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Predictors of Admission for Stroke or Transient Ischemic Attack 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,
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ADN, Galveston College, 2006

MSN, Walden University, 2018

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

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Abstract

Approximately 11% of patients diagnosed with a stroke or a transient ischemic attack are readmitted to the hospital, creating a cost burden of nearly $2 billion per year for Medicare beneficiaries. Because researchers and policy makers consider hospital readmission for patients with strokes or transient ischemic attack to be an indicator for the delivery of quality care, the Centers for Medicare and Medicaid Services has imposed financial penalties of up to 3% of a hospital's Medicare reimbursement in 1 year for excessive readmissions, potentially impacting the financial sustainability of various healthcare organizations. The ecological systems theory allows for the understanding of how microsystems, mesosystems, exosystems, macrosystems, and chronosystems impact the development, influence, and predictability characteristics of a specific population serviced in a healthcare setting. This quantitative study analyzed cross-sectional data from the 2016 National Hospital Ambulatory Care Survey, using cross-tabulations with chi-square followed by multiple regression analyses. Overall, this study addressed the gap in the existing literature by examining admission rates for patients with the diagnoses of strokes or TIA and the association between ancillary service use, insurance status, and provider level evaluation. The study concluded that few predictors that exist between the independent and dependent variables, with the exception of the amount of laboratory tests ordered. Maintaining the financial reasonability by avoiding penalties for stroke or transient ischemic attack unnecessary admission from value-based purchasing, the implication for social change is maintaining access to care for patients by avoiding hospital closures.

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Dedication

I would like to dedicate this dissertation in memory of my mother, Darlene Hammond, RN. She led me to go into the healthcare profession. While she was taken too early in life, she has always been by my side pushing me to overcome challenges and continue my journey to be the best I can be.

Acknowledgments

This dissertation is dedicated to my family. They have been my rock during this time when life did not exist between school and work. Thank you, Dad, for always pushing me outside my comfort zone and constantly guiding me to be my best. Also, thank you to my husband, daughter, and son for understanding for three years that school came before anything fun.

I could not have completed this journey without the guidance of my committee chair, Dr. James Rohrer. He has been a blessing of diligence, guidance, and perseverance. Using his knowledge, we were able to get this dissertation complete and hopefully help save patients’ admissions and the life of future patients.

Lastly, I would like to thank my heavenly father. With Him, I have faced and overcome many obstacles when it would have been easier to walk away from. Yet, with Him on my side, all things can be accomplished.

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Section 1: Foundation of the Study and Literature Review

Strokes are responsible for one out of every 20 deaths; a stroke occurs every 40 seconds, kills every 4 minutes, and every year, more than 795,000 people in the United States experience one (Centers for Disease Control and Prevention [CDC], 2017b). One out of every four stroke survivors will experience another with even higher odds of death (National Stroke Association, 2018). The estimated annual cost of stroke care in the United States is $34 billion dollars (CDC, 2017a). One major factor for preventing a stroke or transient ischemic attack (TIA) and decreasing the severity of permanent disabilities is education prehospital and while admitted (National Stroke Association, 2018). Healthcare administrators are challenged with providing cost-effective care while ensuring patients and families are ready to accept full responsibility for caring for themselves or their charges.

With the higher risk of mortality after the first cerebrovascular accident (CVA), major regulatory bodies joined forces to create a nationwide set of guidelines for hospitals to follow. In 1999, the Joint Commission requested input from performance measure experts, state hospital associations, health provider organizations, and other associates to create a plan to share with the Centers for Medicare and Medicaid Services (CMS) (Joint Commission, 2018). Since 2000, the healthcare industry has been attempting to master the diagnosing, treating, educating, and discharging of stroke or TIA patients so they have the best quality of life possible.

In this study, I evaluated the variables of total laboratory and radiology studies obtained in the emergency department, health insurance status, and provider level to predict hospital readmissions for stroke or TIA patients. With the results of this study, healthcare organizations might be able to identify outcomes, processes, and structure variables, and how they correlate to predict readmissions to avoid penalties imposed by CMS and ultimately have better patient outcomes.

In this section I present various subsections focused on the research problem statement, research hypothesis, and null hypothesis related to the research questions. I outline the theoretical foundation, nature of the study, literature search strategy and keywords, literature review, terms used in the study, assumptions, and the significance of the study so that future researchers may expand on this study. Additionally, I explain the contributions of the study for positive social change in the healthcare field.

Problem Statement

The CDC has established quality metrics to evaluate facilities against other like-size organizations and to develop national averages. The CDC has confirmed that the quality of care patients received during initial hospitalization directly impact readmissions (CDC, 2018b). While some admissions are unavoidable, Medicare has begun to penalize hospitals where readmission rates are higher than the national average because of the correlation between decreased expected outcomes, cost per beneficiary spending, and lack of leader engagement to provide high-quality care to those in need (Boccuti & Casillas, 2017).

The Affordable Care Act was established in 2009 and brought many changes and challenges to the daily operations of hospital organizations. One of the many changes was the development of value-based purchasing, which initially provided incentives for organizations that met certain benchmarks of care. After the initial implementation period, value-based purchasing shifted to a penalty program. Rice (2016) acknowledged that, in 2012, of the 3,400 hospitals subjected to the Affordable Care Act's requirements, only 799 hospitals met the Hospital Readmissions Reduction Program; the rest had a 3% penalty levied against their Medicare and Medicaid reimbursements. Kauffman (2016) discussed that, in 2015, Medicare spent $600 billion in benefits for senior citizens of which $17 billon was classified as potentially avoidable. Strokes, both ischemic and hemorrhagic, account for approximately 14% of reportable readmissions to hospitals each year (Allen, Barron, & Mo, 2017).

Mittal, Rabinstein, Mandrekar, Brown, and Flemming (2017) conducted a study on readmissions of patients discharging with a diagnosis of acute ischemic stroke. They used the Rochester Epidemiology Project data set, which was comprised of information from two medical centers between January 2007 and December 2011. Using a multivariable logistic regression model with a negative predictor variable of unplanned readmission, Mittal et al. determined that 7.6% of the patient population could have had preventable readmissions. While the researchers evaluated many variables related to the patient discharge location, there was little evidence of organizational characteristics or ancillary service use to determine the impact of quality of care provided at both locations. Further research on the hospital discharge process is necessary to examine to the potential of further reductions of readmissions.

Purpose of Study

The purpose of this quantitative study is to explore whether admission rates for patients previously diagnosed with strokes or TIAs from the emergency department have specific correlations with ancillary service use, insurance status, and provider level evaluation. With the increased use of emergency departments, quick identification by all levels of providers is necessary for optimal patient outcomes. Failure to meet outcome requirements can negatively affect patients and cause dire consequences for organizations.

Research Question and Hypothesis

RQ1: Is there an association between hospital readmissions for stroke or TIA patients and ancillary service use among patients seen in an emergency department while controlling for age, gender, race/ ethnicity, and living situation?

$H_0$1: Radiology service usage is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

H_a1: Radiology service usage is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

$H_0$2: Laboratory service usage is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

H_a2: Laboratory service usage is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

RQ2: Is there an association between hospital stroke or TIA readmissions and insurance status among patients seen in an emergency department while controlling for age, gender, race/ ethnicity, and living situation?

$H_0$1: Health insurance coverage is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

H_a1: Health insurance coverage is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

RQ3: Is there an association between hospital stroke or TIA readmissions and provider level among patients seen in an emergency department while controlling for age, gender, race/ ethnicity, and living situation?

$H_0$1: Being seen by a physician, midlevel provider, or intern/resident is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

H_a1: Being seen by a physician, midlevel provider, or intern/resident is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

Theoretical Foundation for the Study

The theoretical framework for this study was Urie Bronfenbrenner's ecological systems theory. According to Kamenopoulou (2016) Bronfenbrenner surmised that the development of individuals had a direct correlation with their environment. Using this theory, the understanding of how microsystems, mesosystems, exosystems, macrosystems, and chronosystems impact the development, influence, predictability, and bio-ecological characteristics of specific populations serviced in healthcare settings. With the independent variable of stroke or TIA readmissions, the ecological systems theory can be used to examine the association of age, patient residence, insurance status, laboratory and radiological ancillary service usage, and provider level as the dependent variable, which can impact future examinations to prevent the unnecessary return of patients.

Nature of the Study

For this study, I used a quantitative, cross-sectional study design. Quantitative research allows for pertinent means of interpreting statistical data from repositories to identify possible links between variables and outcomes (Lagoe, Nanno, & Luziani, 2012). I used multiple linear regression models and bivariate analysis to identify specific variables from a quantitative data set to evaluate different variables to determine the critical factors of readmission rates. The dependent variable I used was hospital admission from the emergency department with the diagnosis of ischemic or hemorrhagic strokes or TIAs, and independent process variables I used were total laboratory and radiologic tests completed in the emergency department, insurance status, and whether patients evaluated in the emergency department by a physician, midlevel provider, or intern/resident.

Literature Search Strategy and Keywords

The National Hospital Ambulatory Medical Care Survey's Emergency Department Patient Record (NHAMCS) is a data repository that was developed in 1973 and modified in 2006 to include community health centers where patients visited physician and nonphysician clinicians (CDC, 2018). The data set was generated to collect information on the use and acquisition of services for outpatient ambulatory care service and emergency departments (CDC, 2018). The NHAMCS is designed to provide objective, reliable data for researchers to evaluate multiple service lines, such as emergency departments, outpatient departments, and ambulatory surgery locations, excluding federal, military, and Veterans Administration hospitals (CDC, 2017b).

I used Walden University, the Thoreau Multi-Database Search, and Google Scholar to locate scholarly journal articles related to my research questions. Using keywords to search led to multiple articles that I used in meta-analyses and evaluated the cited references in each article. Some of the keywords I used were *emergency department, emergency room, ED, ER, stroke, readmission, stroke readmission, transient ischemic attacks, radiology test, laboratory test, age, gender, race/ ethnicity, living situation, readmission, midlevel provider, provider, doctor, process, outcomes, risk, Insurance Coverage, Urie Bronfenbrenner's ecological systems theory.*

Literature Review

In my literature review, I examined 11 studies over several years, spanning from 2012 to 2018. My literature review comprised of key variables: emergency department, Medicare alignment with quality of care, readmissions of stroke or TIA patients, impact of laboratory and radiological tests completed in the emergency department, health insurance status, and patients seen by a physician versus a midlevel provider. The key variables were relevant to the concept of this research analysis and the financial impact on healthcare organizations if quality metrics are not met and the cost of readmissions increases (Robinson, Howie-Esquivel, & Vlahov, 2012). The review summarized the gaps in the literature related to the risk factors of total laboratory and radiological tests, health insurance status, and patients seen by a physician, midlevel provider, or intern/resident as a predictor of hospital readmissions with patients diagnosed with ischemic or hemorrhagic strokes or TIAs.

Age and Hospital Admissions

Robinson et al.(2012) completed a multianalysis approach to the evaluation of readmissions. They evaluated the variables of demographics, clinical and healthcare use characteristics, and quality of care literature for their research. They discovered that advanced age showed a higher trend of readmission along with a poor understanding of managing the conditions diagnosed. Twenty percent of Medicare patients, 2.3 million people, showed an alignment for risk factors of returning to the hospital due to retention of education, ability to afford medications, lack of proper follow-up, and taking medications as prescribed. Robinson et al. further argued that lack of accuracy in hospital teaching, health literacy, and an increasing number of emergency department visits all contributed to higher readmission rates. They used the NHAMCS data set, with an emphasis on prospective cohort, retrospective cohort, and secondary analysis study designs. They disclosed that they were unable to develop or obtain a tool that would completely predict or counteract readmissions. This aligns with the proposed research to determine if a grouping of demographic, ancillary use, and organizational characteristics might continue to direct the ability to predict and prevent readmissions for stroke or TIA patients.

Living Conditions and Hospital Admissions

Nouh, McCormick, Modak, Fortunato, and Staff (2017) completed a retrospective case-control study evaluating stroke and TIA patients. The study sample was patients readmitted between January 2013 and December 2014, where *N* = 1,799. The researchers used a chi-square test of proportions and multivariable logistic regression to identify independent predictors' association with the return of patients. Of the total sample, 135 patients were rehospitalized. Among the study population, the index of stock admissions was 67% ischemic, 19% hemorrhagic, and 14% TIAs. The study produced common etiologies of infection (30%), recurrent strokes (17%), and cardiac complications (14%). The most significant socioeconomic factor was living conditions and if patients lived alone or with another person. Those who cohabitated were brought to the emergency room quicker than those who lived alone, which in return reduced their mortality index from 37.3% to 13.3%, with p = < 0.01.

Vahidy et al. (2017) conducted a weighted analysis using the 2013 Nationwide Readmission Database to gain a statistical significance of all U.S. hospitalizations. Using logistic regression models, the researchers were able to determine crude and adjusted odds ratios and 95% confidence intervals for the association between care and readmissions. With a sample size of 319, 12.1% of ischemic strokes were readmitted. Of the readmissions, 12.9 were considered potentially preventable and 10.5% were considered planned. Older patients, who had Medicare coverage and lower household incomes, were at the top level of readmission, with the average age being 68 years old.

Health Insurance Status and Hospital Admissions

Chakraborty et al. (2017), completed a retrospective cohort study of acute care hospitalizations in South Carolina to examine if there was variation among payer sources with readmissions. Through the South Carolina Revenue and Financial Affairs Office, the researchers were able to obtain information based on patient movement since 1996. Using all payer sources and cross-referencing them against gender, race, age, urban/rural status, and specific comorbidities based on the ICD-9-CM codes, Chakraborty et al. used data from 65 South Carolina hospitals. There was a total of 271,365 readmissions, of which 21,535 were planned, showing a total readmission rate of 11%. The results showed that Medicare and Medicaid populations had the highest likelihood to be hospitalized among patients over 70 years old, and from the age 18–69 years, the most likely were uninsured African American men.

Basu, Hanchate, and Bierman (2018) examined the variation in rates of readmission in California, Florida, Missouri, New York, and Tennessee for 2009. Using a multivariate analysis, with a population of 7,306,286, the researchers determined that across all five states and insurance statuses, the length of stay showed positive association with readmissions regardless of coverage, predominately in the Medicare population.

Social Demographics and Clinical Risk Factors

Keyhani et al. (2014) compiled the clinical and social risk factors for unanticipated hospital readmissions for stroke or TIA patients. The independent variables included demographic, clinic, and social risk factors and the data sources were the Veterans' Administration from 114 hospitals. Using a generalized logistic regression model for clustering and multivariate analysis, they determined that 12.8% of stroke patients had readmissions. They did note that low-income veterans had a higher prevalence of readmissions with a spotlight on several vital hospitals serving these patients. They could have added variables of providers who evaluated and the number of ancillary tests as predictors. Doing so adds background to a study because of the possibility of the organizational characters that can be added to develop a higher comprehensive evaluation of stroke or TIA readmission rates.

Wachelder et al. (2017) completed a retrospective study identifying the burden on emergency department capacity and impact on unanticipated readmissions to hospitals for patients with chronic disease illnesses, such as previous strokes, given specific demographic and socioeconomic characteristics. With electronic healthcare data from a large organization, Wachelder et al. used random sampling to extract data with particular disease process, atrial fibrillation, heart failure, chronic obstructive pulmonary disease, and stroke, and they examined the demographic characteristics of age, economic status, and the Charlson Comorbidity Index to quantify comorbidities. Additionally, they put variables for vital sign parameters, laboratory tests, radiological tests, and ED diagnoses using ICD-10 codes for further breakdown. The variable analysis gave the researchers an in-depth view of how various demographics and socioeconomic characters play into the arrival patterns of patients and allows for the examination of the organization's approach to the treatment of this research population. This study aligned with this proposed research study because the focus on organizational characteristics while in the ED and in-patient and examine if there is a correlation amongst various caregivers and their preferences.

Yang, Huang, Liu, and Mukamel (2018) evaluated the readmission rates of stroke or TIA patients based on their perception of responsiveness of hospital staff and communication from medical providers. Using CMS's Hospital Consumer Assessment of Healthcare Providers and Systems scores, they used multivariate regression models with risk-adjusted readmission rates as the dependent variables and the scores as the independent variables of interest. Their findings suggest that the most tremendous impact against readmission rates where with hospitals that had scored in the 75% and higher. This gives background to the expectations of organizational structure, characteristics, demographic background abilities to learn, and adaption of the hospital to provide high-quality care.

Impact of Radiology Tests for Stroke or TIA Admissions

Kilkenny, Longworth, Pollack, Levi, and Cadilhac (2013) conducted a multilevel logistic regression modeling study to examine the factors that contribute to early readmissions after discharge for a hospital with the primary diagnosis of stroke or TIA. It was determined that 6.5% of patients returned within 28 days. Using a bivariate analysis of 43 factors, comprised of patient characteristics, clinical processes of care, social circumstances, health system, and length of stay, they were able to identify modifiable and nonmodifiable variables. In this study, the researcher's examination revealed that patient who did not receive an initial computerized tomography of the head had an 11% higher rate of returning and patients admitted to rural settings versus urban hospitals had less radiological and laboratory studies contributing to a higher readmission rate. There were numerous limitations identified because of the lack of data available if patients presented outside of the participating hospitals. This study provides a strong background to examine organizational characteristics and process further to ensure high quality, evidence-based care is provided regardless of location.

Patients Seen by Provider Level

Nouh et al. (2017) completed a research study on the mortality of readmission of stroke or TIAs patients. The used a retrospective case review of hemorrhagic, ischemic, or TIA, focusing on socio-economic indicators, clinical comorbidities, symptom characteristics, and length of stay. The researchers used a chi-square test of proportions and multivariable logistic regression to identify independent predictors of the returns. They recognized that the top three readmission etiologies where infection (30%), recurrent stroke and TIA (20%), and cardiac complications (14%). During the analyzation, they determined that the type of provider or service line the patient was initially admitted playing a crucial role as an independent variable. This gives strength to the examination of the organizational characteristics for provider type and implications of the quality of care the stroke or TIA patients receive.

ED use is becoming a common trend across the United States. With the significant overflow of the ED, it has been identified that there is an insufficient number of emergency physicians, thus creating the growing demand for midlevel practitioners (Brown, Sullivan, Espinola, & Camargo, 2012). Brown et. al. (2012) completed a retrospective observational study of 470,664 ED visits from 1993 to 2009. The researchers used a weighted linear regression to analyze annual trends in the use of midlevel providers, controlling for patient age, gender, ethnicity, insurance provider, ED visit characteristics of arrival time, arrival by ambulance, urgency of ED visit, imaging, medication ordered, ED length of stay, and discharge disposition, as well as hospital characteristics. The research produced the results that use of midlevel providers in the ED is increasing. The ED visits seen by a midlevel practitioner only, as compared to those seen by a physician only, were not as likely to be admitted to the hospital. Since the study did not display data by broken down yearly use, but rather collectively for the period 1993 to 2009, this prevents the reader from clearly understanding the data supporting the conclusion of the growing demand for midlevel practitioners.

Definitions

National Hospital Ambulatory Medical Care Survey (NHAMCS): A survey conducted annually by the CDC from a national sample of visits to hospital EDs, collecting data about use and provision of ambulatory care services (Watts, Bryan, & Tarwater, 2014). EDs across all 50 states and the District of Columbia, omitting federal, military, and Veterans Administration hospitals report data into the repository (Watts, Bryan, & Tarwater, 2014).

Patients diagnosed with stroke or TIA: Patients presenting to the ED with the ICD-9 diagnosis code of 434.11 to 434.91 (HIPAA Space, 2007).

Hospital admission from the emergency department (ED): The admission of patients to the hospital from the ED and patients transferred to another hospital from the ED (CDC, 2016b).

Insured: Insurance status of insurance versus no insurance (United States Burau, 2015). ED visits defined as having insurance are any combination of private insurance, Medicare, Medicaid, Workers Compensation, or other insurance (United States Census Burau, 2015)

Uninsured: ED visits defined as having no insurance are self-pay, charity, or no charge (United States Census Burau, 2015)

Provider: Under federal regulations, medical provider is defined as a doctor of medicine or osteopathy, podiatrist, dentist, chiropractor, clinical psychologist, optometrist, nurse practitioner, nurse-midwife, physician's assistant, or a clinical social worker (Code of Federal Regulations, 2012).

Patients Evaluated by a Physician versus a Midlevel Practitioner: Patients evaluated in the ED by a physician versus a nurse practitioner or physician assistant (Brown, Sullivan, Espinola, & Camargo, 2012).

Midlevel Practitioner: Nurse practitioners, physician assistants, and (Brown, Sullivan, Espinola, & Camargo, 2012).

Ethnicity: Hispanic or Latino, White, Black or African-American, or other (CDC, 2017b).

Assumptions

One assumption was that the 2016 National Ambulatory Care Survey Emergency Department Patient Records comprised from healthcare organization participating, 267 EDs of 377 eligible, provided accurate information to the survey, resulting in a valid sample size of ED visits. These assumptions are necessary in the analysis of considering risk factors for hospital admission for patients previously diagnosed with a stroke or TIA and have a readmission, the total number of laboratory and radiological tests obtained in the ED, insurance status, and patients evaluated by a physician, or midlevel provider or intern/resident in the ED.

Another assumption was that the NHAMCS provides nationally representative data on ambulatory care visits to hospital emergency departments in the United States. It was further assumed that covariates of gender and ethnicity reduce potential errors in the analysis, as according to Mirkin, Enomoto, Caputo, Hollenbeak (2017), both characteristics are associated with a higher risk of readmission. The accuracy of the data repository is essential in developing hypothesis using this data.

Scope and Delimitations

The purpose of the study was descriptive with conclusions subject to the data provided to the 2016 NAMCS by participating EDs. The variables risk factors for hospital readmission for patients previously with stroke or TIA readmissions from the emergency department, total number of laboratory tests obtained in the ED, total number of radiology tests obtained in the ED, insurance status, and patients evaluated by a physician, midlevel provider, or intern/resident in the emergency department were the focus of the study, as there is a gap in the literature analyzing these variables.

The level of extrapolation of the study was limited to patients treated and admitted from the emergency department who have been diagnosed with a stroke or TIA, had specific laboratory test ordered, had specific radiology test ordered, insurance class, and were examined by a physician, midlevel provider, or intern/resident, as there are numerous other variables that may influence hospital readmissions.

The sections of literature review have provided insight to problematic implications for stroke or TIA readmissions. The generalizability of the study is limited to patients readmitted to the hospital, previously diagnosed with an ischemic or hemorrhagic stroke or TIA, had laboratory test run, radiological test taken, type of insurance, and were examined in the emergency department by a physician, midlevel provider, or intern/resident. Section 1 has also imparted medical terminology used throughout the trail of the research study. Additionally, the nature of the study and research questions have been presented to provide clarity concerning the basis of the research with an administrative foundation.

Significance, Summary, and Conclusions

The evaluation of risk factors for hospital readmissions from the emergency department for patients previously diagnosed with ischemic or hemorrhagic strokes or TIAs, the study potentially contributes the discipline of healthcare administration in advancing evidence-based practice and closing the knowledge gap in understanding the relationship between the stated risk factors and hospital readmissions. Stokes is the main cause of adult disability in developed countries around the world (Anderlini, Wallis, & Marinovic, 2018). Not only does the damage affect the individual's everyday life, it puts them at greater risk for other major complications.

After extensive research, there is no known literature examining hospital readmissions from the emergency department with patients diagnosed with ischemic or hemorrhagic strokes or TIAs using Urie Bronfenbrenner's ecological systems theory. Additionally, there are no studies that consider the outcome variables of total number of laboratory tests obtained in the emergency department; total number of radiology tests obtained in the emergency department; insurance status; patient evaluated in the emergency department by a physician, midlevel provider, or intern/resident controlling for age, gender, ethnicity/ race, and living conditions.

Being able to examine how risk factors align with hospital readmissions from the emergency department, administrators can combat the levying of financial penalties against hospitals from the Centers for Medicare and Medicaid Services for excessive readmissions (Chamberlain, Sond, Mahendraraj, Lau, & Siracuse, 2018). Hospitals with excess readmission rates higher than national averages will begin to be penalized the facility for reimbursements on Medicare patients according to the University of Minnesota Rural Health Research Center (2015). With penalties such as these, many healthcare entities might have issues with staying open. As hospitals and medical practices close in certain geographical locations, patients have less access to emergent, nonemergent, and preventive care has negatively impacted statistics in maintaining a healthy community (Rosenbach & Dayhoff, 2005).

Section 2: Research Design and Data Collection

In Section 1, I evaluated the current literature related to risk factors for hospital readmissions for patients diagnosed with ischemic or hemorrhagic stroke or TIA, with emphasis on other research using the NHAMCS over multiple years, spanning from 1993 to 2011. Numerous previous researchers have conducted studies on readmissions for strokes and TIAs, but there is a gap in the consideration of ecological systems theory.

The purpose of the study is to quantitatively explore the research gap regarding risk factors for the dependent variable of hospital readmissions from the ED for patients diagnosed with ischemic or hemorrhagic stroke or TIA based on process quality measures and independent variables—total number of laboratory tests obtained in the ED, total number of radiology tests obtained in the ED, insurance status, and patients evaluated by a physician, midlevel provider, or intern/resident in the ED—as there is a gap in the literature. In this section, I present the specifics of the proposed research design, methodology, and analytical tools used to address the gap in the literature.

Research Design and Rationale

The dependent study variable is hospital readmissions from the ED and the independent study variables are total laboratory tests obtained in the ED, total radiological tests obtained in the ED, insurance type, and patients evaluated by a physician, midlevel practitioner, or intern/resident. The covariates of age, gender, race/ethnicity, and living situation are characteristics associated with a higher risk of readmission according to Zhou, Della, Roberts, Goh, and Dhaliwal (2016). To examine if the independent process and structure variables predict the dependent outcome variable, I used a quantitative nonexperimental design using cross-sectional archival data from the 2016 NHAMCS to conduct cross-tabulations with chi-square followed by multiple regression analysis.

Methodology

Study Population

The target population for this research is patients diagnosed with ischemic or hemorrhagic stroke or TIA who are admitted to the hospital through the ED. I used the NHAMCS, conducted annually by the CDC National Center for Health Statistics, to inspect hospital admissions from the ED with patients diagnosed with both types of stroke or TIAs.

Sampling and Sampling Procedures

The NHAMCS is a national survey, completed annually, that encompasses visits to the ED, outpatient department and, freestanding and hospital-based ambulatory surgical centers for vital healthcare statistics. The survey uses a four-stage design that narrows from geographic sampling units to hospitals in these areas to ED service areas within these hospitals to specific patient visits (Schissler, Rozenshtein, Schluger, & Einstein, 2015). Each patient visit is weighted using the product of the corresponding sampling fractions with each stage to produce national estimates.

The 2016 survey was conducted by the CDC (2016) from December 29, 2014, through December 29, 2016; 457 hospitals opted to participate, with 377 having eligible EDs. There were 267 hospitals participating, resulting in an unweighted ED response rate of 70.8%, there were 374 emergency services areas identified from the participating EDs, and 291 of those responded for at least half of their expected ED visits based on volume of visits during the reporting period. A total of 21,061 patient record forms were submitted electronically to compose the sample, resulting in a two-stage sampling response rate of 55.1% unweighted and 58.4% weighted.

NHAMCS has restricted data available to include emergency service area and hospital type, state and county codes, annual ED volumes, teaching hospitals, trauma rating, and medical school affiliation (McCaig & Bur, 2012). Because the information is publicly available, there is no requirement to gain permission for access to the data.

Power Analysis

I used the G*Power analysis calculator to conduct sample size analysis. Based on the results of the power analysis, the required sample size for the logistic regression analysis was 1,007 (power = 0.80, alpha = 0.05, and odds ratio = 2), as shown in Table 1. G*Power's logistic regression analysis priori function was used to calculate the odds ratios.

Table 1

Logistic Regression Power Analysis Using G*Power

Input:	Tail(s)	2
	Effect Size	0.05
	Power (1-β err prob)	0.80
Output:	Total sample size	1007
	Actual power	0.8001658

Operationalization of Variables

I explored one dependent variable and four independent variables in this study. Hospital admission from the ED for patients diagnosed with hemorrhagic or ischemic stroke or TIA was the dependent variable; while patient seen in the ED and admitted to the hospital, total number of laboratory tests obtained in the ED, total number of radiology studies obtained in the ED, insurance status type, and patient evaluated in the ED by a physician, midlevel provider, or intern/resident are the independent variables, as displayed in Table 2.

The dependent variable is measured by whether a patient was admitted to the hospital from the ED with a diagnosis of cerebrovascular disease/history of stroke or TIA. The independent variable total number of laboratory tests obtained in the ED is measured by the number of blood tests obtained during the ED visit to include complete blood count, comprehensive metabolic panel, basic metabolic panel, glucose, prothrombin time and international normalized ratio, blood urea nitrogen or creatinine, cardiac enzymes, liver function tests, electrolytes, blood culture, brain natriuretic peptide, D-dimer, arterial blood gases, lactate, and other blood tests. The independent variable total number of radiological tests obtained in the emergency department is measured by the number of radiological studies obtained during the ED visit to include brain computed tomography, brain computed tomography angiography, brain computed tomography perfusion, brain magnetic resonance imaging, abdomen/ pelvis computed tomography, chest radiograph, carotid ultrasound, and echocardiography. The independent variable insurance status is measured by the number of ED visits with dummy variable sources of payment from insurance, defined as private insurance, Medicaid or CHIP, Medicare, Medicare and Medicaid, workers compensation, other, or unknown; or expected source of payment with no insurance, defined as self-pay or no charge or charity. The independent variable patient evaluated in the ED by a physician, midlevel provider, or intern/resident is measured by the number of ED visits where a patient was seen by a physician, nurse practitioner, physician assistant, or intern/resident. Each independent variable will be broken into categories and used as dummy variables during analysis.

Additional covariant variables used are age, gender, ethnicity, and living situation. Gender is measured by the number of ED visits for patient gender reported as male or female. Ethnicity is measured by the number of ED visits for patient ethnicity reported as Hispanic or Latino, White, Black, or African American, or other. Age is measured in years, months, and days. Living situation is measured as private residence, nursing home, homeless/homeless shelter, other, and unknown.

Table 2

Dependent and Independent Variables

Dependent variable	Independent variables	Covariates
Hospital admission from the emergency department	Total number of laboratory tests obtained in the emergency department; Total number of radiology tests obtained in the emergency department; Insurance status; Patient evaluated in the emergency department by a physician, mid-level practitioner, intern/resident	Age (Years) Gender (male or female) Race/Ethnicity (Hispanic Non-Hispanic White, Non-Hispanic Black/Other) Living Condition (Private Residence, nursing home, Other)

Data Analysis Plan

The statistical analysis I used to test the hypotheses were cross-tabulations with chi-square and multiple logistic regression analysis to evaluate the relationships between the dependent and process variables and to predict the outcome variable of hospital readmission from the ED. Multiple logistic regression analysis provides the capability to examine the effect of two or more independent metric-level variables on a categorical level dependent variable, controlling for the effect for one variable while examining the effect of the other (Frankfort-Nachmias & Leon-Guerrero, 2015). The odds ratio will be the measure of effect, determining if the process and structure variables are risk factors for the outcome variable of hospital readmission from the ED (Bayarri, Benjamin, Berger, & Sellke, 2016).

I analyzed all data using SPSS (version 25) with the data tables imported from Microsoft Excel. I used the complex sample function to apply sample weights for each unit or sample. I performed logistic regression for each independent-dependent combination using the logistic regression analysis tool. My analysis included the odds ratio and p value ($p \leq 0.05$) for determining significance and cross table analysis to identify the frequency distribution of the variables.

Research Questions and Hypotheses

RQ1: Is there an association between hospital readmissions for stroke or TIA patients and ancillary service use among patients seen in an ED while controlling for age, gender, race/ ethnicity, and living situation?

$H_0 1$: Radiology service usage is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

$H_a 1$: Radiology service usage is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

$H_0 1$: Radiology service usage is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

$H_a 2$: Laboratory service usage is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

$H_0 2$: Laboratory service usage is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

RQ2: Is there an association between hospital stroke or TIA readmissions and insurance status among patients seen in an ED while controlling for age, gender, race/ ethnicity, and living situation?

$H_0 1$: Health insurance coverage is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

$H_a 1$: Health insurance coverage is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

RQ3: Is there an association between hospital stroke or TIA readmissions and provider level among patients seen in an emergency department while controlling for age, gender, race/ ethnicity, and living situation?

$H_0$1: Being seen by a physician, midlevel provider, or intern/resident is not independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

H_a1: Being seen by a physician, midlevel provider, or intern/resident is independently related to readmissions for stroke or TIA patients after controlling for gender, race/ ethnicity, and living situation.

Threats to Validity

External Validity

The data that will be used for this study will be from a secondary data source that pulls hospital visit-based information into the NHAMCS. The Center for Disease Control and Prevention (2016b) selects the hospitals that will be used; this could possibly influence the data content used during this analyzation. Additionally, each state views the use of midlevel practitioners differently, which could cause slight threats to validity.

Internal Validity

Misdiagnosis upon arrival to the emergency department is an identified threat to the validity of the NHAMCS data, as patients with stroke or TIA may not have been diagnosed as the primary reason for the visit. While presenting to the ED for treatment patients may have been initially diagnosed with stroke or TIA upon presentation, but after additional evaluation and testing, that diagnosis was not accurate and was not corrected in the medical record. Due to data availability, the study is based on ED presentation diagnosis, which may or may not be accurate and may or may not be the same as the discharge diagnosis.

Construct Validity

The accuracy of the data contained in the 2016 NHAMCS can be affected by the quality and accuracy of the data submitted by approximately half of the hospitals who elected to participate in the survey. To offset potential inaccurate estimates of the visit data, the weighting methodology employed inflation by reciprocals of selection probabilities, adjustments are made for nonresponse, population ratio adjustments, and weight smoothing, survey results are subject to sampling and non-sampling errors (CDC, 2017a). Biases due to nonresponse and incomplete response were addressed by model-based single imputation for race and ethnicity data, based on research by an internal workgroup (CDC, 2016b).

Ethical Procedures

The 2016 NHAMCS is a public-use secondary data set that de-identifies each patient. The de-identified patient information poses no risk for the disclosure of confidential or protected health information used in the data set for this study. The data set will be stored on a personal computer and discarded after the completion of this study. For ethical purposes, the Walden University Institutional Review Board (IRB) will have oversight on the data analysis and study conclusions.

Ethical Considerations

Walden University has a rigorous Institutional Review Board (IRB) approval process of every research who is conducting research while affiliated with the school. The purpose of the IRB is to ensure that all Walden University research complies with the university's ethical standards, federal regulations, and any applicable international guidelines. The 2016 NHAMCS ED survey is a public data set with participant identify blinded prior to the release of the data. For this study the Walden IRB approval number is 03-07-19-0309658.

Description of Variables

The variables involved in this study was placed in three separate categories. The dependent variable is admission to the hospital. The independent variables are total number of laboratory tests, total number of radiology tests, insurance status, and provider evaluation level. The covariates are age, gender, race/ ethnicity, and living condition. These variables are listed in Table 3.

Table 3

Description of Variables

Dependent Variable
Discharge disposition: Admission to the hospital
Independent Variables
Total number of laboratory tests obtained in the emergency department
Total number of radiology tests obtained in the emergency department
Insurance status
Patient evaluated department by a physician, mid-level practitioner, intern/resident
Covariates
Age (years)
Gender (male or female)
Race/ Ethnicity (Non-Hispanic White, Non-Hispanic Black/ Other, and Hispanic)
Living Condition (Private Residence, nursing home, and other)

Statistical Analysis

I conducted statistical analysis using IBM SPSS Statistics version 25. I used descriptive statistics, including the percentage, frequencies, and a confidence interval of 95%, to describe the sample population characteristics. I used the odds ratio, with 95% confidence interval, for admission to the hospital from the ED using multiple logistic regression analysis while controlling for all covariates described above. The variables measuring each research question, along with statistical test, are shown in Table 4 below.

Table 4

Measurement of Variables

	Independent variable	Dependent variable	Covariates	Statistical test
RQ1; Hypothesis 1	Total radiology test	Admission to the hospital from the ED	Age, gender, race/ethnicity, insurance status	Multiple logistic regression
RQ1; Hypothesis 2	Total laboratory test	Admission to the hospital from the ED	Age, gender, race/ethnicity, insurance status	Multiple logistic regression
RQ2	Insurance status	Admission to the hospital from the ED	Age, gender, race/ethnicity, insurance status	Multiple logistic regression
RQ3	ED Provider, midlevel provider, or intern/resident	Admission to the hospital from the ED	Age, gender, race/ethnicity, insurance status	Multiple logistic regression

Summary

Section 2 evaluated the projected use of the 2016 NHAMCS secondary data set that was used to conduct a quantitative analysis for cross-sectional archival data, using cross-tabulations with chi-square followed by multiple regression analysis. This study seeks to explore the research gap regarding risk factors for the dependent variable of hospital readmissions from the emergency department for patients diagnosed with ischemic or hemorrhagic stroke or TIA based on the process quality measures and independent variables total number of laboratory tests obtained in the emergency department, total number of radiology tests obtained in the emergency department, insurance status type, and patients evaluated by a physician in the emergency department, midlevel provider, or intern/resident are the focus of the study. Section 2 included the suggested mythology for this study, while Section 3 will provide the statistical findings relative to the research questions and hypotheses.

Section 3: Presentation of the Results and Findings

The purpose of this quantitative statistical analysis was to test the hypotheses using cross-tabulations with chi-square and multiple logistic regression analysis. I evaluated the relationships between the dependent and process variables to predict the outcome variable of hospital assumed readmission from the ED for patients diagnosed with stroke or TIA. Additionally, I used multiple logistic regression analysis to examine the effect of two or more independent metric-level variables on a categorical level dependent variable, controlling for the effect for one variable while examining the effect of the other (Frankfort-Nachmias & Leon-Guerrero, 2015). I used the odds ratio to measure the effect, determining if the process and structure variables are risk factors for the outcome variable of hospital readmission from the ED (Bayarri et al., 2016). Section 3 includes results of the statistical analysis of data collected from the 2016 NHAMCS ED data set. I provide a brief description of the survey period for collection, descriptive demographics of the sample, representativeness of the sample, and analysis of the sample. The study results subsection includes the results of the multiple logistic regression and a summary of the results.

Data Collection of Secondary Data Set

For this study, I used the 2016 NHAMCS archivable data set. The data set is generated to collect information on the use and acquisition of services for the ED (CDC, 2018a). The NHAMCS is designed to provide objective, reliable data for researchers to evaluate multiple service lines, such as EDs, outpatient departments, and ambulatory surgery locations, excluding federal, military, and Veterans Administration hospitals

(CDC, 2017b). The data used was from the time period of 2012–2017. In 2012, a change was made to abstract data collection from physicians, rather than from patients, to provide an analytics base that expands the collected information (CDC, 2017a). I analyzed the data using the SPSS version 25 and recoded variables to conform to the analysis needed for the specific research questions.

Inclusion Criteria for Sample Selection

For this study, I mined data from the 2016 NHAMCS public data set. The inclusion criteria variable used was "Does patient have cerebrovascular disease/history of stroke (CVA) or transient ischemic attack (TIA)," excluding all other cases.

Sample Size

A larger representative sample size can reduce the occurrence of sampling error. The 2016 NHAMCS data set has 19,476 entries, and using the sample selection variable, I produced 613 usable cases. As shown in Table 5, the frequency of the 613 CVA/TIA cases is valid at 3.1%. For this study, I used an $p = 0.05$ to ensure the change of incorrectly rejecting the null hypothesis. The odds ratio is a measure of the association between an exposure and outcome to represent the odds that the outcomes will occur given the exposure variable in comparison to the odds that the same outcome will occur in the absences of the exposure (Szumilas, 2010). For this study, I assumed the odds ratio at 2.0 for a meaningful odds ratio and a significance was set at <0.05.

Table 5

Does Patient Have History of stroke or TIA

Valid	*f*	%	Valid %	Cumulative %
No	18854	96.9	96.9	96.9
Yes	613	3.1	3.1	100.0
Total	19467	100.0	100.0	

Results

To analyze the data, I used frequency, crosstabulations, and logistic regression to identify if there were any associations between the dependent and independent variables. Using the odds ratio to evaluate the association between the variables, the outcome can be used to compare the various risk factors of the association. If the odds ratio is greater than one, admissions to the hospital were more likely to occur in comparison to the reference category. When the odds ratio is less than one, admission to the hospital is less likely to occur. A p value of less than 0.05 was set as the significance for the associations, with a confidence interval of 95%.

Statistical Assumptions

It is assumed the cross tabulations with chi-squared restores determine if there is an association between two measured variables at the nominal or ordinal level. The two variables contain two or more categorical or independent groups. Assumptions of the multiple logistic regression analysis is that there are one or more continuous or categorical independent variables, independence of observations and a correlative exclusive dependent variable (Laerd Statistics, n.d.). The statistical assumptions were met and I conducted cross-tabulations with the chi-square analysis and multiple logistic regression models for each dependent variable. Additionally, multiple logistic regression allows for the examination of the effects of the independent variable on the dependent variables, controlling for the effect of one variable while examining the effects of the other variables (Frankfort-Nachmias & Leon-Gurerro, 2015).

Frequency

Table 6 shows the descriptive statistics data for frequency of the independent and covariate variables. In the study, there were 267 hospitals, resulting in an unweighted ED response rate of 70.8%. There were 374 emergency services areas identified from the participating EDs, and 291 of those responding for at least half of their expected ED visits based on volume of visits during the reporting period. A total of 21,061 patient record forms were submitted electronically to compose the sample, resulting in an overall two-stage sampling response rate of 55.1% unweighted and 58.4% weighted. There were 613 patients for which I abstracted data from the NHAMCS to use in this study.

Insurance status was run under four categories: (a) private insurance; (b) Medicare; (c) Medicaid, CHIP, or other state-based program; and (d) other. Twenty-six (13.6%) patients admitted to the hospital had private insurance; 129 (64.9%) had Medicare; 20 patients (10.5%) had Medicaid, CHIP, or other state-based program; and 21 (11%) were other.

The age variable was broken into four categories: (a) under 44 years, (b) 45–64 years, (c) 65–74 years, and (d) 75 years and older. Under 44 years old accounted for the least number of patients with 60 (9.8%). The age brackets from 45–64 years and 75 years and older combined made up 69.2% of the population, and 65–74 years of age came in at

21%. The majority of the patient sample had a living situation of private residence: 515 or 84%. Nursing homes were the living situation for 9%, and other was 7%. Race/ ethnicity were broken into three variables: (a) non-Hispanic White, (b) Hispanic, and (c) non-Hispanic Black/other. A majority of the population were non-Hispanic White: 403, 65.7%. Non-Hispanic Black/other had 25.3%, and Hispanic had 9%. Among the four data variables for payer type, Medicare held over half the population at 58.2%, followed by Medicaid, CHIP, or other state-based program at 16.6%, private insurance at 13.4%, and other at 11.7%.

For the laboratory tests variable, the highest count was for zero studies ordered at 149 patients (24.3%), followed by two studies at 145 (23.7%), and three studies at 142 (23.2%). These three frequencies equate to 71.2% of total laboratory studies ordered. One laboratory study ordered was 30 (4.9%), and five and above laboratory tests was 57 patients (11.7%). There are four different provider levels evaluated: (a) ED attending physician, (b) ED resident/intern, (c) nurse practitioner, and (d) physician assistant. ED attending physician accounted for 583 patients (95.1%), ED resident/intern was 67 patients (10.9%), nurse practitioner was 52 (8.5%), and physician assistant was 57 patients (9.3%). The total percentage of frequency is higher than 100% likely because some patients saw more than one provider type.

Table 6

Frequency and Percent Statistics of Admission to the Hospital

Frequencies Statistics			
		Frequency	Percent
Age in Years	Under 44 Years	60	9.8%
	45-64 Years	204	33.3%
	65-74 Years	129	21.0%
	75 Years and Over	220	35.9%
Patient Residence	Private Residence	515	84.0%
	Nursing Home	55	9.0%
	Other	43	7.0%
Race and Ethnicity	Non-Hispanic White	403	65.7%
	Non-Hispanic Black/ Other	155	25.3%
	Hispanic	55	9.0%
Payer Type	Private Insurance	82	13.4%
	Medicare	357	58.2%
	Medicaid or CHIP or other state-based program	102	16.6%
	Other	72	11.7%
Total Laboratory Tests	0 Lab Test	149	24.3%
	1 Lab Test	30	4.9%
	2 Lab Test	145	23.7%
	3 Lab Test	142	23.2%
	4 Lab Test	90	14.7%
	5 Lab Tests and Above	57	9.3%
Provider Level	Attending Physician	583	95.1%
	Resident/ Intern	67	10.9%
	Nurse Practitioner	52	8.5%
	Physician's Assistant	57	9.3%

Cross Tabs

Table 7 is the unweighted crosstabulation for the variables of patients who are admitted to the hospital with the diagnosis of CVA or TIA. The chi-square analysis showed results being at the .000 significance level for the total number of laboratory studies ordered. Age is broken into four categories with 65-74 years and greater than 75 years old had a total of 74.8%, followed by 45-64 years at 25.6% and under 44 years old at 20.4%. Of the three categories for patient residence, other was at 43.1%, followed by

40.9% for nursing home, and private residence at 29.9%. Race/ ethnicity had the highest percentage at 33.9% for non-Hispanic black/other, followed closely by non-Hispanic white at 31.7%, then Hispanic at 28.1%. For payer type, other had the highest admission percentage at 35.5%, then Medicare at 33.3%, private insurance at 29.6%, and lastly Medicaid or CHIP or other state-based program at 24.8%. The number of laboratory studies were broken into six categories. Zero laboratory studies ordered had 12.5% admitted to the hospital, followed by one laboratory studies had 19.2%, two laboratory studies had 27.1% admitted, three laboratory studies had 38.5%, four laboratory studies had 47.7%, and finally 59.3% for five or more laboratory studies. For provider level evaluation and decision to admit, attending physicians had 31.7%, resident/ inter 50.7%, nurse practitioner 38.5%, and physician's assistant 29.8%.

Table 7

Cross Tabulations

	Admit to the Hospital	
	No	Yes
Age		
Under 44 years	79.60%	20.40%
45–64 years	74.40%	25.60%
65–74 years	62.70%	37.30%
75 years and over	62.50%	37.50%
Patient residence		
Private residence	70.10%	29.90%
Nursing home	59.10%	40.90%
Other	56.90%	43.10%
Race/ ethnicity		
Non-Hispanic White	68.30%	31.70%
Non-Hispanic Black/other	66.10%	33.90%
Hispanic	71.96%	28.10%
Payer Type		
Private insurance	70.40%	29.60%
Medicare	66.70%	33.30%
Medicaid, CHIP, or other state-based program	75.20%	24.80%
Other	64.50%	35.50%
Total laboratory tests		
0 lab tests	87.50%	12.50%
1 lab test	80.80%	19.20%
2 lab tests	72.90%	27.10%
3 lab tests	61.50%	38.50%
4 lab tests	52.30%	47.70%
5 lab tests and above	40.70%	59.30%
Provider level		
Attending physician	68.30%	31.70%
Resident/intern	49.30%	50.70%
Nurse practitioner	61.50%	38.50%
Physician assistant	70.20%	29.80%

Results of Multiple Logistic Regression

Multiple logistic regression was explored using SPSS with a 95% confidence level. Per Table 8, the independent variables that were statistically significant in predicating hospital admissions from the ED for patients diagnosed with CVA or TIA was total laboratory testing (p-value= .000) and see by resident/intern (p-value= 0.05). The independent variables age (p-value= .134), residence (p-value= .227), race/ ethnicity (p-value= .670), payer type (p-value= .937), seen by MD (p-value= .241), seen by nurse practitioner (p-value= .087), and seen by physician's assistant (p-value= .951) were not statistically significant given the p-value was above the allowed threshold of .05.

Table 8 is the unweighted logistic regression analysis for the significant independent variable, total number of laboratory tests obtained in the ED, had an odds ratio of .162 for patients admitted from the ED and diagnosed with heart failure with two or less laboratory tests obtained in the ED. The odds ratio showed an association between patients with two or less laboratory tests obtained had significantly lower odds of being admitted versus patients with 5 or more laboratory tests obtained. In addition, those with three laboratory tests obtained also had significantly lower odds of being admitted versus patients with 5 or more tests, with odds ratio .430 as displayed in Table 8. In summary, fewer laboratory tests obtained in the ED is associated with lower risk of hospital admission, with the highest range for admission being from the reference category of five laboratory tests and above.

As displayed in Table 8, considering the significance level of patients seen by resident/intern, the odds ratio of 2.189 with a lower confidence interval of 1 and upper level of 4.794, for patient admitted to the hospital with a diagnosis of CVA or TIA implied a patient has statistically higher odd of being admitted to the hospital than those of other provider levels. All other categories had odds ratios between .578 through 8.588 demonstrating a no association with admission.

Table 8

Logistic Regression

Admit to this hospital	Yes	Odds ratio	95% confidence interval		Sig.
			Lower	Upper	
Age		.	.	.	0.134
	Under 44 years	0.459	0.181	1.165	.
	45-64 years	0.504	0.266	0.956	.
	65-74 years	0.783	0.424	1.448	.
	75 years and over	.	.	.	.
Patient residence		.	.	.	0.227
	Private residence	0.504	0.176	1.441	.
	Nursing home	0.882	0.308	2.53	.
	Other	.	.	.	.
Race/ ethnicity		.	.	.	0.67
	Non-Hispanic White	1.204	0.605	2.399	.
	Non-Hispanic Black/other	1.535	0.592	3.981	.
	Hispanic	.	.	.	.
Payer type		.	.	.	0.937
	Private insurance	1.021	0.31	3.364	.
	Medicare	0.791	0.273	2.286	.
	Medicaid, CHIP, or other state-based program	0.932	0.32	2.713	.
	Other	.	.	.	.
Total laboratory tests		.	.	.	0.001
	0 lab tests	0.097	0.035	0.271	.
	1 lab test	0.162	0.033	0.788	.
	2 lab tests	0.259	0.107	0.628	.
	3 lab tests	0.43	0.196	0.942	.
	4 lab tests	0.601	0.284	1.272	.
	5 lab tests and above	.	.	.	.
Provider level	Attending physician	2.228	0.578	8.588	0.241
	Resident/intern	2.189	1	4.794	0.05
	Nurse practitioner	1.733	0.922	3.258	0.087
	Physician assistant	.	.	.	0.951

Total Radiology Studies

Table 8 represents the total radiology studies with two categories of no radiology test and three or greater studies. At 97.2%, 596 patients did not receive a radiology study in the emergency department. The histogram shows an extreme right-skewed distribution. With the substantial amount of patient that did not receive a radiology study, this did not allow for a testing, so the variable was removed from the study.

Provider Level

The ED attending physician's saw the majority of the sample population, the percent of admission was 31.2% with a p= .176. Nurse practitioners admitted 38.5% of the admission population with a p= .235. Physician assistants saw 29.8% of the patients admitted with a p= .820. While ED residents/ interns saw 50.7% of patients admitted with a *p*= .000. Through this regression analysis the ED residents/ interns where the only subset of providers who showed an association between provider level and admission to the hospital.

Hypotheses Test Results

RQ1 was developed to determine if the independent variable of total number of radiology tests had an impact on the decision to admit to the hospital for patients diagnosed with stroke or TIA. During the analysis, it was determined there were too few of cases to determine significance. Therefore, the null hypothesis of H_a1 is not rejected and there is no correlation, for this study, to say radiology testing impacts the decision to admit a patient diagnosed with a history of CVA or TIA to the hospital.

The second hypothesis for RQ1 explores to association between total laboratory studies ordered in the ED and the decision to admit a patient that has been diagnosed with a CVA or TIA. There was strong statistical significance with a p= .000 to be predictive of association. With the given results, the null hypothesis was rejected and $H_0$2 was accepted.

RQ2 explored if there was an association between hospital stroke or TIAs readmissions and insurance status among patients seen in an ED while controlling for age, gender, race/ ethnicity, and living situation. According to the cross-tabulation and multiple logistic regression analysis, all statistical significance was unfounded and the null hypothesis of H_a1 was accepted that there is no correlation between insurance coverage and decision for admission to the hospital.

RQ3 attempted to determine if the dependent variable representing the outcome of admission to the hospital from the ED for patients diagnosed with CVA or TIA could be predicated from independent variable of provider type (attending physician, resident/intern, nurse practitioner, or physician assistant) see by the patient in the ED. Both the crosstabulations with chi-square and multiple logistic regression determined with a 95% confident level that the independent variable, provider type seen by the patient in the ED, was not significant in predicating the outcome variable, hospital admission from the ED for patients diagnosed with CVA or TIA. There was however, a very soft significance to the prediction of admission with a $p = .05$ for patients seen by a resident/ intern. In summary, of RQ3, $H_0$1midlevel is not independently related to readmissions for stroke or TIAs patients after controlling for gender, race/ ethnicity, and living situation is accepted.

RQ1 was answered with patients admitted from the ED with the diagnosis of CVA or TIA was able to be predicted by the number of laboratory studies performed while in the ED, but the total number of radiology studies performed did not contain enough studies to be evaluated. RQ2 was answered that insurance status did not predict the admission from the ED for a patient with the diagnosis of stroke or TIA. RQ3 was answered was answered that the provider level seen in the ED (attending physician, resident/intern, nurse practitioner, and physician's assistant) does not predict hospital admission, with the exception of a soft significance $p = .05$ for resident/ intern, for patients with the diagnosis of CVA or TIA.

Summary

In Section 3, I explored the results and findings of my doctoral study, including the data collection, results of the descriptive statistics, cross tabulations, and multiple logistic regress analysis for each of the hypotheses and research questions. The study examined ED data from the 2016 NHAMCS collected by the CDC National Center for Health statistics to determine the patient diagnosed with a CVA or TIA had a correlation with laboratory and radiology studies performed in the ED, insurance type, or provider level was predictive of hospital admission. Section 4 provides a detailed analysis and interpretation for the results of the data analysis and findings or the study.

Section 4: Application to Professional Practice and Implications for Social Change

Strokes are among the most costly and deadly disease processes that affect thousands of people each year. Every year, 795,000 people experience a stroke or TIA in the United States (CDC, 2017a). The estimated annual cost of treatment for strokes is $34 billion, but there are numerous opportunities for addressing this through prevention and being proactive as opposed to reactive (National Stroke Association, 2018).

In this quantitative study I explored whether admission rates for strokes or TIA from the ED with the diagnosis of CVA or TIA have specific correlation with ancillary service use, insurance status, and provider level evaluation. With increased usage of EDs, quick identification by all levels of providers is necessary for optimal patient outcomes. Failure to meet the outcome requirements can negatively affect patients and can cause dire consequences for healthcare organizations.

Interpretation of Findings

In healthcare, quality metrics are top priority. When evaluating specific diagnoses for admission, quality indicators are established, and failure to meet these requirements may lead to penalties and negative consequences for an organization. In this quantitative study, I examined whether admission rates for patients previously diagnosed with strokes or TIA from the ED had specific correlation with the number of laboratory tests ordered, insurance status, and provider level evaluation. With increased usage of EDs, quick identification by all levels of providers is necessary for optimal patient outcomes.

My results indicated a significant predictor of patients with the diagnosis of stroke or TIA who had five or more laboratory tests ordered. There was also a soft predictor for patients admitted who were seen by an intern/resident. My other findings showed that there was no significance between the number of radiology studies ordered, health insurance, being seen by a physician, nurse practitioner, or physician assistant, age, race/ethnicity, gender, and living conditions.

Lokeskrawee, Muengtaweepongsa, Inbunleng, Phinyo, and Patumanond (2019) determined laboratory tests to be a predictor of admissions for stroke patients and of utmost importance when initially treating this population. In my study, the research dove deeper into the number of laboratory tests ordered as a predictor of admission. There is little to no research exploring the exact number of tests ordered and their association between admission for patient diagnosed with stroke or TIA.

Kilkenny, Longworth, Pollack, Levi, and Cadilhac (2013) determined that 6.5% of patients returned within 28 days were discharged with a diagnosis of stroke or TIA. They revealed that patients who did not receive an initial computerized tomography scan of the head had an 11% higher rate of returning, and patients admitted to rural settings versus urban hospitals had fewer radiological and laboratory studies, contributing to a higher readmission rate. With the numerous limitations identified because of the lack of data available if patients presented outside participating hospitals, this study provides a strong background to examine organizational characteristics and process further to ensure high quality, evidence-based care is provided regardless of location. In my study, I attempted to evaluate if the number of tests ordered had a significant impact on patients admitted, but there were too few cases to count or make a prediction with any significance.

Chakraborty et al. (2017) completed a retrospective cohort study using all payer sources and cross-referencing them against gender, race, age, and urban/rural status; specific comorbidities based on the ICD-9-CM codes showed a total readmission percentage of 11%. The results showed that Medicare and Medicaid populations had the highest odds to be rehospitalized, with patients greater than 70 years old and from the age of 18-69 years were uninsured African American men. Basu et al. (2018) examined the variation in rates of readmission in California, Florida, Missouri, New York, and Tennessee for 2009 and found a positive association with admissions and the Medicare population. My findings indicated no statistical significance for any one payer type, which is different from previous years studies.

According to Nouh et al. (2017), the type of provider a patient initially sees played a crucial role as to who was admitted and who was not. Brown et al. (2012) completed a study using data from 1993 to 2009 and produced results that patients seen by a midlevel practitioner only, as compared to those seen by a physician only, were not as likely to be admitted to the hospital. My study showed that for patients diagnosed with stroke or TIA who were admitted through the ED, there was no significance as to which level of provider saw them. It is noteworthy that patients seeing an intern/resident did have a slight significance at a $p = 0.05$ level.

Findings to Theory

Bronfenbrenner's ecological systems theory surmised that the development of an individual had a direct correlation with the environment they were surrounded in (Kamenopoulou, 2016). Using this theory, I was able to understand how microsystems, mesosystems, exosystems, macrosystems, and chronosystems impacted the influence and predictability characteristics of the stroke and TIA diagnosed population being admitted serviced in the healthcare setting. With the independent variable of stroke or TIA admissions, the ecological systems theory examined the association with age, patient residence, insurance status, laboratory and radiological ancillary service usage, and provider level being the dependent variable can give impact to the future of examination to prevent an unnecessary return of patients.

Limitations of the Study

The limitations of the study explore possible areas of potential future research. To further expand research based off the of results that have been produced. For possible additional studies to be designed to isolate the independent variable related to geography, patient income, and hospital spending per beneficiary. Low-income patients for example, may be less willing to seek preventive medical treatment regularly due to cost associated with doctors' appointments and prescription purchasing. States that are further south, have a higher population of younger Americans, and higher rates of obesity can likely be contain areas populated on incomes and access, or lack thereof, to services which can create overuse of ED services, thus potentially creating higher cost of spending (National Research Council, 2013).

In future testing, researchers could use a mixed research methodology for case study or use a large medical facility in specific states to examine data trends in various regions, rather than solely reliant on the NHAMCS Emergency Department. Using a mixed research model could offer insights on reasoning behind ED use versus primary care, patient outreach program use, and possible regional factors limiting access to care.

Implications for Professional Practice and Positive Social Change

The study findings have the potential for real positive social change; however, the limitations of the study may limit its immediate impact. With the statistical significance being placed on the correlation between hospital admission and total number of laboratories studies run, this is where this study can directly drive community healthcare. Community outreach programs have become increasingly popular due to the implantation from Obamacare, where healthcare organizations and state and federally funded programs, need to begin addressing gaps in care of their community.

According to Marsh (2015), the enormous amount of education and community outreach surrounding strokes has made astronomical headway towards managing, predicating, and treating CVAs or TIAs. There has been a shift over the past decade of being able to target a set population type, ethic/race, and age of strokes. While strokes are more common in the elder population, the risk screens and warning sign education have been dramatically improved over the recent past (Marsh, 2015).

Conclusion

I examined and identified the relationship between hospital admissions from the ED for patient diagnosed with CVAs or TIAs, total laboratory and radiology studies ran, insurance status, and provider levels. Due to the limitations of the study, I recommend combining multiple years' worth of data, expanding the number of explanatory variables, and having a more in-depth focus on the types of laboratory studies to help narrow the field of what is ordered in relation to predictability to assist in controlling costs of care.

Overall, this study addressed the gap in the literature review examining admission rates for patients with the diagnosis of strokes or TIA from the ED that have specific correlations with ancillary service use, insurance status, and provider level evaluation. The study concluded that there were few correlations between the independent and dependent variables, with the exception of the amount of laboratory services ordered. This plays into CMS's view on the overspending by healthcare organizations to manage acute or chronic disease types and is showing a positive trend in the work that has already been put into the education for prevention, identification, and treatments of patient's experiences signs and symptoms of a stroke or TIA.

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