fortunate students to have a chair who was willing to impart his intellectual knowledge in an effort to assist me in producing my goal of obtaining a doctorate degree.

I would also like to thank the parents in my life Christopher and Diane Powell for their unconditional support and guidance throughout my academic career. A special thanks to all of my friends and family who have supported, and inspired me. I'm forever grateful for having such a strong support system.

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Introduction

Medicare reimbursement rates are primarily regulated by the federal government and receive further itemization per state. Respectively each Medicare reimbursement claim undergoes a lengthy process prior to reimbursement of claims being compensated. This process entails the coordination of benefits, coverage implication, billing, coding, denials, audits, and appeals. Additionally, each itemized claim requires comprehensive detailed information per patient and specific services rendered during the date(s) of service from the provider (Centers for Medicare & Medicaid Services, 2017). Medicare reimbursement differs by state and is impacted by the classification of reimbursement rate. Medicare reimbursement is comprised of eight categorical rates that assist in medical coverage. These rates entail medical assistance, capitated, critical access hospitals, federally qualified health centers, fee-for-services, Indian health service, managed care organization, and Medicare waiver rates (Centers for Medicare & Medicaid Services, 2017). An additional factor that contributes to Medicare reimbursement rate involves geographic adjustments that are based on locality within rural regions of the United States, which interpose a 5% to 10% increase above the national average (Centers for Medicare & Medicaid Services, 2017).

The rate of Medicare reimbursement must adhere to federally legislated guidelines despite variations among states to ensure corroborated payment parameters. These parameters also dictate the payment rate for length of stay (LOS) per inpatient hospitalization or encounter (Weiss & Elixhauser, 2012). Medicare Part A is the segment of Medicare that insures a patient's LOS for specific healthcare facilities such as acute care, critical access, inpatient rehabilitation, and long-term care hospitals (Medicare.gov, 2017). From 2008 to 2012 the hospital inpatient LOS for Medicare patients displayed an increase in aggregate hospital costs and a decrease in

usage by Medicare patients (Weiss & Elixhauser, 2012). The LOS for Medicare recipients decreased 1.9%between 2008 and 2012, whereas the cost gradually increased 0.7% over the duration of 4 years. For Medicare recipients (65 years and older), the rate of hospitalization has decreased nearly 4% for 4 consecutive years during the timeframe of 2008 to 2012 (Weiss & Elixhauser, 2012).

Hypertension and the rate of Medicare reimbursement for the LOS have exhibited variation from 2003 to 2012 with a decline in usage beginning in 2008 (Weiss & Elixhauser, 2012). In 2008 hypertension among Medicare patients was the most common comorbidity accounting for 69% of the hospitalizations across the United States (Fraze, Jiang & Burgess, 2010). The average hospitalization cost per hypertensive Medicare patient annually was $30,286, with an average LOS of 11 days in 2013; however, the average LOS for non-governmental applied insurance had a higher average LOS of 28.5 days for the same timeframe (Canavan, 2013). Medicare inpatient utilization management undergoes a process of applying relative diagnosis related groups (DRGs) to further establish the necessity of hypertensive Medicare patients LOS. The inpatient utilization management process may be a determining factor in variations among Medicare beneficiaries and private insurance holders. The utilization practice attempted to explain the stringent guidelines that healthcare organizations must adhere to in applying DRG's to re-admissions for hypertensive Medicare patients (Weiss & Elixhauser, 2012).

Variations among reimbursement rates for hypertensive Medicare beneficiaries and LOS were expected to differ by state; however, establishing further understanding of the variation within insurance providers required in depth exploration. Inpatient utilization of hypertensive Medicare patients was recorded as costlier than commercially insured in 2011, showing a

variation nearly $30,000 annually (Burke, Hunsche, Régulier, Nagao, Buzinec, & Drake, 2015). In the research study, comparisons of variables utilized a multivariate analysis to assist in determining elements associated with the LOS during hypertensive patient hospitalization (American Psychological Association, 2012). A multivariate regression model assisted in determining predictors in LOS, the relevance for Medicare reimbursement rates, and further explained variations (Qureshi, et al, 2013). The analysis also attempted to assist in stabilizing the pre-determined LOS for Medicare recipients.

Problem Statement

The source of longer lengths of hospital stay and extended hospitalization among Medicare patients have not been fully understood. Patients with hypertension were chosen as the focus for the study because this is a critical group of Medicare patients, and the logic of their lengths of hospital stay, though previously explored, was not completely understood (Medicaid.gov, 2016; Qureshi et al, 2013). The LOS for Medicare recipients were partially predetermined by the rate of reimbursement as it pertained to each state. Due to variations among states, there was no established rate of reimbursement per encounter for Medicare patients (Cabin, Himmelstein, Siman & Woolhandler, 2014).

Some elements assisted in determining the rate of reimbursement per occurrence. These included the medical condition (e.g., hypertension), the managed care organization's reimbursement rate, the fee-for-service rate, and Medicaid/Medicare waiver rates. Additional factors that partially determined the LOS for Medicare patients included supplemental private health, insurance, the state in which the hospital care was delivered, and the year in which the patient was hospitalized (Medicaid.gov, 2016). These factors regulate the government outlier strategies for cost-containment that govern the LOS reimbursement for Medicare patients

(Freitas, Silva-Costa, Lopes, Garcia-Lema, Teixeira-Pinto, Brazdil & Costa-Pereira, 2012). Governmental regulations that determine reimbursement rates and LOS continue to vary considerably and create variations depending on location, current reform, and organizational dynamics (Kim, Kleerup, Ganz, Ponce, Lorenz & Needleman, 2015; Medicaid.gov, 2016).

Purpose of the Study

The principal goal that drove the research study was to explain the variations in LOS for Medicare patients with hypertension (O'Brien, Xue, Ingersoll & Kelly, 2013). The knowledge gap targeted by this study involved the mix of reimbursement rates that shortened lengths of stay, thus containing costs for Medicare patients. Doing so required adjusting for the effects of covariates. These included a common medical comorbidity (diabetes), gender, race or ethnicity, year, and the region in which the care was provided (Cabin et al, 2014).

Research Questions and Hypotheses

RQ1: Are reimbursement rates related to the LOS for Medicare patients with hypertension as the reason for admission after controlling for geographic region, age, year, gender race/ethnicity, and diabetes?

H1: The hospital reimbursement rate is related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H2: The hospital reimbursement rate is not related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

RQ2: Are the hospital reimbursement rates associated with prolonged hospitalization for Medicare patients admitted for hypertension when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes?

H3: The hospital reimbursement rate is associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H4: The hospital reimbursement rate is not associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

Theoretical Framework

The theoretical framework for the research study was the epidemiological triad model (Rohrer, Grover & Moats, 2013). The triad was composed of person, place, and time variables. The triad model has been used in epidemiological investigation of disease outbreaks and has been applied to hospital outcomes. This particular conceptual framework guided an epidemiological exploration of variations in LOS and its association with triad variables (Centers for Disease Control and Prevention.gov, 2017). The epidemiological triad model has been successfully utilized by the World Health Organization (WHO) in determining influences such as socio-economic, biological, and physical elements associated with infectious diseases, more specifically in relation to the transmission of human immunodeficiency virus (HIV) within specific locations (World Health Organization, 2014). The triad model factored in the host, agent, and environment that identified intrinsic causes which had an affect the equilibrium of the triad model. The agents were composed of biological, physical, mechanical components; while the host consists of age, gender, ethnicity, customs, religion, and genetics. Lastly, the model factors in environmental constituents which were comprised of physical, exposure, social, and economic elements. Interaction between the three triad factors of the model illustrated causation, and assisted in unearthing balance (Rohrer et al, 2013).

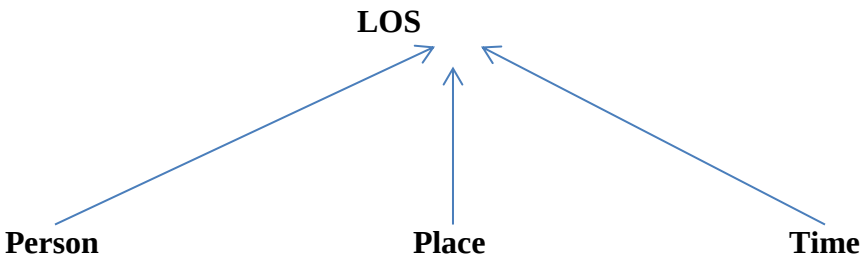

Figure 1. Advanced model of the triangle of epidemiology. Adapted from *Foundations of Epidemiology* (2nd ed. p. 14), by A.M. Lilienfeld and D.E. Lilienfeld, 1980, New York, NY: Oxford University Press.

Significance of the Study

The findings of the research study provided an analytical explanation for the forces that drove Medicare patients' LOS. This study explained the logic behind costs applied for the duration of hospitalization, in addition to delivering a foundation for policy reform by providing analyzed data to Medicare and policy decision-makers to amend guidelines for reimbursement rates and LOS (Ginsburg & Rivlin, 2015). The research is methodologically significant because it employs current codes from the 10th revision of the International Statistical Classification of Disease and Related Health Problems (ICD-10), which could result in higher accuracy of medical diagnoses than was possible prior to ICD-10 (Medicaid.gov, 2016; Qureshi, Adil, Zacharatos & Suri, 2013). The importance of the research is substantial, given its potential to provide an explanation for trends in Medicare LOS as reported in previous Centers for Medicare and Medicaid (CMS) documents (Maeda, Henke, Marder, Karaca, Friedman & Wong, 2014).

The study is significant for healthcare administrators because the findings may assist in standardizing reimbursement rates for Medicare recipients without placing limitations on the patients' LOS, and may assist in improving patient outcomes. The research is also significant because it provides further examination into the cost-shift theory for Medicare reimbursement while simultaneously assisting in determining variations in current Medicare payment policies.

These policies contain incentives for healthcare to optimize reimbursement that may lead to efficient lengths of stay for Medicare recipients (White, 2013). The research study is also significant because the results uncovered the logic behind particular Medicare states refusing to cover extended LOS, while LOS and reimbursement rates in other states exhibit dramatic dissimilarities. The research is meaningful due to the potential for revealing the rationale for a government entity not being transparent across the board, as well as indicating whether there was any improvement to decrease the fluctuations (Medicaid.gov, 2016).

Nature of the Study

The nature of the study involved quantitative methodology and cross-sectional design. Medicare patients with hypertension who were hospitalized during the period between 2011 and 2013 were selected for analysis. A regression analysis was utilized to estimate the association between the dependent variable, LOS, and reimbursement rates while controlling for covariates. The analysis allowed the researcher to determine a relationship between the dependent variable and the independent variables utilizing a multivariable logistic regression. The findings assisted in reducing the gap in the literature regarding the determinants of Medicare lengths of stay (Busby, Purdy & Hollingworth, 2015). Predictors of LOS for Medicare recipients with hypertension were also identified. An epidemiologic triad approach guided the analysis by using variables about person, place, and time (Rohrer, Grover & Moats, 2013).

Definition of Terms

The list below provides detailed definitions of terms utilized throughout the course of the study.

Reimbursement rate: Term used for the payments that hospitals and physicians receive in return for services rendered to Medicare beneficiaries (MedicareResources.org, 2015)

LOS (LOS): Term used to describe the duration of a single episode of hospitalization.

Inpatient days are calculated by subtracting day of admission from day of discharge (Medical Dictionary, 2017).

Blood pressure: Term used to describe two measurements of systolic and diastolic, blood pressure is the force exerted by circulating blood on the walls of blood vessels and is an important component of vital signs in human beings (Medical Dictionary, 2017).

Hypertension: Term used to define repeatedly elevated blood pressure exceeding 140 over 90 mmHg. A systolic pressure above 140 or a diastolic pressure over 90 (Medicinenet.com, 2017).

Borderline hypertension: Blood pressure measurement that lies between the highest acceptable normal blood pressure and hypertensive blood pressure (Moser, 2007).

Chronic hypertension: Long term condition in which blood pressure is higher than normal range blood pressure of 140/90 (Medical Dictionary, 2017).

Inpatient level of care: Term used to describe the intensity of medical care being rendered by a physician or healthcare facility (Medical Dictionary, 2017).

Race: Refers to groups of people who have differences and similarities in biological traits deemed by society to be socially significant, meaning that people treat other people differently because of them (Merriam-Webster.com, 2017).

Ethnicity: The fact or state of belonging to a social group that has a common national or cultural tradition. refers to shared cultural practices, perspectives, and distinctions that set apart one group of people from another. That is, ethnicity is a shared cultural heritage (Merriam-Webster.com, 2017).

Diagnosis-related group (DRG): A statistical method of classifying inpatient stays into groups that assist in insurance compensation (Merriam-Webster.com, 2017).

Centers for Medicare and Medicaid (CMS): A segment of the Department of Health and Human Services (Centers for Medicare and Medicaid Services, 2017)

Medicare: A single-payer, national social insurance provider governed by the United States government (Centers for Medicare and Medicaid Services, 2017)

Assumptions

The study was contingent upon identifying current data displaying variations among reimbursement rates for Medicare hypertensive patient's LOS. Dissimilarities were exhibited on the region in which data is derived to express fluctuations in reimbursement rates for Medicare recipients. The utilization of Medicare in conjunction with private insurance further provided clarification in the differentiation of rates of Medicare reimbursement for hypertensive patients. Significant governmental budgetary restraints within Medicare were vital factors in reduced LOS (Ishak, Stolar, Hu, Alvarez, Wang, Getsios & Williams, 2012). Additionally, various elements that contributed to hypertension among Medicare patients could not be gauged, such as patients who are genetically prone to hypertension as well as diet, exercise, environmental factors, lifestyle choices, and stress.

Scope and Delimitations

The researcher examined Medicare beneficiaries across the United States who were medically diagnosed with hypertension. Medicare beneficiaries with hypertension were chosen as a target population because hypertension continues to be the leading cause of chronic disease commonly labeled as the silent killer (Grabowski, Huckfeldt, Sood, Escarce, & Newhouse, 2012). The research study incorporated a secondary dataset from Healthcare Cost and Utilization Project (HCUP) nationwide database of the National Inpatient Sample (NIS) for 2011 to 2013. The research study was analyzed for the years 2011 to 2013 for the U.S. population. Study outcomes have the potential to support greater consistency in LOS and reimbursement

rates for hypertensive Medicare beneficiaries as well as clarification while controlling for geographic location, age, gender, year, race/ethnicity, and medical comorbidities. The research study encompassed all Medicare beneficiaries including those who were categorized as physically handicapped, and therefore qualified for Medicare benefits.

The previous sections of this study have provided an overview of problematic implications of Medicare reimbursement and the LOS for hypertensive patients. It also presented a relevant purpose of conducting a research aimed at presenting a social significance for a targeted population utilizing a triad methodology. Section 1 has also imparted medical terminology that was utilized throughout the course of the research study. Likewise, the research questions and nature of the study have been presented to provide clarity concerning the basis of the research with an epidemiological foundation.

A further in-depth analysis of the research questions and literature review addressing the gap in literature was targeted in this study, and relevant social impacts on the Medicare population. The literature review establishes a theoretical framework by utilizing a triad method, indicates the need for research on LOS and reimbursement rates while recognizing aspects of previous research studies on related topics. The literature review also identifies new techniques for interpreting previous research, recognizes gaps within the literature, and justifies the need for further research that specified a current timeline. Finally, the literature review identifies how LOS and reimbursement rates have been researched, while providing interpretations of previous and current material.

Literature Review

Medicare was signed and implemented in 1965 by former president Lyndon B. Johnson. Benefits for Medicare beneficiaries are initiated at the age of 65; however, beneficiaries may enroll up to 3 months prior to their 65th birthday to ensure a timely enrollment (Centers for Medicare & Medicaid Services, 2017). Establishing the rate of reimbursement and the LOS for Medicare recipients required additional examination by region due to the variations within Medicare policies. In accordance to each state, these variations produce distinctive differences in healthcare coverage for LOS within each state due to state Medicare policies (Medicare.gov, 2017). Ongoing research has built on information provided by the Centers of Medicare and Medicaid (CMS) to capture factors that contribute to the LOS. Some of the elements incorporate medical diagnosis, morbidity, Medicare in conjunction with additional private insurance, and participation of the provider. These factors which contribute to the LOS for Medicare recipients have been explored to determine appropriate LOS (Qureshi, et al, 2013). Background knowledge of reimbursement rates among Medicare recipients also took into account the total fees associated with the LOS.

The differences in state Medicare policies were elements contributed to variations among regions for LOS and expenses. The differences drove from hospitalization which were closely associated elements that required closer assessment within the research study (Qureshi, et al, 2013). Analyzing data provided within the secondary data set had the potential to unveil the gap of how certain components contribute to the LOS for person, timeframe, and location. The research had the capability to acquire a better understanding of the reasoning for discrepancies in the LOS for Medicare recipients (Qureshi, et al, 2013). The findings from previous research studies pertaining to the association between LOS, and cost accrued has indicated that Medicare

patients who were hospitalized for longer a duration have higher rates in the national estimates with greater hospitalization charges (Busby, Purdy & Hollingworth, 2015).

These components had the potential to inform Medicare policy decision-makers to become more cognizant of the variations in hospital charges and LOS for Medicare recipients (Busby, et al, 2015). Likewise, further exploration may contribute to the overall health of the Medicare hypertensive population by aiding in the decline of the national healthcare deficit (McLaughlin & Olson, 2012). Further analysis of the research study likewise may assist in identifying the elements of variation along with determining factors of extended hospital duration. Additional research attempted to conclude the impact of hospital costs and LOS has on the healthcare economy.

Strategies Used for Literature Review

The intention of the research study was to ascertain plausible explanations for variations in reimbursement rates and LOS for hypertensive Medicare patients. Exploring online resources that were peer-reviewed on BioMed Central, PubMed, government reports, literature matrix (created by the researcher to enable quick comparisons among articles to determine the scope), Google Scholar, and EBSCOhost will be utilized. Additional relevant resources utilized were the Centers for Medicare & Medicaid (CMS), National Institute of Health (NIH), and evidence table. Research articles that were relevant dating greater than five years were utilized merely for the purpose of previous were established research. The terminology that was utilized to acquire relevant literature were *LOS, reimbursement rate, hypertension, supplemental private insurance, hospital charges, admission, Medicare, inpatient management, mortality, CMS, DRG, and variations.*

Gap Addressed

A review of related literature exploring the reimbursement rates and LOS for Medicare patients disclosed the need for further research in determining the variations in LOS and reimbursement rates. Variations in hospital charges across the United States were significantly higher for private insurance providers as opposed to Medicare (Maeda et al, 2014). The reimbursement rates factored in market-based tactics to ensure payment reform which assisted in variations in reimbursement rates (Yoo et al, 2012). Additional research was conducted to determine the LOS strategic guidelines to determine the reduction rate for Medicare patients LOS (Martinez-Martinez et al, 2013). Additional factors that were associated with the LOS for Medicare patients with hypertension entailed costs accompanied by comorbidities that increased LOS, as well as admission and re-admission rates (Machnicki et al, 2011).

Demographics also influence the rate of reimbursement per region; however, determining the calculations and guidelines that are applicable to Medicare patients remained to be standardized across the United States for LOS (Busby et al, 2015; Ku-Chou et al, 2012). An increased LOS additionally adds to outlier and costs associated with inpatient management; therefore, driving the overall cost of inpatient stays beyond the estimated costs (Caravan, 2013; Sawant et al, 2013). Over utilization of the emergency departments has warranted additional research to explore per diem cost and LOS for hypertension and hypertension related illnesses such as ischemic attacks, and vascular failure (Ishak et al; 2012; Singh et al, 2016). Previous literature has not addressed the variables utilizing the triad approach in further determining the reimbursement rates and LOS for hypertensive Medicare patients. The epidemiological approach was suited to addressing the gap in literature, and providing knowledge of the process utilized to govern reimbursement rates and LOS while imparting health care coverage.

RQ1: Are reimbursement rates related to the LOS for Medicare patients with hypertension as the reason for admission after controlling for geographic region, age, year, gender race/ethnicity, and diabetes?

H1: The hospital reimbursement rate is related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H2: The hospital reimbursement rate is not related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

RQ2: Are the hospital reimbursement rates associated with prolonged hospitalization for Medicare patients admitted for hypertension when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes?

H3: The hospital reimbursement rate is associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H4: The hospital reimbursement rate is not associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

Table 2

Literature Matrix: LOS Results from Various Research Studies

Author/Year/Title	Sample	Variables	Design	Findings
Maeda, et al, 2014 Variation in Hospital Inpatient Prices Across Small Geographic Areas.	162 Counties 6 States	DV – Inpatient pricing IV – Geographic location	Multivariate Analysis Linear Regression	Prices are significantly higher for private vs. Medicare. Payment policies from Medicare affect private payers. Public policy that take into consideration market-based approach or payment reform to reduce price variation
Qureshi et al, 2013 Factors associated with length of hospitalization in patients admitted with transient ischemic attack in United States	385	DV – LOS IV – Hospital charges	Multivariate Analysis	Further strategies are required to determine the reduction of LOS
Mehta et al, 2016 Primary payer status, individual patient characteristics, and hospital-level factors affecting LOS and total cost of hospitalization in total laryngectomy	4,128	DV – LOS IV – Total Cost of Hospitalization	Multivariate Analysis Multi-linear Regression	The odds of being top quartile of LOS for Medicaid patients by 41% compared to private insured patients After controlling for medical factors Medicaid patients had increased LOS Overall cost was higher for Medicaid and Medicare
Busby et al, 2015 A systematic review of the magnitude and cause of geographic variation in unplanned hospital admission rates & LOS for ambulatory care	43,819	DV – LOS IV – Admission Rates	Cross-sectional Analysis	Wide variation in admission rate Fewer admission triggering shorter LOS

(table continues)

Yoo et al, 2012 Effect of Reimbursement Reductions on Bone Mineral Density Testing for Female Medicare Beneficiaries	1,320	DV- Reimbursement Reduction IV – Supplemental private health insurance	Cox proportional hazard regression analysis	Significant association between reimbursement reductions and decrease in BMD test in female Medicare beneficiaries without supplemental private insurance
Ku-Chou et al, 2012 Prediction of LOS of First-Ever Ischemic Stroke	330	DV- LOS IV – clinical predictors	Univariate Analysis and Multiple Regression Analysis	Severity of stroke revealed to be a vital factor that influences the LOS after a cute stroke hospitalization
Martinez-Martinez et al, 2013 Transient ischemic attacks clinics provide equivalent and more efficient care than early in-hospital assessment	211	DV – Inpatient Management IV – Cost per patient	Logistic regression	Transient ischemic attacks clinics are efficient for the early management of low- to moderate-risk TIA patients compared to in-hospital assessment, with no higher recurrence rates and at almost one-fifth the cost.
Machnicki et al, 2011 Kidney transplant Medicare payments and LOS: associations with comorbidities and organ quality	27,594	DV- LOS IV – Medicare Payments	Multi-linear regression	Impact of comorbidities on reimbursement, LOS and transplant finances depend on local practice, outcomes and reimbursement system. Further studies should be conducted to confirm associations and design appropriate interventions
Burke et al, 2015 Characterizing Pulmonary Hypertension--Related Hospitalization Costs Among Medicare Advantage	2,275	DV- Readmission of pulmonary hypertension hospitalization IV – premature mortality	Linear regression	PH-related hospitalizations incur substantial healthcare costs and require long hospital stays for patients with PAH. Improved treatment approaches reduce PAH disease progression leading to costly and burdensome inpatient stays

(table continues)

Ishak et al, 2012 Accounting for the relationship between per diem cost and LOS when estimating hospitalization costs	11,614	DV- LOS IV – Per Diem Costs	Linear regression	Per diem costs are not independent of LOS
Canavan, 2013 Rehospitalization Is Driving Costs in Pulmonary Arterial Hypertension	4,009	DV – LOS IV – Hospitalization Costs	Linear regression	Overall, PAH who were hospitalized during the study period from January 2007 through December 2011, 39.2% were re-hospitalized more than once.
Sawant et al, 2013 Increased LOS and costs associated with inpatient management of vascular access failures	172	DV – LOS IV - Costs	Logistic regression analysis	Vascular access management contributes to significant expenses especially during first few months of initiation of dialysis. This increases workload on the already overburdened hospital infrastructure and draws up costs and increases length of stay
Singh et al, 2016 Emergency Department and Inpatient Healthcare utilization due to Hypertension.	2,934,838	DV – Hospitalization outcomes (LOS, charges, disposition) IV- Hypertension associated ED	Multivariable-adjusted linear or logistic regression	Hypertension associated with significant healthcare burden in the U.S. Future studies should assess strategies to reduce hypertension-associated cost and healthcare burden
Suh et al, 2014 Effect of health insurance type on healthcare utilization in patients with hypertension: a national health insurance database	325,566	DV – LOS IV – Hospitalization Costs	Logistic regression	The pattern of higher healthcare utilization among MA patients persists even after controlling for baseline health conditions

Medicare Hospitalization Cost

Hospital charges accrued by Medicare patients are estimated total payment amounts that encompass the diagnosis related group (DRG) cost, total charge per diem, Medicare primary payer cost, coinsurance, deductible, and DRG outlier total (Centers for Medicare & Medicaid Services, 2017). CMS utilized data on hospital-specific expenses for over 3,000 hospitals nationally. Each healthcare facility applied government specified Medicare Severity Diagnosis Related Group (MS-DRG) annually to itemize services rendered to Medicare patients. Nearly 75% of Medicare discharges were represented by the MS-DRG which accounts for more than 7 million inpatient prospective payment system (IPPS) discharges (Centers for Medicare & Medicaid Services, 2017). Medicare likewise applied supplemental payments to the healthcare facilities commonly known as outlier payments which were formulated to safeguard against substantial economic loss.

Medicare Payment

Medicare reimbursements for hypertensive patients are categorized into groups determined by payer status such as denials (i.e., medically unnecessary or non-covered care/patient), delays (i.e. additional review required), and payments forthcoming (Mehta, Flores, Thompson, & Nathan, 2016). Payment validation within each healthcare organization entails eligibility verification, metrics, benchmarking, and cost methodology in an effort to remain within a model of care and reimbursement. Billing and coding for Medicare reimbursement involves five-digit current procedural terminology (CPT) and modifiers for appropriate coding which also permit accuracy (Medicare.gov, 2017). Reimbursement expectations vary depending on the appropriate charge capture, coding and claims submission that each healthcare facility submits to Medicare by accepting applicable billing. Each Medicare claim presented by a healthcare provider is obligated to be under government compliance to ensure an operational

revenue cycle. The utilization of DRG coding and current ICD-10 compliance are more efficient means of providing a specific charge structure due to the capability of the process to deliver accuracy and compliance solutions (Medicare.gov, 2017). Reimbursement and revenue cycle optimization for Medicare patients are continuously undergoing procedures that should minimize denied and delayed compensation. Rejection resolutions for payment posting and denial analysis are predetermined by traditional and current coding practices that are in conjunction with regulatory compliance. As compensation for medical care is acquired, many healthcare organizations are contracted to utilize a process termed *super billing* (charges completed by provider) in an effort to obtain expedited payment (Medicare.gov, 2017).

Demographics and clinical predictors contribute to LOS for Medicare patients depending on the state and local parameters established in outlier assessments. Regional specifications may likewise interject the rate of admissions, and readmissions for predictors such as hypertension, gender, age, and race/ethnicity (Chang, Tseng, Weng, Lin, Liou, Teng-Yeow & Tan, 2002). Influential factors in the rate of Medicare reimbursement operate in conjunction with recurrent cost analysis to alleviate intermittent and distinct variations.

Although consistency is an imminent segment of Medicare reimbursement; elements such as location and medical severity greatly influence general revenue cycle components (Chang et al, 2002). Demographic and medical characteristics of patients whose LOS was assessed disclosed that the median for age was 66 of which 58.5% were men and 41.5% women (Chang, Tseng, Weng, Lin, Liou, Teng-Yeow & Tan, 2002). The median LOS was 7 days, which also encompassed other variables such as smoking, stroke, severity of stroke, neurological impairments, and LOS post-acute hospitalization (Chang et al, 2002).

Pulmonary hypertension (PH) fees for Medicare patients incurred significant costs due to readmissions, and required a longer duration of hospitalization. Many PH patients often encounter a higher readmission rate within 1-year due to the chronic pulmonary disease encountering many complications (Burke et al, 2015). The average cost for Medicare patient hospitalization from PH was just over $46,000 in 2011 with the average LOS was approximately 11 days. The cost and LOS for admission were significantly higher for Medicare versus commercially insurance with the difference being just under $20,000 per year, and with a four-day variation in LOS (Burke et al, 2015).

From 1989 to 2014, the rate of Medicare spending increased approximately 5.5% per year, placing it at a rate 6.3% behind the annual rate of commercial insurance per person. Additionally, from 2010-2015 the spending rates were somewhat analogous for Medicare, and commercial insurance with an annual increase of only 1.4% over the duration of a six-year time frame (Cubanski & Neuman, 2016). The projected spending expenditure for Medicare between 2015 and 2025 is 7.1% which is a 4.4% gain for the annual growth between 2010 and 2015 (Cubanski & Neuman, 2016).

Supplemental Private Insurance

Supplemental insurance in conjunction with Medicare coverage provides patients with a broader range of medical coverage, and places the provider at a higher rate of reimbursement with the dual coverage. Medicare revenue is provided by numerous sources such as general revenue, payroll taxes, beneficiary premium, social security taxation, interest, and state payments (Medicare.gov, 2017). Medicare supplemental insurance (Medigap) provides Medicare patients with additional coverage that encompasses copays, coinsurance, and deductibles (Medicare.gov, 2017).

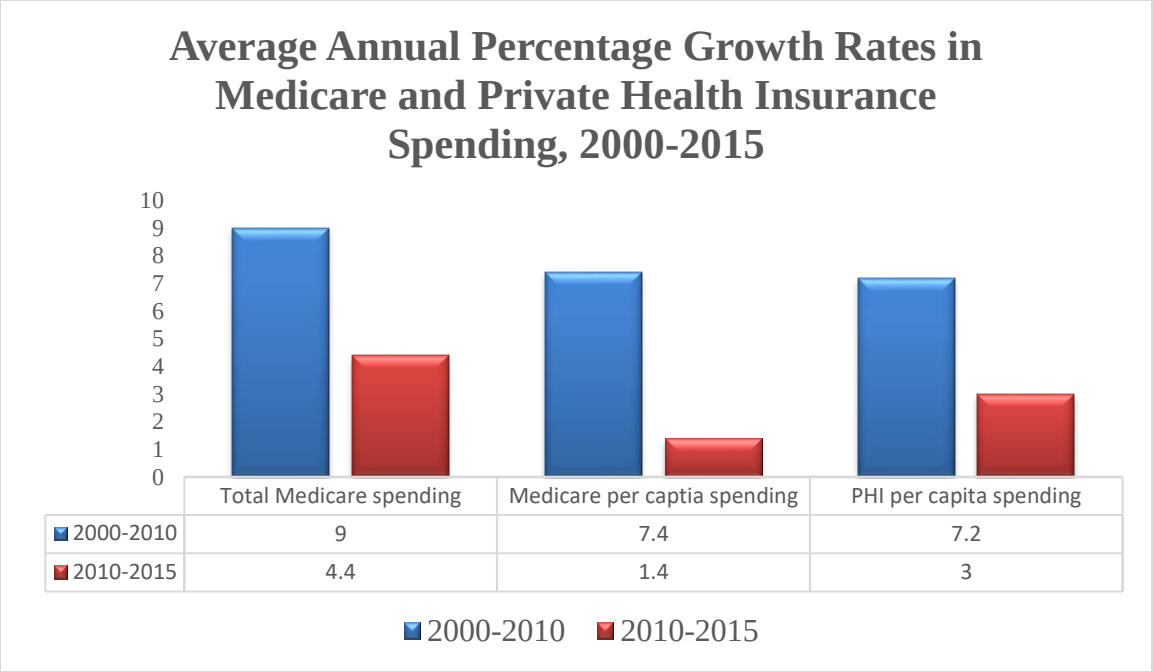

Figure 2. Average annual growth rate percentage in Medicare and private health insurance spending, 2000-2015, by Kaiser Family Foundation.
Source: Cubanski & Neuman, The Facts on Medicare Spending and Financing. Kaiser Family Foundation analysis of Medicare spending data from Boards of Trustees; private health insurance spending data from the CMS National Health Expenditures data.

The Medicare annual growth rate and private health insurance indicated a decrease from 2010-2015 as opposed to 2000-2010 (Cubanski & Neuman, 2016). Primary insurance principal purpose is to provide reimbursement first, and the beneficiary will be responsible for the remainder of costs incurred. Secondary insurance provides reimbursement for a portion or the remainder of the cost after primary insurance has been compensated. Medicare beneficiaries that possess both primary and secondary insurance coverage with one being private insurance have the option to enroll in Medicare Part A. Medicare Part A utilized in conjunction with private insurance provides the beneficiary with medical coverage either free of charge or with a low premium and no out-of-pocket limitation (Medicare.gov, 2017). Additional Medicare coverage such as Part B can be applied as a secondary insurance for beneficiaries in conjunction with health insurance from an employer.

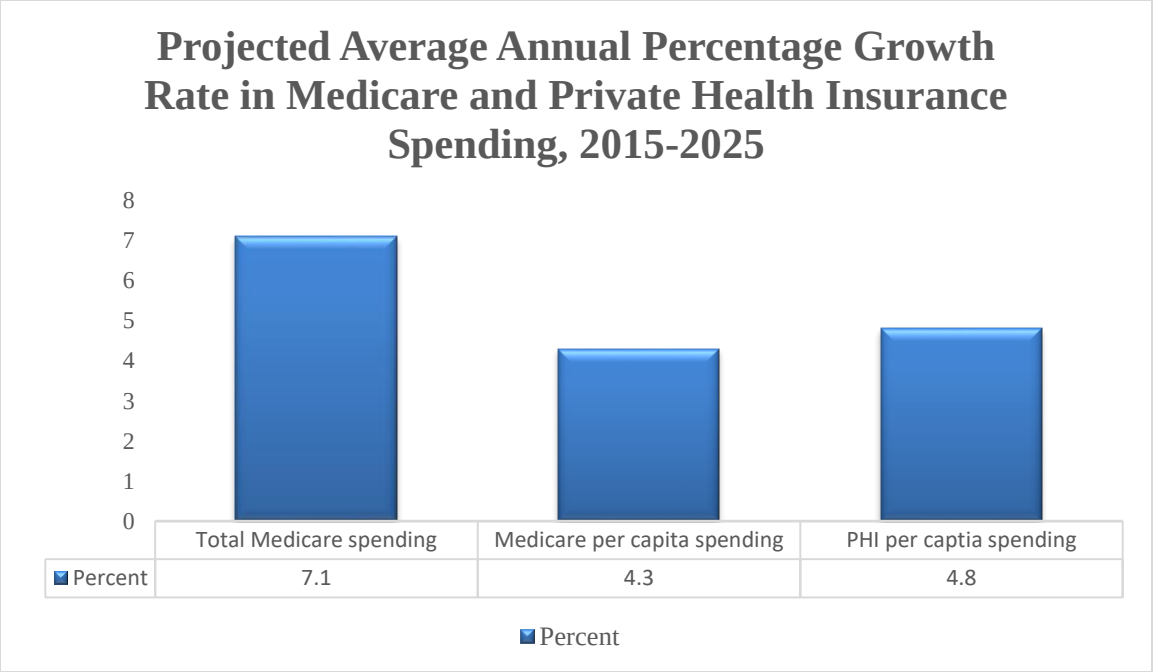

Figure 3. Projected average annual percentage growth rate in Medicare and private health insurance spending, 2000-2015 by Kaiser Family Foundation.
Source: Cubanski & Neuman, The Facts on Medicare Spending and Financing. Kaiser Family Foundation analysis of Medicare spending data from Boards of Trustees; private health insurance spending data from the CMS National Health Expenditures data.

Enhanced management for Medicare patients such as age and health specified treatment have the capability to assist in progression toward a reduction of exorbitant and onerous LOS (Burke et al, 2015). Medicare and primary health insurance spending that operates collectively possess a greater chance of claims being reimbursed; however, the total Medicare spending far exceeds private health insurance per capita while there is only a marginal difference in Medicare and PHI per capita (Cubanski & Neuman, 2016). Controlling for Medicare costs can be taxing; however, when additional healthcare coverage is applied such as Medigap, TRICARE, long-term care insurance, the Federal Employees Health Benefits Program (FEHBP), and American Association of Retired Persons (AARP) expenditures can be curtailed. The type of insurance has an influence on patient frequency, resources, preventative utilization, and more explicitly on LOS (Suh, Kang, Kim & Shin, 2014).

Reimbursement Rate

The rate of Medicare reimbursement heavily relies on funding from the federal government and states (Medicare Resources, 2012). The Medicare-to-Medicare fee gauges a healthcare organization fees within each state, and adjusts reimbursement rates accordingly per service state or region (Medicaid.gov, 2017). The Medicare fee schedule is comprised of itemized fees utilized to reimburse providers, and provide a fee maximum for the services rendered. The services rendered may include laboratory services, durable medical equipment (DME), ambulatory services, primary care services, hospitalization, and much more that are all assessed with the Medicare fee schedule (Medicaid.gov, 2017).

The Medicare fee schedule and hospital LOS outlier management process administers particular guidelines to financing within a healthcare system. During the process of healthcare administration and Medicare outlier consulting, it is determined the maximum LOS for Medicare patients will be accordance to the medical diagnosis (Freitas, Silva-Costa, Lopes, Garcia-Lema, Teixeira-Pinto, Brazdil & Costa-Pereira, 2012; Medicare.gov, 2017). Nearly 4.0% of high LOS outliers accounted for 19.2% of total hospitalization with academic hospitals having a longer LOS and readmissions (Freitas et al, 2012).

Inpatient Pricing

Inpatient pricing is contingent on the complexity of the healthcare organization and a patient's medical diagnosis as well as the determinant of LOS (Maeda, Henke, Marder, Karaca, Friedman & Wong, 2014). A patient's intricate diagnosis is assessed by medical professionals and administration to ensure that the Medicare guidelines are taken into consideration when applying hospital pricing. Likewise, consideration is applied to the costs that will vary systematically with the determined LOS, location, and the complexity of a patient's medical condition **(**Ishak et al, 2012).

Length of Stay

The LOS for Medicare patients is determined by the medical diagnosis, DRG, demographics, and government guidelines that are applicable to each healthcare organization. The duration for patient stay is categorized into the average LOS and the geometric LOS. The difference between the average LOS and geometric mean LOS is that the average LOS is the calculations a hospital defines as the duration a patient stays within an occurrence during hospitalization (Freitas et al, 2012). The average LOS is also analyzed by the number of patients with similar/same diagnosis with a LOS divided by the total number of patients admitted over the past 12 months. Whereas, the geometric mean LOS is a computed by multiplying all of the LOS and using the nth root of the number of patients (Freitas et al, 2012).

Admission Rate

The admission rate is constantly rising due to the age of Medicare beneficiaries, and the ongoing medical conditions associated with an aging or physically handicap population (Canavan, 2013). Current trends in hypertensive patients are often coupled with other chronic illnesses such as diabetes, kidney failure, and cardiovascular disease (Lipska, Ross, Wang, Inzucchi, Minges, Karter, Huang, Desai, Gill, Krumholz, 2014). These illnesses have directly impacted the rate in which Medicare patients are hospitalized and treated in an effort to effectively care for older adults or the physically disabled (Busby, Purdy & Hollingworth, 2015). Additionally, the LOS is influenced by admission rate as well as the readmission of hypertensive patients with combined sickness. Hospitalization costs and LOS for hypertensive patients with pulmonary arterial hypertension estimated just over $30,000 with the average LOS of 11 days. The total costs for patients that were readmitted was approximately $71,000 with a LOS of 24.5 days (Canavan, 2013).

Readmission Rate

The readmission rate of hypertensive Medicare patients is calculated by estimating the number of patients who return for the same diagnosis within 30 days of the previous discharge. The readmission rate can be further examined by age, gender, and demographic location (Dartmouthatlas.org, 2017). This data provides detailed reimbursement rates for hospital admission and readmission for various healthcare facilities such as skilled nursing facilities and outpatient establishments for reimbursement rates on behalf of the health services rendered.

Currently, healthcare organizations with low inpatient admission rates are commonly located within rural regions; however, these regions have been recorded as having lower rates of mortality (Minemyer, 2017). The mortality rate for Medicare patients that were discharges within seven days was 0.12%, which contributed to approximately 10,000 unexpected deaths annually (Minemyer, 2017). Hospitals with higher admission rates which discharged nearly 85% of Medicare patients incurred a death rate of 3.4% higher than healthcare organizations with a lower admission rate (Qureshi, Adil, Zacharatos & Suri, 2013).

Inpatient Management

Since 2012 there has been a nationwide decline in the admission and readmission rates for Medicare patients. This decrease may be a direct result of a plethora of healthcare process improvement techniques, and quality of care initiatives that have been implemented within many healthcare organizations (Martínez-Martínez, Martínez-Sánchez, Fuentes, Cazorla-García, Ruiz-Ares, Correas-Callero, Lara-Lara & Díez-Tejedor, 2013; McLaughlin & Olson, 2012). A more comprehensive exploration for the decline in readmission still requires further investigation (Sawant, Mills & Dhingra, 2013). The number of Medicare admissions has decreased from 11.4 million in 2007 to 10.4 million in 2012, and readmission rate from 2.1 million in 2007 to 1.9 million in 2012 (Gerhardt, Yemane, Apostle, Oelschlaeger, Rollins, Brennan, 2014)

Geographic Factors

Geographic elements consistently have an effect on the rate of Medicare reimbursement, mortality, LOS, admission, and readmission rates. Medicare geographic adjustment factors have been utilized in an effort to ensure that healthcare providers and healthcare organizations are reimbursed sufficient payment for the care provided (Geographic Adjustment Factors in Medicare Payments, 2011). Some geographic factors also consist of adjustments of fee-for-service reimbursement rates in accordance to geographic location to control variations among rural and metropolitan regions. The adjustments attempt to assist in providing reimbursements that reflect on local costs of rendering care. This process aids in ensuring that Medicare provides adequate payment per region according to the geographic practice cost index (Edmunds & Sloan, 2011).

In an effort to enhance accuracy in geographic adjustments, Medicare attempts to gauge reimbursement according to the local labor market, in which healthcare providers manage and contend for employees (Busby, Purdy & Hollingworth, 2015). With the utilization of labor market data, Medicare can make certain that broadening healthcare providers to be incorporated in computing a wage index, and fluctuations in pricing (Edmunds & Sloan, 2011). The fluctuation in pricing per region may directly impact the rate of reimbursement, and the LOS when healthcare organizations are striving to adhere to Medicare guidelines. A conceptual rationale for utilizing data from a healthcare sectors versus industry-wide can assist in improving accuracy in geographic adjustments and address concerns conveyed by stakeholders. The Institute of Medicine (IOM) evaluates the accuracy of geographic adjustments factors, methodology, data, and the effects adjustments have on Medicare reimbursement rates. The evaluations assist in the quality of care, higher rate of reimbursements, and overall health of the populations (Maeda et al, 2014).

Hypertension

Medicare patients who have been diagnosed with hypertension can be covered under Medicare Part B and D. Medicare covers patients for screening that assist in alleviating stroke which may be directly caused from hypertension prevalence (Medicare.gov, 2017). Hypertensive patients account for nearly 70 million people across the U.S., and over $42.9 billion was spent in 2010 to treat hypertensive patients. Approximately 1 in every 3 adults is clinically diagnosed with hypertension, and the prevalence increases with an aging population (CMS.gov, 2017). Within the age range of 18 to 39 nearly 7% of the population is diagnosed with hypertension, while there is nearly 67% with hypertension over the age of 60. Hypertension is the leading cause of chronic disease mortality in the U.S. due to uncontrolled high blood pressure resulting in approximately 1,000 deaths daily (CMS.gov, 2017).

Table 1

Classification of Hypertension

Blood Pressure Classification	Systolic Blood Pressure (SBP) – mmHG	Diastolic Blood Pressure (DBP) – mmHG
Normal	<120	<80
Pre-hypertensive	120-139	80-89
Stage 1 Hypertension	140-159	90-99
Stage 2 Hypertension	>160	>100

Note. 2004 Joint National Committee on Prevention, Detection, Evaluation & Treatment of High Blood Pressure. Source: National Heart, Lung, and Blood Institute (NHLBI), National Institutes of Health. http://www.nhlbi.nih.gov/guidelines/hypertension

Hypertension accounted for nearly 55% of Medicare fee-for-service in 2012. The disparities associated with elderly hypertension were among the highest in the African-American population at 63%, followed by 56% in the Asian/Pacific Islander community, and 55% of Non-Hispanic/whites (CMS.gov, 2017)

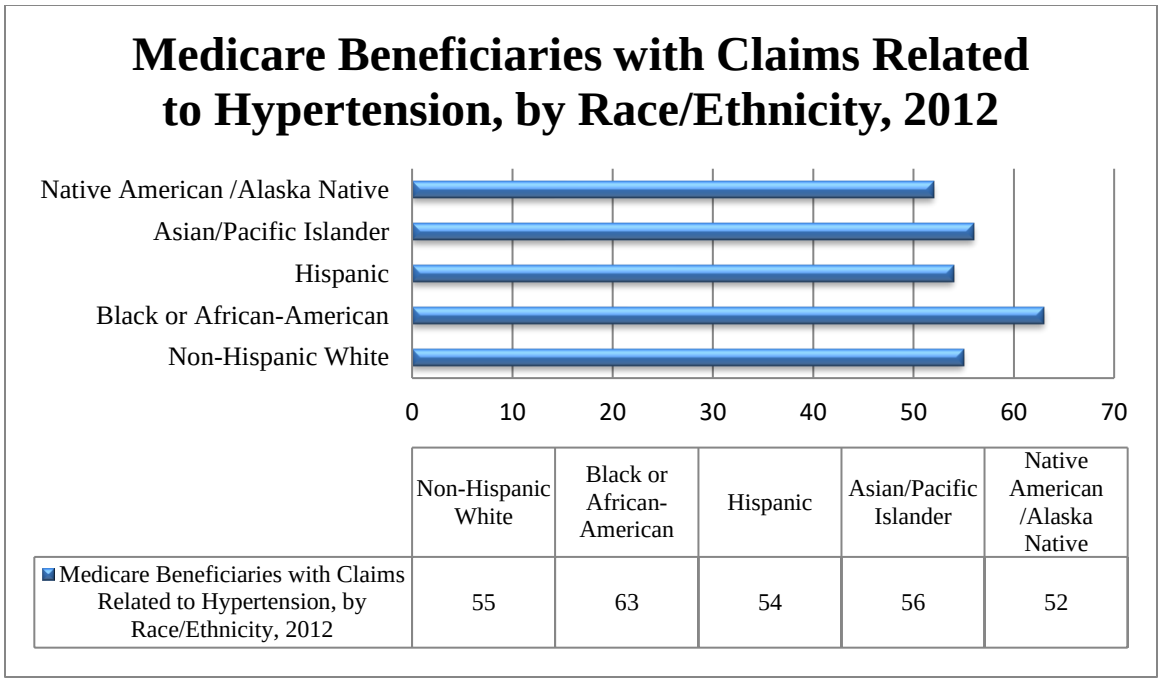

Figure 4
Source: Centers for Medicare & Medicaid Services. Chronic Condition Data Warehouse (CCW) Centers for Disease Control and Prevention. Hypertension among Adults in the United States: National Health and Nutrition Examination Survey, 2011-2012.
Centers for Medicare & Medicaid Services. Chronic Conditions.

Despite the plethora of medications and treatments to combat hypertension, high blood pressure still remains to be fully controlled or eradicated among Medicare patients. Some factors that accompany prevalence with the Medicare population are non-adherence to prescribed treatment, patients who are genetically pre-disposed to hypertension, lack of awareness that the chronic disease exists due to insufficient treatment, socio-demographic, and clinical characteristics (CMS.gov, 2017). Hypertension prevalence that addresses the variation in clinically diagnosed Medicare patients among socio-demographics has the capability to strengthen regulations associated to quality of care as well as assist in providing standardization in LOS, admission, and reimbursement rates. By applying industry wide consistency, Medicare policies have the potential to employ quality measures in an effort to develop regulated specifications across the healthcare continuum (Mastragelo, 2014).

Hypertension Mortality

Hypertension among Medicare patients is commonly accompanied with other chronic diseases such as diabetes, ischemic heart disease, high cholesterol, renal failure, stroke, arthritis, and dementia (Moser, 2007). The most prevalence triad chronic condition combination is ischemic heart disease, hypertension, and diabetes with 33.7% prevalence. This triad has a per capita spending expenditure of nearly $20,000 per patients; however, the most costly triad is stroke, chronic kidney disease, and asthma (Semilla, Chen, Dall, 2015).

The reduction in mortality rate among Medicare patients post implementation of Medicare Part D assisted in the reduction of deaths by 2.2% annually. Medicare Part D enhanced drug coverage which aided in comprehensive coverage, and increased utilization of hypertensive medication with treatment. Since the implementation of Part D, approximately 200,000 Medicare beneficiaries have increased longevity by an average of 3 years (CMS.gov, 21017).

Hypertension mortality and geographic variations are consistent in LOS; furthermore, placing a higher mortality rate in rural regions. The rate of hypertension mortality during re-admission was decreased by 4% in 2013 as opposed to 1% for initial hospitalization (Freeman, Wang, Akar, Desai, Krumholz, 2017). In 2013 Medicare fee-for-service patients who were admitted and treated with more cost consuming treatments; however, the quality of care rendered results greater than 30-day readmissions with a lower mortality rate (Freeman et al, 2017).

Hypertension ED Utilization

Utilization of the emergency department (ED) and inpatient health services for hypertension related occurrences within the United States has increased since 2009 from 920,984 to 1,041,233 for patients with hypertension as the primary diagnosis (Singh & Yu, 2016). Hypertension is medically described as blood pressure measuring greater than 140/90 mm Hg

(Williams, 2012). Of the over one million hypertension related visits to the ED, 23% of the patients were hospitalized for further monitoring, testing, and treatment. During the course of the last four years there has been a 13% upsurge in ED utilization for hypertension documented cases that has added to national health care deficit (Singh & Yu, 2016). One in seven adults classified as hypertensive that utilizes the ED is uninsured, which is estimated at 4 million nationwide (Brooks, 2016). Approximately 15% of hypertensive related visits to the ED were by those who were uninsured and an addition 23.4% utilized Medicaid (Centers for Disease Control and Prevention.gov, 2015). The individuals who received Medicaid coverage were more likely to utilize the ED than those who had private insurance (Centers for Disease Control and Prevention.gov, 2015). Despite the plethora of medical therapy for hypertension treatment and monitoring, it remains an inadequate system for cost-containment within the U.S., thus creating a negative impact on the health care economy (Centers for Disease Control and Prevention.gov, 2015). Of the ED visits due to hypertension associated instances 11% of patients were hospitalized and an additional 13% transferred to other health care facilities (Singh & Yu, 2016). Nearly 18% of uninsured hypertensive patients neglected visits to a primary care physician, and thus utilized the ED as means of primary care treatment (Brookes, 2016).

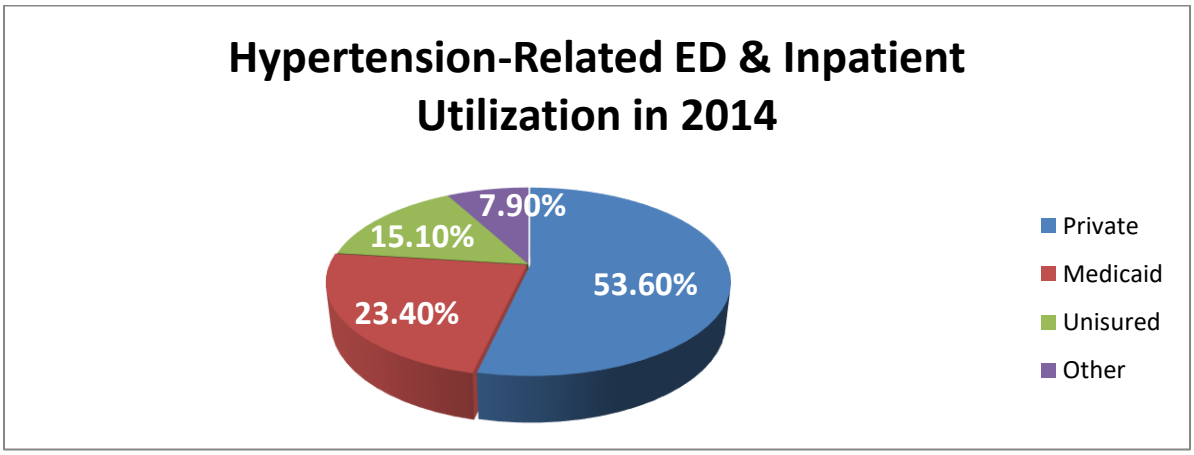

Figure 5
Source: (Centers for Disease Control and Prevention.gov, 2015)

Summary

The reimbursement rate for hypertensive patients receiving Medicare benefits varied depending on a number of factors as explored within the literature review. These variations were comprised of several components that assisted a geographic region in reducing readmissions, assigning the appropriate LOS, and adequate reimbursement rate per location. Medicare guidelines are practiced in accordance to state and governmental regulations; however, the guidelines were not consistent across all states. Geographic adjustments are one of the many reasons that reimbursement variations occur with specified regions (Geographic Adjustment Factors in Medicare Payments, 2011).

Additional insurance utilized in conjunction with Medicare supplemental (Medigap) offered beneficiaries with a broader range of coverage and alleviates the responsibility of disbursing out-of-pocket funds (Medicare.gov, 2017). Approximately 4.0% of high LOS outliers accounted for 19.2% of extended stay which caused a longer LOS and a greater probability for readmissions (Freitas et al, 2012). Healthcare facilities with high admission rates discharged nearly 85% of Medicare patients triggering a death rate of 3.4% higher than hospitals with a low admission rate for hypertensive patients (Qureshi, Adil, Zacharatos & Suri, 2013).

The literature review focused on exploring reasoning for variations per geographic region and the LOS for Medicare hypertensive patients. The literature also exhibited factors of Medicare that have implications on healthcare costs such as prevalent chronic diseases that are expressed in an aging population as well as groups (ethnic/race, gender, region) that were impacted by hypertension. The variations in acceptable LOS per region also had an influence of the rate of reimbursement on behalf of Medicare beneficiaries. Likewise, the utilization of the ED interjected and is an initial dynamic in the LOS along with admission or readmission. Minimizing the use of the ED, and interchanging activity with routine office visits may alleviate

additional costs. The significance of the research may provide rationale for a government entity consistency nationwide, and whether there has been any improvement to decrease the fluctuations (Medicaid.gov, 2016). The need for further research is based upon further strategies that are required to determine the reduction of LOS, the significant price variation in Medicare and private insurance, the demand for a market-based approach or payment reform, and additional research pertaining to the impact of comorbidities on reimbursement and LOS as a U.S. healthcare burden (Qureshi et al, 2013). Furthermore, seeking determinants of extended hospitalization and concluding the effect on costs that impacted the LOS for Medicare patients nationwide are gaps that were explored.

The research had the capability to provide a positive social impact by providing new reimbursement standards that will benefit Medicare recipients. Likewise, with enhanced guidelines implemented by Medicare it had the potential to require flexibility in reimbursement for treatment surrounding hypertension, and gauging the essentials for targeted populations which may increase the rate of reimbursement (Suh et al, 2016). Strengths within the research unveiled the need for maximizing the LOS allotted by healthcare organization and Medicare reimbursement guidelines in an effort to become more cost efficient while meeting the healthcare needs of the population. However, the drawback of maximizing the LOS for hypertensive patients may contribute to the already rising deficit of the healthcare economy nationwide. Increased LOS may also place a strain on the rate of reimbursement considering there was a flat fee rate for the services rendered despite the increasing number of Medicare patients with chronic diseases. An opportunity presented was the possibility of increased reimbursements and extended LOS for patients with medical necessity; however, the threats of encompassed the validity of the rates of reimbursement and variations pertaining to demographic regions.

Section 2: Research Method

Introduction

The research method that was applied to assess the hypothesis was a quantitative multivariate analysis. The logistic regression analysis testing determined that there was a direct correlation in hospital reimbursement rates being associated with prolonged hospitalization and/or reimbursement rates related to the LOS for Medicare patients with hypertension. This section presented the research methodology, setting, size, region, target population, instruments and materials utilized to assist in the analysis. Multiple studies were explored that were comparable and consistent in controlling for similar covariates, LOS and reimbursement rates for Medicare patients with hypertension.

Research Design

A logistic research design was applied to the study to present correlation between variables as well as an epidemiological model consisting of person, place, and time. A quantitative design assisted in identifying the extent of the correlation and factors within the target population. A quantitative analysis verified the data presented via the use of statistical package for the social sciences (SPSS). The design assisted in determining trends within Medicare reimbursement rates and LOS factors associated with hypertensive patients. The research design likewise assisted in quantifying data from the target population, and measuring the incidence from multiple aspects within the sample including exploring additional findings. The quantitative research was utilized in determining variations in reimbursement rates and LOS by the region in which Medicare benefits were applied. It also explored applicable results that were utilized in creating positive social change within the target population.

Methodology

Setting and Sample

Data were analyzed that represented of hypertensive patients who had received Medicare benefits from 2011 to 2013. A secondary data set that was utilized in the research study was acquired from the Healthcare Cost and Utilization Project (HCUP) nationwide database of the National Inpatient Sample (NIS) for the duration of 2011 - 2013. In conjunction with the secondary data set supplied by HCUP-NIS examination of the reimbursement rates for LOS for Medicare patients was used while simultaneously controlling for covariates categorized from the secondary data set (Qureshi, et al, 2013). To obtain secondary data from HCUP, a mandatory data use agreement course was completed that addressed the key aspects of utilizing secondary from the HCUP website (Agency for Healthcare Research and Quality, 2016). A certificate code was then issued to access the secondary dataset electronically, and provided authorization for utilizing data to conduct testing for the research setting that concentrated on the U.S. population of hypertensive Medicare patients.

Target Population

The research focused on Medicare recipients who were medically diagnosed as hypertensive. The inclusion of hypertensive Medicare patients was necessary in order to assess the hypothesis, and determine whether there was a correlation among reimbursement rates and LOS for hypertensive patients. Patients who were not medically diagnosed with hypertension or receiving Medicare benefits were excluded from the research study. The research did not exclude patients based upon location, gender, ethnicity/race, age, physical disability, or pre-existing comorbidities, but rather utilized the covariates to determine additional factors that exhibited variations.

Data Analysis

The statistical analysis was composed of a descriptive, a two-way test of association, followed by multivariate logistic regression to address *Research Question 1*, and logistic regression to address *Research Question 2*. Categorical variables were analyzed to determine the percentage of male and female subjects as well as to define race/ethnicity in each category. Further analysis assisted in defining the number of subjects by medical comorbidity and year. The mean, mode, and standard deviation were calculated per category to exhibit variations per year. The research analyses likewise assisted in establishing a high or low rate of reimbursement, and determining the average LOS for Medicare patients with hypertensions. The covariates were analyzed to determine the significance in variations.

Power Analysis

Sample Size: X-Sectional, Cohort, & Randomized Clinical Trials	
Two-sided significance level(1-alpha):	95
Power(1-beta, % chance of detecting):	80
Ratio of sample size, Unexposed/Exposed:	3
Percent of Unexposed with Outcome:	50
Percent of Exposed with Outcome:	67
Odds Ratio:	2
Risk/Prevalence Ratio:	1.3
Risk/Prevalence difference:	17

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Sample Size - Exposed	94	92	100
Sample Size-Nonexposed	281	275	298
Total sample size:	375	367	398

References

Figure 6
Kelsey et al., Methods in Observational Epidemiology 2nd Edition, Table 12-15
Fleiss, Statistical Methods for Rates and Proportions, formulas 3.18 &3.19
CC = continuity correction
Results are rounded up to the nearest integer.
Results from OpenEpi, Version 3, open source calculator--SSCohort

The power analysis was calculated with the utilization of Open Source Epidemiologic Statistics for Public Health, Version 2.3.1 (Open Source Epidemiologic Statistic for Public Health, 2013). The power analysis calculations for sample size yielded a minimum of 398 for the research study, given a beta of 80% which provided a high enough effect volume for determining the LOS and reimbursement rate for Medicare patients with hypertension. The estimated confidence level, power, odds ratio, ratio of unexposed to exposed, and percentage of unexposed with outcome were calculated to assist in determining an effective sample size for the research study by utilizing the sample cohort and randomized clinical trial study calculations provided by Open Source Epidemiologic Statistics for Public Health.

Instruments and Materials

The Healthcare Cost and Utilization Project (HCUP) nationwide database of the National Inpatient Sample (NIS) database that encompassed a secondary dataset from 2011 to 2013 was utilized. The secondary dataset encompassed patients as the unit of analysis, and provided data for the dependent and independent variables that were analyzed. SPSS was the statistical tool utilized to measure the data by applying a logistic regression analysis. Upon receiving calculations post logistic regression analysis and descriptive statistic assisted in analyzing the data within SPSS, and interpretation aided in determining a null or alternative hypothesis.

The dependent variable, LOS was analyzed in conjunction with the independent variable of reimbursement rate. The covariates within the research were age, gender, location, timeframe in which services were rendered ethnicity/race, and diabetes. The location of the research was limited to United States, and the ethnicities represented included White, Asian/Pacific Islander, Black/African-American, Hispanic, and other to encompass smaller groups. The timeframe for the research included 4 consecutive years of data to exhibit a current study aimed at exploring

the gap in literature as well as current and past findings pertaining to the LOS. The secondary dataset was tested against the following research study questions:

RQ1 – Are reimbursement rates related to the LOS for Medicare patients with hypertension as the reason for admission after controlling for state, age, year, gender race/ethnicity, and diabetes?

H1: The hospital reimbursement rate is related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for state, age, year, gender, race/ethnicity, and diabetes.

H2: The hospital reimbursement rate is not related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for state, age, year, gender, race/ethnicity, and diabetes.

RQ2 – Are the hospital reimbursement rates associated with prolonged hospitalization for Medicare patients admitted for hypertension when controlling for state, age, year, gender, race/ethnicity, and diabetes?

H3: The hospital reimbursement rate is associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for state, age, year, gender, race/ethnicity, and diabetes.

H4: The hospital reimbursement rate is associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for state, age, year, gender, race/ethnicity, and diabetes.

Data Protection and Privacy

The research study underwent the approval process of the Walden University Institutional Review Board (IRB) to utilize an external secondary dataset. The Data Protection Act 1998 was defined for processing data on patients that are identifiable for living individuals. (Personal Data

Protection Commission, 2017). This act protects individuals from being exploited and private information from unsolicited distribution. This data protection act was also applied to ensure that Protected Health Information (PHI) was safeguarded and provided individuals with an array of privacy rights. The PHI rights however permit the disclosure of data required for quality of patient of care and necessary documentation for verification. PHI also works in conjunction with the Health Insurance Portability and Accountability Act (HIPAA) to ensure patient confidentiality in relation to electronic or hardcopy data within research studies as well as in healthcare facilities.

The protection of human subjects during the course of research required permission for academic institutions and clinical trials. All patient specific information was protected and underwent re-coding where necessary to uphold patient privacy during the duration of the research study. Approval from Walden IRB and HCUP privacy agreement use sustained and presented no harm to the individual information provided by HCUP participants. The research did not present any ethical issues for the university, Medicare, the researcher, or participants in an effort to further determine gaps in previous related literature.

Threats to Validity

A critical threat to validity of the research study that had implications was the misdiagnosis of hypertension for Medicare beneficiaries who were pre-hypertensive and those who had infrequent occurrences of elevated blood pressure. The volume of patients who had a prevalence of hypertension and had been medically diagnosed for a period of greater than 6 months provided more reliable data than beneficiaries who had elevated blood pressure readings caused by stress, diet, exercise, or additional factors. An external factor that may have impacted the validity of the research study was the absence of Medicare recipients who were classified as

physically disabled, and were diagnosed as hypertensive. To safeguard against threats to statistical validity, data representing a period of 4 years were utilized to permit a larger sample size as well as the ability to exhibit possible variations within a given timeframe.

Summary

In summary, the quantitative research study was conducted to determine whether there was a correlation between LOS and reimbursement rates for Medicare patients with hypertension. The (HCUP) Nationwide database of the National Inpatient Sample (NIS) was utilized as the secondary source for data. The secondary data source was converted to SPSS which assisted in further analyzing the dependent and independent variables as well as applicable covariates associated with the research study. The variables applied with the research were relevant to place, time frame, and patient. The sample size of 398 for the time frame of 2011 to 2013 was calculated as a sufficient size to ensure and effective population size. The target population for the research study was Medicare patients that were medically diagnosed with hypertension within the United States. This size was determined by the calculations provided by Open Source Epidemiologic Statistics for Public Health.

Section 3: Research Results

Introduction

The objective of the research study was to determine whether there was a correlation between the LOS and the rate of reimbursement among Medicare recipients with hypertension while controlling for multiple covariates as listed in the research questions below.

RQ1 – Are reimbursement rates related to the LOS for Medicare patients with hypertension as the reason for admission after controlling for geographic region, age, year, gender race/ethnicity, and diabetes?

H1: The hospital reimbursement rate is related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H2: The hospital reimbursement rate is not related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

RQ2 – Are the hospital reimbursement rates associated with prolonged hospitalization for Medicare patients admitted for hypertension when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes?

H3: The hospital reimbursement rate is associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H4: The hospital reimbursement rate is not associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

Data Cleaning and Preprocessing

The initial sample size for the secondary data set was comprised of 22,440,121 cases for three consecutive years (2011, 2012 & 2013) across the United States. The data set was filtered by inclusion of the hypertensive Medicaid patients and further randomized to consist of 3,000 cases. The randomized results entailed a total of 197 missing cases for race/ethnicity. The 197 cases within the data set may have been attributed to patients having the option of not completing documentation for race/ethnicity, or refusing to provide race/ethnicity information when Medicaid status was provided. The exclusion of 197 cases of the 3,000 produced a 6.6% omission factor for the cases to be analyzed, thus creating a very minimal impact. An additional inclusion criterion was applied whereby patients needed to be a minimum of 18 years of age because the research study was geared toward an aging population. Recoding for all variables was utilized to formulate data with numeric measures for precise analysis.

Descriptive Statistics

The below table represents the descriptive statistical data output for the research study utilizing the results for (N = 3,000) cases. The analysis encompassed the dependent variable of LOS and the independent variable rate of reimbursement along with covariates that consisted of age, gender, race/ethnicity, rate of reimbursement, year, region of the United States, and diabetes. The dependent variable of LOS was divided into two categories of short duration and long duration of hospital stay. The dependent variable of LOS was a dichotomous measure that contained short and long hospitalization. The population of the research study encompassed individuals with Medicare over the age of 18 who had been medically diagnosed as hypertensive. Medicare patients who were not classified as physically handicapped or under the age of 18 were excluded from the study.

Table 4

Summary of Descriptive Statistics of LOS, Age, Gender, Reimbursement Rate, Race/Ethnicity, Region, Diabetic, and Year for Medicare patients.

Variable	Characteristic	*N* = 3,000	Percentage
LOS	0-3 days	1543	51.4%
	>=4 days	1457	48.6%
Age	18-65	1277	42.6%
	66-85	1299	43.3%
	>= 86	424	14.1%
Rate of	0 -25%	755	25.2%
Reimbursement	26-50%	732	24.4%
	51-75%	734	24.5%
	76-100%	779	26.0%
Gender	Female	1386	46.2%
	Male	1614	53.8%
Race/Ethnicity	White	1998	71.3%
	Black	438	15.6%
	Hispanic	221	7.9%
	Asian	53	1.9%
	Other	93	3.3%
Region	South	430	14.3%
	Northeast	697	23.2%
	Mid-West	1676	55.9%
	West	197	6.6%
Diabetic	Yes	2128	70.9%
	No	872	29.1%
Year	2011	1371	45.7%
	2012	1186	39.5%
	2013	443	14.8%

Note: The data output for descriptive statistical analysis utilizing a sample size of 3,000 cases and all variables.

As show in the above descriptive table reflected 3 consecutive years, the data represents the results of descriptive statistics (*N* = 3000). The dependent variable LOS was grouped into two classifications of 0-3 days, and greater than or equal to 4 days. Approximately 51.4% (*N* = 1543) were hospitalized for 0-3 days, and 48.6% (*N* = 1457) hospitalized for 4 days or greater over a three-year consecutive time frame. The variable age of Medicare patient was categorized into three classifications that were 18-65 years included 42.36% (*N* = 1277) ; 66-85 years included 43.3% (*N* = 1299); and greater than or equal to 86 years of age at 14.1% (*N* = 424).

The rate of reimbursement was categorized in 4 groups which consisted for low rate of reimbursement 0-25%, moderately low 26-50%, moderately high 51-75%, and high rate of reimbursement which consisted of 76-100% compensation. The low category of rate of reimbursement applied to 25.2% of the participants (*N* = 755), the moderately low category accounted for 24.4% (*N* = 732), moderately high applied to 24.5% (*N* = 734), and the high rate of reimbursement applied to 26.0% (*N* = 779). Although rate of reimbursement appeared consistent in calculations, the high rate of reimbursement was analyzed to be higher than the other three categories.

Data for the variable gender indicated that females were represented at 46.2% of the sample (*N* = 1386), while males represented a slightly higher percentage 53% (*N* = 1614). Data for the variable race/ethnicity was classified into five groups. The variable ethnicity indicated that 71.3% (*N* = 1998) were White; 15.6% (*N* = 438) were Black; 7.9% (*N* = 221) were Hispanic, 1.9% (*N* = 53) were Asian; and 14.3% (*N* = 93) were classified as *other* or *missing race/ethnicity*. Region was categorized into four groups across the United States: South, Northeast, Mid-West, and West. The Southern region represented 14.3% (*N* = 430) of the

sample; Northeastern accounted for 23.2% (*N* = 697); Mid-Western accounted for 55.9% (*N* = 1676); and Western United States represented 6.6% (*N* = 197).

The research study also included the comorbidity of diabetes which accounted for 70.9% (*N* = 2128) of which were diabetic, and 29.1% (*N* = 872) of the Medicare patients that were hypertensive but not diabetic and hypertensive. The research study encompassed three consecutive years of 2011, 2012, and 2013. In 2011 there were 45.7% (*N* = 1371) cases, in 2012 39.5% (*N* = 1186), and 2013 accounted for 14.8% (*N* = 443)

Two Way Tests of Association

Table 6

Summary of Two-Way Tests of Association Among LOS and Independent Variables

Variable	Category		LOS 0-3 Days	LOS >=4 Days	*P*-value	Total
Age	18-65	Count	719	558		1277
		% with Age	56.3%	43.7%		100%
		% with LOS	46.6%	38.3%		42.6%
	66-85	Count	625	674	.000	1299
		% with Age	48.1%	51.9%		100%
		% with LOS	40.5%	46.3%		43.3%
	>=86	Count	199	225	.001	424
		% with Age	46.9%	53.1%		100%
		% with LOS	12.9%	15.4%		14.1%
Total		Count	1543	1457		3000
		%with Age	51.4%	48.6%		100%
		% with LOS	100%	100%		100%

continued

Variable	Category		LOS 0-3 Days	LOS >=4 Days	*P*-Value	Total
Rate of Reimbursement	0-25%	Count	602	153	.000	755
		% with ROR	79.7%	20.3%		100%
		% with LOS	39.0%	10.5%		25.2%
	26-50%	Count	436	296	.000	732
		% with ROR	59.6%	40.4%		100%
		% with LOS	28.3%	20.3%		25.2%
	51-75%	Count	306	428	.000	734
		% with ROR	41.7%	58.3%		100%
		% with LOS	19.8%	29.4%		24.5%
	76-100%	Count	199	580		779
		% with ROR	25.5%	74.5%		100%
		% with LOS	12.9%	39.8%		26.0%
Total		Count	1543	1457		3000
		% with ROR	51.4%	48.6%		100%
		% with LOS	100%	100%		100%
Gender	Male	Count	822	792		1614
		% with Male	50.9%	49.1%		100%
		% with LOS	53.3%	54.4%		53.8%
	Female	Count	721	665	.298	1386
		% with Female	52.0%	48.0%		100%
		% with LOS	46.7%	45.6%		46.2%
Total		Count	1543	1457		3000
		% with Gender	51.4%	48.6%		100%
		% with LOS	100%	100%		100%

continued

Variable	Category		LOS 0-3 Days	LOS >=4 Days	*P*-Value	Total
Race/ Ethnicity	White	Count	1018	980		1998
		% with LOS	71.2%	71.3%		71.3%
		% with Race	51.0%	49.0%		100%
	Black	Count	220	218	.965	438
		% with LOS	15.4%	15.9%		15.6%
		% with Race	50.2%	49.8%		100%
	Hispanic	Count	124	97	.543	221
		% with LOS	8.7%	7.1%		7.9%
		% with Race	56.1%	43.9%		100%
	Asian	Count	27	26	.502	53
		% with LOS	1.9%	1.9%		1.9%
		% with Race	50.9%	49.1%		100%
	Other	Count	40	53	.926	93
		% with LOS	2.8%	3.9%		3.3%
		% with Race	43.0%	57.0%		100%
Total		Count	1429	1374		2803
		% with LOS	100%	100%		100%
		% with Race	51.0%	49.0%		100%
Year	2011	Count	691	680		1371
		% with LOS	44.8%	46.7%		45.7%
		% with Year	50.4%	49.6%		100%
	2012	Count	626	560	.254	1186
		% with LOS	40.6%	38.4%		39.5%
		% with Year	52.8%	47.2%		100%
	2013	Count	226	217	.025	443
		% with LOS	14.6%	14.9%		14.8%
		% with Year	51.0%	49.0%		100%
Total		Count	1543	1457		3000
		% with LOS	100%	100%		100%
		% with Year	51.4%	48.6%		100%

continued

Variable	Category		LOS 0-3 Days	LOS >=4 Days	*P*-Value	Total
Region	South	Count	214	216		430
		% with LOS	13.9%	14.8%		14.3%
		% with Region	49.8%	50.2%		100%
	Northeast	Count	351	346	.864	697
		% with LOS	22.7%	23.7%		23.2%
		% with Region	50.4%	49.6%		100%
	Mid-West	Count	928	748	.022	1676
		% with LOS	60.1%	51.3%		55.9%
		% with Region	55.4%	44.6%		100%
	West	Count	50	147	.002	197
		% with LOS	3.2%	10.1%		6.6%
		% with Region	25.4%	48.6%		100%
Total		Count	1543	1457		3000
		% with LOS	100%	100%		100%
		% with Region	51.4%	48.6%		100%
Diabetic	Yes	Count	1106	1022	.355	2128
		% with LOS	71.7%	70.1%		70.9%
		% with Diabetes	52.0%	48.0%		100%
	No	Count	437	435		872
		% with LOS	28.3%	29.9%		29.1%
		% with Diabetes	50.1%	49.9%		100%
Total		Count	1543	1457		3000
		% with LOS	100%	100%		100%
		% with Diabetes	51.4%	48.6%		100%

Table 6 represents the results of the two-way test of association among each independent variable and the dependent variable LOS for short and long duration. Table 6 also displays the *p*-value for each independent variable which serves as the indicator of the variable being statistically significant or not statistically significant. The two-way tests encompassed a sample size of (*N* = 3000) cases. The age category of 18-65 years had a short stay of 40.5% (*N* = 625) and a long duration of 46.3% (*N* = 674) which yielded (*p* = .000) indicating that the variable was statistically significant. The age range of 66-85 years had 46.6% (*N* = 719) of the highest percentage in short duration of hospitalization among all age categories. The age category of >=86 years yielded the lowest in short duration with 12.9% (*N* = 199) as well as long duration with 14.1% (*N* = 424).

The rate of reimbursement, 0-25% chance of being reimbursed yielded the second highest number of cases at 39% (*N* = 602). It also yielded a percentage in long duration category was lower for patients with low reimbursement rate at 10.5% (*N* = 153). The highest rate of reimbursement in the category of 76-100% yielded at 39.8% (*N* = 580) rate of reimbursement. The category of 26-50% yielded 28.3% (*N* = 436) short duration and 51-75% produced 29.4% (*N* = 428) for long duration. These results yielded a statistically significant (*p*-value = .000) independent variable for the entire category.

The variable gender had two categories, female and male with a higher rate for both short and long duration for males. The short duration for males was analyzed at 53.3% (*N* = 822), with 54.4% (*N* = 792) for long duration. Females yielded 46.7% (*N* = 721) for short duration and 45.6% (*N* = 665) for long duration, producing a (*p*-value = .298) and indicating a variable that was not statistically significant.

The race/ethnicity variable was not statistically significant in no categories due to each *p*-value being greater than .05. The white category had a considerable margin over the other races at 71.2% (*N* = 1018) for short duration and 71.3% (*N*= 980) for long duration. The black category for short duration was 15.4% (*N* = 220) and 15.9% (*N* = 218) for long duration. The other races classified as Hispanic, Asian, and other were all less than 9% for both short and long duration of hospital stay. The variable region was categorized into 4 groups that span across the United States. South, Northeast, Mid-West, and West regions were all analyzed for short and long duration which yielded a considerable difference among the Mid-West region at 60% (*N* = 928) for short duration and 51.3% (*N* = 748) for long duration. The Western region was at a mere 3.2% (*N* = 50) for short duration and 10.1% (*N* = 147) for long duration making it the lowest in both categories nationwide. These results yielded the Mid-West and West statically significant with a (*p*-value = .022 and p-value = .002).

The diabetic variable generated 71.7% (*N*= 1106) for short duration and 70% (*N* = 1022) for long duration indicating that approximately 72% of hypertensive Medicare patients were also diabetic. While 28% (*N* = 437) short duration patients and 29.9% (*N* = 435) long duration patients were not diabetic; however, hypertensive. The diabetic variable was not statistically significant with a (*p*-value = .355). The calendar year variable of 2011 and 2012 yielded a variable that was not statistically significant. The year 2011 yielded a 44.8% (*N* = 691) for short duration and 46.7% (*N* = 680) for long duration placing it at the highest rate of hospital stay in both categories during 2011. The year 2012 yielded results of 40.6% (*N* = 626) for short duration and 38.4% (*N* = 560) for long duration ranking 2012 as the median for LOS for both duration categories. The 2013 category was the lowest ranking year in both short and long

duration with a 14.6% (*N* = 226) for short duration and 15% (*N* = 217) for long duration of hospitalization being statistical significance (*p*-value = .025).

Multiple Logistic Regression Analysis

Table 7

Multiple Logistic Regression Analysis of Short Duration LOS and Long Duration LOS (N = 3000)

Variable	Characteristic	Adjusted Odds Ratio	95% C.I.	P-Value
Age	18-65	Reference		
	66-85	.724	.604 - .868	.000
	>= 86	1.547	1.195 - 2.003	.001
Rate of	0 -25%	.081	.063 - .105	.000
Reimbursement	26-50%	.236	.187 - .298	.000
	51-75%	.475	.377 - .599	.000
	76-100%	Reference		
Gender	Female	.915	.744 - 1.081	.298
	Male	Reference		
Race/Ethnicity	White	Reference		
	Black	1.221	.965 - 1.545	.097
	Hispanic	.740	.543 - 1.008	.056
	Asian	.923	.502 - 1.695	.795
	Other	1.495	.926 - 2.412	1.000
Region	South	Reference		
	Northeast	1.025	.724 - 1.357	.864
	Mid-West	.707	.525 - .952	.022
	West	2.026	1.300 - 3.157	.002
Diabetic	Yes	Reference		
	No	1.182	.985 - 1.419	.072
Year	2011	Reference		
	2012	1.141	.910 – 1.431	.254
	2013	1.403	1.044 – 1.885	.025

Table 7 represents a multiple logistic regression model of the cases (N = 3000) which illustrated the odds ratio, 95% confidence interval, and p-value. A multiple logistic regression analysis was conducted to establish the correlation between dependent variable and the independent variables while controlling for the covariates. The multiple logistic regression also ascertained the presence of probability of the given output with specific percent. The dependent variable LOS was dichotomous for short duration (recoded = 0) or long duration of stay (recoded = 1). The following variables were not statistically significant: gender, year (2012), race/ethnicity, region (northeast and south), and diabetes. The statistically significant variables were age, rate of reimbursement, region (Mid-West, West), and the year (2013).

The variable age had a reference category of 18-65 years old that was primarily utilized as a reference group due to a healthier age range of Medicare patients. The adjusted odds ratio in 66-85 years was .724 (p-value = .000) and (95% confidence interval range of .604 - .868), yielding a statistically significant age category. The age range of 66-85 had an odds ratio of a long stay which were lower for this age group compared to reference category. The age category ranging >= 86 years had an adjusted odds ratio of 1.547 (p-value = .001) and (95% confidence interval range of 1.195 – 2.003). This category age range was also statistically significant due to the p-value and with a provided 1.547 chance more likely to have an extended hospitalization than the reference group.

The reference group of 75-100 percentile was utilized for the rate of reimbursement. The category of 0-25% yielded an adjusted odds ratio of .081 and (95% confidence interval range of .063 - .105), making this category 91.9% lower odds of having a longer LOS than the highest reimbursement category. The 51-75% category had an adjusted odds ratio of .475 (95%

confidence interval range of .377 - .599), making this category 52.5% lower odds of having a longer LOS than the reference group.

The variable region was statistically significant in the Mid-West and West regions. The Mid-West region was statistically significant with a (*p*-value = .022) with an adjusted odds ratio of .707 and (95% confidence interval of range of .525 - .952). The West region was statistically significant with a (*p*-value = .002) and an adjusted odds ratio of 2.026 which presented greater significance as compared with the reference group.

The variable year utilized 2011 as the reference group since it had the largest frequency of (*N* = 1242). The variable year of 2013 generated an adjusted odds ratio of 1.403 (95% confidence interval range of 1.044 – 1.885) with a statistically significant (*p*-value = .025), yielding a greater significance as compared to the reference group. The year 2012 was not statistically significant with a (*p*-value = .254). The adjusted odds ratio was 1.403 (95% confidence interval range of .910 – 1.431), yielding a category with greater significance as compared to the reference group.

Summary

The purpose of the descriptive analysis was to summarize the variables and measurements within the research study with the use of quantitative analysis. The two-way test of association was conducted to determine the relationship between the dependent and independent variable. The objective of the multivariate logistic regression was to establish which variables impacted to the LOS and determine the odds ratio, 95% confidence interval, and the statistical significance of each variable. The age group with the largest ratio belonged to the 66-85 years old at 41% (*N* = 1216). The rate of reimbursement variable yielded consistency in odds ratio, 95% confidence interval, and statistical significance which averaged around 23% (*N*

= 700) among the 4 groups. The 95% confidence interval for the rate of reimbursement ranged from (.063 to .599) for 3 categories and a (*p*-value = .000) for each category with the adjusted odds ratio ranging (.081 to .475) as compared to the reference group.

Although gender was not statistically significant, the gender variable female had slightly under 46.2% (*N* = 1386) with a .915% adjusted odds ratio compared to males. Females were 8.5% less likely to have longer hospitalization compared to the reference group. While the white race/ethnicity had the bulk of cases as white with a frequency of 67% (*N*=1998), the race/ethnicity variable did not have any statistically significant categories.

Only the Mid-West and Western regions had a statistical significance (*p*-value =.002 and *p*-value = .022) in each region that may be attributed to geographic variation with in rural areas, and in unplanned hospital admission rates. The odds ratio of the Mid-West region yielded .707 (95% confidence interval range of .525 - .952), producing a 29.3% lower odds of having a longer LOS than the reference group. The West region yielded a 2.026 adjusted odds ratio with (95% confidence interval range of 1.300 – 3.157), which produced greater significance as compared with the reference group.

The comorbidity of diabetes did not have statistical significance or impact on the correlation of LOS and the rate of reimbursement. The year variable presented significance in 2013 which yielded a (*p*-value = .025). Despite the multiple variables presented, none of the variables eliminated the correlation between LOS and rate of reimbursement. Section 4 presents the interpretation of findings, research study discussion, social change, and suggestions for additional research.

The below first research question cannot be resolved due to the dependent variable LOS not being provided within the secondary data set as a continual variable. Since the research

question cannot be addressed due to the omission of a continuous LOS, a rejection or acceptance of null or alternative hypothesis cannot be applied; therefore, the research question was removed.

RQ1 – Are reimbursement rates related to the LOS for Medicare patients with hypertension as the reason for admission after controlling for geographic region, age, year, gender race/ethnicity, and diabetes?

H1: The hospital reimbursement rate is related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H2: The hospital reimbursement rate is not related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

Research question two direct variable LOS is categorical and significant; therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. The (*p*-value = .000) presented significance between the dependent (LOS) and independent variable (rate of reimbursement).

RQ2 – Are the hospital reimbursement rates associated with prolonged hospitalization for Medicare patients admitted for hypertension when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes?

H3: The hospital reimbursement rate is associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H4: The hospital reimbursement rate is not associated with prolonged hospitalization for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

Section 4: Discussion, Conclusion, and Recommendations

Overview

The purpose of this research study was to examine variations in LOS for Medicare patients with hypertension and to provide an analytical explanation for the risk factors that have been driving Medicare patients' extended stay. The objective was also to explain the logic behind costs applied for the duration of hospitalization and grasp concepts relevant to standardizing reimbursement rates for Medicare recipients without placing limitations on patients' extended stay. The research involved further examination of cost-shift theory in relation to Medicare reimbursement while simultaneously assisting in determining the variations in current Medicare payment policies by state.

Interpretation of Findings

The quantitative outcome of the research study revealed that the statistically significant variables were age, rate of reimbursement, region (Mid-West and West), and calendar year 2013. The age category of 65-85 years displayed a greater odds ratio than the reference group which was further explained by the onset age of 65 years for Medicare patients. Although, typically people within the age range of 18-65 years may display a healthier population than the aging patients from 65-85 years, extended stay rates for the latter were lower than the reference group. The rate of reimbursement reference category of 0-25 percentile for 0-3 days had the greatest amount of cases (N=602), however, the highest percentage of LOS was 39.8% in the >= 4 days category. The category with the lowest percentage of extended stay was in the 0-25 percentile with a 10.5% hospitalization, and a 20.3% rate of reimbursement for >= 4 days duration. The rate of reimbursement was the highest in the 0-25 percentile at 79.7% which indicated that only a quarter of reimbursements were paid by Medicare at nearly an 80% probability for the Medicare patients who were hospitalized for 0-3 days. Although the goal for reimbursement rate is 100%

compensation for short duration, only 25.5% are reimbursed; however, the >= 4 days category for the 75 -100th percentile displayed 74.5%, which indicated that the rate of reimbursement for longer duration had a greater probability of reimbursement.

The variable of region encompassed two categories that were statistically significant. The Mid-West region contained the highest number of cases (*N* = 928) with a 60.1% LOS for 0-3 days duration. The >= 4 days category was comprised of 51.3% extended say which yielded the longest duration in all regions. The West region yielded the lowest number of cases (*N*= 50) in all regions with a 3.2% LOS for the 0-3 days category. The West region also consisted of the longest extended stay within the region for the >= 4 days category at74.6%. The outcome for the Mid-West and West regions may primarily be due to the geographic adjustment variations that occur within regions that are not as densely populated. The results for the regions elucidated that there are geographic variations among more rural states that permit a higher rate of reimbursement as well as an extended length of hospitalization among Medicare hypertensive patients.

The variable of year contained three categories, of which only 2013 was statistically significant. The 0-3 days was comprised of (*N* = 226), which was nearly 15% of the total population for the short duration. The extended stay for the 0-3 days category was 14.6% of (*N* = 1543) for short duration, which was significantly lower than both 2011 and 2012 (44.8% & 40.6%). The >= 4 days category in 2013 yielded 14.8% of the (*N* = 1457) for percentage of extended stay for long duration. Both short and long duration for the calendar year 2013 yielded a total of (*N* = 443) cases out of the (*N* = 3000) at a 14.8% total LOS. The calendar year 2013 had the lowest amount of cases which can be attributed to the number of Medicare patients which experienced a gradual decline in enrollees and beneficiaries.

The variables such as race/ethnicity, gender, and diabetes were discovered to have no impact on the rate of reimbursement or LOS for Medicare patients with hypertension as well as no statistical significance. The findings of the research assisted in identifying gaps in the literature concerning which factors impacted the rate of reimbursement and the LOS. Geographic adjustment variations within the Mid-West and West regions played a significant role in fluctuations among the dependent and independent variables; however, the correlation between LOS and rate of reimbursement remained consistent despite the covariates that were applied.

The significance of the research study provided an analytical explanation of the risk factors that drive the rate of reimbursement and the LOS for Medicare patients with hypertension by exposing variations such as geographic adjustments. The significance of the research study also contributed a new viewpoint to previous and forthcoming research studies resources that focus on Medicare patients' hospital duration and the influence it has on Medicare's rate of reimbursement across each region of the United States. The findings of the research study also integrated the literature review by further emphasizing the variations in reimbursement and hospital duration for Medicare hypertensive patients as displayed in the analysis. Likewise, the research study revealed the determinants of extended stay, and the influence on reimbursement rates across four regions in the United States that were presented in the analysis. As in previous research studies, the literature review incorporated extended hospitalization and rate of reimbursement to have variations across different regions. More specifically, the Mid-West and West regions exhibited the greatest variations as compared to the other regions. This was primarily due to the geographic adjustment variations within rural regions that are customary for Medicare reimbursement claims.

The epidemiological triad model that was utilized was deemed necessary, in that it provided a critical aspect of encompassing Medicare patients across the United States within the timeframe of 2011 to 2013. The epidemiological framework was utilized to investigate Medicare hypertensive patients and hospital outcomes in relation to rates of reimbursement. More specifically, person was represented by Medicare patients, place was identified as 4 regions within the United States, and time was exhibited by the years 2011 to 2013. The triad model implemented the LOS, person, place, and time frame for an effective approach illustrating the interaction among the factors within the model. The conceptual framework directed epidemiological exploration of variations in lengths of stay.

The research study and existing research studies were synthesized by exploring various factors such as race, region, gender, age, comorbidities, Medicare reimbursement rates, and yearly time frame to determine prolonged hospitalization for hypertensive Medicare patients. The research correlation also sought out the national LOS and modifications that occurred with the rate of reimbursement, and the analysis revealed that patients who were admitted typically stayed 0-3 days unless multiple comorbidities were present. Medicare patients who were hospitalized for >= 4 days displayed hypertension and additional health conditions such as diabetes, renal failure, and congestive heart failure which were commonalities among hypertensive patients. The research studies provided a response to an identified issue with variations in Medicare reimbursement and LOS variations within the United States. This research study has addressed where (Mid-West & West), what (geographic adjustments factors), and why (estimations of operating expenses in rural regions) questions pertaining to variations in reimbursement rates occur for hypertensive Medicare patients. The factors that were once unknown in previous research have now been unearthed to address variations.

Limitations of the Study

The limitations of the research included of omission of the dependent variable LOS not having a continuous measure within the secondary data set. The secondary data set only provided the dependent variable LOS to be analyzed as categorical, with the categories 0-3 days and >= 4 days. Due to the omission of a continuous dependent variable, the below *Research Question 1* was not answered, and the researcher could not reject or accept the hypothesis or null hypotheses. Therefore, the first research question could not be analyzed, and only leaving the second research question to be analyzed and to address the significance of the research and hypothesis.

RQ1 – Are reimbursement rates related to the LOS for Medicare patients with hypertension as the reason for admission after controlling for geographic region, age, year, gender race/ethnicity, and diabetes?

H1: The hospital reimbursement rate is related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

H2: The hospital reimbursement rate is not related to the LOS for Medicare patients with hypertension as the reason for admission when controlling for geographic region, age, year, gender, race/ethnicity, and diabetes.

Prior to the analysis of the secondary dataset, it was unknown that secondary data set would have excluded a continuous direct variable prior to analyzing the data set. The unknown factor was uncovered during the analysis and could not have been foreseen prior to internal review board (IRB) approval. This exclusion impacted the research by reducing necessary outcome data that may have addressed the reimbursement rates related to the LOS for Medicare

patients with hypertension as the reason for admission after controlling for geographic region, age, year, gender race/ethnicity, and diabetes.

Recommendations for Further Research

Further research could also encompass the mortality rate of hypertensive Medicare patients. Hypertension-related mortality increased by 23% overall from 2000-2013 for both men and women (Centers for Disease Control and Prevention, 2015). The mortality rate for men within the age range of 45-64 years old displayed a 58.2% increase and 65-74 years exhibited a 16.5% increase with a statistically significant (*p*-value = .05). The mortality rate can be incorporated within the existing covariates or perhaps replace covariates that were not statistically significant within the research study.

An additional recommendation for further research would require isolation of geographic regions to provide explicit populations from specific states and contrast the variations among an itemized number of states. Identifying exact states may provide a researcher with the capability to compare particular states that utilize geographic adjustments in rates of reimbursements as well as target the number of days that hypertensive Medicare patients are being allotted for hospitalization. State isolation would also permit a researcher to associate variations in Medicare policies per state by examining differences in adjustments per region and state.

Geographic adjustments in Medicare reimbursement have been utilized within regions in an effort to ensure that medical providers within rural areas are being fairly compensated based on operating expenses within the region and state. By incorporating a more specific area for analysis would also permit for a researcher to further examine reimbursement rates that typically result in over or under payment for Medicare expenses. Future research could also integrate variables such as primary payer, secondary insurance type, Medicare DRG coding, total charges, and risk of mortality.

Implication for Social Change

Implications for social change may deliver a foundation for policy reform by furnishing analyzed data to Medicare and policy decision-makers to amend guidelines for reimbursement rates and LOS. The social change could be methodologically significant because it may assist in employing utilization of current ICD-10 codes, and this; may result in higher accuracy of medical diagnosis than was seen prior to ICD-10. The research may assist in social change by providing explanation for trends in Medicare lengths of stay. Likewise, the study may assist healthcare administrators in standardizing reimbursement rates for Medicare recipients without placing limitations on the patients' LOS, and possibly improving patient outcomes.

The research may also be significant for social change because it could provide further insight into the cost-shift theory for Medicare reimbursement while simultaneously assisting in determining variations in current Medicare payment policies. These policies contain incentives for healthcare to optimize reimbursement that may lead to efficient lengths of stay for Medicare recipients. The implications could include unearthing the logic behind particular Medicare states refusing to cover extended LOS, while LOS and reimbursement rates in other states exhibit dramatic dissimilarities. The social change has the capability to be meaningful due to the potential to reveal rationale for a government entity not being transparent across the board, as well as to indicate whether there has been any improvement to decrease the fluctuations.

Furthermore, the research study may have implications for social change in that it may lead to an even distribution of reimbursements which may alleviate medical and financial strain on Medicare patients and their families. Medicare patients who reside in densely populated areas may receive the same fair pricing, hospitalization, and reimbursements that those in rural regions do.

Conclusion

In summation, the research provides insight on rates of reimbursement across 4 regions, indicating that the Mid-West and West regions of the United States utilizing geographic adjustment variations. The adjustment variations have modified the rate of reimbursement as well as the length of hospitalization in these two regions. Although, there is prevalence of hypertension among Medicare patients in all regions, two regions were analyzed as having higher rates of reimbursement and more appropriate LOS.

The correlation between the dependent variable LOS and the independent variable rate of reimbursement remained consistent even after the covariates were applied during a two-way test and a multiple regression analysis. Alleviating variations in reimbursements may not be a quick process; however, applying uniform policies across the United States may assist in a more strategic form of reimbursements. Lastly, the results of the research study may promote social change through the application of equivalent charges, reimbursements, and LOS across all four regions of the United States.

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Appendix A

Literature Matrix: LOS Results from Various Research Studies

Author/Year/Title	Sample	Variables	Design	Findings
Maeda, et al, 2014 Variation in Hospital Inpatient Prices Across Small Geographic Areas.	162 Counties 6 States	DV – Inpatient pricing IV – Geographic location	Multivariate Analysis Linear Regression	Prices are significantly higher for private vs. Medicare. Payment policies from Medicare affect private payers. Public policy that take into consideration market-based approach or payment reform to reduce price variation
Qureshi et al, 2013 Factors associated with length of hospitalization in patients admitted with transient ischemic attack in United States	385	DV – LOS IV – Hospital charges	Multivariate Analysis	Further strategies are required to determine the reduction of LOS
Mehta et al, 2016 Primary payer status, individual patient characteristics, and hospital-level factors affecting LOS and total cost of hospitalization in total laryngectomy	4,128	DV – LOS IV – Total Cost of Hospitalization	Multivariate Analysis Multi-linear Regression	The odds of being top quartile of LOS for Medicaid patients by 41% compared to private insured patients After controlling for medical factors Medicaid patients had increased LOS Overall cost was higher for Medicaid and Medicare

Busby et al, 2015 A systematic review of the magnitude and cause of geographic variation in unplanned hospital admission rates & LOS for ambulatory care	43,819	DV – LOS IV – Admission Rates	Cross-sectional Analysis	Wide variation in admission rate Fewer admission triggering shorter LOS *(table continues)*
Yoo et al, 2012 Effect of Reimbursement Reductions on Bone Mineral Density Testing for Female Medicare Beneficiaries	1,320	DV- Reimbursement Reduction IV – Supplemental private health insurance	Cox proportional hazard regression analysis	Significant association between reimbursement reductions and decrease in BMD test in female Medicare beneficiaries without supplemental private insurance
Ku-Chou et al, 2012 Prediction of LOS of First-Ever Ischemic Stroke	330	DV- LOS IV – clinical predictors	Univariate Analysis and Multiple Regression Analysis	Severity of stroke revealed to be a vital factor that influences the LOS after a cute stroke hospitalization
Martinez-Martinez et al, 2013 Transient ischemic attacks clinics provide equivalent and more efficient care than early in-hospital assessment	211	DV – Inpatient Management IV – Cost per patient	Logistic regression	Transient ischemic attacks clinics are efficient for the early management of low- to moderate-risk TIA patients compared to in-hospital assessment, with no higher recurrence rates and at almost one-fifth the cost.
Machnicki et al, 2011 Kidney transplant Medicare payments and LOS: associations with comorbidities and organ quality	27,594	DV- LOS IV – Medicare Payments	Multi-linear regression	Impact of comorbidities on reimbursement, LOS and transplant finances depend on local practice, outcomes and reimbursement system. Further studies should be conducted to confirm associations and design appropriate interventions

Burke et al, 2015 Characterizing Pulmonary Hypertension--Related Hospitalization Costs Among Medicare Advantage	2,275	DV- Readmission of pulmonary hypertension hospitalization IV – premature mortality	Linear regression	PH-related hospitalizations incur substantial healthcare costs and require long hospital stays for patients with PAH. Improved treatment approaches reduce PAH disease progression leading to costly and burdensome inpatient stays

(table continues)

Ishak et al, 2012 Accounting for the relationship between per diem cost and LOS when estimating hospitalization costs	11,614	DV- LOS IV – Per Diem Costs	Linear regression	Per diem costs are not independent of LOS
Canavan, 2013 Rehospitalization Is Driving Costs in Pulmonary Arterial Hypertension	4,009	DV – LOS IV – Hospitalization Costs	Linear regression	Overall, PAH who were hospitalized during the study period from January 2007 through December 2011, 39.2% were re-hospitalized more than once.
Sawant et al, 2013 Increased LOS and costs associated with inpatient management of vascular access failures	172	DV – LOS IV - Costs	Logistic regression analysis	Vascular access management contributes to significant expenses especially during first few months of initiation of dialysis. This increases workload on the already overburdened hospital infrastructure and draws up costs and increases length of stay
Singh et al, 2016 Emergency Department and Inpatient Healthcare utilization due to Hypertension.	2,934,838	DV – Hospitalization outcomes (LOS, charges, disposition) IV- Hypertension associated ED	Multivariable-adjusted linear or logistic regression	Hypertension associated with significant healthcare burden in the U.S. Future studies should assess strategies to reduce hypertension-associated cost and healthcare burden

Suh et al, 2014 Effect of health insurance type on healthcare utilization in patients with hypertension: a national health insurance database	325,566	DV – LOS IV – Hospitalization Costs	Logistic regression	The pattern of higher healthcare utilization among MA patients persists even after controlling for baseline health conditions