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Hospital Admission from the Emergency Department for Patients Diagnosed with Heart Failure

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Walden University

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Walden University

College of Health Sciences

This is to certify that the doctoral study by

Tammy Young

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

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Walden University
2019

Abstract

Hospital Admission from the Emergency Department for Patients Diagnosed with Heart Failure

by

Tammy Young

MS, Walden University, 2016

BS, Jacksonville State University, 1998

BS, Jacksonville State University, 1990

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

May 2019

Abstract

Approximately 25% of those hospitalized with congestive heart failure are readmitted within 30 days after discharge. Because researchers and policy makers consider hospital readmission within 30 days for patients with heart failure to be a quality of care issue, the Centers for Medicare and Medicaid Services has imposed financial penalties of up to 3% of a hospital's Medicare revenue for 1 year for excessive readmissions, potentially impacting the financial sustainability of some organizations. The purpose of the study was to address the research gap regarding the outcome quality measure of hospital admissions from the emergency department (ED) and 2 each process and structure variables. The Donabedian conceptual framework was used to assess quality of care through the triad of structure, process, and outcome. The quantitative study comprised analysis of cross-sectional archival data from the 2015 National Hospital Ambulatory Care Survey using cross-tabulations with chi-square followed by multiple logistic regression analysis. Findings showed that process quality measures of being seen in the ED within 72 hours and total laboratory tests obtained in the ED were predictive of lower likelihood of admission. The structure quality measure of insurance was not predictive; however, being seen by provider type consulting physician was predictive of higher likelihood of admission, whereas being seen by a nurse practitioner was predictive of lower likelihood of hospital admission. The implications of this study for social change are helping hospitals maintain financial stability through avoidance of financial penalties for heart failure readmission, supporting access to care for patients by avoiding hospital closures.

Hospital Admission from the Emergency Department for Patients Diagnosed with Heart Failure

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Walden University

May 2019

Acknowledgments

I would like to thank my best friend and greatest supporter, my husband, Don, who inspired and encouraged me to pursue a doctoral degree. I have reached this milestone in my academic career because of his motivation and unwavering support.

I would like to express my sincere gratitude to my committee chair, Dr. James Rohrer, for his quick responses, patience, guidance, and mentorship. I consider myself beyond fortunate to have had him as my chair. I would also like to acknowledge my committee member, Dr. Cynthia Newell, for her quick responses and feedback as well.

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Section 1: Foundation of the Study and Literature Review

Chronic congestive heart failure affects more than five million Americans and attributes to more than one million hospital stays annually (Chamberlain, Sond, Mahendraraj, Lau, & Siracuse, 2018). Of those hospitalized for the condition, approximately one-fourth are readmitted within 30 days, contributing to the cost burden of $1.7 billion per year spent by Medicare for patients who were readmitted with congestive heart failure (Mirkin, Enomoto, Caputo, & Hollenbeak, 2017).

In 2009, the Centers for Medicare and Medicaid Services (CMS) publicly reported risk-adjusted, unplanned, all-cause readmission rates for patients with heart failure, leading to the implementation of reimbursement policies to incentivize hospitals to reduce these readmissions to avoid decreased Medicare reimbursement for congestive heart failure readmission rates higher than those predicted (Bergethon et al., 2016). The implementation of these reimbursement policies was instrumental in launching several national campaigns intended to assist hospitals in decreasing unplanned readmissions for patients with heart failure (Bergethon et al., 2016). The goal set in October, 2009, for these initiatives was to reduce 30-day readmission rates by 20% nationwide by December, 2012 (Bergethon et al., 2016). There was minimal success in reducing heart failure readmissions through these reimbursement policy initiatives, with readmission rates remaining relatively steady at 24.7% from July, 2006, to June, 2009, and 23.1% from July, 2009, to June, 2012 (Bergethon et al., 2016).

The Affordable Care Act, which was signed into law in March, 2010, created the Hospital Readmissions Reduction Program, which required CMS to financially penalize

hospitals that had higher than predicted readmission rates within 30 days of the initial hospitalization, reducing hospital reimbursements effective October, 2012 (Chamberlain et al., 2018). The law initially applied to patients with congestive heart failure, myocardial infarction, and pneumonia readmitted to the hospital within 30 days of discharge (Synderman, et al., 2014). For fiscal year 2015, CMS estimated 2,638 hospitals were penalized $428 million for these readmissions (Hoffman & Cronin, 2015); however, the penalties escalated to $564 million, impacting 2,573 hospitals in fiscal year 2017 (Zimmerman, 2017).

The study is needed due to the significance of the financial penalties reducing Medicare reimbursement dollars up to 3% of a hospital's total Medicare payments for fiscal years 2015 and beyond. The penalties are impactful to healthcare administrators, as these penalties were applied to all reimbursement dollars for 1 year initially (Hoffman & Cronin, 2015) and currently for up to 3 years. With 30-day heart failure readmissions remaining consistent at approximately 25% (Bergethon et al., 2016), reducing the percentage of patients admitted or readmitted for heart failure from the ED represents one possible approach to reducing hospitalizations and rehospitalizations (Blecker, Ladapo, Doran, Goldfeld, & Katz, 2014), potentially reducing or avoiding the financial penalties imposed by CMS.

In this study I sought to determine if risk factors for readmission of patients seen in the emergency department (ED) within the last 72 hours, total laboratory tests obtained in the ED, health insurance, and the provider type seen by patients in the ED predicts hospital admission for patients with heart failure. Through this study, hospitals can

potentially better understand these outcome, process, and structure quality measure variables and how they predict readmission, potentially avoiding the financial penalties imposed by CMS. Avoiding the penalties from CMS contributes to sustaining the financial viability of the organization, and ultimately maintains access to care for all patients. According to Countouris, Gilmore, and Yonas (2014), hospital closures are dependent on the profit status of the hospital. A penalty of up to 3% of all Medicare reimbursement dollars for 12 months, combined with other financial challenges such as labor, drug, and supply costs, could impact the financial margins of the organization. In addition, hospital closures have a negative effect on the overall health in the surrounding community and on the residents' access to health care services, causing some people to forego medical treatment due to the inconvenience of travel to nonlocal facilities (Countouris et al., 2014). Eliminating the financial penalties for excessive readmissions of patients diagnosed with heart failure can contribute to supporting on-going hospital operations, which consequently produces social change by maintaining access to care.

This section comprises subsections on the research problem, the purpose of the study, the research questions and associated hypotheses, the theoretical foundation, the nature of the study, the literature search strategy and keywords, the literature review, the terms used in the study, the assumptions for the study, the significance of the study, and potential contributions of the study for positive social change.

Problem Statement

Approximately one-fourth of patients discharged from the hospital with a primary diagnosis of heart failure are consistently readmitted within 30 days of discharge (Ziaeian

& Fonarow, 2016). Researchers and policy makers consider 30-day heart failure readmissions a source of excessive spending that is preventable when quality care is provided (Ziaeian & Fonarow, 2016). The CMS has imposed financial penalties against hospitals for related high readmission rates. Attempting to avoid these financial penalties, one strategy hospitals have utilized is partnering with other providers to implement postdischarge heart failure disease management programs, such as the Get with the Guidelines-Heart Failure national quality improvement program (Bergethon et al., 2016). Despite these programs, unplanned readmission rates for patients with heart failure continue to be consistent at approximately 25% within 30 days of discharge (Bergethon et al., 2016).

Once discharged from the hospital, the daily risk of readmission for patients diagnosed with heart failure is highest on post-discharge day 3 and does not decrease to 50% until postdischarge day 38 (Ziaeian & Fonarow, 2016). Within the first 3 days postdischarge, insufficient time has elapsed for traditional postdischarge heart failure disease management programs to be effective. At the point when patients present to the ED with changes in heart failure symptoms, according to Bhatia et al. (2014), decisions are made regarding hospital readmission. Unscheduled return visits to the ED within 72 hours resulting in hospital admission are rarely a result of deficiencies in the medical management occurring during the initial or index ED visit (Cheng, Shroff, Khan, & Jain, 2016). Laboratory testing volume conducted in the ED is a process quality measure predictive of hospital admission and readmission (Ben-Assuli, Shabtai, Leshno, & Hill, 2014). In addition, patients who are insured are more likely to be admitted to the hospital

(Wilson, Dev, Mahan, Malhotra, & Miller, 2016), a structural quality measure. Further, patients seen in the ED by a physician are more likely to be admitted to the hospital, as compared to a midlevel provider (Honigman-Warner et al., 2017), an additional structural quality measure. According to Blecker et al. (2014), a potential strategy to reduce hospital readmissions for heart failure is to reduce admissions from the ED. The topic is relevant for health care administration, given 25% of patients with heart failure are consistently readmitted within 30 days of hospital discharge (Ziaeian & Fonarow, 2016), combined with CMS imposing financial penalties of up to 3% of Medicare reimbursement dollars for 12 months, potentially impacting the financial sustainability of some hospitals (Zimmerman, 2017).

Purpose of the Study

The purpose of the quantitative study was to address the research gap regarding risk factors for hospital admission from the ED for patients diagnosed with heart failure for the process quality measures of patients who were seen in the ED within the last 72 hours and total laboratory tests obtained in the ED; and for the structure quality measures of health insurance and the provider type seen by patients in the ED. These risk factors for hospital admission warrant consideration for helping to avoid the associated financial penalties imposed by CMS for patients readmitted with heart failure.

My the intent for the study was to determine if the independent variables patient seen in the ED within the last 72 hours, total number of laboratory tests obtained in the ED, health insurance, and provider type seen by patients in the ED predict the dependent variable of hospital admission from the ED for patients with heart failure. The covariates

of gender and ethnicity were included in the study because, according to Mirkin et al. (2017), both characteristics are associated with a higher risk of readmission within 30 days.

Research Questions and Hypotheses

RQ1: Does being seen in the ED within the least 72 hours predict hospital admission for patients with heart failure?

$H_0$1: Patients seen in the ED within the last 72 hours does not predict hospital admission for patients with heart failure.

H_a1: Patients seen in the ED within the last 72 hours does predict hospital admission for patients with heart failure.

RQ2: Does total laboratory tests obtained in the ED predict hospital admission for patients with heart failure?

$H_0$2: Total laboratory tests obtained in the ED does not predict hospital admission for patients with heart failure.

H_a2: Total laboratory tests obtained in the ED does predict hospital admission for patients with heart failure.

RQ3: Does health insurance predict hospital admission for patients seen in the ED with heart failure?

$H_0$3: Health insurance does not predict hospital admission for patients seen in the ED with heart failure.

H_a3: Health insurance does predict hospital admission for patients seen in the ED with heart failure.

RQ4: Does the provider type seen in the ED predict hospital admission for patients with heart failure?

$H_0$4: The provider seen in the ED does not predict hospital admission for patients with heart failure.

H_a4: The provider seen in the ED does predict hospital admission for patients with heart failure.

Theoretical Foundation for the Study

The theoretical framework for this study is the Donabedian conceptual framework, which will be used to assess the quality of care through the triad of structure, process, and outcome (Donabedian, 1966), while supporting the position that medical care rendered to the patient and the underlying characteristics of the patient produce health outcomes (McDonald et al., 2007). Donabedian's conceptual framework establishes reliable measures of quality can be reconstructed from valid measures of structure and process that are linked to outcomes (Ayanian & Markel, 2016). In considering risk factors for hospital readmission from the ED for patients diagnosed with heart failure, selected process and structure variables were included in the study to determine quality of care as determined by admission from the ED.

Patients seen in the ED within the last 72 hours was a process variable, as unscheduled return visits was a quality metric (Cheng et al., 2016). Total laboratory tests obtained in the ED was a process variable used to diagnose and admit patients to the hospital for heart failure (Ayanian & Markel, 2016). Health insurance was a structure variable of the health care environment of the ED (Donabedian, 1980, p. 81), which

influences the delivery of efficient care through how the processes are carried out within the environment (Fay, Carll-White, & Real, 2018), The qualifications of professional personnel, meaning the provider type seen by patients in the ED, was a structure variable (Donabedian, 1980, p. 81), as provider-level variation may occur due to differences in experiences and local practice patterns (Honigman-Warner et al., 2017). Hospital admission was an outcome variable reflecting a quality measure for patients diagnosed in the ED with heart failure, as ED providers are pivotal in the decision making process for hospitalization (Blecker et al., 2014).

Nature of the Study

The study was a quantitative analysis of cross-sectional archival data, utilizing cross-tabulations with chi-square followed by multiple logistic regression analysis. The rationale for the study design was to examine the relationships between the structure and process variables in predicting the outcome variable of hospital admission from the ED. The dependent outcome variable was hospital admission from the ED; the independent structure variables were health insurance and provider type; and the independent process variables were having been seen in the ED within the last 72 hours and total laboratory tests obtained in the ED. Further, covariates of gender and ethnicity wee included. In the study I analyzed archival data from the 2015 National Hospital Ambulatory Medical Care Survey (NHAMCS).

Literature Search Strategy and Keywords

I used the databases PubMed, ProQuest Central, Medline, and Ebsco; Walden University library; and Google Scholar to locate scholarly journal articles related to the

research questions. I utilized key words to assist in finding and locating relevant literature in PubMed, ProQuest, Medline, and Ebsco databases through the Walden University library. I used Google Scholar to find sources included in other databases. Some of the key words used in the searches were *ED, ER, emergency department, emergency room, heart failure, admission, admit, lab tests, 72 hours, insurance, physician, mid-level provider, Donabedian, readmission, 30-day readmission, return visit, unscheduled return visit, structure, process, outcomes, risk,* and *CMS readmission.* I endeavored to locate and utilize materials published within the last 5 years; however, I used older literature if more recent information was unavailable.

Literature Review

In the literature review I examine nine studies using the NHAMCS over multiple years, spanning from 1993 to 2011, and one study using the state inpatient database for California, New York, Florida, and Washington for 2006 to 2011 as related to risk factors for hospital readmission for patients diagnosed with heart failure. The literature review is based on key variables of ED visits for patients diagnosed with heart failure, admission to the hospital from the ED, patients seen in the ED within the last 72 hours, total laboratory tests obtained in the ED, health insurance, and provider type seen by patients in the ED, to include studies which correlate these variables as risk factors for hospital admission from the ED. The key variables were relevant, as the CMS is levying financial penalties against those hospitals with high rehospitalization rates within 30 days of the index admission to reduce the morbidity and associated costs related to these readmissions (Blecker et al., 2014). Further, the review summarizes the gaps in the literature related to

the risk factors of patients seen in the ED within the last 72 hours, total laboratory tests obtained in the ED, health insurance, and provider type seen by patients in the ED as predictors of hospital admission for patients with heart failure.

Literature Review Related to Key Variables

Emergency Department Visits for Patients Diagnosed with Heart Failure

A retrospective observational study by Blecker et al. (2014) of 2,158 ED visits for patients with heart failure representing 7,438,175 visits in the United States concluded the number of ED visits and subsequent hospital admissions for these patients has not changed from 2002 to 2010 for one of the most common causes of 30-day rehospitalization. The number of ED visits for heart failure ranged from 914,739 in 2002 to 848,634 in 2010, with an annual change of -0.7% at a 95% confidence level (Blecker et al., 2014). The study divided ED visits into gender, five age categories, and ED disposition for patients with heart failure (Blecker et al., 2014). Univariate and multivariate regression models were used to estimate the change in the likelihood of ED disposition of hospital admission, with covariates of age, gender, race, ethnicity, insurance, systolic blood pressure, heart rate, diabetes, acute myocardial infarction, cardiac dysrhythmias, pneumonia, chronic obstructive pulmonary disease, asthma, acute or chronic kidney disease, dementia, hospital ownership, and hospital region (Blecker et al., 2014). The data analysis of the study was somewhat difficult to follow, using a simulation model that was not clearly described to account for the variance in the yearly estimates from an annual national probability sample of ED visits using the NHAMCS.

Singer, Skopicki, Thode, and Peacock (2014) studied 891 ED visits over a 5-year period for patients with acute heart failure, concluding these patients had a mean age of 69 years, were 51% male, and 65% White. Age, gender, and ethnicity were similar across the associated hemodynamic profiles of hypertensive, normotensive, and hypotensive (Singer et al., 2014). The focus of the retrospective observational study was to examine hemodynamic profiles to provide the basis for initial medical management (Singer et al., 2014). The study utilized univariate and multivariate analyses to determine associations between age, gender, ethnicity, and medications prescribed versus the three hemodynamic profiles, not taking health insurance into consideration (Singer et al., 2014). The covariates considered in the study were mean age, gender, ethnicity, geographic region, metropolitan statistical area, hospital ownership, intubation, admission, administration of at least one cardiovascular agent, administration of diuretics, and administration of vasodilators (Singer et al., 2014). The study results summarized the data across the three hemodynamic profiles; however, the data were displayed by individual profile, impeding clear understanding of the analyses.

Admissions to the Hospital from the Emergency Department

The estimated 5.8 million people in the United States with heart failure account for 5% of acute hospitalizations (Singer et al., 2014), which has not changed from 2002 to 2010 (Blecker et al., 2014). Urban, Mumba, Martin, Glowicz, and Cipher (2015) conducted a retrospective quantitative study using multiple logistic regression with the modified early warning system (MEWS) as the primary predictor and hospital admissions from the ED and patients seen in the ED in the past 72 hours as the dependent variables

(Urban et al., 2015). Patients' age, gender, race, and ethnicity were the covariates (Urban et al., 2015). The MEWS parameters of heart rate, systolic blood pressure, respiratory rate, temperature, oxygen saturation level, and Glasgow Coma Scale score identified signs of physiological decline (Urban et al., 2015). The study included 4.14% of the sample population of 34,936 ED visits with the comorbidity of congestive heart failure, concluding for every one-unit increase in the MEWS score used to predict hospital admission, patients were 33% more likely to be admitted to the hospital from the ED (Urban et al., 2015). The study by Urban et al. (2015) considered vital signs on arrival to the ED and did not consider interventions during the ED encounter that could impact the decision to admit the patient to the hospital. In addition, there were many variations in MEWS models, often developed based on the needs of the hospital, making it difficult to validate a single instrument to identify signs of physiological decline (Urban et al., 2015).

A retrospective observational study by Napoli, Mullins, and Pines (2014) analyzed 1,626 ED visits admitted to an ED observation unit (EDOU) from 2009 to 2010 with the most common diagnoses of chest pain, abdominal pain, syncope, cardiac dysrhythmias, mood disorders, skin and soft tissue infections, and congestive heart failure. The EDOU visits were divided by observation admit and observation discharge, then further analyzed by the covariates age, ethnicity, gender, triage acuity, payer, reason for visit, region, and hospital type (Napoli et al., 2014). Survey weighted logistic regression was used to analyze potential predictors for hospital admission after treatment in the EDOU (Napoli et al., 2014). Adjusted odds ratios were calculated for admission after observation for each of the covariates (Napoli et al., 2014). In the sample studied,

640 of the 1,626 ED visits treated in the EDOU resulted in hospital admission (Napoli et al., 2014). The mean age of patients admitted to the EDOU was 50.5 years, with the mean age of patients admitted to the hospital after treatment in the EDOU of 54.1 years (Napoli et al., 2014). The study concluded patients 65 years or older is a strong predictor of hospital admission after EDOU care, with this age group being 5 times more likely to be admitted after EDOU care than patients less than 18 years of age (Napoli et al., 2014). The study did not clearly display the data and related analysis to support all conclusions described.

Total Laboratory Tests Obtained in the Emergency Department

Laboratory tests obtained in the ED is a process quality measure used to diagnose and admit patients to the hospital for heart failure (Ayanian & Markel, 2016). A study by Carlson, Menegazzi, and Callaway (2013) provided a retrospective observational review of 135,085 ED visits for patients identified as having insurance or not having insurance to determine resource utilization of the uninsured being seen in the ED. Resource utilization of tests evaluated blood, radiographic, and nonradiographic testing (Carlson et al., 2013). Laboratory blood tests for complete blood count, serum urea nitrogen/creatinine, cardiac enzymes, electrolytes, glucose, liver function tests, arterial blood gases, prothrombin time/international normalized ratio, blood cultures, blood alcohol, toxicology screen, and other blood tests were included (Carlson et al., 2013). A multivariate predictive testing model determined health insurance predicted testing, adjusting for age, gender, acuity, and cardiovascular or circulatory disease, concluding those who were uninsured had fewer tests (Carlson et al., 2013). Another multivariate

model for predicting procedures determined health insurance predicted procedures, adjusting for age, gender, acuity, and respiratory, cardiovascular or circulatory diseases, similarly concluded those who were uninsured also had fewer procedures (Carlson et al., 2013). In addition, the study concluded health insurance was not predictive of admission when adjusting for age, gender, acuity, respiratory, cardiovascular or circulatory diseases. Further, ethnicity was not predictive in any of the models (Carlson et al., 2013). The findings of Carlson et al. (2013) concluded 16.6% of ED visits were uninsured, with this group receiving fewer diagnostic or laboratory tests in the ED than those with insurance.

The study by Carlson et al. (2013) did not display all the data utilized in the analyses from which the conclusions were drawn. The authors acknowledged several limitations of the analyses due to self-reported fields in the database, potential regional variations not considered, a lack of consideration for social factors that may have contributed to the data, and not evaluating the reasons for ED visit ICD-9 codes (Carlson et al., 2013).

Patients Seen in the Emergency Department Within the Last 72 Hours

One possible approach to reducing hospitalization or rehospitalization of patients with heart failure is to reduce the percentage of those patients admitted or readmitted from the ED (Blecker et al., 2014). The reasons patients may return to the ED within 72 hours of a previous visit may be due to clinical deterioration or incorrect diagnosis or treatment (Trivedy & Cooke, 2015). According to Cheng et al. (2016), an unscheduled return visit to the ED is a quality metric. Further, in a retrospective review of 1,829 ED visits that returned within 72 hours, most hospital admissions occurring from the revisit

were due to patient noncompliance or progression of illness, not inadequacy of care of physician-related factors (Cheng et al., 2016). Urban et al. (2015) concluded the MEWS score, consisting of heart rate, systolic blood pressure, respiratory rate, temperature, oxygen saturation level and Glasgow Coma Scale, had no association or ability to predict a recent ED visit within the past 72 hours.

Capp et al. (2015) retrospectively studied 21,800 ED visits of nonelderly adults from 2010, with 5,659 of those visits covered by Medicaid only, the second largest payer for all adult nonelderly ED visits in the United States. The study utilized descriptive statistics to describe the epidemiology of Medicaid-covered ED visits, categorizing the data by sociodemographic, health care use, clinical, and ED care variables (Capp et al., 2015). Socioeconomic variables included: age, gender, ethnicity, health insurance, homelessness, percent poverty in the patient's zip code, and percent of adults with a bachelor's degree in the patient's zip code (Capp et al., 2015). Health care utilization variables included: seen in the ED within the last 72 hours, discharged from any hospital within the last 7 days, frequency of ED use in the past 12 months, reason for ED visit, arrival to the ED via ambulance, arrival to the ED during business hours, and ED visit on weekday versus weekend (Capp et al., 2015). Clinical variables included triage acuity level, as defined by the estimated severity index system and chronic medical conditions defined by the NHAMCS as cerebrovascular disease, congestive heart failure, conditions requiring dialysis, and diabetes (Capp et al., 2015). ED variables included consultant use, mental health provider use, and admission to the hospital from the ED (Capp et al., 2015).

Capp et al. (2015) concluded that almost one-third of all ED visits are from frequent ED users, defined as four or more ED visits per year. Only 14.66% of the Medicaid-covered visits returned to the ED within 72 hours of the initial visit, with 11.42% resulting in hospital admission, which is lower than the national ED hospital admission average (Capp et al., 2015). Further, the majority of Medicaid enrollees who use the ED are young females, with visits occurring Monday through Friday between 8:00 AM and 5:00 PM (Capp et al., 2015).

The study by Capp et al. (2015) was complex, with multiple variables. The study displayed tables describing sociodemographic, health care use, and clinical variables; however, the data was not displayed for the ED variables. In addition, explanation of the descriptive statistical methods employed was minimal and the analysis was difficult to follow.

Health Insurance

Patients who are insured are more likely to be admitted to the hospital (Wilson et al., 2016). A study by Carlson et al. (2013) retrospectively reviewed resource utilization of 135,085 ED visits from 2006 to 2009 identified with and without health insurance, concluding that 16.6% of patients who present to the ED are uninsured (Carlson et al., 2013). Compared to those who are insured, the uninsured are more likely male, aged 18 to 44 years, have lower rates of circulatory or cardiovascular disorders, fewer respiratory diagnoses, fewer diagnostic tests and procedures, and are less likely to be admitted to the hospital (Carlson et al., 2013).

Chamberlain et al. (2018) conducted univariate and multivariate analyses of factors predicting hospital readmission for patients with heart failure for derivation and validation cohorts. The univariate analysis of the derivation cohort of 642,448 heart failure readmissions in New York and California from 2006 to 2011 concluded the odds of readmission for the uninsured group was .04 more likely than the Medicare-insured group; however, the univariate and multivariate analyses of the validation cohort of 365,359 heart failure readmissions in Florida and Washington from 2006 to 2011 concluded uninsured patients were less likely to be readmitted than those with Medicare, Medicaid, and private insurance (Chamberlain et al., 2018). Covariates controlled for age, gender, ethnicity, income quartile, primary payer, length of stay, discharge location, mortalities present during admission, and comorbidities for both the derivation and validation cohorts (Chamberlain et al., 2018). The study was complex with multiple variables, including variables for 26 comorbidities; however, Chamberlain et al. (2018) displayed data for both cohorts and each variable.

Health insurance also impacts the volume of ED visits (Pukurdpol, Wiler, Hsia, & Ginde, 2014). A retrospective analysis of 241,167 ED visits from 1997 to 2009 categorized those visits using the New York University (NYU) ED classification algorithm based on the primary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM; Pukurdpol et al., 2014). The study used multivariable linear regression to determine the association of payer type—private, Medicare, Medicaid, uninsured, or other—and arrival time to the ED with average primary care-treatable classification, adjusting and controlling for age, gender, ethnicity, geographical

region, urban status, and survey year (Pukurdpol et al., 2014). The study concluded that as compared to privately insured ED visits, uninsured visits have a 2.4% higher probability of being seen in the ED for primary care-treatable conditions (Pukurdpol et al., 2014).

One potential issue with the study by Pukurdpol et al. (2014) is there was no comparative criterion standard to evaluate the prevalence of primary care-treatable visits against the validated NYU ED algorithm. In addition, the study did not consider or adjust for frequent users of the ED, severity of the ED episode, or comorbidities of the individual patient. In addition, patients with primary diagnoses of psychiatric conditions, alcohol use, or drug use were not included in the analyses, as the NYU ED algorithm excluded these visits (Pukurdpol et al., 2014).

According to Watts, Bryan, and Tarwater (2014), a retrospective observational study of 35,000 ED visits from 2006 until the economic downturn of 2008, Medicaid-insured ED visits demonstrated a decreasing trend of 2% per year; however, after the economic downturn of 2008 and for the next 2 years, Medicaid-insured ED visits demonstrated a considerably increasing trend of 20% per year, exhibiting greater dependence on ED services than for uninsured patients. The study used logistic regression to analyze changes in the relative proportions of ED visits for each payer and Poisson regression was used to compare trends in ED visit rates for each payer type, controlling for age (Watts et al., 2014). The study stratified the variables for each year, 2006 through 2010, and compared insurance coverage percentages to total United States

population data for the same years (Watts et al., 2014). The study was comprehensive and displayed data utilized in determining the study conclusions.

Patients Seen in the Emergency Department by Provider Type

Patients seen in the ED by provider type represents an opportunity for provider-level variation, due to differences in experiences and local practice patterns (Honigman-Warner et al., 2017). Increasing ED visits combined with an insufficient number of emergency physicians creates the growing demand for midlevel providers in emergency care (Brown, Sullivan, Espinola, and Camargo (2012). A retrospective observational study of 470,664 ED visits from 1993 to 2009 employed 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; discharge disposition; and hospital characteristics (Brown et al., 2012). The study concluded utilization of midlevel providers in the ED is increasing (Brown et al., 2012). ED visits seen by a midlevel provider only, as compared to those seen by a physician only, were less likely to be admitted to the hospital (Brown et al., 2012). The study did not display data by year but rather collectively for the period 1993 to 2009, preventing the reader from clearly understanding the data supporting the conclusion of the growing demand for midlevel providers.

There are not many studies examining midlevel providers in the ED; however, studies done in primary care have shown midlevel providers produce comparable outcomes to physicians. One such study by Rohrer, Angstman, and Garrison (2012)

examined 2-week return visits between retail clinics staffed by midlevel providers and standard medical clinics staffed by physicians. While Brown et al. (2012) noted a difference in hospital admission rates for patients seen in the ED by a midlevel provider versus a physician, Rohrer et al. (2012) noted there was no difference in return visits in the retail and medical clinic settings staffed by midlevel providers and physicians, respectively.

Literature Review Summary

The relatively unchanged number of ED visits and subsequent hospital admissions for patients diagnosed with heart failure has prompted CMS to impose financial penalties against hospitals as an intervention to reduce the associated costs resulting from one of the most common diagnoses (Blecker et al., 2014). With the literature review I sought to relate risk factors for hospital readmission for patients diagnosed with heart failure to the following variables: ED visits for patients diagnosed with heart failure, admissions to the hospital from the ED, patients seen in the ED within 72 hours, total laboratory tests obtained in the ED, health insurance, and the provider type seen by patients in the ED.

The review determined patients with a mean age of 69 years, male gender, and White ethnicity are the most common demographic characteristics of those admitted to the hospital with heart failure. Risk factors for hospital readmission include signs of physiological decline or progression of illness within 72 hours of the previous ED visit, being insured, and being seen by a physician in the ED versus by a midlevel provider. Uninsured patients presenting to the ED are more likely male, aged 18 to 44 years, with fewer circulatory or cardiovascular disorders and respiratory diagnoses, and who have

fewer diagnostic tests and procedures, with a lower likelihood of being admitted to the hospital.

Gaps in the Literature

The literature review based on key variables of ED visits for patients diagnosed with heart failure did not demonstrate relationships between these variables as related to risk factors for hospital admission from the ED for this population. While some of the studies considered a few of the key variables identified, none addressed if patients seen in the ED within 72 hours, total laboratory tests obtained in the ED, health insurance, and the provider type seen predict admission for patients with heart failure; therefore, gaps in the literature exist.

The literature supports the concept that patients who are uninsured receive fewer laboratory tests in the ED as compared to those with insurance (Carlson et al., 2013). In addition, the literature supports laboratory testing obtained in the ED is a process quality measure predictive of hospital admission and readmission (Ben-Assuli et al., 2014). There is no current literature that examines if total laboratory tests obtained in the ED, in conjunction with being seen in the ED within the last 72 hours, are process variables predictive of hospital admission. The literature also individually supports the concept that health insurance influences a higher likelihood of hospital admission and provider type seen by patients in the ED, with those seen by a physician versus midlevel provider more likely admitted to the hospital; however, there is no current literature that considers these two structure variables together as being predictive of hospital admission.

Definitions

National Hospital Ambulatory Medical Care Survey (NHAMCS): A standardized survey conducted annually by the Centers for Disease Control and Prevention (CDC) from a national sample of visits to hospital EDs, collecting data about utilization and provision of ambulatory care services (Watts et al., 2014). Hospital EDs are surveyed in all 50 states and the District of Columbia, omitting Federal, military, and Veterans Administration hospitals (Watts et al., 2014).

Patients diagnosed with heart failure: Patients presenting to the ED with the ICD-9 diagnosis code of 428.0 through 428.9 (Chamberlain et al., 2018).

Hospital admission from the emergency department (ED): Patients admitted to a hospital from the ED (CDC, 2016b).

Patients seen in the ED within 72 hours: Patients seen in this ED within the last 72 hours and discharged (CDC, 2016b).

Total laboratory tests obtained in the ED: Laboratory tests obtained in the ED to include: complete blood count, comprehensive metabolic panel, basic metabolic panel, glucose, prothrombin time, blood urea nitrogen or creatinine, cardiac enzymes, liver function tests, electrolytes, blood culture, brain natriuretic peptide, D-dimer, blood alcohol concentration, arterial blood gases, lactate, and other blood tests (CDC, 2016b).

Insurance: Type of insurance versus no insurance (Carlson et al., 2013). ED visits defined as having insurance are any combination of private insurance, Medicare, Medicaid, worker's compensation, or other insurance (Carlson et al., 2013). ED visits defined as having no insurance are self-pay, charity, or no charge (Carlson et al., 2013).

Provider type seen by patients in the ED: Patients seen in the ED by an attending physician, consulting physician, nurse practitioner, or physician assistant (Brown et al., 2012).

Ethnicity: White, Black, Hispanic or other (CDC, 2016b).

Assumptions

One assumption was that the National Hospital Ambulatory Care Survey (NHAMCS) provides nationally representative data on ambulatory care visits to hospital EDs in the United States. I further assumed that covariates of gender and ethnicity reduce potential errors in the analysis, as according to Mirkin et al. (2017), both characteristics are associated with a higher risk of readmission within 30 days. A second assumption was that the 2015 NHAMCS is constructed from the participating 267 EDs of 377 eligible, and that accurate information was provided to the survey, resulting in a representative sample of ED visits. These assumptions were necessary in the analysis of considering risk factors for hospital admission for patients with heart failure seen in the ED within the last 72 hours, the total number of laboratory tests obtained in the ED, health insurance, and the provider type seen by patients in the ED.

Scope and Delimitations

The scope of the study was descriptive with conclusions subject to the data provided to the 2015 NHAMCS by participating EDs. The variables of risk factors for hospital admission for patients with heart failure seen in the ED within the last 72 hours, total number of laboratory tests obtained in the ED, health insurance, and the provider type seen by patients in the ED are the focus of the study, as there is a gap in the

literature analyzing these variables. The study involves the subpopulation of patients seen in the ED in the United States and diagnosed with congestive heart failure during a random four-week period from December 29, 2014 to December 27, 2015 (CDC, 2016b).

The generalizability of the study is limited to patients admitted to the hospital from the ED, diagnosed with heart failure, who were seen in the ED within 72 hours, had laboratory tests obtained in the ED, had or did not have health insurance, and the provider type seen by patients in the ED, as there are other factors which may also influence hospital admission. According to Singer et al. (2014), patients presenting to the ED with acute heart failure have a mean age of 69 years, are 51% male, and 65% White.

Significance, Summary, and Conclusions

Through evaluation of risk factors for hospital admission from the ED for patients diagnosed with heart failure, the study potentially contributes to the discipline of health care administration in advancing practice and knowledge in understanding the relationship between these risk factors and hospital admission. Approximately 25% of patients with heart failure are readmitted to the hospital within 30 days of the index admission (Bergethon et al., 2016). Understanding these risk factors and hospital admissions from the ED is significant to health care administrators, as the CMS is levying financial penalties against hospitals for excessive readmission rates (Chamberlain et al., 2018). These financial penalties are material to health care administrators, as the penalty of up to 3% of the hospital's total Medicare payments is applied for one full year (Hoffman & Cronin, 2015), potentially impacting the financial stability of the organization (Countouris et al., 2014). Maintaining financial stability and viability of the

organization maintains access to care for patients by avoiding hospital closures secondary to eroding profit margins from imposed financial penalties by the CMS (Countouris et al., 2014), promoting social change.

One theme in the literature regarding risk factors for hospital readmission within 30 days of the index admission for patients diagnosed with heart failure is the readmission rate is remaining steady at 25% (Bergethon et al., 2016). Another theme is an unscheduled return visit the ED is a quality metric (Cheng et al., 2016), with researchers and policy makers considering the 30-day heart failure readmission rate as a source of excessive spending that is preventable when quality care is provided (Ziaeian & Fonarow, 2016).

There is no known literature examining hospital admission from the ED for patients diagnosed with heart failure based on the Donabedian's conceptual framework of quality of care through the triad of structure, process, and outcome (Donabedian, 1966). Consequentially, there are no studies that consider the outcome variable hospital admission from the ED; process variables patients seen in the ED within 72 hours and the total number of laboratory tests obtained in the ED; and structure variables health insurance and provider type seen by patients in the ED. This study therefore fills the gap existing in the current literature, providing practical application and extension of knowledge in the discipline of health care administration. Examination of these structure, process, and outcome variables will not only address practice from the standpoint of risk factors for hospital admission, but also expand knowledge in how these risk factors predict hospital admission for patients with heart failure.

Section 2: Research Design and Data Collection

In the previous section, I reviewed the current literature related to risk factors for hospital readmission for patients diagnosed with heart failure, with an emphasis on previous studies using the NHAMCS over multiple years, spanning from 1993 to 2011. While multiple researchers have explored various risk factors for hospital admission from the ED, there is a research gap in consideration of Donabedian's conceptual framework of assessing the outcome of hospital admissions from the ED for patients diagnosed with heart failure for the outcome, structure, and process quality measures.

The purpose of the study was to quantitatively explore the research gap regarding risk factors for the dependent variable of hospital admissions from the ED for patients diagnosed with heart failure based on (a) the process quality measures and independent variables of patients seen in the ED within the last 72 hours and total laboratory tests obtained in the ED, and (b) the structure quality measures and independent variables of insurance and provider type seen by patients in the ED. The outcome of hospital admission from the ED as predicted by these risk factors is relevant to health care administration as the associated financial penalties imposed by CMS for the 25% of patients readmitted with heart failure within 30 days of discharge can impact the financial sustainability of some organizations (Countouris et al., 2014). In this section, I present the specifics of the research design, methodology, and analytical tools used to address the gap in literature.

Research Design and Rationale

The dependent study variable was hospital admissions from the ED and the independent study variables were patients seen in the ED within the last 72 hours, total laboratory tests obtained in the ED, insurance, and provider type seen by patients in the ED. The covariates of age and ethnicity were considered, as both are characteristics associated with a higher risk of readmission within 30 days according to Mirkin et al. (2017). To determine if the independent process and structure variables predict the dependent outcome variable, I used a quantitative nonexperimental design utilizing cross-sectional archival data from the NHAMCS from 2015 to conduct cross-tabulations with chi-square followed by multiple regression analysis.

The design choice for the study is consistent with other studies analyzing hospital admissions from the ED. Chamberlain et al. (2018) explored 30-day readmission risk for patients with heart failure, utilizing chi-square tests and binary logistical regression, and Napoli et al. (2014) and Watts et al. (2014) analyzed data from the NHAMCS employing logistic regression analysis in studying predictors of hospital admission and changes in insurance after the 2008 economic downturn, respectively.

Methodology

Study Population

The target population for this research was patients diagnosed with heart failure who were admitted to the hospital from the ED. The NHAMCS for 2015, conducted annually by the CDC National Center for Health Statistics, was utilized to analyze hospital admissions from the ED for patients diagnosed with heart failure.

Sampling and Sampling Procedures

The NHAMCS is an annual nationally representative probability sample survey of visits to EDs, outpatient departments, and hospital-based and freestanding ambulatory surgical centers by the CDC National Center for Health Statistics (CDC, 2016b). The survey collects patient-level data, patient disposition, and hospital-level data (Napoli et al., 2014), sampling EDs in all 50 states and the District of Columbia, omitting Federal, military, and Veterans Administration hospitals, collecting data about use and provision of ambulatory care services representative of EDs across the country (Watts et al., 2014). Participation in the NHAMCS is voluntary.

The sampling strategy is relevant, given there were 136.9 million ED visits in 2015 (CDC, 2016b); it was impractical to gather data on each encounter. The sample was drawn using a multistage probability design with samples of primary sampling units, hospitals within primary sampling units, and patient visits within emergency service areas of each selected hospital, with the U. S. Bureau of the Census serving as the data collection agent (CDC, 2016b). Each included hospital is randomly assigned to one of 16 4-week reporting periods (McCaig & Burt, 2012).

The 2015 survey was conducted from December 29, 2014 through December 29, 2015, with a total of 377 participating of the 457 hospitals selected to participate that met the scope of the study and had eligible EDs (CDC, 2016b). There were 267 hospitals participating in providing ED data, resulting in an unweighted ED response rate of 70.8% (CDC, 2016b). There were 374 emergency services areas identified from the participating EDs, with 291 of those responding for at least half of their expected ED

visits based on volume of visits during the reporting period (CDC, 2016b). A total of 21,061 patient record forms were submitted electronically to formulate the sample, resulting in an overall unweighted and weighted two-stage sampling response rate of 55.1% and 58.4%, respectively (CDC, 2016b).

The NHAMCS has optional, restricted data available to include state and county codes, emergency service area and hospital type, annual ED visit volume, teaching hospital, medical school affiliation, and trauma rating (McCaig & Burt, 2012); however, access for the secondary data for this study utilizes the NHAMCS publicly available data. Because the data are available publicly, there are no necessary permissions to gain access to the data.

Power Analysis

G*Power, a free power analysis calculator, was used 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. The effect size of the odds ratios was computed using G*Power's logistic regression analysis priori function.

Table 1

*Logistic Regression Power Analysis Using G*Power*

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

Operationalization of Variables

One dependent and four independent variables were explored in this study. Hospital admission from the ED for patients diagnosed with heart failure was the dependent variable, while patients seen in the ED within the last 72 hours, total number of laboratory tests obtained in the ED, health insurance, and provider type seen by patients in the ED were the independent variables, as displayed in Table 2.

The dependent variable was measured by whether an individual patient was admitted to the hospital from the ED. The independent variable patient seen in the ED within the last 72 hours represents patients seen in the same ED during the last 72 hours and discharged. The independent variable total number of laboratory tests obtained in the ED was 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 or international normalized ratio, blood urea nitrogen or creatinine, cardiac enzymes, liver function tests, electrolytes, blood culture, brain natriuretic peptide, D-dimer, blood alcohol concentration, arterial blood gases, lactate, and other blood tests. The independent variable health insurance was measured by the number of ED visits with expected source of payment, defined as unknown, private insurance, Medicaid or CHIP, Medicare, or all other, to include worker's compensation, self-pay, charity, or other. The independent variable of provider type seen by patients in the ED was measured by the number of ED visits where a patient was seen by an attending physician, consulting physician, nurse practitioner, or physician assistant. Additional independent variables used as study covariates were gender and ethnicity, with gender measured by the number

of ED visits for patient gender reported as male or female and ethnicity measured by the number of ED visits for patient ethnicity reported as White, Black, Hispanic, or other.

Table 2

Dependent and Independent Variables

	Dependent variable	Independent variables	Covariates
	Hospital admission from the ED	Patient seen in the ED within the last 72 hours; Total number of laboratory tests obtained in the ED; Health insurance; Provider type seen in the ED	Gender (male or female); Ethnicity (white, black, or Hispanic or other)

Data Analysis Plan

I analyzed data from the 2015 NHAMCS for this study using the Statistical Package for the Social Sciences (SPSS), Version 25. The sample data were inflated or weighted to produce unbiased annual national estimates and include standard errors (CDC, 2016b). According to the Emergency Department Summary Tables for the 2015 NHAMCS, the ED visit weights included inflation by reciprocals of selection probabilities, adjustment for nonresponse, population ratio adjustments, and weight smoothing; therefore, there was no data cleaning and screening procedures relative to the study analysis. Data contained in the 2015 NHAMCS which were not relevant to the study and associated variables was not included in the statistical analysis.

Research Questions and Hypotheses

RQ1: Does being seen in the ED within the last 72 hours predict hospital admission for patients with heart failure?

$H_0$1: Patients seen in the ED within the last 72 hours does not predict hospital admission for patients with heart failure.

H_a1: Patients seen in the ED within the last 72 hours does predict hospital admission for patients with heart failure.

RQ2: Does total laboratory tests obtained in the ED predict hospital admission for patients with heart failure?

$H_0$2: Total laboratory tests obtained in the ED does not predict hospital admission for patients with heart failure.

H_a2: Total laboratory tests obtained in the ED does predict hospital admission for patients with heart failure.

RQ3: Does health insurance predict hospital admission for patients seen in the ED with heart failure?

$H_0$3: Health insurance does not predict hospital admission for patients seen in the ED with heart failure.

H_a3: Health insurance does predict hospital admission for patients seen in the ED with heart failure.

RQ4: Does the provider type seen in the ED predict hospital admission for patients with heart failure?

$H_0$4: Provider type seen in the ED does not predict hospital admission for patients with heart failure.

H_a4: Provider type seen in the EDdoes predict hospital admission for patients with heart failure.

Detailed Analysis Plan

The statistical tests that will be utilized to test the hypotheses are cross-tabulations with chi-square followed by multiple logistic regression analysis, as the intent of analysis is to examine the relationships between the structure and process variables in predicting the outcome variable of hospital admission from the ED. Further, 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, while 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 (Szumilas, 2010), determining if the process and structure variables are risk factors for the outcome variable of hospital admission from the ED.

Studies reviewed in the literature emphasized the value of including potential covariates that may contribute to study findings. For example, Blecker et al. (2014) studied treatment of acute heart failure in the ED or observation unit as an alternative to hospitalization from the ED. The existing s tudy analyzed the association between the covariates of age, gender, race, ethnicity, insurance, systolic blood pressure, heart rate, diabetes, acute myocardial infarction, cardiac dysrhythmias, pneumonia, chronic obstructive pulmonary disease, asthma, acute or chronic kidney disease, dementia,

hospital ownership, and hospital region, all of which could influence the decision for hospitalization from the ED (Blecker et al., 2014). Covariates of gender and ethnicity are included in this study because both characteristics are associated with a higher risk of readmission within 30 days of hospital discharge for patients diagnosed with heart failure (Mirkin et al., 2017).

Categorical data analysis utilizing cross-tabulations with chi-square will examine the relationships between the structure and process variables with the outcome variable. Results of the study will be based on the conventional threshold for multiple logistic regression testing of 0.05 for the p-value.

Threats to Validity

External Validity

Data for this study originated from secondary data collected and weighted to produce unbiased national annual estimates. Because the survey is visit-based rather than population-based, incidence or prevalence rates of health conditions within the population cannot be determined (McCaig & Burt, 2012). The data utilized for this study is not sorted by state, which may be relevant, considering there are different scopes of practice among mid-level providers and state-sponsored insurance benefits across all 50 states, from which data was collected. Further, hospitals are selected by the CDC National Center for Health Statistics to participate in the survey for which participation if selected is not mandatory, possibly influencing the data content, as the overall unweighted and weighted two-stage sampling response rate was 55.1% and 58.4%, respectively (CDC, 2016b).

Internal Validity

Patient misdiagnosis upon presentation to the ED is an identified threat to the validity of the NHAMCS data, as patients with heart failure may not have been diagnosed with heart failure as the primary reason for the ED visit when presenting to the ED for treatment; and likewise, patients may have been initially diagnosed with heart failure upon ED 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 2015 NHAMCS is only as good as the quality of the data submitted by approximately half of the hospitals who elected to participate in the survey. To mitigate potential inaccurate estimates of the ED visit data, the weighting methodology employed inflation by reciprocals of selection probabilities, adjustment for nonresponse, population ratio adjustments, and weight smoothing. In addition, survey results are subject to sampling and nonsampling errors (CDC, 2016). 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 data contained in the 2015 NHAMCS is a public-use secondary data set that is patient de-identified. Because the data is de-identified, there were no risks for the

disclosure of confidential or protected health information in the dataset utilized for the study. The data set will be downloaded and stored on a personal computer and will be deleted when the study is concluded, to maintain the security of the data set. For ethical purposes, the Walden University Institutional Review Board oversaw the data analysis and study conclusions (Walden Institutional Review Board approval no. 12-11-18-0501026).

Summary

Section 2 described utilizing the 2015 NHAMCS secondary data set to conduct a quantitative analysis of cross-sectional archival data, utilizing cross-tabulations with chi-square followed by multiple regression analysis. The study seeks to determine if the process variables of patient seen in the ED within 72 hours and total number of laboratory tests obtained in the ED and structure variables of health insurance and provider type seen by patients in the ED predict the outcome variable of hospital admission from the ED. Further, while section 2 includes the suggested methodology for the study, section 3 provides the statistical findings relative to the research questions and associated hypotheses.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative study was to utilize Donabedian's framework of outcome, process, and structure to determine if risk factors for process and structure quality measures predict the outcome quality measure. The NHAMCS for 2015, conducted annually by the CDC National Center for Health Statistics, contains the dependent and independent variables utilized to analyze the selected risk factors for hospital admissions from the ED for patients diagnosed with heart failure.

The dependent variable and outcome quality measure was hospital admission from the ED for patients diagnosed with heart failure. The independent variables and process quality measures were patients who were seen in the ED within the last 72 hours and the total number of laboratory tests obtained in the ED, and the structural quality measures were insurance and provider type seen by patients in the ED. Covariates of gender and ethnicity were included in the study because both characteristics are associated with a higher risk of readmission within 30 days (Mirkin et al., 2017). Utilizing these outcome, process, and structure dependent and independent variables, the research questions and associated hypotheses follow.

RQ1: Does being seen in the ED within the last 72 hours predict hospital admission for patients with heart failure?

$H_0$1: Patients seen in the ED within the last 72 hours does not predict hospital admission for patients with heart failure.

H_a1: Patients seen in the ED within the last 72 hours does predict hospital admission for patients with heart failure.

RQ2: Does total laboratory tests obtained in the ED predict hospital admission for patients with heart failure?

H_02: Total laboratory tests obtained in the ED does not predict hospital admission for patients with heart failure.

H_a2: Total laboratory tests obtained in the ED does predict hospital admission for patients with heart failure.

RQ3: Does health insurance predict hospital admission for patients seen in the ED with heart failure?

H_03: Health insurance does not predict hospital admission for patients seen in the ED with heart failure.

H_a3: Health insurance does predict hospital admission for patients seen in the ED with heart failure.

RQ4: Does the provide type seen in the ED predict hospital admission for patients with heart failure?

H_04: Provider type seen in the ED does not predict hospital admission for patients with heart failure.

H_a4: Provider type seen in the ED does predict hospital admission for patients with heart failure.

Section 3 includes results of the statistical analyses (cross-tabulations and logistical multiple regression) of data utilized from the 2015 NHAMCS data set. I

provide brief descriptions of the survey time frame for data collection, response rates of the data set, discrepancies in the data set, descriptive and demographic characteristics of the sample, representativeness of the sample, univariate analysis of the sample, and conclude with a summary of the results.

Data Collection of Secondary Data

Time Frame, Response Rates, and Discrepancies of the Data Set

I utilized archival data from the CDC 2015 NHAMCS for the study. The data selected for the study was for patients diagnosed with heart failure admitted to the hospital from the ED, seen in the ED within the last 72 hours, total number of laboratory tests obtained in the ED, health insurance, provider type seen by patients in the ED, gender, and ethnicity. The NHAMCS is an annually conducted probability sample that surveys visits to EDs, outpatient departments, and hospital-based freestanding ambulatory surgical centers from all 50 states and the District of Columbia. Federal, military, and Veterans Administration hospitals are excluded from the survey. Data for the 2015 survey was collected during a random 4-week period from December 29, 2014, through December 29, 2015. Of the 457 hospitals selected to participate in the survey, 377 met the scope of the study and had eligible EDs, and 267 participated, resulting in an unweighted ED response rate of 70.8% (CDC, 2016b).

The archived data set initially comprised 21,061 patient record forms submitted electronically by the participating EDs to formulate the weighted data set. I utilized the subpopulation of patients seen in the ED and diagnosed with heart failure, representing 652 unweighted records. The G*Power analysis required a sample size of 1.007 (power

= 0.80, alpha = 0.05, and odds ratio 2), creating a limitation of the data set. This limitation was not apparent until the data set was downloaded, as the preliminary content was based on a weighted sample. There were no discrepancies in the data noted. Nonapplicable data was excluded to segregate the subpopulation of patients seen in the ED and diagnosed with heart failure and to remove the variables not considered as part of this study. The variable for insurance was categorized to combine worker's compensation, self-pay, charity, and other into an all other category. In addition, the 16 laboratory variables of complete blood count, comprehensive metabolic profile, basic metabolic profile, glucose, prothrombin time or international normalized ratio, blood urea nitrogen or creatinine, cardiac enzymes, liver function tests, electrolytes, blood culture, brain natriuretic peptide, D-dimer, blood alcohol concentration, arterial blood gases, lactate, and other blood tests were combined into one laboratory test variable and categorized by the total number of tests obtained in the ED as 2 or fewer, 3 to 5, or 6 or more.

Baseline Characteristics, Populations Representativeness

Table 3 presents the descriptive statistics of the unweighted categorical variables using the sample of 652 cases. The analysis included the dependent variable of patients admitted from the ED and diagnosed with heart failure with frequency of 253 cases or 38.8%. The analysis also included the independent variables seen in the ED within the last 72 hours, total number of laboratory tests obtained in the ED, health insurance, provider type seen by patients in the ED, and covariates gender and ethnicity.

As noted in Table 3, 33 patients or 5.1% were seen in the ED within 72 hours. Of the 652 cases, 245 or 37.6% had 2 or fewer laboratory tests ordered in the ED; 274 or 42.0% 3 to 5 tests; and 133 or 20.4% 6 or more tests. Health insurance for the 652 cases were 37 or 5.7% unknown insurance status; 72 or 11.0% private insurance; 441 or 67.6% Medicare; 75 or 11.5% Medicaid or CHIP; and 27 or 4.1% represented all other insurance which included worker's compensation, self-pay, charity, and other. While the total number of cases was 652, some patients were seen in the ED by more than one provider; therefore, there were a total of 850 provider encounters in the ED for patients diagnosed with heart failure, with 596 or 91.4% seen by an attending physician; 156 or 23.9% seen by a consulting physician; 33 or 5.1% seen by a nurse practitioner; and 65 or 10.0% seen by a physician assistant. The covariates of gender and ethnicity, per Table 3, was 309 or 47.4% male and 343 or 52.6% female; and 486 or 74.5% White, 115 or 17.6% Black, and 51 or 7.8% Hispanic or other.

Table 3

Descriptive Statistics

Variable	Frequency	Percent (%)
Admitted from ED		
Yes	253	38.8
No	399	61.2
Seen in ED within 72 hours		
Unknown	43	6.6
Yes	33	5.1
No	576	88.3
Total number of lab tests obtained in ED		
2 or less	245	37.6
3 to 5	274	42.0
6 or more	133	20.4
Health insurance		
Unknown	37	5.7
Private insurance	72	11.0
Medicare	441	67.6
Medicaid or CHIP	75	11.5
All other	27	4.1
Seen in ED by provider type		
Attending physician	596	91.4
Consulting physician	156	23.9
Nurse practitioner	33	5.1
Physician assistant	65	10.0
Gender		
Male	309	47.4
Female	343	52.6
Ethnicity		
White	486	74.5
Black	115	17.6
Hispanic or other	51	7.8

The 2015 NHAMCS data set, collected as an annual nationally representative probability sample survey, was gathered from participating EDs during a randomly assigned 4-week reporting period from December 29, 2014, through December 29, 2015, utilizing a multistage probability design. The data gathered was survey-based rather than population-based; therefore, according to McCaig and Burt (2012), the sample of patients diagnosed with heart failure may not reflect the incidence or prevalence rates of this condition within the population. However, the probability sampling strategy was relevant as there were more than 136.9 million ED visits in 2015, making it impossible to collect data on each ED encounter (CDC, 2016b).

I considered the outcome dependent variable of hospital admission from the ED for patients diagnosed with heart failure, the independent process variables seen in the ED within the last 72 hours and total number of laboratory tests obtained in the ED, the independent structure variables health insurance and provider type seen by patients in the ED, along with covariates gender and ethnicity. The two covariates were selected for inclusion in the study because according to Mirkin et al. (2017), both characteristics were associated with a higher hospital readmission risk for patients diagnosed with heart failure. However, as displayed in Table 5, cross tabulations with chi-square revealed neither gender nor ethnicity was statistically significant for correlation with hospital admission from the ED for patients diagnosed with heart failure (p value = .988 and p value = .206, respectively), and therefore did not justify the need for inclusion in the study.

Study Results

This subsection includes the statistical assumptions, research questions, results of the statistical analysis findings, hypotheses test results, answers to research questions, and concludes with a summary of the study results.

Statistical Assumptions

The assumptions of cross tabulations with chi-square are to determine if there is an association between two variables measured at an ordinal or nominal level; the two variables consist of two or more categorical, independent groups; and no cells in the cross tabulations have an expected count of less than 5 (Laerd Statistics, n.d.a.). Assumptions of multiple logistic regression are the dependent variable is measured on a dichotomous scale, there are one or more continuous or categorical independent variables, independence of observations, and a mutually exclusive dependent variable (Laerd Statistics, n.d.b.). Statistical assumptions were met and cross-tabulations with chi-square and multiple logistic regression were conducted and analyzed for the dependent variable, patient diagnosed with heart failure admitted to the hospital from the ED and each of the independent variables seen in the ED within the last 72 hours, total laboratory tests obtained in the ED, health insurance, and provider type seen by patients in the ED. In addition, multiple logistic regression enabled examination of the effects of the two independent variables on the dependent variable, while concurrently controlling for the effect of one variable while analyzing the effect of the other variable, enabling the researcher to isolate the effects of each independent variable separately from each other (Frankfort-Nachmias & Leon-Gurerro, 2015).

Research Questions

RQ1: Does being seen in the ED within the last 72 hours predict hospital admission for patients with heart failure?

RQ2: Does total laboratory tests obtained in the ED predict hospital admission for patients with heart failure?

RQ3: Does health insurance predict hospital admission for patients seen in the ED with heart failure?

RQ4: Does the provider type seen in the ED predict hospital admission for patients with heart failure?

Results of Cross Tabulations

Both weighted and unweighted cross-tabulations were conducted using SPSS; However, only the unweighted tests produced the Pearson chi-square test for independence which was used to determine if there was an association of the categorical variables tested. All chi-square tests had zero cells with an expected count less than five, meeting the assumption. Table 4 represents the weighted two-way cross tabulations per SPSS output, with no p-values or significance values produced for the dependent variable, patients admitted from the ED and diagnosed with heart failure, and the independent variables seen in the ED within the last 72 hours, total number of laboratory tests ordered in the ED, health insurance, provider type seen by patients in the ED, and covariates gender and ethnicity. Table 5 displays the unweighted cross tabulations for the same dependent and independent variables and covariates.

The unweighted two-way table results as shown in Table 5, include the Pearson chi-square output. The Pearson chi-square test is utilized to test for the existence of a significant relationship between categorical variables. Further, the purpose of the chi-square output is to test the null hypothesis that no relationship exists between the cross-tabulated variables (Frankfort-Nachmias & Leon-Guerrero, 2015). Based on the asymptomatic significance of the Pearson chi-square test results below the conventional threshold of .05, the independent variables seen in ED within the last 72 hours (p-value=.029), total laboratory tests obtained in the ED (p-value=.000), and seen in the ED by a consulting physician (p-value=.000) or nurse practitioner (p-value=.004) are statistically significant in relation to the dependent variable of hospital admission from the ED for patients diagnosed with heart failure. In addition, the independent variables health insurance (p-value=.115), seen in the ED by an attending physician (p-value=.175) or physician assistant (p-value=.456) were not statistically significant. As previously referenced, covariates gender (p-value=.988) and ethnicity (p-value=.206) were not statistically significant either.

Table 4

Weighted Two-Way Table Results – Hospital Admission and Independent Variables

Variable	Hospital admission			
	Yes		No	
	N *(in thousands)*	Percent (%)	*N* *(in thousands)*	Percent (%)
Seen in ED within 72 hours	28.9	16.1	150.8	83.9
Total number of lab tests obtained in ED				
2 or less	326.0	20.0	1306.0	80.0
3 to 5	893.5	45.2	1082.1	54.8
6 or more	530.4	65.8	275.2	34.2
Health insurance				
Unknown	86.6	28.2	220.1	71.8
Private insurance	215.3	42.6	290.0	57.4
Medicare	1223.2	42.4	1662.7	57.6
Medicaid or CHIP	195.8	35.4	357.1	64.6
All other	29.2	18.0	41.2	82.0
Seen in ED by provider type				
Attending physician	1591.9	40.4	2346.0	59.6
Consulting physician	659.5	71.5	263.3	28.5
Nurse practitioner	49.6	19.0	211.6	81.0
Physician assistant	217.3	46.8	247.2	53.2
Gender				
Male	817.1	39.1	1275.0	60.9
Female	932.8	40.2	1388.2	59.8
Ethnicity				
White	1306.8	41.4	1847.0	58.6
Black	291.3	34.7	548.0	65.3
Hispanic or other	151.9	36.1	268.4	63.9

Table 5

Unweighted Two-Way Table Results – Hospital Admission and Independent Variables

Variable	Hospital admission							
	Yes		No		Total			
	N	%	*N*	%	*N*	%	Pearson Chi-Sq	*p*-value
Seen in ED within 72 hours							7.068	.029
Yes	7	21.2	26	78.8	33	5.1		
No	224	38.8	352	61.1	576	88.3		
Unknown	22	51.2	21	48.8	43	6.6		
Total	253	38.8	399	61.2	652	100.0		
Total number of lab tests obtained in ED							82.668	.000
2 or less	45	18.4	200	81.6	245	37.6		
3 to 5	123	44.9	151	55.1	274	42.0		
6 or more	85	63.9	48	36.1	133	20.4		
Total	253	38.8	399	61.2	652	100.0		
Health insurance							7.436	.115
Unknown	12	32.4	25	67.6	37	5.7		
Private	30	41.7	42	58.3	72	11.0		
Medicare	181	41.0	260	59.0	441	67.6		
Medicaid or CHIP	25	33.3	50	66.7	75	11.5		
All other	5	18.5	22	81.5	27	4.1		
Total	253	38.8	399	61.2	652	100.0		
Seen in ED by provider type								
Attending	236	39.6	360	60.4	596	70.1	1.841	.175
Consulting	104	66.7	52	33.3	156	18.4	.000	.000
Nurse Prac	5	15.2	28	84.8	33	3.9	8.189	.004
Phys Asst	28	43.1	37	56.9	65	7.6	.555	.456
Total	373	43.9	477	56.1	850	100.0		
Gender								.988
Male	120	38.8	189	61.2	309	47.4		
Female	133	38.8	210	61.2	343	52.6		
Total	253	38.8	399	61.2	652	100.0		
Ethnicity								.206
White	198	40.7	288	59.3	486	74.5		
Black	37	32.2	78	67.8	115	17.6		
Hisp or oth	18	35.3	33	64.7	51	7.8		
Total	253	38.8	399	61.2	652	100.0		

Results of Multiple Logistic Regression

Weighted multiple logistic regression was conducted using SPSS with a 95% confidence level. Per Table 6, the independent variables that were statistically significant in predicting hospital admission from the ED for patients with heart failure were seen in the ED within the last 72 hours (p-value=.040), total number of laboratory tests ordered in the ED (p-value=.000), seen by a consulting physician (p-value=.000), and seen by a nurse practitioner (p-value=.011). The independent variables health insurance (p-value=.424), seen by provider type attending physician (p-value=.544), seen by provider type physician assistant (p-value=.769), and covariates gender (p-value=.596) and ethnicity (p-value=.423) were not statistically significant, as the p-values were above the conventional threshold of .05.

As displayed in Table 6, considering the significant independent variable, seen in the ED within the last 72 hours, the odds ratio of .931 for patient seen in the ED within the last 72 hours implied a patient diagnosed with heart failure and seen in the ED within the last 72 hours had statistically significant lower odds of being admitted than a patient who was not seen within the last 72 hours.

Per Table 6, the significant independent variable, total number of lab tests obtained in the ED, had an odds ratio of .169 for patients admitted from the ED and diagnosed with heart failure with 2 or less laboratory tests obtained in the ED. The odds ratio determined patients with 2 or less laboratory tests obtained had significantly lower odds of being admitted versus patients with 6 or more laboratory tests obtained. In addition, those with 3 to 5 laboratory tests obtained also had significantly lower odds of

being admitted versus patients with 6 or more tests, with odds ratio .575 as displayed in Table 6. In summary, fewer laboratory tests obtained in the ED is associated with lower risk of hospital admission.

Per Table 6, the significant independent variable seen by provider type consulting physician had an odds ratio of 3.425, indicating significantly increased odds of being admitted from the ED for patients with heart failure. Conversely, the significant independent variable of seen by provider type nurse practitioner has an odds ratio of .260, meaning significantly decreased odds of being admitted from the ED for patients with heart failure. In summary, patients seen in the ED by provider type consulting physician were more likely to be admitted and those seen by a nurse practitioner were less likely to be admitted from the ED. These findings are further addressed in section 4.

Table 6

Significant Results of Weighted Multiple Logistic Regression for Hospital Admission

Independent variables	Odds Ratio	95% confidence interval		*p*-value
		Lower	Upper	
Seen in ED within 72 hours				
Yes vs no	.931	.870	.997	.040
Total number of lab tests obtained in ED				.000
2 or less vs 6 or more	.169	.101	.283	
3 to 5 vs 6 or more	.575	.362	.913	
Health insurance				.424
Unknown vs all other	2.086	.573	7.593	
Private vs all other	1.930	.590	6.320	
Medicare vs all other	2.528	.857	7.455	
Medicaid or CHIP vs all other	1.981	.604	6.496	
Seen in ED by provider type				
Attending physician	.811	.413	1.594	.544
Consulting physician	3.425	2.249	5.215	.000
Nurse practitioner	.260	.092	.733	.011
Physician assistant	1.093	.605	1.975	.769
Covariates				
Gender	.907	.633	1.300	.596
Ethnicity	.887	.661	1.190	.423

Hypotheses Test Results

Research question 1. Research question one endeavored to determine if the dependent variable representing the outcome quality measure of admission to the hospital from the ED for patients diagnosed with heart failure could be predicted from the process quality measure and independent variable of patient seen in the ED in the last 72 hours. Both cross tabulations with chi-square and multiple logistic regression determined with a 95% confidence level that the independent variable, patient seen in the ED within the last

72 hours, was significant in predicting the outcome variable, hospital admission from the ED for patients with heart failure. The predictive relationship was statistically significant per cross tabulations (p-value=.029) per Table 5 and statistically significant per multiple logistic regression (p-value=.040) per Table 6 for patients seen in the ED within the last 72 hours, as the p-values are below the conventional threshold of .05. The odds ratio of .931 demonstrated statistically significant lower odds of being admitted from the ED as compared to those not seen in the ED within the last 72 hours. Even so, the odds ratio of .931 established a weak effect between the two variables. Therefore, being seen in the ED within the last 72 hours for patients with heart failure does predict hospital admission from the ED and the null hypothesis is rejected: *H□1: Patients seen in the ED within the last 72 hours does not predict hospital admission for patients with heart failure.*

Research question 2. Research question two sought to determine if the dependent variable representing the outcome quality measure of admission to the hospital from the ED for patients diagnosed with heart failure could be predicted from the process quality measure and independent variable of total laboratory tests obtained in the ED. Both cross tabulations with chi-square and multiple logistic regression determined with a 95% confidence level that the independent variable, total laboratory tests obtained in the ED, was significant in predicting the outcome variable, hospital admission from the ED for patients with heart failure. The predictive relationship was statistically significant per cross tabulations per Table 5 (p-value=.000) and statistically significant per multiple logistic regression per Table 6 (p-value=.000) for total number of laboratory tests obtained in the ED, as the p-values were below the conventional threshold of .05. Per

Table 6, the odds ratio of .169 for 2 or less tests obtained in the ED, versus 6 or more; and the odds ratio of .575 for 3 to 5 tests obtained in the ED, versus 6 or more demonstrated there was significantly reduced odds of being admitted based on the total number of laboratory tests obtained in the ED. In addition, the odds ratio of .169 for 2 or less tests demonstrated a strong magnitude of significant effect between the two variables; whereas, the odds ratio of .575 for 3 to 5 tests demonstrated weak effect. Therefore, the total number of laboratory tests obtained in the ED for patients with heart failure does predict hospital admission from the ED and the null hypothesis is rejected: *H□2: Total laboratory tests obtained in the emergency department does not predict hospital admission for patients with heart failure.*

Research questions 3. Research question three attempted to determine if the dependent variable representing the outcome quality measure of admission to the hospital from the ED for patients diagnosed with heart failure could be predicted from the structure quality measure and independent variable of health insurance. Both cross tabulations with chi-square and multiple logistic regression determined with a 95% confidence level that the independent variable, health insurance, was not significant in predicting the outcome variable, hospital admission from the ED for patients with heart failure. The predictive relationship was not statistically significant per cross tabulations per Table 5 (p-value=.115) and was not statistically significant per multiple logistic regression per Table 6 (p-value=.424) for health insurance, as the p-values were above the conventional threshold of .05. In addition to health insurance not being a statistically significant predictor of admission from the ED, per Table 6, the odds ratios of 2.086 for

unknown insurance versus all other, 1.930 private insurance versus all other, 2.528 Medicare versus all other, and 1.981 Medicaid or CHIP versus all other, are associated with no greater odds of admitting or not admitting to the hospital from the ED. Therefore, health insurance for patients with heart failure does not predict hospital admission from the ED and the null hypothesis is not rejected: *H□3: Health insurance does not predict hospital admission for patients seen in the emergency department with heart failure.*

Research question 4. Research question four endeavored to determine if the dependent variable representing the outcome quality measure of admission to the hospital from the ED for patients diagnosed with heart failure could be predicted from the structure quality measure and independent variable of provider type (attending physician, consulting physician, nurse practitioner, or physician assistant) seen by the patient in the ED. Both cross tabulations with chi-square and multiple logistic regression determined with a 95% confidence level that the independent variable, provider type seen by the patient in the ED, was significant in predicting the outcome variable, hospital admission from the ED for patients with heart failure.

The predictive relationship between admission from the ED and seen by an attending physician was not statistically significant per cross tabulations per Table 5 (p-value=.175) and was not statistically significant per multiple logistic regression per Table 6 (p-value=.544), as the p-values are above the conventional threshold of .05. Per Table 6, the odds ratios of .811 demonstrated no greater likelihood of admitting or not admitting

to the hospital from the ED. Therefore, being seen by the provider type attending physician does not predict hospital admission from the ED for patients with heart failure.

The predictive relationship between admission from the ED and seen by a consulting physician was statistically significant per cross tabulations per Table 5 (p-value=.000) and was statistically significant per multiple logistic regression per Table 6 (p-value=.000), as the p-values are below the conventional threshold of .05. Per Table 6, the odds ratio of 3.425 demonstrated significantly higher odds of admission from the ED. In addition, being seen in the ED by a consulting physician demonstrated a very strong magnitude of significant effect, as evidenced by an odds ratio of 3.425. Therefore, being seen by the provider type consulting physician does predict hospital admission from the ED for patients with heart failure.

The predictive relationship between admission from the ED and seen by a nurse practitioner was statistically significant per cross tabulations per Table 5 (p-value=.004) and was statistically significant per multiple logistic regression per Table 6 (p-value=.011), as the p-values are below the conventional threshold of .05. Per Table 6, the odds ratios of .260 demonstrated significantly lower odds of hospital admission from the ED. The odds ratio of .260 also showed a strong effect between the two variables. Therefore, being seen by the provider type nurse practitioner does predict hospital admission from the ED for patients with heart failure.

The predictive relationship between admission from the ED and seen by a physician assistant was not statistically significant per cross tabulations per Table 5 (p-value=.456) and was not statistically significant per multiple logistic regression per Table

6 (p-value=.769), as the p-values are above the conventional threshold of .05. Per Table 6, the odds ratios of 1.093 demonstrated no greater likelihood of admitting or not admitting from the ED. Therefore, being seen by the provider type physician assistant does not predict hospital admission from the ED for patients with heart failure.

In summary of research question four, patients seen by provider types attending physician and physician assistant did not predict hospital admission for patients with heart failure; however, those seen by a consulting physician or nurse practitioner were predictive. Therefore, the null hypothesis is not rejected: H□4: The provider type seen in the ED does not predict hospital admission for patients with heart failure.

Answers to Research Questions

Research question one was answered with patients seen in the ED in the last 72 hours does predict hospital admission from the ED for patients diagnosed with heart failure. Research question two was answered that total laboratory tests obtained in the ED does predict hospital admission for patients with heart failure. Research question three was answered that health insurance does not predict hospital admission from the ED for patients diagnosed with heart failure. Research question four was answered that the provider type seen in the ED (attending physician, consulting physician, nurse practitioner, or physician assistant) does predict hospital admission, with patients seen by a consulting physician or nurse practitioner predictive of being admitted as compared to those seen by provider type attending physician or physician assistant. Among the significant independent variables predictive of hospital admission from the ED for

patients diagnosed with heart failure, the strongest predictor was seen in the ED by a consulting physician with an odds ratio of 3.425.

Summary

Section 3 presented the results and findings of my doctoral study, including the data collection schema; results of the descriptive, cross tabulations with chi-square, and multiple logistic regression analyses of the hypotheses and research questions; and the key findings. The study examined ED data from the 2015 NHAMCS collected by the CDC National Center for Health Statistics to determine if seen in the ED in the last 72 hours, total number of laboratory tests obtained in the ED, health insurance, or provider type seen in the ED was predictive of hospital admission from the ED for patients diagnosed with heart failure.

Section 4 provides a detailed analysis and interpretation of the results and findings of the study. This section includes comparison of findings to the peer-reviewed literature, analysis and interpretation of the findings in the context of Donabedian's conceptual framework, limitations, recommendations, and conclusions relevant to the study.

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

The purpose of this quantitative study was to address the research gap regarding risk factors for hospital admission from the ED for patients diagnosed with heart failure for the process quality measures of seen in the ED within the last 72 hours and total number of laboratory tests obtained in the ED, and for the structure quality measures of health insurance and provider type seen in the ED. Findings from both the cross tabulations with chi-square and multiple logistic regression indicated significant, predictive relationships of being admitted from the ED for patients diagnosed with heart failure seen in the ED within the last 72 hours, total number of laboratory tests obtained in the ED, and seen by provider type consulting physician or nurse practitioner. Conversely, findings from the cross tabulations with chi-square and multiple logistic regression indicated no significant predictive relationships between hospital admission from the ED for patients with heart failure and health insurance and seen by provider type attending physician or physician assistant. Section 4 includes an interpretation of the findings, limitations of the study, recommendations for further research, and implications for professional practice and social change.

Interpretation of the Findings

The process quality measures of seen within the last 72 hours and total laboratory tests obtained in the ED were significant predictors of hospital admission from the ED for patients diagnosed with heart failure. Patients seen within 72 hours had statistically significant lower odds of admission from the ED. Patients with fewer tests obtained in the ED were associated with statistically significant lower odds of admission as well. As

previously referenced, patients who had 2 or fewer laboratory tests obtained in the ED and those with 3 to 5 tests had significantly lower odds of admission as compared to those who had 6 or more tests obtained.

The structure quality measure health insurance was not a significant predictor of being admitted from the ED for patients diagnosed with heart failure; however, provider type seen in the ED was a statistically significant predictor. Being seen by provider type consulting physician significantly increased the odds of admission from the ED, whereas, seen by provider type nurse practitioner significantly decreased the odds of admission. Seen by provider type attending physician or physician assistant were not significant and were not predictive of hospital admission from the ED. In the following subsections, I compare findings to the literature and to Donabedian's conceptual framework, which was used to assess the quality of care through the triad of structure, process, and outcome.

Findings to the Literature

My findings indicated significant predictors of hospital admission of being seen in the ED within the last 72 hours, having fewer laboratory tests obtained in the ED, and being seen by provider type nurse practitioner, all of which lowered the odds of admission to the hospital for patients diagnosed with heart failure. However, being seen by a consulting physician increased the odds. The process quality measures seen in the last 72 hours and total number of laboratory tests obtained in the ED and structure quality measures health insurance and provider type seen in the ED were not previously considered in the literature as risk factors for the outcome quality measure of hospital admission from the ED for patients diagnosed with heart failure. My findings indicated

the structure quality measures health insurance, being seen by provider type attending physician or physician assistant, and covariates gender and ethnicity were not significant predictors for the outcome quality measure of hospital admission from the ED for patients diagnosed with heart failure. In the following subsections, I present findings broken down by the independent variables that were significant predictors of hospital admission from the ED for patients diagnosed with heart failure.

Seen in the emergency department within the last 72 hours. A study by Blecker et al. (2014) determined most hospitalizations for heart failure begin in the ED and a potential strategy to reduce heart failure hospitalizations and rehospitalizations is to reduce the percentage of patients diagnosed with heart failure who are admitted to the hospital from the ED. According to Cheng et al. (2016), most return visits to the ED for all diagnoses are due to patient noncompliance with care or progression of the illness, rather than deficiencies in the quality of medical care rendered during the initial ED visit and result in discharge to home. There were no previous studies regarding hospital admission from the ED for patients diagnosed with heart failure and seen in the ED within the last 72 hours. My study concluded patients diagnosed with heart failure who were seen in the ED within the last 72 hours had statistically significant lower odds of hospital admission, as compared to those who were not seen within the last 72 hours. This finding aligns with the study by Cheng et al. (2016) that being seen in the ED within the last 72 hours is more likely to result in discharge home rather than admission to the hospital.

Total laboratory tests obtained in the emergency department. As shown in the literature review, a study by Carlson et al. (2013) concluded uninsured patients had fewer laboratory tests obtained in the ED, as compared to those with health insurance; however, the study also concluded insurance was not predictive of hospital admission from the ED. There were no previous studies regarding hospital admission from the ED for patients diagnosed with heart failure and the number of laboratory tests obtained in the ED. My study determined patients diagnosed with heart failure who had fewer than 6 laboratory tests obtained in the ED had statistically significant lower odds of hospital admission from the ED, as compared to patients who had 6 or more laboratory tests. Similar to the conclusion of the study by Carlson et al. (2013) that insurance was not predictive of hospital admission from the ED, my study determined insurance was not predictive of hospital admission from the ED for patients diagnosed with heart failure. Because my study found insurance was not significant in predicting hospital admission, the number of laboratory tests obtained in the ED may relate to the complexity of the clinical presentation of the patient being evaluated in the ED in order to make a decision if admission is warranted.

Provider type seen in the emergency department. According to a study by Honigman-Warner et al., (2017), patients seen in the ED by a physician had statistically significant higher odds of hospital admission, as compared to those seen by a midlevel practitioner. The study categorized providers into two types, licensed physician and midlevel practitioner, with no differentiation between types of licensed physicians or types of midlevel practitioners. A study by Brown et al., (2012) established that patients

seen in the ED by a midlevel practitioner only, as compared to patients seen by a physician only, were less likely to be admitted to the hospital from the ED, at 3.1% and 14%, respectively. The study by Brown et al., (2012) defined midlevel practitioners as nurse practitioners or physician assistants and defined physicians as attending, staff, on call, consulting or other, on call fellow, or resident/intern. There were no previous studies regarding hospital admission from the ED for patients diagnosed with heart failure and seen in the ED by provider types attending physician, consulting physician, nurse practitioner, or physician assistant.

From my study I concluded patients diagnosed with heart failure who were seen in the ED by a consulting physician had statistically significant greater odds of hospital admission, whereas, being seen in the ED by an attending physician was not a significant predictor of hospital admission. In addition, my study established patients diagnosed with heart failure who were seen in the ED by a nurse practitioner had statistically significant lower odds of hospital admission, whereas, being seen by a physician assistant was not a significant predictor of hospital admission. My finding related to patients diagnosed with heart failure and seen by provider type consulting physician aligns with the study finding by Honigman-Warner et al., (2017) as compared to all physicians; however, the study by Honigman-Warner et al., (2017) does not differentiate between attending and consulting physicians. According to my study, cross tabulations with chi-square determined consulting physicians saw 23.9% of patients diagnosed with heart failure presenting to the ED. Of those patients seen, 41.1% were admitted by the

consulting physician. Patients typically seen by a consulting physician are those requiring more specialized assessment or treatment for their medical condition.

Further, my finding related to patients diagnosed with heart failure and seen by provider type nurse practitioner are consistent with the study finding by Brown et al., (2012) as compared to provider types nurse practitioner and physician assistant; however, the study by Brown et al., (2012) does not differentiate between midlevel providers nurse practitioner and physician assistant. According to my study, 5.1% of patients diagnosed with heart failure presenting to the ED were seen by a nurse practitioner. Patients typically seen by a nurse practitioner may present to the ED as more medically stable. Of those patients seen by the nurse practitioner, only 2% were admitted. For the patient who appears medically stable when seen by a nurse practitioner to be admitted to the hospital, the nurse practitioner must consult a physician for an order to admit.

Findings to Theory

Risk factors for hospital admission from the ED for patients diagnosed with heart failure are relevant in analyzing if such risk factors can predict hospital admission. Researchers have not thoroughly explored the relationship between the outcome quality measure of hospital admission from the ED for patients diagnosed with heart failure and the risk factors or valid measures of being seen in the ED within the last 72 hours, total laboratory tests obtained in the ED, health insurance, and provider type seen by the patient in the ED. Donabedian's conceptual framework is founded on the concept that reliable measures of quality can be reconstructed from valid measures of structure and process that are linked to outcomes (Ayanian & Markel, 2016). Based on this concept

and considering being seen in the ED within the last 72 hours and total laboratory tests obtained in the ED are process quality measures, and in addition, health insurance and provider type seen by the patient in the ED are structure quality measures, I deemed the Donabedian model to be an applicable theoretical framework for this study. The concept of Donabedian's framework of assessing the quality of care through the triad of structure, process, and outcome (Donabedian, 1966) remains as the foundation of health care quality assessment today (Ayanian & Markel, 2016).

The aforementioned process and structure variables were included in the study as quality measures or indicators for admission from the ED for patients diagnosed with heart failure. The analysis suggests being seen in the ED within the last 72 hours, the total number of laboratory tests obtained in the ED, and provider type seen by the patient in the ED are indicators of illness severity, not quality. Patients who were seen in the ED within the last 72 hours were likely due to patient noncompliance or progression of heart failure symptoms, not due to the quality of care of the prior ED visit. Patients who had 6 or more laboratory tests obtained in the ED and were seen by a consulting physician probably did so because of the clinical complexity of their heart failure symptoms and related medical condition. In addition, patients seen by the nurse practitioner require a physician order for hospital admission. The process and structure variables or quality measures included in this study do not seem to indicate poor quality of care.

Limitations of the Study

There were limitations in the research data set that influenced generalizability, validity, and reliability of the findings. The data set utilized for this study was the 2015

NHAMCS, as the variables contained in the data were identified and included in the study premise, prospectus, and proposal. The 2016 NHAMCS data set became available in November 2018, when the study proposal was completed. In retrospect, utilizing the 2016 data set may have been more relevant, as more recent data became available when the data set was downloaded for statistical analysis. Based on the results of the G*Power analysis, the required sample size for the logistic regression analysis was 1,007 (power=0.80, alpha=0.05, and odds ratio 2). Once the 2015 NHAMCS data set was downloaded and sorted to include only patient encounters in the ED for those diagnosed with heart failure, the sample size available was 652. The preliminary information regarding the data set was weighted and the actual number of encounters used to provide the probability sample size was not available until downloaded.

Recommendations

The limitations of the study disclose potential areas for improvement for future researchers. To extend the research, there is a need to perhaps combine more than one year of data to provide a statistically adequate sample to strengthen the statistical relationship between patients admitted from the ED who were diagnosed with heart failure and seen within the last 72 hours, total laboratory tests obtained, health insurance, and provider type seen in the ED. In addition, the research could be further extended by expanding the number of covariates beyond gender and ethnicity, which despite research by Mirkin et al. (2017), were both determined to be statistically insignificant in predicting hospital admission from the ED. Furthermore, the research could be extended to focus on the differences in hospital admission rates from the ED for patients with heart failure

based on the specific provider type seen in the ED, i.e. attending physician, consulting physician, on-call physician, resident, intern, nurse practitioner, physician assistant, or emergency medical technician.

Implications for Professional Practice and Social Change

This section provides implications for professional practice and positive social change relevant to predicting hospital admission from the ED for patients diagnosed with heart failure and being seen within the last 72 hours, total number of laboratory tests obtained in the ED, and being seen in the ED by provider type consulting physician or nurse practitioner. Currently, hospitals are being financially penalized for excessive readmissions for patients diagnosed with heart failure, at a rate of up to 3% of all Medicare reimbursement dollars for one year. With hospital organizations faced with financial challenges such as labor, drug, and supply costs, many cannot sustain continued operations, as hospital closures are dependent on the profit status of the hospital (Countouris et al., 2014). As financial penalties continue to be levied, this study may assist health care administrators in understanding some components of hospital readmissions for patients with heart failure admitting from the ED, because, according to Blecker et al. (2014), a potential strategy to reduce hospital readmissions for heart failure is to reduce admissions from the ED.

Professional Practice

Although unscheduled return visits to the ED is a quality metric (Cheng et al., 2016), these visits for patients diagnosed with heart failure reduce the odds of hospital admission from the ED. Because these visits reduce the odds of hospital admission, and

consequently reduce hospital readmissions for heart failure, an implication for professional practice is to not focus on this quality metric as a source of potential deficiency in the initial medical management of the patient, but rather as a means to assess avoided hospital admissions from the ED for patients diagnosed with heart failure.

Laboratory testing volume conducted in the ED is a process quality measure predictive of hospital admission and readmission (Ben-Assuli et al., 2014). For patients diagnosed with heart failure, having fewer than 6 laboratory tests obtained in the ED reduces the odds of hospital admission, as compared with those patients with 6 or more tests obtained. Because fewer laboratory tests obtained may be indicative of lesser severity of the patient's illness, those with more than 6 tests are likely more ill. Therefore, an implication for professional practice when analyzing the quality measure of laboratory testing volume conducted in the ED is to compare the test volume to the patient's acuity level to determine if correlation exists as a quality indicator.

Patients seen by mid-level providers, such as nurse practitioners, are generally of lower acuity (Brown et al., 2012). Further, while utilization of mid-level providers in increasing, there are differences in the penetration of mid-level providers into U. S. emergency care, regarding type of mid-level provider, hospital, and setting (Brown et al., 2012). The study determined being seen by provider type nurse practitioner, reduced the odds of hospital admission from the ED, which seemed to moderate the impact of admission for those seen by provider type physician. An implication for professional practice is to expand utilization of nurse practitioners in the ED setting. Nationally representative data confirms care rendered by mid-level providers extends beyond minor

patient presentations (Brown et al., 2012). In addition, expanding utilization of nurse practitioners not only reduces the odds of hospital admission, but also aids in addressing the insufficient numbers of physicians available to staff U. S. EDs (Brown et al., 2012).

Patients seen in the ED by provider type consulting physician probably did so because of the clinical complexity of their heart failure symptoms and related medical condition. The implication for professional practice is to ensure attending physicians and other front-line medical providers in the ED are appropriately assessing and diagnosing patients with heart failure that require a referral to be seen by provider type consulting physician.

Positive Social Change

The rate of 30-day hospital readmission for patients diagnosed with heart failure remains consistent at approximately 25% (Bergethon et al., 2016). In addition, the financial penalties of up to 3% of all Medicare reimbursement dollars for one year continue. Reducing the percentage of patients admitted or readmitted from the ED is one approach to potentially reducing the financial penalties (Blecker et al., 2014) and consequently sustaining the financial viability of the organization. By maintaining financial stability of organizations through avoidance of financial penalties for heart failure readmissions, the implication for social change is maintaining access to care for patients by preventing hospital closures.

Hospital readmissions for patients with heart failure is considered a quality metric. However, my study added clarity to the relationship between hospital admissions from the ED for patients diagnosed with heart failure and being seen within the last 72

hours, total laboratory tests obtained in the ED, and being seen by provider types nurse practitioner or consulting physician. The relationship between these quality measures does not indicate poor quality care, but rather severity of illness. Therefore, as health care administrators develop understanding that readmission is not a reflection of quality care but rather severity of illness, the approach to reducing readmissions for heart failure can be adapted to assist in reducing readmissions and financial penalties, ultimately, avoiding hospital closure and providing continued access to hospital health care services.

Conclusion

I identified the relationship between quality measures hospital admission from the ED for patients diagnosed with heart failure and being seen within the last 72 hours, total laboratory tests obtained in the ED, and being seen by provider types nurse practitioner and consulting physician. Due to limitations of the study, I recommended combining more than one of year of data, expanding the number of covariates, and focusing on the differences in hospital admission rates from the ED based on specific provider types seen.

Overall, this study addressed the gap in the literature regarding the relationship between the quality measures of hospital admission from the ED for patients diagnosed with heart failure and seen in the ED within the last 72 hours, total laboratory tests obtained in the ED, health insurance, and provider type seen in the ED. The study concluded the relationships were not due to poor quality of care rendered during the previous ED visit, but rather severity of illness. As CMS continues to levy financial penalties against organizations for excessive hospital readmissions for patients with heart failure, deemed a quality of care issue, the issue is not quality of care. Hospital

administrators can use the study results to focus on managing the severity of illness to impact hospital admissions from the ED to avoid financial penalties and support ongoing financial sustainability of the organization. Lastly, utilizing Donabedian's conceptual framework to assess the quality of care through the triad structure, process, and outcome allowed for understanding how quality measures may not be indicative of quality of care.

References

Ayanian, J. Z., & Markel, H. (2016). Donabedian's lasting framework for health care quality. *New England Journal of Medicine, 375*(3), 205-207. https://doi.org/10.1056/nejmp1605101

Ben-Assuli, O., Shabtai, I., Leshno, M., & Hill, S. (2014). EHR in emergency rooms: Exploring the effect of key information components on main complaints. *Journal of Medical Systems, 38*(4), 1-8. https://doi.org/10.1007/s10916-014-0036-y

Bergethon, K. E., Ju, C., DeVore, A. D., Hardy, N. C., Fonaro, G. C., Yancy, C. W., . . . Hernandez, A. F. (2016). Trends in 30-day readmission rates for patients hospitalized with heart failure: Findings from the Get with the Guidelines-Heart Failure Registry. *Circulation-Heart Failure, 9*(6), e002594. https://doi.org/10.1161/circheartfailure.115.002594

Bhatia, R. S., Austin, P. C., Stukel, T. A., Schull, M. J., Chong, A., Vu, J. V., & Lee, D. S. (2014). Outcomes in patients with heart failure treated in hospitals with varying admission rates: Population-based cohort study. *BMJ Quality and Safety, 23*(12), 981-988. http://dx.doi.org/10.1136/bmjqs-2014-002816

Blecker, S., Ladapo, J. A., Doran, K. M., Goldfeld, K. S., & Katz, S. (2014). Emergency department visits for heart failure and subsequent hospitalization or observation unit admission. *American Heart Journal, 168*(6), 901-908. https://doi.org/10.1016/j.ahj.2014.08.002

Brown, D. F. M., Sullivan, A. F., Espinola, J. A., & Camargo, C. A. (2012). Continued rise in the use of mid-level providers in US emergency departments, 1993-2009.

International Journal of Emergency Medicine, 5(21), 1-5. https://doi.org/10.1186/1865-1380-5-21

Capp, R., West, D. R., Doran, K., Sauaia, A., Wiler, J., Coolman, T., & Ginde, A. A. (2015). Characteristics of Medicaid-covered emergency department visits made by nonelderly adults: A national study. *Journal of Emergency Medicine, 49*(6), 984-988. https://doi.org/10.1016/j.jemermed.2015.07.043

Carlson, J. N., Menegazzi, J. J., & Callaway, C. W. (2013). Magnitude of national ED visits and resource utilization by the uninsured. *American Journal of Emergency Medicine, 31*(4), 722-726. https://doi.org/10.1016/j.ajem.2013.01.001

Centers for Disease Control and Prevention. (2016a). National Hospital Ambulatory Medical Care Survey (NHAMCS) 2015 dataset. [dataset file]. Retrieved from ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NHAMCS

Centers for Disease Control and Prevention. (2016b). National Hospital Ambulatory Medical Care Survey (NHAMCS) 2015 emergency department summary tables. Retrieved from https://www.cdc.gov/nchs/data/nhamcs/web_tables/2015_ed_web_tables.pdf

Chamberlain, R. S., Sond, J., Mahendraraj, K., Lau, C. S. M., & Siracuse, B. L. (2018). Determining 30-day readmission risk for heart failure patients: The readmission after heart failure scale. *International Journal of General Medicine, 11,* 127-141. https://doi.org/10.2147/ijgm.s150676

Cheng, J., Shroff, A., Khan, N., & Jain, S. (2016). Emergency department return visits resulting in admission: Do they reflect quality of care? *American Journal of*

Medical Quality, 31(6), 541-551. https://doi.org/10.1177/1062860615594879

Countouris, M., Gilmore, S., & Yonas, M. (2014). Exploring the impact of a community hospital closure on older adults: A focus group study. *Health and Place, 26,* 143-148. https://doi.org/10.1016/j.healthplace.2013.11.008

Donabedian, A. (1966). Evaluating the quality of medical care. *Milbank Memorial Fund Quarterly, 44*(3), 166-203.

Donabedian, A. (1980). *The definition of quality and approaches to its assessment.* Ann Arbor, MI: Health Administration Press.

Fay, L., Carll-White, A., & Real, K. (2018). Emergency nurses' perceptions of efficiency and design: Examining ED structure, process, and outcomes. *Journal of Emergency Nursing, 44*(3), 274-279. https://doi.org/10.1016/j.jen.2017.09.001

Frankfort-Nachmias, C., & Leon-Guerrero, A. (2015). *Social statistics for a diverse society* (7th ed.). Thousand Oaks, CA: Sage Publications.

Hoffman, J., & Cronin, M. (2015). The true financial impact of hospital readmissions. *Journal of the Healthcare Financial Management Association, 69*(1), 68-75.

Honigman-Warner, L. S., Galarraga, J. E., Litvak, O., Davis, S., Granovsky, M., & Pines, J. M. (2017). The impact of hospital and patient factors on the emergency department decision to admit. *Journal of Emergency Medicine, 54*(2), 249-257. https://doi.org/10.1016/j.jemermed.2017.11.024

Laerd Statistics. (n.d.a.). Chi-square test for association using SPSS statistics. Retrieved February 26, 2019 from https://statistics.laerd.com/spss-tutorials/chi-square-test-for-association-using-spss-statistics.php

Laerd Statistics. (n.d.b.). Binomial logistic regression using SPSS statistics. Retrieved February 26, 2019 from https://statistics.laerd.com/spss-tutorials/binomial-logistic-regression-using-spss-statistics.php

McCaig, L. F., & Burt, C. W. (2012). Understanding and interpreting the National Hospital Ambulatory Medical Care Survey: Key questions and answers. *Annals of Emergency Medicine, 60*(6), 716-721.e1. https://doi.org/10.1016/j.annemergmed.2012.07.010

McDonald, K. M., Sundaram, V., Bravata, D. M., Lewis, R., Lin, N., Kraft, S. A., McKinnon, M., Paguntalan, H., & Owens, D. K. (2007). Conceptual frameworks and their application to evaluating care coordination interventions. *Closing the quality gap: A critical analysis of quality improvement strategies, 9.7*(5). Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK44008/

Mirkin, K. A., Enomoto, L. M., Caputo, G. M., & Hollenbeak, C. S. (2017). Risk factors for 30-day readmission in patients with congestive heart failure. *Heart & Lung, 46*(5), 357-362. https://doi.org/10.1016/j.hrtlng.2017.06.005

Napoli, A. M., Mullins, P. M., & Pines, J. M. (2014). Predictors of hospital admission after ED observation unit care. *American Journal of Emergency Medicine, 32*(11), 1405-1407. https://doi.org/10.1016/j.ajem.2014.08.039

Pukurdpol, P., Wiler, J. L., Hsia, R. Y., & Ginde, A. A. (2014). Association of Medicare and Medicaid insurance with increasing primary care-treatable emergency department visits in the United States. *Academic Emergency Medicine, 21*(10), 1135-1142. https://doi.org/10.1111/acem.12490

Rohrer, J. E., Angstman, K. B., & Garrison, G. (2012). Early return visits by primary care patients: A retail nurse practitioner clinic versus standard medical office care. *Population Health Management, 15*(4), 216-219. https://doi.org/10.1089/pop.2011.0058

Singer, A. J., Skopicki, H., Thode, H. C., & W. F. Peacock. (2014). Hemodynamic profiles of ED patients with acute decompensated heart failure and their association with treatment. *American Journal of Emergency Medicine, 32*(4), 302-305. https://doi.org/10.1016/j.ajem.2013.12.005

Synderman, D., Salzman, B., Mills, G., Hersh, L., & Parks, S. (2014). Strategies to help reduce hospital admissions. *The Journal of Family Practice, 63*(8), 430-438a.

Szumilas, M. (2010). Explaining odds ratios. *Journal of Canadian Academy of Child and Adolescent Psychiatry, 19*(3), 227-229.

Trivedy, C. R., & Cooke, M. W. (2015). Unscheduled return visits (URV) in adults to the emergency department (ED): A rapid evidence assessment policy review. *Emergency Medicine Journal, 32*(4), 324-329. https://doi.org/10.1136/emermed-2013-202719

Urban, R. W., Mumba, M., Martin, S. D., Glowicz, J., & Cipher, D. J. (2015). Modified early warning system as a predictor for hospital admissions and previous visits in emergency departments. *Advanced Emergency Nursing Journal, 37*(4), 281-289. https://doi.org/10.1097/tme.0000000000000076

Watts, S. H., Bryan, E. D., & Tarwater, P. M. (2014). Changes in insurance status and emergency department visits after the 2008 economic downturn. *Academic*

Emergency Medicine, 22(1), 73-80. https://doi.org/10.1111/acem.12553

Wilson, S., Dev, S., Mahan, M., Malhotra, M., & Miller, J. (2016). Identifying disparity in emergency department length of stay and admission likelihood. *World Journal of Emergency Medicine, 7*(2), 111-116. https://doi.org/10.5847/wjem.j.1920-8642.2016.02.005

Ziaeian, B., & Fonarow, G. C. (2016). The prevention of hospital readmissions in heart failure. *Progress in Cardiovascular Diseases, 58*(4), 379-385. https://doi.org/10.1016/j.pcad.2015.09.004

Zimmerman, B. (2017, August 4). CMS to punish more than 2.5k hospitals for 30-day readmissions: 7 things to know. *Becker's Clinical Leadership & Infection Control.* Retrieved from https://www.beckershospitalreview.com/quality/cms-to-punish-more-than-2-5-hospitals-for-30-day-readmissions-7-things-to-know.html