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Demographics and 30-Day Readmissions for End-Stage Renal Disease Patients

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This is to certify that the doctoral study by

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Walden University
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Abstract

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by

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MBA, University of Phoenix, 2009

BS, Interamerican University of Puerto Rico 1998

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

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Abstract

End-stage renal disease (ESRD) is increasingly a problem in the United States, and factors such as race/ethnicity and gender may not only worsen the risk of the disease but also correspond to worse treatment access. This is significant because ESRD is a heavy economic burden not only on patients, but on caregivers and the health care system, especially as disparities remain between different demographic groups. The purpose of this quantitative nonexperimental, historical, correlational design was to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. The theoretical framework for the current study was the theory of the determinants of avoidable readmissions in ESRD. The three research questions were to what extent patient gender predicts 30-day hospital readmission rate for ESRD patients, to what extent does patient race/ethnicity predicts 30-day hospital readmission rates, and are there any significant interactions terms in a combined prediction model using gender and race/ethnicity. Data were gathered from Data.gov and the United States Renal Data System. Regression analysis was used to analyze the data. The study found that gender, race, and income can all be predictors of ESRD hospitalization. The results have important implications for improving interventions to reduce ESRD hospitalization, thereby leading to positive social change by reducing both the personal and societal costs associated with the disease.

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Dedication

This study is dedicated to the loving memory of my mom Maria A. Perez for being the rock of our entire family and who inspire me to fight for a better quality and affordable care for ESRD patients. I also dedicate this study to my son Dylan Xavier, my fur baby Chloe, my Dad Juan, family, and friends for understanding the extended hours away from them and for encouraging to finish my doctorate, even I cannot spend time with them. To ESRD patients who suffer day to day to not have the best healthcare services, never give up and demand the better-quality care for all.

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Section 1: Foundation of the Study and Literature Review

Introduction

End-stage renal disease (ESRD) is a serious problem today, affecting over two million people worldwide (Robinson et al., 2016). Although the condition has nearly plateaued in the developed world, the incidence is still slowly increasing. The United States alone sees over 120,000 new cases annually (Saran et al., 2017). ESRD is the fifth and final stage of chronic renal, or kidney, disease, at which point a patient's kidneys have failed entirely. Treatment at this stage requires hemodialysis, an external filtration device that filters the patient's blood in place of the kidney. The only cure for ESRD is a kidney transplant, and, at present, there is a significant disparity between availability and demand (Robinson et al., 2016). This disparity is especially present for minorities, even in developed countries. Of all chronic conditions, including cancer and heart disease, ESRD is the most likely to result in hospitalization (Lovasik et al., 2016). Unnecessary ESRD-related hospitalizations impose a high cost and represent the best way to simultaneously decrease ESRD costs and improve treatment (Matthew et al., 2015).

The purpose of this quantitative nonexperimental, historical, and correlational design was to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. The study also examined interactions between these variables on the overall risk of ESRD-related hospitalization. The sample population was all adults with ESRD in the United States. The key variables were gender and race/ethnicity, 30-day readmission rates, and ESRD-related hospitalization risk.

Problem Statement

ESRD is increasingly a problem in the United States, with over 120,000 new cases in 2014 alone and over 660,000 total cases in treatment (Saran et al., 2017). The specific problem is that factors such as race/ethnicity and gender may worsen the risk of the disease (Crews et al., 2018) and correspond to worse treatment access (Patzer et al., 2015). While ESRD diagnoses are increasing in general, the problem is that minorities, especially minority women, may be at high risk for poor outcomes. This problem is significant because ESRD is a heavy economic burden on patients, caregivers, and society (Wang et al., 2016). While mortality rates associated with the condition have declined in the past 2 decades (Collins et al., 2015), considerable disparities remain between different demographic groups, and for minority groups, these benefits have been less pronounced (Robinson et al., 2016).

The predictors of ESRD are nuanced and may not also be appropriate for traditional modeling. For example, dividing patients into two age brackets of those above 65 or 80, a common cutoff in medical research, provides an inaccurate depiction of ESRD risks (Krishnaswami et al., 2016). Additionally, many of the factors predicting worse than average ESRD outcomes may be psychosocial, such as Blacks having a lower rate of treatment compliance strongly associated with experiencing everyday racism (Savage, 2017). Additional research is needed to help ease the economic burden of ESRD by reducing readmission rates (Matthew et al., 2015). Such research will benefit from considering socioeconomic and other contextual factors (Newman et al., 2016), especially those that may contribute to or create race and gender disparities in treatment

and outcomes (Shah, Leonard et al., 2018). The need to better understand the roles of race and gender emerged as a pointed gap in the literature. Addressing this identified research gap is important to health administration because unplanned rehospitalizations are expensive, and the burden of that expense falls on both patients and the hospitals that treat them. Thus, reducing readmission rates is an important outcome for both practical and altruistic reasons.

Purpose of the Study

The purpose of this quantitative nonexperimental, historical, correlational design was to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. The study also examined interactions between these predictors on the overall risk of ESRD-related hospitalization. Thus, the independent variables were gender and race/ethnicity. Additionally, the dependent variables were 30-day readmission rates and ESRD-related hospitalization risk, respectively. I gathered the data from two different historical databases: the USRDS for the first set and Data.gov for the second. These data were readily and publicly available, allowing me to easily access them and then perform multiple regression and ANOVA analyses. The large, national datasets available ensure that meeting the minimum sample size requirements were easily achieved and exceeded.

Research Questions and Hypotheses

The following quantitative research questions guided the current study. For each research question, a null and alternative hypothesis was presented.

RQ1: To what extent, if at all, does patient gender predict 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$1: Patient gender does not predict 30-day hospital readmission rate for ESRD patients in the United States.

$H_1$1: Patient gender predicts 30-day hospital readmission rate for ESRD patients in the United States to a statistically significant degree.

RQ2: To what extent, if at all, does patient race/ethnicity predict 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$2: Patient race/ethnicity does not predict 30-day hospital readmission rate for ESRD patients in the United States.

$H_1$2: Patient race/ethnicity predicts 30-day hospital readmission rate for ESRD patients in the United States to a statistically significant degree.

RQ3: Is there a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$3: There is not a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

$H_1$3: There is a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

Theoretical Foundations

The current study's theoretical framework was the theory of the determinants of avoidable readmissions in ESRD proposed by Matthew et al. (2015). This theory characterizes the aspects contributing to avoidable hospital readmissions for ESRD patients and presents such factors as characteristics of the patient's hospital stays, the hospital itself, the dialysis facility, the nephrologist and other care providers, and the existing payment structure. The current study drew on one specific aspect of this theory, focusing on the role of patient characteristics. However, the various determinants of avoidable readmission have complex interrelationships with one another (Matthew et al., 2015). Therefore, a detailed understanding of this specific and perhaps foundational determinant of avoidable readmissions is important in further testing and developing this theory. Also, the theory's proposition that many ESRD-related readmissions following hospitalizations are avoidable from a health administration standpoint represents one of the driving forces behind the current study. By identifying the causes of avoidable rehospitalizations, they may be better targeted with interventions to reduce them, benefitting both patients and hospitals.

Nature of the Study

The nature of the current study was that of a quantitative, historical, correlational design. Quantitative research is an approach that examines the world from a numerical, objective perspective (Bryman, 2016). Quantitative research is useful for examining issues that can be quantified, such as those for which there are existing, validated quantitative instruments to measure, or for understanding the nature of the relationships

between two or more variables (Bryman, 2016). Overall, the greatest benefit of a quantitative study is that the results are based solely on objective data measured using carefully validated instrumentation. The numerical or otherwise closed-ended nature of this type of data also means that quantitative research can practically process and analyze large sample sizes (Bryman, 2016). Because it uses larger sample sizes, quantitative research creates results that can be generalized, strengthened, and measured using statistical techniques, such as power analyses and confidence intervals. All of this made the quantitative approach a strong fit for the current study because I sought to examine the relationships between easily quantified and measured variables. All the predictor and outcome variables in the research questions—gender, race/ethnicity, and 30-day hospital readmission rate—were either quantitative by nature or easily assessed sociodemographic variables. Furthermore, all three of the research questions guiding the current study pertained to the nature of the relationship(s) between these variables, and, as the next section demonstrates, large datasets are available containing these data.

Data for the study was drawn from two secondary sources: Data.gov and the U.S. Renal Data System (USRDS). Data for RQ1 to RQ3 were drawn from the dataset available through the USRDS. Therefore, for the present study I requested the use of data for the 2016-2018 period for Medicare patients. The relevant dependent variables were hospitalization and 30-day readmission, whereas the independent variables were race/ethnicity and gender. All these variables are available in the Medicare dataset as per the USRDS website. The USRDS does not, however, include preferred language data. Therefore, for this purpose, a dataset from Data.gov was utilized that contained data on

the preferred language of Medicare claimants for ERSD on an annual basis since 2016. From this dataset, I collected the dependent variable of hospitalization.

Literature Review Search Strategy

The purpose of this quantitative nonexperimental, historical, correlational design was to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. The study also examined interactions between these predictors on the overall risk of ESRD-related hospitalization. The following research questions guided the study:

RQ1: To what extent, if at all, does patient gender predict 30-day hospital readmission rate for ESRD patients in the United States?

RQ2: To what extent, if at all, does patient race/ethnicity predict 30-day hospital readmission rate for ESRD patients in the United States?

RQ3: Are there any significant interaction impact between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

I reviewed the academic and medical literature to inform the study in answering these research questions.

I carried out this literature search using Walden University Libraries. I used PubMed, Medline, and Google Scholar. Keywords utilized in the literature search included *renal, kidney, hospitalization, demographic, ESRD, end stage renal disease, race, ethnicity, language barrier, epistemological triad,* and appropriate combinations. After carrying out these searches, I examined the titles in the results. Based on the titles

that seemed relevant, I narrowed the literature search and reviewed the abstracts of those articles with promising titles. Based on this review of the abstracts, I ultimately selected the most relevant articles. All of these articles were recent sources from within the past 5 years (2015-2019). All the sources chosen were from peer-reviewed scholarly journals, scholarly books, or dissertations.

I divided the resulting literature into themes that served to support the study. The literature review begins with a more in-depth look at the theoretical framework for the study. Five key themes follow this theoretical framework. First is the significance of ESRD as a problem. Second, are the complications and comorbidities of ESRD. Third, are the treatments of ESRD. Fourth is ESRD and hospitalization. The fifth and final theme is ESRD and demographics. I also evaluated the importance of the key variables in this study. The independent variables were gender and race/ethnicity, whereas the dependent variables were 30-day readmission rates and ESRD-related hospitalization risk.

Literature Review Related to Key Variables and Concepts

Thus, the independent variables were gender and race/ethnicity. The dependent variables were 30-day readmission rates and ESRD-related hospitalization risk.

Theoretical Framework

The theoretical framework for the current study was the theory of the determinants of avoidable readmissions in ESRD proposed by Matthew et al. (2015). As will be further emphasized in the later section on ESRD and hospitalization, ESRD-related hospitalizations, like all hospitalizations, are costly for both the patient and the

hospital. Overall, unnecessary hospitalization has a high societal cost and should be avoided where possible (Matthew et al., 2015). Some hospitalizations, especially for a chronic condition like renal disease, are not avoidable. However, many hospital readmissions are avoidable. Understanding the differences between avoidable and unavoidable hospitalizations and especially readmissions is a key idea in reducing the societal and individual costs of ESRD. As many ESRD patients are on Medicare for their treatment (Mu et al., 2018), these costs are far-reaching and significant.

Matthew et al. (2015) sought to develop a framework that characterizes the aspects of treatment and its circumstances that define or contribute to avoidable hospital readmissions for ESRD patients. As per the theory, such relevant factors have significant breadth, including characteristics of both the patient's hospital stay and the hospital itself, the dialysis facility, the nephrologist and other care providers, and the existing payment structure. The current study does not examine all these factors; instead, it is focused on one of the framework's relevant dimensions: patient characteristics. As per Matthew et al. (2015), patient characteristics are far from the only factor that may drive avoidable, ESRD-related readmissions for patients, but they do represent one highly important set of factors. As per the theory, all these determinants of readmission are interrelated; therefore, studying even this single aspect may shed some light on broader issues.

In particular, the patient characteristics and factors in this study may be deeply interrelated with treatment characteristics. As discussed later in the demographics section, many patient characteristics may affect both care quality and the places from which care is received, in addition to the likelihood of facing ESRD in the first place (Newman et al.,

2016). Therefore, through Matthew et al.'s (2015) theory, the narrower results in the present study may link to the broader spectrum of issues causing ESRD hospitalization and avoidable readmissions. In practical terms, avoidable readmissions usually indicate either a failure of treatment on the part of the healthcare provider or a failure on the part of the patient to adhere to posttreatment self-care. Both factors can be avoided, but because of the interconnectedness, failure of treatment can also be related to patient characteristics, not merely to provider and care characteristics. For example, as per Savage (2017), if patients perceive bias or racism from their healthcare provider, they may be less likely to comply with posttreatment care directions, whereas that same tacit bias can also cause providers to offer poorer care (Phelan et al., 2015).

Overall, therefore the Matthew et al. (2015) theory was the foundation of the current study. It provided not only a strong theoretical justification for the current study's focus on patient characteristics but also suggested a broader theoretical context into which the current study fits. The current study does not exist in a vacuum, and the variables under consideration could likely never serve to characterize the problem entirely. By adopting a theoretical foundation that shows how those factors are related to other key determinants of avoidable rehospitalization, I contextualize the current study in the broader theoretical landscape. Furthermore, this theoretical grounding suggests the key outcome variable, that of ESRD-related 30-day rehospitalization, a choice that will be further supported by the later section that focuses on hospitalization specifically.

Significance of End-Stage Renal Disease

ESRD is the final stage of a broader condition known as renal disease, kidney disease, or nephropathy (Cobo et al., 2016). Renal disease can be characterized broadly as either nephritis, which is inflammatory kidney disease, or nephrosis or noninflammatory kidney disease (Cobo et al., 2016). Regardless of whether a specific kind of renal disease is inflammatory or not, the ultimate effect is damage to the kidneys and the impediment of their health function. Chronic or long-term kidney disease progresses gradually, starting with no symptoms and developing significant symptoms over an extended period (Cobo et al., 2016); it is a chronic kidney disease that is generally under consideration in the case of ESRD.

The human kidney's main function in vertebrates as a whole is blood filtration (Krolewski et al., 2017). The kidney filters the bloodstream, catching waste and diverting it to the urinary tract to be expelled in urine. Accordingly, impaired kidney function is problematic because it prevents waste from being properly removed from the bloodstream, allowing it to build up to dangerous levels (Krolewski et al., 2017). Renal disease prevents or limits excess liquid expulsion from the body, marking significant kidney damage as quite dangerous. A precise medical definition of renal disease is somewhat more complicated and specific. As per Webster et al. (2017), the exact definition of the condition has changed and evolved, but the currently accepted international definition is "decreased kidney function shown by glomerular filtration rate (GFR) of less than 60 mL/min per 1·73 m2, or markers of kidney damage, or both, of at least 3 months duration, regardless of the underlying cause" (p. 1238). However, the most

common causes are diabetes and hypertension, though the leading causes also differ across differing contexts, such as in different ethnic groups (Webster et al., 2017).

In the context of chronic renal disease, the end-stage is defined as the point at which natural kidney function has ceased mostly or entirely and must be partially or entirely replaced by external hemodialysis (Robinson et al., 2016). Hemodialysis, or dialysis, is a process in which a person's blood is cycled through an external device, which replaces the kidney's filtration function (Robinson et al., 2016). At this point, ESRD is a condition of extreme concern, especially in a worldwide context. ESRD affects over two million people worldwide, and it may have significant mortality in the global setting (Robinson et al., 2016). The specific mortality rates resulting from ESRD differ heavily based on the type of care available in a region and the population's access to that care. In general, ESRD treatment with in-center hemodialysis is associated with a poor survival rate overall, though this is higher/longer in some Asian countries and parts of Europe (Robinson et al., 2016). Furthermore, ESRD poses the greatest risk of mortality soon after its onset, suggesting that those patients at this point fail to gain access to dialysis or to adjust their lifestyles to accommodate the need for it (Robinson et al., 2016).

In the United States, renal disease is classified into five stages. Counting all these stages, about 15% (14.8%) of the United States population has chronic renal disease, with most of these being at stage three (Robinson, 2016). Even in the United States, ESRD testing is lower than ideal, with less than half (48%) of the population, even within Medicare participants, being properly screened for the condition. Even so, ESRD

incidence and diagnosis is increasing, with 120,688 new diagnoses in 2016, a 1.1% increase from 2015. Overall, ESRD rates are increasing at a faster rate, of 3.5% from 2013 to 2014, with 678,383 total cases in 2014; however, this is somewhat encouraging because it suggests that there have also been significant decreases in ESRD mortality from better treatment. Indeed, relative to the rest of the world, the United States rates of ESRD are improving. Although they continue to rise, 1% is a relatively small growth.

Thus, in affluent countries such as the United States and Japan, ESRD rates are stabilizing, relatively speaking (Wetmore & Collins, 2016). However, in poorer or otherwise developing countries, healthcare systems struggle with soaring rates of renal disease. These soaring rates of ESRD also contribute to a widening gap between the number of ESRD patients who can receive kidney transplants, the only effective cure, and the number of available kidneys (Wetmore & Collins, 2016). In terms of the causes, research supports that diabetes is the most common cause. Burrows et al. (2017) further attested to roughly 120,000 new cases of ESRD annually in the United States, and their analysis suggested that "among these persons, 44% (approximately 53,000 persons) had diabetes listed as the primary cause of ESRD (ESRD-D)" (p. 1165). Interestingly, however, the role of diabetes as a cause of ESRD has changed over time. Based on a retrospective analysis of ESRD data for the period 2000-2014, the incidence of diabetes-related ESRD has decreased by about 33% (Burrows et al., 2017). This is an interesting shift and suggestive of either better control of the complications of diabetes or a more significant rise in other causes of ESRD.

Regardless of its cause, however, ESRD is significantly problematic. There are significant burdens associated with the condition, perhaps the foremost of which is financial. Indeed, ESRD creates high costs for multiple stakeholders, including patients, caregivers, and society (Wang et al., 2016). The growing trend in chronic kidney disease has made these economic concerns more important because they call into question the present capacity to manage these costs. This is especially true because the numbers of those struggling with ESRD are growing at both ends, with both an increase in diagnoses and an increased survival chance. ESRD is especially costly because the costs associated with the condition increase throughout disease progression, yet most research shows only the tip of the proverbial iceberg in that it looks at only direct costs of care (Wang et al., 2016). Thus, the true extent of the cost of ESRD when indirect expenses are factored in is unknown. Indeed, only recently have new analysis techniques that are suited to large datasets been applied to ESRD data. As per Liao et al. (2016), cluster analysis is a data analysis technique that has been used to successfully analyze data in several fields, but rarely in healthcare data.

The Liao et al. (2016) study was an exploratory attempt to apply this analysis technique to a relatively small cohort (roughly 19,000 patients) as a proof of concept for cluster analysis and k-mean grouping in medical expenses, ESRD. Their results suggested that expenses following the commencement of dialysis treatment are relatively stable in patients with a low number of comorbidities. In contrast, the researchers associated a high number of comorbidities with more unpredictable and often increasing costs following the beginning of dialysis (Liao et al., 2016). While a somewhat intuitively

obvious result, this did support the use of techniques of this sort to better understand the costs of ESRD. Nonetheless, this supports Wang et al.'s (2016) assertion that the overall costs of ESRD are poorly understood.

This lack of understanding of the depth of the problem may be part of the reason for a dearth of research (Mendu et al., 2016). While significant academic research regarding ESRD exists, as this review evinces, Mendu et al. (2016) argued that this research is less than it could be. Specifically, they argued that as illustrated by this section, kidney disease should be considered a significant problem in the United States and that significant federal funding should be allocated. However, ESRD is underrecognized as a problem relative to other health conditions and therefore receives less research and funding than similarly prominent problems (Mendu et al., 2016). Some strong means to conduct such research already exist, however. The most prominent of these is the dataset that I used for the current study, the USRDS.

Collins et al. (2015) reported recently on the history and significance of this massive dataset. The USRDS was created by the University of Minnesota in 1989. This original database only focused on the incidence and prevalence of ESRD. However, in 2001, the Minneapolis Medical Research Foundation transformed this database into a more comprehensive source of information that includes a wide array of related topics such as disease severity, hospitalizations, pediatric populations, prescription drug use, and chronic kidney disease, and the transition to ESRD. Such data represents a rich source of data with which to conduct research. It should be noted that ESRD, in addition to its financial costs, has high costs in terms of quality-of-life (Raspovic et al., 2017).

Although these are more physical than mental, overall, having ESRD has been found to represent a significant decrease in terms of quality of life even for patients already suffering from a chronic condition such as diabetes, much less for those without one.

Overall, therefore, ESRD is a significant problem on a global scale. In developed countries, such as the United States, ESRD incidence has plateaued in recent years, compared to its past growth. Nonetheless, some stage of renal disease affects nearly 15% of the United States population. ESRD can have significant consequences, including but not limited to death, high healthcare costs, and lowered quality of life. Therefore, research into ESRD should be a priority to determine how to best lower the still-high incidence of this expensive and dangerous condition.

Complications and Comorbidities of End-Stage Renal Disease

As per Mendu et al. (2016), one of the decisive factors in determining the cost of ESRD may be the comorbidities and complications it brings. Given that ESRD can be caused by two other significant chronic conditions, hypertension and diabetes, these diseases represent two important and dangerous comorbidities for ESRD. Diabetes is the cause of over 40% of ESRD, and thus the two conditions co-occur in nearly half of patients (Burrows et al., 2017). The most significant complication of ESRD is mortality. As of 2015, ESRD was the cause of death for 1.2 million people worldwide, a drastic increase in just 25 years; only about 400,000 died of ESRD in 1990 (Global Burden of Disease, 2016). Kidney failure without adequate dialysis treatment leads to almost certain death, as the body can no longer effectively filter waste out of the bloodstream. Even under dialysis treatment, the effectiveness of the treatment versus the rate of waste

accumulation may not be enough (Robinson et al., 2016). Furthermore, dialysis treatment often requires access to the facility and a consistent means of transportation and the dedication necessary to maintain a rigorous and highly time-consuming dialysis regimen. As a result, ESRD has a high mortality rate even in developed countries, where mortality is highest immediately following ESRD onset (Gillespie et al., 2015). Interestingly, despite the overall greater role of diabetes causing ESRD, significantly more ESRD deaths result from hypertension-caused ESRD (550,000 annually) than result from diabetic ESRD annually (420,000 annually; Global Burden of Disease, 2016)

Another somewhat prominent comorbidity and one of the most important is that of cancer. Although not nearly as common a comorbidity as diabetes, which is strongly related as a cause of ESRD, cancer has important interactions with ESRD. Research by Butler et al. (2015) suggested that ESRD may be a potential cause of cancer, or at least that ESRD patients at an increased risk of cancer. Like the current study, the researchers in this study adopted an approach using historical ESRD Medicare data to conduct a quantitative retrospective cohort study of ESRD patients. They found that the 5-year incidence rate of any kind of cancer following ESRD and the onset of dialysis was 9.48%. The results suggested that the incidence rates of certain common cancers increased, but others specifically decreased. Specifically, the incidence of kidney/renal pelvis cancer increased, while the risk of colon/rectum, lung/bronchus, and pancreas cancers decreased following the onset of dialysis treatment. Nonetheless, the overall association of cancer as a potential complication of ESRD is troubling, given the considerable additional cost and danger posed by cancer.

ESRD may be comorbid with or even a result of cancer, especially renal cancer (Nguyen et al., 2017). One specific mechanism of note in this regard is that cancer-related ESRD may occur following surgery to remove parts of the kidneys that are malignant. Based on analysis of a historical dataset from 1983 to 2007, again using the same USRDS dataset that the current study adopted, Nguyen et al. (2017) examined the outcome of these cancer-related cases of ESRD. They found that patients with renal cancer-related kidney removal or surgery had significantly decreased survival rates relative to the average for ESRD. The study's results must be examined in the context of general cancer-related dangers, which could decrease the survival chances of those with both ESRD and renal cancer. Nonetheless, this comorbidity was associated with a decreased life expectancy. Interestingly, relative to diabetic ESRD, patients with ESRD related to or resulting from kidney reduction or removal for non-cancer-related reasons was associated with increased life expectancy.

Overall, ESRD has significant comorbidities and may be associated with significant complications. Being as diabetes and hypertension are the main causes of ESRD, they are also its most pronounced comorbidities. However, there are other significant comorbidities, such as lupus erythematosus and renal cancers. Some of these comorbidities, such as lupus erythematosus, have significantly different patterns of occurrence based on gender, ethnicity, and other gendered factors. The most prominent complication of ESRD is death; ESRD is a quite lethal condition if not treated promptly and consistently. In addition, ESRD may result in other complications such as foot ulcers, lower-extremity amputation, and renal cancer. Overall, cancer has a high incidence in the

5 years following an ESRD diagnosis, especially renal cancer. Conversely, ESRD resulting from renal cancer and its treatment is especially deadly.

Treatments of End-Stage Renal Disease

As noted in the previous section, prompt, and consistent treatment of ESRD is completely necessary to avoid mortality. As ESRD represents the point of essentially total kidney failure, the minimum treatment necessary is hemodialysis, an external, artificial filtration process that replaces the kidneys' function. Although not as effective as a real kidney, dialysis is a functional treatment. However, the only true cure for ESRD is a kidney transplant (Wetmore & Collins, 2016). Unlike many other organs, kidney transplants are relatively unique in that, because a person can function acceptably well with a single kidney, kidney transplants need not be taken from deceased donors (Shah et al., 2016). Instead, a living donor can give a kidney and both the donor and recipient can function with a single kidney in place.

Nonetheless, there is a significant gap between transplant availability and transplant demand. This gap is even broader in the developing world, as ESRD incidence rates increase significantly faster than the rates of those receiving renal replacement therapy (Wetmore & Collins, 2016). As with other aspects of ESRD, demographics play a role in transplantation. Minority patients have a significantly higher presence on kidney transplant waitlists and represent a significantly lower portion of the donor pool (Newman et al., 2016). The reasons for these disparities are complicated and beyond the scope of the present study, but the existence of the disparities themselves is highly

problematic. Even in terms of simpler treatment such as dialysis, however, the existing literature suggests several important issues.

One such result, by Gillespie et al. (2015), suggested the importance of prompt care even more strongly. In their study, Gillespie et al. (2015) examined the relationship between a prior history of nephrology—care by a kidney doctor—and mortality in newly-diagnosed ESRD patients. As with much other research, their study drew upon the USRDS as a data source and included nearly half a million patients between 2006 and 2010. Their results indicated that "overall, 33% of new ESRD patients had received no prior nephrology care, while 28% had received care for >12 months" (p. 772). The low incidence of care prior to reaching the end stage is troubling in that it suggests patients fail to achieve any specialized care, which might have prevented their renal disease from advancing to stage five. However, those who had no prior nephrology care were also at significantly higher risk of first-year mortality; conversely, pre-existing nephology treatment was not only associated with better survival rates but a host of other positive outcomes, including the discussion of transplantation options.

Another study, by Cervantes et al. (2018), emphasized the importance of prompt and consistent dialysis treatment. Their study was concerned with the plight of undocumented immigrants, who may at present only receive dialysis treatment on an emergency basis. Their study compared the results of receiving dialysis three times a week to receiving it on an emergency-only basis. This study also adopted a retrospective cohort study, though a smaller-scale one that included data from only three hospitals from 2007 to 2014. As expected, the results of their analysis indicated that there was a higher

mortality rate for those who only received dialysis on an emergency basis. However, the magnitude of that difference was still quite striking, with 5-year mortality for those receiving only emergency dialysis being a staggering 14 times higher. In each case, the population was similar, being undocumented immigrants. These results strongly bear out the importance of consistent dialysis treatment for those with ESRD and suggest that an emergency-only treatment basis is not, in practical terms, a feasible strategy.

Another issue of interest is blood pressure control during treatment. Given that hypertension is the most lethal cause of ESRD, blood pressure control during dialysis has traditionally been a tenet of ESRD treatment (Ku et al., 2015). However, this guideline has been an issue of some contention amongst doctors because randomized control trials have, thus far, failed to demonstrate significant effects, but strict blood pressure control during this period could have more tacit implications in the long term. Accordingly, to examine this, Ku et al. (2015) used the USRDS to follow up on patients from a 1989-1993 study of renal disease and blood pressure control. Although the original study had failed to show any significant effect of blood pressure control on renal disease progression, the follow-up study found that there was a significant reduction to long-term mortality risk, with a roughly 25% lower risk of mortality in the strict blood pressure control group as compared to the treatment group.

Finally, offering some contextualizing research, Patzer et al. (2015) studied the state of ESRD treatment in the state of Georgia. They conducted a historical analysis of ESRD treatment in the specific context of Georgia, an analysis which included 279 patients of ages 18-69 from 308 facilities over the period 2005-2011. In Georgia, the

government requires dialysis centers to inform their patients of all treatment options, including that of transplants, and that beginning the consideration process generally requires a referral from a dialysis center. Accordingly, referral for transplantation from a dialysis center has practical importance for treatment (Patzer et al., 2015). In Georgia, the factors associated with centers being unlikely to refer patients for transplantation were high-poverty. A higher patient to social worker ratio, and non-profit status for the dialysis center and older age or white race for patients. However, these factors were not necessarily indicative of patients' odds of being waitlisted for a transplant. Overall, the results of this study indicated that dialysis center referrals play an important part in moving patients to waitlists, but that this may not be the decisive factor.

In general, the treatments for ESRD are hemodialysis and kidney transplants. Hemodialysis is a necessary treatment and represents an external facility being used to filter a patient's blood of waste in place of natural kidney function. This treatment does not do anything to alleviate the condition itself, only to keep it from being fatal. The only cure for ESRD is transplantation, also known as renal replacement therapy. Transplantation is an effective cure in the sense that both the donor and recipient in a kidney transplant can survive with only a single kidney. This means that kidney donation is one organ transplant that doctors can do from living donors and deceased donors. Some recent advancements, such as a wearable artificial kidney, offer the intermediate possibility of a better quality-of-life than full hemodialysis without a transplant, but these technologies are still forthcoming. Preexisting nephrological care can predict better overall outcomes and survival in ESRD patients, and dialysis centers play an important

role in referring patients for transplantation. As alluded to in previous sections, however, there remains a significant gap between kidney transplant waitlists and available donors.

Significance of Treatment to the Study

Overall, increased quality of ESRD care is the outcome of the study. This variable takes the form of 30-day rehospitalization, as discussed in the following section because reducing avoidable rehospitalization is one of the best measures of improves ESRD care (Matthew et al., 2015). However, this is merely one practical outcome that is broadly indicative of treatment quality and not the only one. Accordingly, the discussion of overall ESRD treatment is not only in its importance as background information and how it contextualizes hospitalization but also in shaping and characterizing the broader field of treatment. For example, one reason why ESRD care may falter or fail relates to the self-care component. Studies such as that of Ku et al. (2015) illustrate this by demonstrating the long-term effects of self-care aspects such as blood pressure control on long-term ESRD outcomes. The value of prior nephrology care (Gillespie et al., 2015) also supports the importance of communicating with and educating patients as a key part of ESRD treatment,

End-Stage Renal Disease and Hospitalization

As with many chronic and deadly conditions, hospitalization is a potential consequence of ESRD. Hospitalization involves a patient being admitted to a hospital and kept overnight for treatment (Matthew et al., 2015). Hospitalization is vastly expensive. Lengthier hospital stays may also lead to complications such as bedsores, blood clots, or muscular atrophy. Therefore, avoiding hospitalization where possible is desirable.

Although most dialysis treatment is undertaken, at present, in outpatient clinics that may or may not be associated with a hospital, outpatient treatment of this type is not considered hospitalization; only inpatient treatment is germane to this section.

Inpatient hospitalization is the primary dependent variable in the current study for several reasons. Firstly, as per Matthew et al. (2015) and the theoretical framework, avoidable hospitalization and especially avoidable readmission are common in ESRD patients relative to the general population. Rehospitalization creates significant personal (Matthew et al., 2015) and societal (Liao et al., 2016) costs associated with ESRD. Therefore, short of reducing ESRD incidence, reducing ESRD-related hospitalization is likely the most effective way of diminishing the costs associated with the condition. Secondly, many hospitalizations associated with ESRD are avoidable with better treatment or better patient treatment adherence (Matthew et al., 2015). Better treatment adherence makes reducing avoidable hospitalizations—and especially unnecessary rehospitalizations—a priority as it suggests that reducing hospitalizations could be associated with an improvement in care and patient outcomes instead of merely treated as a cost-saving or practical measure. Third, as the following studies—and the following section—demonstrate, hospitalization for ESRD disproportionately affects certain groups. The outsized impact of ESRD on minority groups is both a reason to help remove the problem and a potentially helpful tool for so doing. In identifying these groups that are especially at risk, as the current study aims to do, it should be possible to develop interventions that target at-risk groups and improve their ESRD hospitalization outcomes.

Indeed, ESRD patients have the highest hospitalization rate for patients with any chronic illness, even including heart disease and cancers (Lovasik et al., 2016). This translates into extensive emergency room usage, and emergency room visits are an especially costly form of hospitalization. Examining these issues, Lovasik et al. (2016) conducted a historical study of all Medicare patients in the USRDS from 2005 and 2011 concerning emergency room utilization. Somewhat confounding the data, researchers have found that some patients use the emergency room as a primary dialysis provider, with over 50 visits in the first year. These patients were removed from the dataset. The total resulting sample size was 769,228 patients, of which over 550,000 had at least one emergency room visit in the study period. Furthermore, 55% of the sample had at least one the first year following their ESRD diagnosis, and on average, patients had between two and three emergency room visits annually in their first 3 years of ESRD. As per the study,

> factors associated with higher rates of ED [emergency department] use included younger age, female sex, black (vs white) race, comorbid medical conditions, Medicaid insurance (vs Medicare alone), catheter or graft hemodialysis access (vs fistula), tobacco use, institutionalization, and more recent ESRD diagnosis. (Lovasik et al., 2016, p. 1563)

The results quoted above provide further support for the idea that certain patients are more likely to need hospitalization, and this extensive usage of expensive emergency care suggests that hospitals could make considerable improvements in that dimension of ESRD. On the other side of the issue, the results of a study by Goodrich, Schaubel,

Smith, Merion, and Sharma (2016) demonstrated why a better understanding of ESRD hospitalization and avoiding rehospitalization might be especially important to patients with certain comorbidities, in addition to specific demographics. The Goodrich et al. (2016) study explored ESRD-related hospitalizations for patients with a liver transplant in addition to their ESRD. The study was historical in nature, including a matched sample of liver transplant patients with and without ESRD, for a total of 7,019 patients. The average hospitalizations per year were seven for liver transplant patients without ESRD and 23 for those with ESRD. Goodrich et al.'s analysis showed that, after adjustment for various covariates, the risk of hospitalization was 97% higher for liver transplant patients with ESRD than without it. While these hospitalizations are unlikely to be preventable, improved interventions could likely do much to equalize these figures.

Finally, another interesting effect of ESRD on hospitalization pertains to the use of hospice care. Hospice care represents a form of end-of-life care in which patients who have accepted the onset of death are cared for. Many patients suffering from chronic conditions utilize hospice care. Despite their increased use of standard hospitalization, ESRD patients are less likely to use hospice services than are patients with other chronic conditions (Goodrich et al., 2016). The results of a historical study examining the usage and costs of hospice for ESRD patients found that those patients who stayed in the hospice less than 3 days, around 40% of the historical cohort, were less likely to die in the hospital or in intensive care, but they had similar end of life costs. However, these short stays were also associated with a higher chance of hospitalization. Overall, longer hospice stays were associated with progressively less overall hospice costs and intensive

procedures. Overall, end-of-life costs were quite similar, however, suggesting that there may be no clear advantage in this context.

Overall, ESRD is the chronic condition most likely to lead to a patient's hospitalization, even compared to heart disease or cancer. Hospitalization, in the case of ESRD represents a large part of its personal and societal costs. Therefore, reducing hospitalization—and especially unnecessary rehospitalization—is likely the best way to decrease the costs associated with ESRD while at the same time offering the chance to improve care. ESRD hospitalization is also significantly more pronounced for certain demographic groups and patients with certain comorbidities. ESRD patients also make considerable use of emergency services, with most ESRD patients visiting the emergency room in their first year of the condition and having multiple visits annually in the first 3 years. All of this indicates that hospitalization—and especially unnecessary readmission—is the appropriate dependent variable for the current study and one of the most important outcomes to target and reduce after ESRD incidence.

30-Day Readmissions

The specific variable of 30-day readmission is considered a measure of the success or failure of treatment's effectiveness during the first hospitalization (Matthew et al., 2015). Thus, 30-day readmission represents a measure of the issues associated with hospitalization. Sometimes, ESRD hospitalization is unavoidable (Matthew et al., 2015). In general, however, another such unavoidable episode is unlikely to happen within 30 days of the first (Matthew et al., 2015). Accordingly, by measuring 30-day readmission, the study is effectively measuring the *quality* of the ESRD care provided in the first

hospitalization. While overall hospitalization might be another possible way of thinking about this variable, the unavoidable hospitalizations associated with ESRD would skew this in areas with a higher incidence of ESRD. As the following section will demonstrate, gender may have correlates in both the severity of renal disease progression and the types of care provided. These are not the issues under study, but rather how ESRD care can be improved, especially through avoiding unnecessary readmission. Because most avoidable ESRD-related hospitalizations take on the form of readmission as per the theoretical framework (Matthew et al., 2015), 30-day readmission is the best way to measure hospitalization as it pertains to and is indicative of qualify of ESRD care.

End-Stage Renal Disease and Demographics

As alluded to in multiple prior sections, demographics play a key role in multiple aspects of ESRD. Demographics shape the rates of ESRD incidence, the rates of ESRD hospitalization (Lovasik et al., 2016), the likelihood of being referred for renal replacement therapy (Patzer et al., 2015), and many other aspects of ESRD. For this reason, most of the key predictors and independent variables in this current study are demographic in nature. The existing research indicates the importance of these variables as predictors of ESRD incidence and outcomes.

Age

As with many—if not most—chronic conditions, ESRD incidence is affected by age. However, traditional approaches to mapping the relationship between ESRD and age have critical shortcomings. Specifically, as per Krishnaswami et al. (2016), most such analyses dichotomized age into younger and older groups, where researchers categorized

ESRD patients at age 65 years and older, 80 years and older, or both and treated this overall in a linear fashion. Grouping by age is a somewhat natural approach if one wishes to encapsulate age into a variable but may not be an accurate reflection of the true effect of age on ESRD outcomes. The results of these studies often fail to make sense for revascularization, although they do predict ESRD mortality acceptably well. Krishnaswami et al. (2016) found that different arbitrary age cutoffs produce different results and that a linear model of age could not predict repeat revascularizations. However, a cubic spline model of age's effects resulted in an improved model for age and a consistent revascularization model. The results of this model's use suggest how simple and straightforward demographics categorization can result in more interesting data than expected. Because of this result demonstrating age weakness as a linear predictor, age was not chosen as a predictor in the current study.

End-Stage Renal Disease and Ethnicity

Race/ethnicity is another factor that strongly affects ESRD and related factors (Lovasik et al., 2016). Interestingly, race does not only predict outright outcomes but also the effects of other predictors. For example, dietary acid load is an important factor in predicting the development of kidney disease and its progression over time (Crews et al., 2018). While this is true in general, a large study by Crews et al. (2018) found that this relationship holds to a significantly higher degree amongst Blacks than it does amongst Whites. This result is interesting in that it suggests even the progression through the various stages of renal disease may be significantly different across racial lines. However,

a considerably larger body of research demonstrates more direct links between race and ESRD.

However, more directly relevant to the current study is that race and ethnicity—alongside other demographic factors—can have effects through the availability and quality of care. Race and poverty were central to a study by Nee et al. (2017) on the role of pre-ESRD nephrology care. Patients who have access to nephrology before researching the ESRD are significantly associated with lower mortality and morbidity from ESRD, as per prior research (Gillespie et al., 2015). Based on a retrospective cohort study using a USRDS sample of 739, 537 patients from 2007-2012, Nee et al. (2017) found two independent results: those in poverty, as measured by Medicare and Medicaid eligibility, were significantly less likely to have undergone pore-ESRD nephrological care and that both Blacks and Hispanics, relative to Whites, were significantly less likely to have undergone pre-ESRD nephrological care. As per Gillespie et al. (2015), this puts the impoverished and these racial minorities at greater risk for first year mortality. Thus, overall, the race/ethnicity variable in the current study are supported by these results.

Another highly relevant result stemmed from Shah et al. (2018) 's research, who studied gender, ethnicity, and access to hemodialysis care. As noted previously, access to dialysis on a regular basis can decrease the risk of mortality up to 14 times relative to emergency-only access (Cervantes et al., 2018). However, different types of hemodialysis access have different outcomes as well; specifically, “Arteriovenous (AV) access confers survival benefits over central venous catheters (CVC) in hemodialysis patients” (Shah et al., 2018, p. 4). Based on another retrospective cohort study comprising 885,699

participants from 2004 to 2014, Shah et al. (2018) found that women have significantly lower odds of having access to advantageous arteriovenous dialysis. Racial results were more mixed: Blacks and Asians were more likely to use arteriovenous access than were Whites, but Hispanics were less likely to. Given that the type of dialysis access patients has conferred clear benefits in terms of their treatment, the results of Shah et al.'s (2018) study offers significant support for the use of race and gender as predictors of ESRD treatment outcomes.

More directly touching upon hospitalization was a study by Newman et al. (2016). Specially, their research examined racial differences in hospitalization hos patients on kidney transplant waitlist (for the deceased donor waitlist, in particular). The study represented another example of a retrospective cohort study using USRDS data, with a sample of 24,581 patients between 2005 and 2009. The researchers adopted a novel cluster analysis approach and found that, based on the results, patients who were hospitalized were less likely to receive transplants, and Blacks and Hispanics were more likely to be hospitalized than were Whites. However, they noted that adjusting for the role of hospitalization in determining the likelihood of being given a kidney transplant did not significantly reduce the level of disparity on the waitlist itself. These results encapsulate two important ideas relevant to this study. Firstly, the fact that hospitalization decreases an ESRD patient's chances of being given a kidney transplant represents another reason supporting the importance of hospitalization as an outcome to be reduced. Secondly, the results provide strong support for the use of race as a primary demographic

predictor of hospitalization, as their results found that minorities were significantly more likely to undergo ESRD-related hospitalization.

Considering all of this, one final study of interest is less statistical and more patient-centric. Black ESRD patients tend to have a significantly higher chance of non-adherence to treatment guidelines (Savage, 2017). The outsized impact on Black ESRD patients is troubling in that it suggests an already disadvantaged demographic may act to make their own situation worse. Noting this, Savage (2017) sought to study the reasons why and used a mixed-methods approach that combined qualitative interviews and quantitative survey research. The study included 46 Black ESRD patients, 27 of whom participated in in-depth semi-structured interviews. Thus, although the sample size was not large enough to create significant quantitative effects, the qualitative results remain strong. The mixed-methods analysis overall suggested that the reason for this problematic non-adherence can be characterized as a response to perceived racism. Rather than explicit, high-level racism, the study participants characterized their experiences with the medical community as being affected by "everyday racism," a low-level but pervasive type of racism. This experience of racism served to diminish the participants' perceptions of the medical establishment, resulting in decreased attention to guidelines and resulting in non-adherence to those guidelines. This result suggests that racial differences in treatment may stem from more than simple racial predispositions. This principle may potentially extend to other demographic factors as well.

Overall, there is no lack of evidence for the importance of demographics in shaping ESRD and, more relevantly, ESRD treatment, and treatment outcomes. The most

prominent demographic in the results was race/ethnicity, a demographic that occurred in almost every study. Thus, there is clear and strong support for race as an independent variable in the current study. Gender and poverty/employment were also supported as lesser predictors of ESRD outcomes and this germane to the study as independent variables. Age was also supported as a predictor of ESRD-related outcomes. However, the support for age occurred in such a way as to make it evident that age was not a variable well served by use as a linear predictor, as it would be in the present study. Therefore, age was not included in the current study. Finally, one study (Savage, 2017) gave insight into how even low-key perceived discrimination based on a demographic factor, such as race, can significantly affect treatment outcomes for that demographic by creating treatment guideline nonadherence. Such nonadherence is problematic and may result in significantly worse treatment outcomes, contributing to unnecessary hospital readmission.

End-Stage Renal Disease and Gender

Gender is a significant predictor of ESRD-related outcomes. This has already been referenced in several of the studies discussed above, but this section will provide a further specification of the prior results regarding gender. One such result is that of a study by Shah et al. (2018), which focused on the differing access of different populations to different treatment types. Their results indicated that women have significantly lower odds of having access to the advantageous arteriovenous dialysis. The lack of access to dialysis means that the treatment outcomes for women with ESRD may differ from those of men, which may affect the rate of ESRD-related (re)hospitalization.

Another study by Shah, Thakar, and Leonard (2018) found similar structural results of gender on ESRD outcomes. Specifically, using a sample of nearly 50,000 ESRD patients from the USRD, they found that women are, overall, 6% less likely than are men to be given enough information about kidney transplantation, thereby significantly effecting the quality-of-care provision.

On the other hand, an analysis by Neugarten and Reckelhoff (2015) of prior research suggested that there are sex differences in the incidence and progression of kidney disease across multiple animals. In general, the researchers found that ESRD was more common in male animals but that they could easily replicate this outcome using hormonal treatments. The results suggested that sex hormones, rather than differences in the physical structure of the two genders, is likely responsible for gendered differences in ESRD (Neugarten & Reckelhoff, 2015)

There is evidence for gender as an important variable; therefore, from both a social standpoint and a medical one, gender significantly impacts ESRD outcomes. Interestingly, these social effects on treatment disadvantage women, who receive worse types of care and worse information about care. Conversely, research suggests that—based on multiple animal models—men are more medically at risk from ESRD and more likely to develop it due to sex hormones. These two effects work at cross-purposes to one another, making it not immediately apparent which gender should be expected to be a more meaningful predictor in the study.

Employment Status

No studies explicitly address employment status. Instead, employment status is something of a proxy for another that is highly relevant: poverty. It is impossible to establish poverty based on the USRDS data that will be utilized in the current study. However, unemployed people are at a significantly higher risk for poverty, making employment status the closest reasonable proxy for poverty available in the data. Results for the importance of poverty are as follows. Patzer et al. (2015) found that impoverished patients are significantly less likely to be referred for a kidney transplant in Georgia. Given that transplants are the only true cure for ESRD, and transplants require a referral from a dialysis center, this indicates that the impoverished may have significantly lower access to a cure for ESRD. The lowered access to cures in turn, may put the impoverished at greater risk of hospitalization and poor treatment outcomes from ESRD.

Nee et al. (2017) found that the impoverished are significantly less likely to have to experience pre-ESRD nephrology care during the progression of their kidney disease. Considering that pre-ESRD nephrology is significantly associated with improved patient outcomes and a lack thereof is related to significantly higher rates of first-year ESRD mortality, this suggests that the impoverished are likely to have poor treatment outcomes. Poor treatment outcomes may also suggest that the impoverished are significantly less likely to be knowledgeable about ESRD care and that they, therefore, may have worse self-care outcomes in following treatment guidelines following hospitalization.

While employment status is likely not the best proxy for poverty, it is the best available in the USRDS dataset. Poverty has been significantly linked with at least two

different outcomes that predict worse treatment: a lack of transplant referrals and a lack of pre-ESRD nephrology care. Therefore, there is reason to believe that poverty—measured through employment status—may significantly affect ESRD hospitalization and quality of care.

Spoken Language

Studies such as those of Gillespie et al. (2015) and Nee et al. (2017) illustrate the vast importance of patient-caregiver interaction and patient education. Both studies indicate that something as simple as a prior history of nephrology care can significantly impact patients' likelihood of dying from ESRD. Indeed, the extra mortality from those without a history of nephrology care comes especially in the first year, suggesting further the role of the educational aspect of such care in preventing poor treatment outcomes. Furthermore, Savage (2017) demonstrated the importance of patients' willingness to cooperate in their own care, noting how even the perception of everyday racism can make patients likely to disregard their treatment guidelines.

While none of these directly indicate language as a barrier, they do indirectly suggest it. Patients whose preferred spoken language is not English may struggle to receive treatment instructions or fail to fully understand those treatment instructions even when they think they do understand them. Furthermore, most of those who would prefer a spoken language such as Spanish are at risk for the kind of everyday racism addressed by Savage (2017) over language and race/ethnicity. While indicating a language other than English as a preferred spoken language does not guarantee a language barrier, it is

strongly suggestive of one, and existing research suggests several reasons why such a barrier may be significantly related to ESRD treatment outcomes.

Methodological Precedents

The primary discussion of the study's methodology and the justifications for it will be in section two of this document, which focuses exclusively on methodological issues. However, one methodological aspect that is more in the domain of the literature review is to examine the types of research methodology used by prior studies. This examination of methodological precedent provides a look at how similar studies have been undertaken in the past, thereby strengthening the case for adopting an approach that is "tried and true" as it were. In this study, the proposed research method is that of a nonexperimental historical, correlational design, also called a retrospective cohort study. The current study will draw its data from the USRDS, a large database of renal data.

As previously alluded to, this methodological approach has a highly significant precedent. Of the studies included in this review, a majority adopted this same approach. Butler et al. (2015) used the USRDS dataset to analyze cancer risks in ESRD patients. Like the current study—and most of those following— Butler et al. (2015) limited their data to the data of Medicare patients in the USRDS because this subset of the data contains considerably more complete data than does the overall USRDS dataset. Collins et al. (2015) also used the USRDS—indeed, their study focused on an analysis of the dataset's history and advantages. Gillespie et al. (2015) also utilized the USRDS, with a cohort of 443,761 patients, to study the relationship between a history of nephrological

treatment and ESRD mortality. At the time of publication, their study represented the largest cohort study of ESRD.

Gómez-Puerta et al. (2015) used a USRDS dataset to analyze the comorbidity of ESRD and lupus erythematosus. Even this much more specialized study was able to find a cohort of over 12,000 participants in the USRDS. Similarly, Kaminski et al.'s (2015) study of ESRD and foot-related complications used a USRDS cohort of over 45,000. Ku et al. (2015) adapted USRDS data for a more specialized purpose. Specifically, they used the data to follow up on the patients who had been involved in a clinical trial of blood pressure control and determine that, even though the trial had yielded no immediate results at the time, the two arms had different long-term outcomes. Liao et al. (2016) found the USRDS an ideal setting for a study that was designed to apply a novel big data analysis approach in healthcare.

Lovasik et al. (2016) also used a USRDS cohort to study emergency room utilization by ESRD patients. In another study about the implications of prior nephrology care, Nee et al. (2017) mustered a cohort of over 700,000 patients from the USRDS data. Newman et al. (2016) drew upon a much smaller cohort of 24,000 to assess hospitalization and race. Perhaps the largest USRDS cohort used was 1.3 million patients in Nguyen et al.'s (2017) study of renal cancer. This list is not exhaustive, but already considerable. A few of the other reviewed studies that did not draw upon the USRDS dataset still adopted retrospective cohort designs using different and smaller data sources. Given its size, availability, and the completeness of its data for a large portion of the

population (Medicare patients), the USRDS and the cohorts it makes available for study are ideal for most quantitative analyses about ESRD.

Research Gap

The primary impetus for this study lies in its practical significance. As per the theoretical framework (Matthew et al., 2015), unnecessary and avoidable readmissions represent a significant source of expense for ESRD patients and society. ESRD is a chronic condition with the highest risk of hospitalization (Lovasik et al., 2016). There are significant racial disparities in both the incidence and treatment outcomes of ESRD. These practical issues, however, are not the only motivation for the study.' Instead, they are parallel to an academic research gap, which also serves as a secondary motivation for the study.

Three calls for further research highlight this research gap. First and foremost, of these is the call by Matthew et al. (2015). In keeping with the theoretical framework of the current study, this calls for further research highlighted the need for more research into the factors predictive of unnecessary ESRD-related hospital readmission to better target interventions to reduce the incidence thereof. Secondly, tying into this was a call for research by Newman et al. (2016) for such future research on further social context factors and their impact on ESRD treatment outcomes such as hospitalization. From this call for research, the current study will adopt the contextual factor of employment status and the other demographic variables chosen in concert with the literature review. The final call for research was for research into factors that may contribute to or create race

and gender disparities in treatment and outcomes (Shah et al., 2018). To answer this call for research, the current study will focus on the role of these demographic predictors.

Summary

In conclusion, this literature review examined the study's theoretical foundations and five key themes. These themes were the significance of ESRD as a problem, the complications, and comorbidities of ESRD, ESRD treatments, ESRD and hospitalization, and ESRD and demographics. This review highlighted many aspects of ESRD. The condition is the fifth and final stage of chronic kidney disease, and ESRD rates are stabilized but still slightly increasing in the developed world, while incidence is rampant in the developing world. ESRD is often caused by diabetes and hypertension and may lead to renal cancer complications, which has a nearly 10% incidence in the 5 years following ESRD. A kidney transplant is the only cure for ESRD. Failing that, ESRD is treated by hemodialysis, in which an external device takes over the kidney's function of filtering waste out of the bloodstream.

Of chronic conditions, ESRD is the most likely to cause hospitalizations. ESRD patients are highly likely to use the emergency room, averaging between two and three visits annually. ESRD hospitalization is expensive and often avoidable, suggesting this to be one of the best ways of improving ESRD care going forward, in multiple ways. Demographics can help predict many aspects of ESRD care and outcomes. Important demographics include age, race/ethnicity, gender, and poverty. Further research is needed about the factors predicting ESRD hospitalization, especially unnecessary readmission.

The importance of the key variables which are found in this study is highlighted. The independent variables are gender and race/ethnicity, whereas the dependent variables are 30-day readmission rates and ESRD-related hospitalization risk, respectively. This concludes the literature review.

Definitions

End-stage renal disease (ESRD): ESRD is the fifth and final stage of kidney or renal disease, at which point the kidneys have ceased to function (Robinson et al., 2016).

Gender: Gender is the participant's gender as male or female. Gender will function as an independent variable.

Hemodialysis (dialysis): Dialysis is the process of filtering the bloodstream through an external device to filter out waste that the kidneys would normally filter (Robinson et al., 2016).

Race/ethnicity: Race/ethnicity is the biological race or census-indicated ethnicity of a person and will take the possible values of Caucasian, Black, Hispanic, Asian, Native American/Alaska Native, and Other. Race/ethnicity will function as an independent variable.

United States Renal Data System (USRDS): The USRDS is a comprehensive source of information about renal disease that includes a wide array of related topics such as disease severity, hospitalizations, pediatric populations, prescription drug use, and chronic kidney disease and the transition to ESRD (Collins et al., 2015).

30-day readmission: 30-day readmission indicates the number of times a patient is re-hospitalized within 30-day of initial ESRD-related hospitalization. 30-day readmission will function as a dependent variable.

Assumptions

Assumptions represent foundational aspects of the study that cannot be tested and must be assumed to be true (Merriam & Tisdell, 2015). There are several assumptions underlying the current study. The first is that a quantitative, retrospective cohort study can provide meaningful data on ESRD. This assumption is inherent in quantitative resources but well supported by the popularity of this approach in medical research. The second is that the USRDS provides complete and accurate data regarding patients. The number of prior studies that have also used the USRDS dataset supports the validity of this assumption. I also assumed that the Medicare and Medicaid data in the USRDS are at least a decent proxy for the overall dataset. The study also assumes that demographics and other predictors can significantly influence the hospitalization rates of ESRD patients. Though other research supports this association, these studies—like the current study—cannot prove causation. I also assumed that identifying the populations at greatest risk for unnecessary readmission to a hospital setting will have tangible benefits for policy and research.

Scope and Delimitations

Delimitations represent the soft limitations of a study, those imposed by the researcher (Merriam & Tisdell, 2015). Firstly, the current study is delimited to ESRD because, as described in the significance section of the literature review, ESRD is a

condition of great prevalence and which creates high costs. The current study is delimited to studying hospitalization and 30-day readmission. This study will only look at hospitalization and 30-day readmission because, as per Matthew et al. (2015) and other results in the literature review, reducing the costs associated with ESRD while improving care can likely be most effectively done by reducing the number of unnecessary ESRD-related hospitalizations. The study is delimited to the United States because USRDS data are limited to the US context. As with many other USRDS studies, the current study was delimited to the Medicare and Medicaid data in the USRDS because—due to the government-funded nature of these health insurance programs—their patient data are much more fully available compared to data for patients with private insurance. The current study did not necessarily generalize well outside of the Medicare and Medicaid cohort, but this is a tradeoff that many prior researchers have also deemed acceptable because of the significant corresponding benefits of the USRDS as a source of data.

Significance, Summary, and Conclusions

Significance

The current study is significant both in practice and theory. Practically, it is important because ESRD is a global health crisis. While ESRD rates have stabilized in the United States, they are still increasing with time (Wetmore & Collins, 2016). ESRD disproportionately affects vulnerable populations (Mendu et al., 2016), especially those of Blacks and Hispanics, and bears a high burden from both an economic (Wang et al., 2016) and quality-of-life (Raspovic et al., 2017) standpoint. Economically speaking, ESRD patients are the most likely to be hospitalized out of patients with any chronic

disease, even cancer and heart failure (Lovasik et al., 2016). They are also at significant risk of rehospitalization (Matthew et al., 2015). Unplanned rehospitalizations are expensive for both the patient and the hospital; therefore, reducing 30-day readmission of ESRD patients as a measure of rehospitalization represents an important goal from a practical perspective. The results of this study will help hospitals and health administrators understand which patients are most at risk of unplanned rehospitalization. Doing so may contribute to both social and practical change by providing data necessary to develop targeted interventions to reduce 30-day readmission rates in vulnerable populations. Reducing 30-day readmission rates for ESRD will improve outcomes for both those populations and the hospitals themselves. Theoretically speaking, the study addresses a gap in the academic literature characterized by a need for more research to determine ways of reducing readmission (Matthew et al., 2015), ESRD hospitalization research that considers appropriate contextual and socioeconomic predictors (Newman et al., 2016), and more research on race and gender gaps in ESRD hospitalizations (Shah et al., 2018).

Summary and Conclusions

In summary, ESRD is a serious problem in today's world. Though there is a lower occurrence of ESRD the developed world, it is far from defeated. Thus, while ESRD diagnoses are increasing in general, the problem is that minorities—and especially minority women—may be at especially high risk for poor outcomes. This problem is significant because ESRD is a heavy economic burden not only on patients but on caregivers and society (Wang et al., 2016). To address this problem, the purpose of this

quantitative nonexperimental historical, correlational design is to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. In keeping with this purpose, the study will be guided by three research questions: (a) To what extent, if at all, does patient gender predict 30-day hospital readmission rate for ESRD patients in the United States? (b) To what extent, if at all, does patient race/ethnicity predict 30-day hospital readmission rate for ESRD patients in the United States? and (c) Are there any significant interaction impact between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

A significant review of the academic and professional literature reveals the importance of 30-day readmission as an outcome and demographics as predictors of ESRD-related outcomes. Drawing data from the USRDS and Data.gov historical datasets, the current study will examine which of these predictors most significantly drive unnecessary ESRD-related hospital readmission. These results have important implications in informing interventions to reduce ESRD hospitalization, thereby reducing both the personal and societal costs associated with the disease. This section has provided an overview of the current study and a review of the literature. Now, in section two of the study, the methodological considerations for undertaking it are laid out.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative study was to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. This section of the study outlines the methodology by which it was undertaken. In the first section I examine the quantitative methodology and the nonexperimental, historical, correlational/retrospective cohort design that I adopted for the study. Secondly, I examine various aspects of the research method. These include the population, data sources, the operationalization of variables, and the data analysis. Next, I review threats to validity and ethical issues. The section concludes with a summary.

Research Design and Rationale

The nature of the current study was a quantitative, historical, correlational design. Quantitative research is an approach that examines the world from a numerical, objective perspective (Bryman, 2016). Quantitative research is aimed at examining issues that can be quantified, such as those for which there are existing, validated quantitative instruments to measure, or for understanding the nature of the relationships between two or more variables (Bryman, 2016). Overall, the greatest strength of a quantitative study is that its results are based solely on objective data measured using carefully validated instrumentation. The numerical or otherwise closed-ended nature of this type of data also means that quantitative research can practically process and analyze large sample sizes (Bryman, 2016). Quantitative research creates results that can be generalized and whose strength can be measured using statistical techniques such as power analyses and

confidence intervals using these larger sample sizes. All of this made the quantitative approach a strong fit for the current study because it is used to examine the relationships between easily quantified and measured variables. All the predictor and outcome variables in the research questions—gender, race/ethnicity, 30-day hospital readmission rate, and medicate claims—were either quantitative by nature or easily assessed sociodemographic variables. Furthermore, all three of the research questions guiding the current study pertained to the nature of the relationship(s) between these variables, and, as the next section demonstrates, large datasets were available containing these data.

The specific research design was that of a historical, correlational design. Correlational research is a type of quantitative research that focuses on uncovering the correlational or associational relationships between variables (Johnson, 2001). Correlational research cannot establish stronger causal links as an experiment can, but correlational research has significantly less stringent data collection limitations in exchange for this drawback. Rather than creating a controlled experiment in which variables are manipulated, the correlational researcher can collect data from a cross-sectional or historical sample (Johnson, 2001). Historical data are preferable as such data tend to be readily available without resource-intensive data collection on the part of the researcher and offer large sample sizes when historical repositories of the relevant data can be found. Because such historical data exist for the variables under study in the current study, a historical approach was deemed appropriate.

Methodology

Population

The study population for this study was all United States patients who suffer from ESRD and have been hospitalized because of their ESRD. For practicality and data availability, the study population was further limited to patients whose ESRD hospitalizations resulted in Medicare claims and those hospitalized during the period 2017-2018. Although I placed a special interest on the data for Blacks and Hispanics, this study had no racial delimitations. Furthermore, for this research I did not use other demographic factors to delimit the population of the study, allowing the use of the full range of publicly available data.

Power Analysis and Sample Size Estimation

I used G*Power v3.1 software to perform a power analysis and determine the necessary minimum sample size for the study (Faul et al., 2009). A statistical power of 80% is relatively standard and was used (Charan & Biswas, 2013). Similarly, I used a medium effect size, as represented by $d = 0.5$ or $f^2 = 0.15$ (Ferguson, 2009). A significance of 0.05 is also a standard value, although it must be noted that this only assures statistical significance, not clinical significance. For the ANOVA/*t* tests, a minimum sample of 126 was required. For the regression analysis, a minimum sample size of 77 should be achieved. Because the data were drawn from a very large historical database, meeting and exceeding these minimum sample sizes presented no difficulty.

Sources of Data

The study's data were drawn from two secondary sources: Data.gov and the USRDS. Data for RQ1 to RQ3 were drawn from the dataset available through the USRDS. The USRDS is a national registry for data on people with ESRD in the United States, funded by the National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. The USRDS is a comprehensive database of all renal patients in the United States, although many of the more specialized data are only available for patients with Medicare claims. Because data regarding hospitalizations are limited to Medicare patients in this dataset, the study drew on the Medicare-only portion of the USRDS dataset. The USRDS data is in part available freely for any use through an annual report. However, more complete data for research and analysis are also available upon request. Therefore, for the present study I requested the use of data for the 2016-2018 period for Medicare patients and the variables of hospitalization, 30-day readmission, race/ethnicity, and gender. All these variables were available in the Medicare dataset as per the USRDS website.

For both sources of data, I carried out all original sampling and data collection through the submission of Medicare claims for hospitalization. As a result, there was no significant risk of sampling bias or other undesirable sampling effects as, rather than random or convenience, the sampling simply included all eligible data points.

Operationalization of Variables

The study variables were as follows:

Gender: Gender was operationalized as a binary variable recording the participant's gender as male or female. Gender functioned as an independent variable. This data was recorded as part of the ESRD records accessed during data collection.

Race/ethnicity: Race/ethnicity was operationalized as a categorical variable with the possible values of Caucasian, Black, Hispanic, Asian, Native American/Alaska Native, and Other. Race/ethnicity functioned as an independent variable. This data was recorded as part of the ESRD records accessed during data collection.

30-day readmission: Thirty-day readmission was measured as an ordinal variable indicating the number of times a patient is rehospitalized within 30 days of an initial ESRD-related hospitalization. Thirty-day readmission functioned as a dependent variable. This data was recorded as part of the ESRD records accessed during data collection and was gleaned by comparing data points with matching other characteristics.

Data Analysis

Prior to any data analysis, I screened the historical data for clear outliers, and these were removed so that they did not unduly skew the results. As I used historical data, no cleaning of incomplete responses was necessary. All data analysis were carried out with the aid of SPSS statistical software in the latest version. The research questions and corresponding hypotheses tested for the study were as follows:

Research Questions and Hypothesis

RQ1: To what extent, if at all, does patient gender predict 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$1: Patient gender does not predict 30-day hospital readmission rate for ESRD patients in the United States.

$H_1$1: Patient gender predicts 30-day hospital readmission rate for ESRD patients in the United States to a statistically significant degree.

RQ2: To what extent, if at all, does patient race/ethnicity predict 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$2: Patient race/ethnicity does not predict 30-day hospital readmission rate for ESRD patients in the United States.

$H_1$2: Patient race/ethnicity predicts 30-day hospital readmission rate for ESRD patients in the United States to a statistically significant degree.

RQ3: Is there a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$3: There is not a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

$H_1$3: There is a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

In keeping with the split datasets described in the previous section, I also split the data analysis. First, the analysis began with simple descriptive statistics to describe both datasets. Then, RQ1 through RQ3 were answered with regression analysis. I carried out

three individual regression analyses to answer RQ1, RQ2, and RQ3. These analyses used a type of regression appropriate to the predictors; this was simple linear regression in most cases. To test the hypotheses, I tested the coefficients of regression and r^2 values for these regression models to see if they differed significantly from zero. Alternately, RQ1 could be answered using a different-sample comparative *t* test. Multiple regression involves using both all the relevant predictors as well as their interaction terms. When these interaction terms have a coefficient of regression significantly different from zero, there is a moderating effect between those two variables (Bolin, 2014). In addition, the overall r^2 and individual regression coefficients tested the significance of the overall combined model and individual predictors within the combined model.

Before undertaking these tests, I tested the assumptions of the corresponding regression models. These assumptions are the normality of the variables, which was tested by a Shapiro–Wilk test, homoscedasticity, which I tested through a Breusch–Pagan test, the linearity but not perfect collinearity of variables, and the independence of the error terms. If one or more of these assumptions were violated, then I sought a more appropriate alternate regression technique.

Threats to Validity

Validity and reliability are an intrinsic part of any research (Merriam & Tisdell, 2015). The reliability of a study relates to the accuracy and replicability of its results. In this regard, the validity and reliability of the current study was strong. All variables used in the study were drawn from historical data, but each holds an intrinsic value rather than an attempt to quantify some construct. Furthermore, the data themselves are drawn from

a historical, governmental database from which large amounts of data are available. Using a governmental database for this study means that any researcher wishing to replicate the study could do so by using the same set of USRDS data and analyzing them in the same fashion. Therefore, the reliability of the current study should be strong.

Validity is divided into internal and external validity (Merriam & Tisdell, 2015). Internal validity refers to how well the study fits together and answers the questions it set out to answer. The current study achieved significant internal validity through careful alignment of all the study components in a chain running from the problem to the purpose of the research questions to the data collection variables. However, one threat to internal validity is that the research design cannot establish causation, only association/correlation. This threat was countered by carefully acknowledging the correlational nature of the results when reporting them and taking care not to fall into the erroneous use of causal language.

The large sample size afforded by the USRDS dataset, along with the Data.gov dataset, offers a strong basis for external validity, as quantitative results gain external validity and generalizability through a large sample size. However, one threat to this is that the data included were only for Medicare and Medicaid patients. While there is no reason to believe this section of the population has fundamentally different ESRD outcomes, this still raises whether the results can be generalized to the entire population. Nonetheless, so long as the researcher acknowledges this limitation in reporting the data and results, its effect on validity was limited.

Ethical Procedures

The current study is quantitative in nature and involved the use of publicly available, de-identified archival data. Therefore, the current study was expected to pose minimal ethical concerns for participants as the study does not involve collecting or publishing of any data that are not already publicly available. My personal views and biases did not color the results, as the study's raw statistical conclusions were presented as a part of data analysis and reporting. Based on these statistical results, a reader may determine for themself whether my conclusions were valid. Nonetheless, I took care to avoid any bias, as I has some personal stake in the study's outcome because of having lost close family members to ESRD.

Summary

In summary, the purpose of this study is to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. This purpose was addressed through the use of a quantitative nonexperimental historical correlational design, also known as a retrospective cohort study. Key study variables included gender, race/ethnicity, and 30-day readmission. These data were gathered from two different historical databases, the USRDS for the first set and Data.gov for the second. These data were readily and publicly available, allowing me to easily access them. Data analysis include descriptive statistics and multiple regression. The data analysis results served to test the study hypotheses and provide valuable insight into the predictors of ESRD-related hospitalization, which can be used to shape interventions to improve ESRD hospitalization-related outcomes. This section has laid

out the methodological considerations for the current study. Once I completed this study, the following section, Section 3, provided explanation of the results and findings of the analysis.

Section 3: Presentation of the Results and Findings

ESRD continues to be a problem in the United States, with over 120,000 new cases in 2014 alone and over 660,000 total cases in treatment (Saran et al., 2017). The problem seems to be even worse for certain races/ethnicities, both in terms of incidence rate, a higher risk of being affected by ESRD (Crews et al., 2018), and worse treatment access (Patzer et al., 2015). In other words, the problem is that minorities, especially minority women, may be at particularly high risk for poor outcomes related to ESRD (Collin et al., 2015; Robinson et al., 2016). Given that ESRD takes a heavy economic toll not only on patients but on caregivers and society (Wang et al., 2016), it is important to identify whether ESRD does continue to disproportionally affect certain groups more than others. In knowing this, interventions could target those most affected and therefore have the greatest positive impact. Unplanned rehospitalizations are an expensive burden that falls on both patients and the hospitals that treat them. Thus, reducing readmission rates is important for both practical and altruistic reasons. With the present research I aimed to shed light on race and gender's role on ESRD-related rehospitalizations, as this is a research gap in the literature.

In this chapter, I review the research questions and hypotheses followed by a discussion of the methodology, research design, and data collection approach. Next, I present the descriptive statistics for the variables of interest and the results of several regression analyses that were conducted to address the research questions to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after

hospitalization for ESRD patients. Lastly, I discuss the summaries of the findings and discuss the implications of the findings for the present hypotheses.

Research Questions and Hypotheses

The present research and data analyses were guided by the following research questions and hypotheses:

RQ1: To what extent, if at all, does patient gender predict 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$1: Patient gender does not predict 30-day hospital readmission rate for ESRD patients in the United States.

$H_1$1: Patient gender predicts 30-day hospital readmission rate for ESRD patients in the United States to a statistically significant degree.

RQ2: To what extent, if at all, does patient race/ethnicity predict 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$2: Patient race/ethnicity does not predict 30-day hospital readmission rate for ESRD patients in the United States.

$H_1$2: Patient race/ethnicity predicts 30-day hospital readmission rate for ESRD patients in the United States to a statistically significant degree.

RQ3: RQ3: Is there a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

$H_0$3: There is not a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

$H_1$3: There is a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States?

Methodology and Research Design

Rationale for the Present Research Design and Methodology

I used a quantitative nonexperimental, correlational methodology using historical data for the present research. This approach was necessary because random assignment was not possible with the demographic variables of interest. In other words, people cannot be randomly assigned to be male or female, for example.

Although causal claims cannot be confidently made with this approach, regression analyses could inform both the strength and the direction of the relationships between gender, race/ethnicity, and readmission rates for ESRD patients (Gallo, 2015; Montgomery et al., 2012). Thus, the independent variables were gender and race/ethnicity, whereas the dependent variables were 30-day readmission rates and ESRD-related hospitalization risk.

Validity and Reliability

The inability to draw causal inferences due to the nonexperimental approach does limit the internal validity of the research. In other words, because the variables of interest are measured and not manipulated, the research is correlational, and the associations

between variables are also inevitably measured and not manipulated (Thompson et al., 2005). The use of real historical hospital data does increase the reliability and external validity of the research, as it is easier to generalize the findings to other real patients. The obtained hospital data spans from 2007 to 2017, limiting the reliability and external validity of the research by limiting the ability to make inferences about ESRD-related hospitalization rates prior to 2007 and after 2017.

Data Collection, Sample, and Sampling Approach

As stated, the study population was U.S. patients who suffer from ESRD and have been hospitalized because of their ESRD with Medicare claims from the period 2017-2018. Although I placed a special interest on the data for Blacks and Hispanics, this study had no racial delimitations. A minimum sample size of 77 of ESRD patients were recruited for this study.

The data was gathered from two different historical databases: the USRDS for the first set and Data.gov for the second. This data was readily and publicly available, allowing me easy access. The large, national datasets available ensure that meeting the minimum sample size requirements was easily achieved and exceeded. The research sample's gender and race/ethnicity were collected using a survey approach. For readmission rates, data was collected by the hospitals and did not require self-reporting on the part of the patients.

For the present study I requested the use of data for the 2016-2018 period for Medicare patients and the variables of hospitalization, 30-day readmission, race/ethnicity, and gender. All these variables were available in the Medicare dataset as per the USRDS

website. The study drew on the Medicare-only portion of the USRDS dataset because data regarding hospitalizations were limited to Medicare patients in this dataset.

Instrumentation

The data in the USRDS comprised actual health outcomes. Given that the data comprised actual health outcomes rather than self-report measures provided by participants, the data in the USRDS was itself extracted from claims-based and enrollment data obtained from the Centers for Medicare & Medicaid Services. The USRDS data is in part available freely for any use through an annual report. However, more complete data for research and analysis are also available upon request.

Results and Analyses

Descriptive Statistics Analysis

Before conducting analyses to test the hypotheses, I conducted analyses to obtain descriptive statistics for variables of interest: gender, race/ethnicity, and 30-day readmission rates after hospitalization. This was done for each of these variables for the data from years 2007 to 2017. The descriptive statistics in terms of mean and standard deviation can be found in Table 1. In terms of gender differences, the sample of the study consisted of two groups, which were male samples and female samples. In terms of race/ethnicity differences, the sample of the study consisted of four groups, which were Non-Hispanic White, Black, Hispanic, and Other/Unknown race.

Table 1

Descriptive Statistics for Gender, Race/Ethnicity, and 30-Day Readmission Rates After Hospitalization (Percentages).

Year	Statistic	Female	Male	Non-Hispanic white	Black	Hispanic	Other/unknown	Readmission rates
2007	*M*	56.15	43.85	81.99	9.38	5.50	3.13	18.20
	SD	1.72	1.72	13.35	8.90	9.17	4.97	2.19
2008	*M*	56.02	43.98	81.72	9.38	5.61	3.29	84.07
	SD	1.69	1.69	13.40	8.92	9.24	5.01	13.97
2009	*M*	55.92	44.08	81.26	9.57	5.74	3.43	83.66
	SD	1.66	1.66	13.54	9.08	9.36	5.02	14.10
2010	*M*	55.76	44.24	80.82	9.76	5.85	3.57	83.27
	SD	1.62	1.62	13.66	9.23	9.44	5.04	14.20
2011	*M*	55.54	44.46	80.46	9.86	5.93	3.75	82.90
	SD	1.58	1.58	13.69	9.29	9.51	5.02	14.23
2012	*M*	55.41	44.59	80.19	9.86	5.94	4.00	82.59
	SD	1.55	1.55	13.66	9.28	9.52	5.04	14.20
2013	*M*	55.22	44.78	79.96	9.84	5.93	4.27	82.28
	SD	1.52	1.52	13.60	9.21	9.52	5.04	14.13
2014	*M*	55.05	44.95	79.93	9.71	5.84	4.52	82.07
	SD	1.46	1.46	13.45	9.15	9.41	5.02	13.99
2015	*M*	54.94	45.06	79.85	9.56	5.80	4.78	81.89
	SD	1.45	1.45	13.28	9.08	9.22	5.01	13.83
2016	*M*	54.88	45.12	79.56	9.47	5.87	5.10	81.63
	SD	1.43	1.43	13.29	9.02	9.24	5.06	13.83
2017	*M*	54.77	45.23	79.57	9.28	5.71	5.45	81.59
	SD	1.40	1.40	13.12	8.95	8.90	5.16	13.67

Assumption Testing

To determine the appropriate analyses, I conducted tests to examine whether specific assumptions were met for normality, homoscedasticity, and linearity. To test the normality assumption, I plotted the distribution of residuals. The figure revealed a normal distribution of residuals, suggesting this assumption was not violated (Figure 1). Two additional measures of normality, Skewness and Kurtosis, were also not violated (p = .35 and p = .81, respectively). I used a different test to examine whether the variability of the variable was unequal across the range of values of a second variable that predicts it, which revealed that the homoscedasticity assumption was not violated (p = .75). To test the linearity assumption, I plotted the residuals against the dependent variable in the model (i.e., readmission rates after hospitalization). The residuals for each of the predictor variables matched the dependent variable in a linear pattern, suggesting linearity was not violated (Figure 2). Given that the linearity assumption was not violated, linear regression analyses were used to test the hypotheses.

Regression Results

I conducted several regression analyses to address the research questions. I conducted one regression using row-wise averages from 2007 to 2017 for each variable and separate regression analyses for each year. I included gender and race/ethnicity as predictor variables in the model and included readmission rates after hospitalization as an outcome variable to test the hypotheses. To test whether there were any significant interactions between gender, race/ethnicity, I included the interaction terms of gender and race/ethnicity as a predictor in the model.

Research Question 1. The first research question was: To what extent, if at all, does patient gender predict 30-day hospital readmission rate for ESRD patients in the United States? The results of the linear regression for RQ1 is presented in Table 2. The results of the regression analysis using row-wise averages from years 2007 to 2017, for each variable of interest, revealed three main effects: the percentage of females (β =1.02, $p < .01$) Blacks (β = .08, $p < .01$), and Hispanics (β = .05, $p < .05$) in the population, all significantly predicted readmission rates after hospitalization. The model was overall significant, R^2 = .35, *CI* [.26, .42], and accounted for 35% of the variance.

The specific regression results to address RQ1 revealed that the percentage of females in the population significantly predicted readmission rates after hospitalization (β = 1.02, $p < .01$). Specifically, higher percentages of females in the population were associated with higher readmission rates after hospitalization. Furthermore, looking at the relationship between gender and readmission rates after hospitalization revealed that in every year until 2015, the percentage of females significantly and positively predicted readmission rates. Based on these results, $H_0$1 can be rejected, as gender does predict readmission rates.

Table 2

Regression Results Using Row-Wise From Years 2007 to 2017, for Each Variable and Hospital Readmission Rates as the Criterion

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL, UL]	Fit
(Intercept)	-38.67	[-77.53, 0.19]			
Interaction	-0.01	[-0.02, 0.00]	-2.97	[-6.02, 0.08]	
Female	1.02**	[0.30, 1.73]	-2.97	[-6.02, 0.08]	
White	0.45	[-0.01, 0.90]	-2.97	[-6.02, 0.08]	
Black	0.08**	[0.04, 0.13]	-2.97	[-6.02, 0.08]	
Hispanic	0.05*	[0.00, 0.09]	-2.97	[-6.02, 0.08]	
					R^2 = .353** 95% CI[.26,.42]

Note. * indicates $p < .05$; ** indicates $p < .01$. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights; *beta* indicates the standardized regression weights; sr^2 represents the semi-partial correlation squared; *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

Research Question 2. The second research question was: To what extent, if at all, does patient race/ethnicity predict 30-day hospital readmission rate for ESRD patients in the United States? I conducted regression analyses using row-wise averages from the years 2007 to 2017 to answer this question. The results of the linear regression for RQ2 are presented in Table 3. These analyses revealed that the percentage of Blacks and

Hispanics in the population both significantly predicted readmission rates after hospitalization ($\beta = .08$, $p < .01$ and $\beta = .05$, $p < .05$, respectively). Specifically, higher percentages of Blacks and Hispanics in the population were associated with higher 30-day hospital readmission rate for ESRD patients in the United States. The percentage of Whites in the population was not associated with hospital readmission rates, *CI* [-0.01, 0.90].

Additionally, I ran separate regression analyses for each year from 2007 to 2017, with race/ethnicity as a predictor in the model and readmission rates after hospitalization as an outcome variable. In 2007, the percentage of Blacks and the percentage of Whites were significant predictors of readmission rates after hospitalization. The percentage of Hispanics significantly and positively predicted readmission rates in 2008 and from 2014 to 2017. The percentage of Whites only positively predicted readmission rates in 2007 and 2008.

Furthermore, looking at the relationship between race and readmission rates after hospitalization revealed that every year until 2015, the percentage of Blacks significantly and positively predicted readmission rates. The full regression results for each year for RQ2 can be found in Table 3. Based on these results, $H_0 2$ can be rejected, as race/ethnicity does predict readmission rates.

Table 3

2008-2017 Regression Analyses of Hypothesized Predictors of Hospital Readmission Rates

Year	Predictor	*b*	*b* 95% CI	*r*	Fit
2008	Female	1.09**	[0.37, 1.82]	.37**	
	White	0.48*	[0.03, 0.94]	-.42**	
	Interaction	-0.01*	[-0.02, -0.00]		
	Black	0.08**	[0.03, 0.13]	.49**	
	Hispanic	0.05*	[0.00, 0.10]	.16**	
					R^2 = .349** 95% CI[.26,.42]
2009	Female	1.10**	[0.35, 1.85]	.38**	
	White	0.47	[-0.00, 0.94]	-.42**	
	Interaction	-0.01*	[-0.02, -0.00]		
	Black	0.08**	[0.02, 0.13]	.48**	
	Hispanic	0.05	[-0.01, 0.10]	.16**	
					R^2 = .341** 95% CI[.25,.41]
2010	Female	0.99*	[0.21, 1.76]	.37**	
	White	0.41	[-0.08, 0.89]	-.41**	
	Interaction	-0.01	[-0.02, 0.00]		
	Black	0.07**	[0.02, 0.13]	.47**	
	Hispanic	0.04	[-0.01, 0.09]	.16**	
					R^2= .318** 95% CI[.23,.38]
2011	Female	0.91*	[0.13, 1.70]	.36**	
	White	0.39	[-0.10, 0.89]	-.39**	
	Interaction	-0.01	[-0.02, 0.00]		
	Black	0.09**	[0.04, 0.14]	.48**	
	Hispanic	0.04	[-0.01, 0.09]	.12*	
					R^2 = .308** 95% CI[.22,.38]
2012	Female	0.81*	[0.06, 1.55]	.38**	
	White	0.30	[-0.17, 0.78]	-.41**	
	Interaction	-0.01	[-0.01, 0.00]		
	Black	0.08**	[0.03, 0.12]	.48**	

Year	Predictor	*b*	*b* 95% CI	*r*	Fit
	Hispanic	0.03	[-0.02, 0.08]	.14*	
					R^2 = .320**
					95% CI[.23,.39]
2013	Female	0.92*	[0.22, 1.63]	.37**	
	White	0.41	[-0.04, 0.87]	-.42**	
	Interaction	-0.01	[-0.02, 0.00]		
	Black	0.08**	[0.04, 0.13]	.50**	
	Hispanic	0.04	[-0.00, 0.09]	.14*	
					R^2 = .336**
					95% CI[.24,.40]
2014	Female	0.86*	[0.11, 1.61]	.36**	
	White	0.39	[-0.09, 0.88]	-.40**	
	Interaction	-0.01	[-0.02, 0.00]		
	Black	0.10**	[0.05, 0.15]	.50**	
	Hispanic	0.05*	[0.01, 0.10]	.13*	
					R^2 = .322**
					95% CI[.23,.39]
2015	Female	0.74	[-0.01, 1.49]	.34**	
	White	0.33	[-0.16, 0.82]	-.39**	
	Interaction	-0.01	[-0.01, 0.00]		
	Black	0.10**	[0.05, 0.14]	.46**	
	Hispanic	0.06**	[0.02, 0.11]	.15**	
					R^2 = .289**
					95% CI[.20,.36]
2016	Female	0.73	[-0.04, 1.51]	.35**	
	White	0.32	[-0.19, 0.82]	-.40**	
	Interaction	-0.01	[-0.02, 0.00]		
	Black	0.09**	[0.05, 0.14]	.46**	
	Hispanic	0.06*	[0.01, 0.10]	.16**	
					R^2 = .287**
					95% CI[.20,.35]
2017	Female	0.53	[-0.23, 1.29]	.35**	
	White	0.18	[-0.33, 0.68]	-.42**	
	Interaction	-0.00	[-0.01, 0.01]		
	Black	0.10**	[0.06, 0.14]	.46**	
	Hispanic	0.07**	[0.03, 0.12]	.19**	
					R^2 = .310**
					95% CI[.22,.38]

Note. * indicates $p < .05$; ** indicates $p < .01$. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights;

beta indicates the standardized regression weights; sr^2 represents the semi-partial correlation squared; *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

Research Question 3. The third research question was: Are there any significant interaction impact between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States? To test whether there are any significant interactions between gender and race/ethnicity, I conducted regression analyses were conducted with the interaction between gender and race/ethnicity as a predictor in the model. This interaction was significant, β = -.01, $p < .05$. The interaction was such that at lower levels of females in the population, levels of Whites in the population have no significant relationship with hospital readmission rates. However, at higher levels of females in the population, fewer (vs. more) Whites in the population are associated with *higher* hospital readmission rates. The interaction between race and gender was only significant in 2007, 2008, and 2009. The full regression results can be found in Table 4. The regression results for the interaction between gender and race/ethnicity in predicting readmission rates for years 2008-2017 can be found in Table 4. Based on these results, null hypothesis $H_0$3 can be rejected, as there was a significant interaction between the percentage of females in the population and the percentage of Whites in the population, with regards to hospital readmission rates.

Table 4

2007 Regression Results Using Hospital Readmission Rate as the Criterion

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL, UL]	Fit
(Intercept)	-45.34*	[-83.75, -6.92]			
Female	1.16**	[0.45, 1.86]	0.91	[0.36, 1.46]	
White	0.51*	[0.07, 0.95]	0.91	[0.36, 1.46]	
Interaction	-0.01*	[-0.02, -0.00]	0.91	[0.36, 1.46]	
Black	0.07**	[0.02, 0.12]	0.91	[0.36, 1.46]	
Hispanic	0.05	[-0.00, 0.09]	0.91	[0.36, 1.46]	
					R^2 = .354** 95% CI[.26,.42]

Note. * indicates $p < .05$; ** indicates $p < .01$. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights; *beta* indicates the standardized regression weights; sr^2 represents the semi-partial correlation squared; *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

Summary

Section 3 presented the results of the quantitative analysis to test the different research questions of the study. The study outcomes can be found in tables and graphs with descriptive narratives. I used SPSS for the data analysis. The first information presented included in the result section is for the descriptive statistics summaries of the study variables. Then, parametric assumption testing results, including normality, homoscedasticity, and linearity were discussed. This analysis was followed by the discussion of the results of the different regression analyses to address the three different research questions of this study. This chapter ended with a summary of the results.

Taken together, the results of the different regression analyses have several implications for the posed research questions. For RQ1, the regression analysis results resulted in the rejection of $H_0$1, as gender (i.e., the percentage of females in the population) was a significant predictor of hospital readmission rates every year until 2015.

For RQ2, the regression analysis results resulted in the rejection of $H_0$2, as race/ethnicity was a significant positive predictor of hospital readmission rates. Specifically, the percentage of Blacks significantly and positively predicted hospital readmission rates almost every year. The percentage of Hispanics significantly and positively predicted readmission rates in 2008 and from 2014-2017. The percentage of Whites only positively predicted readmission rates in 2007 and 2008.

For RQ3, results of the regression analysis resulted to the partial rejection of $H_0$3 because the interaction between race and gender was significant in 2007, 2008, and 2009. Specifically, the interaction impact showed that at lower levels of females in the population, levels of Whites in the population have no significant relationship with hospital readmission rates. However, at higher levels of females in the population, fewer (vs. more) Whites in the population are associated with *higher* hospital readmission rates.

The following section, Section 4 concludes this study. Implications of the results of the data analysis were discussed in detail in Section 4. Suggestions on how the findings may be applied in an organizational setting and a summary of recommendations for future research are also discussed in Section 4.

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

Introduction

ESRD is a severe issue in the medical field today. ESRD affects over two million people globally (Robinson et al., 2016). One type of treatment for ESRD is hemodialysis, an external filtration device that cleanses the patient's blood instead of the kidney doing so. The primary remedy for ERSD is a kidney transplant, but a donor kidney is difficult to obtain as there is often a lack of supply to meet the demand, and therefore, the problems associated with ESRD lead to frequent emergency department visits and hospital readmissions (Robinson et al., 2016). ESRD patients must contend with other issues such as socioeconomic and demographic differences. A major concern is racism, particularly for Black people, which various studies have shown predict worse than average ESRD outcomes, indicating that a psychosocial element may be associated with treatment (Savage, 2017). The purpose of this quantitative nonexperimental, historical, correlational design was to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. This section will look at the interpretation of the findings as they relate to the literature, limitations, recommendations, and implications for social change. It will close with a conclusion.

Theoretical Foundation

I selected a theoretical foundation to guide and contextualize this research. This framework was a theory of the determinants of avoidable readmissions in ESRD by Matthew et al. (2015). The theory illustrates the characteristics that cause preventable hospital readmissions for the disease. These characteristics can be length of hospital stay,

quality of the hospital, its dialysis facility, the doctors and care providers, and how the treatment is paid for. However, this study only included one aspect of the theory. This aspect was the role of patient characteristics. As the innumerable factors that cause avoidable readmission are interconnected, it is important to understand the relationship between variables (Matthew et al., 2015). Through the focus on demographic and socioeconomic variables, hospitals may be provided with increased resources to mitigate this problem, thereby allowing this theory to expand.

Interpretation of the Data

I used regression analysis to understand the relationships between the variables and readmission rates of ESRD patients (see Gallo, 2015; Montgomery et al., 2012). The study results are as follows: I rejected the null hypothesis of RQ1 and found that gender, in this case the percentage of females, was a significant predictor of hospital readmission rates in every year into 2015. I also rejected the null hypothesis for RQ2 as race/ethnicity was found to have a significant positive predictor of hospital readmission rates. Of the races, Blacks have the highest readmission rate, with Hispanics also maintaining high rates. Lastly, I rejected the null hypothesis of RQ3 as there was zero correspondence between race and gender in the years 2007, 2008, and 2009.

Interpretation of the Findings

Research Question 1

The first research question asked to what extent, if at all, a patient's gender predicts 30-day hospital readmission rate for ESRD patients in the United States. After regression analysis, the study found a statistically significant relationship between

females in the population and readmission rates after hospitalization, thereby rejecting the null hypothesis. More specifically, males are much less likely to have high readmission rates when compared to females in every year until 2015. Thus, there was a statistically significant relationship between gender and readmission rates after hospitalization.

The results of the relationship between gender and readmission rates are difficult to dispute as the sample of 77 Medicare patients came from archived sources. A random assignment was not applied because of the need to select the chosen demographic variables. Regression analysis was the strongest analysis approach to determine the relationship between gender and readmission rates due to the targeted sample (see Gallo, 2015; Montgomery et al., 2012).

In a study by Chan et al. (2017), the authors examined predictors for 30-day readmission rates for ESRD and found gender to be a significant independent predictor. This is supported in a separate study by Chan (2017), which found that age, female gender, and comorbidities all influence 30-day readmission rates. Neugarten and Reckelhoff (2015) studied kidney disease across various animals and found that ESRD progressed more quickly in males than females. The authors suggested that sex hormones rather than the physical structure of genders predicted differences with the disease. However, the suggestion that it is sex hormones rather than gender itself goes against this study's results as the results indicated a statistically significant relationship between the ESRD readmission rates and gender. This is not to discount Neugarten and Reckelhoff (2015), but their study results focused on animals rather than humans.

This study aligned with the theoretical framework of Matthew et al. (2015), which highlighted that patient characteristics represent an important factor in ESRD. Matthew et al. suggested that by studying single demographics, there could be increased knowledge of the broader issues of the disease. This was certainly the case with RQ1, as it showed that women had higher rates than men, yet remained underserved in terms of treatment. These results could help reduce avoidable readmissions due to a lack of treatment from a healthcare provider.

Research Question 2

The second research question asked to what extent, if at all, a patient's race/ethnicity predicts 30-day hospital readmission rate for ESRD patients in the United States. The study found a significant relationship between readmission rates and ethnicity, specifically among Black and Hispanic patients. Black individuals, however, had the highest rate of ESRD, with Hispanics coming in second, yet both were much more significant when compared to Whites.

In general, diseases such as diabetes and hypertension differ among varying ethnic groups (Webster et al., 2017). This information can also be applied to ESRD and other related factors. Lovasik et al. (2016) noted that not only does race predict ESRD outcomes, but it can also affect other predictors. An example of this would be a dietary acid load, which can predict the development of kidney disease and its progression among different races and ethnicities, in this case, Whites and Blacks (Crews et al., 2018). Crews et al. (2018) pointed out that through the various stages of renal disease among racial groups, Black people had a disadvantage with higher rates.

As noted earlier, race can be linked to different socioeconomic conditions. In a study by Nee et al. (2017), the authors noted that care availability differs by demographics. Patients who have easy access to nephrology before reaching ESRD had lower mortality and morbidity rates (Gillespie et al., 2015). Therefore, those of different races need to receive the same treatment as those in other socioeconomic groups. Nee et al. (2017) studied a sample of 739,537 patients from 2007-2012 and found that those in poverty who have Medicare and Medicaid eligibility were less likely to undergo pre-ESRD nephrological care, especially Blacks and Hispanics when compared to Whites. Therefore, Gillespie et al. (2015) noted that this put impoverished and racial minorities at a greater risk for ESRD mortality than Whites. This risk can also affect employment status and insurance availability. Cervantes et al. (2018) noted that those with access to dialysis regularly could decrease the risk of mortality up to 14 times compared to emergency access later.

Newman et al. (2016) examined racial differences in the hospitalization of patients who wait on kidney transplants. The study had a sample of 24,582 patients between 2005 and 2009. The results found that hospitalized patients were less likely to receive a kidney transplant, and, unfortunately, Blacks and Hispanics had higher rates of hospitalization than Whites. The higher rate of hospitalization creates an uneven playing field for those who need kidney transplants**.**

However, not all differences regarding race and ethnicity can be placed squarely on treatment. Savage (2017) found that Black ESRD patients were less likely to adhere to treatment guidelines than other races and ethnicities. One reason for this might be

perceived racism in the healthcare system, as participants stated that they felt everyday racism with the medical community. This everyday racism diminishes the participants' willingness to adhere to guidelines for ESRD treatment. When coupled with the likelihood of increased chances of ESRD and reduced healthcare access, this creates a negative incentive to receiving and maintaining positive treatment.

Like RQ1, the theoretical framework was relevant to this result as race can affect ESRD treatment. These broader principles can reveal discrepancies such as differences in healthcare access among varying demographics and socioeconomic statuses. This affects the way that healthcare is received (Newman et al., 2016). Webster et al. (2017) pointed out that differences among groups can influence ESRD through differing contexts. Typically, avoidable readmissions can be reduced through treatment; however, when there is a failure of the healthcare provider or self-care, treatment can be worsened. Therefore, Matthew et al.'s (2015) framework holds that the narrow results may link to broader issues.

Research Question 3

RQ3 asks if there is a significant interaction between gender and race/ethnicity in predicting 30-day hospital readmission rate for ESRD patients in the United States. Using regression analysis, I focused on gender and race/ethnicity as predictors in the model. There was found to be a significant relationship between both variables; however, there were some inconsistencies. At lower levels of females in the population, levels of whites had no relationship with hospital readmission. However, more females versus more Whites were associated with higher hospitalization rates. The interaction between race

and gender only occurred in 2007, 2008, and 2009. Nevertheless, these results were enough to reject the null hypothesis.

The results of this research question were not surprising. As RQ1 through RQ3 were all found to have statistically significant relationships, it would be shocking to find no correlation between the variables. Additionally, the literature review agreed with the previous research questions, thus further validating the results.

For example, Patzer et al. (2015) found that impoverished patients are less likely to be referred for kidney transplants. Additionally, Nee et al. (2017) found that those in poverty are less likely to have pre-ESRD nephrology than those with money and that those in poverty, as measured by Medicare and Medicaid eligibility, were less likely to receive care as regards to race for Blacks and Hispanics relative to Whites. Gillespie et al. (2015) summed this up in their study that showed impoverished and racial minorities are at risk for 1st-year mortality. Lastly, Shah et al. (2018) found that women are 6% less likely to be given information about kidney transplants than men. Therefore, the combination of these studies reinforces the results of the RQ3. Most importantly, the results of the RQ3 strengthen the theoretical framework. Each response to the research question showed that smaller individual variables could reflect broader issues when regarding ESRD. Each one of these variables provides further opportunity for future research.

Limitations

This study had numerous limitations. The first limitation was that the data was secondary. No data was gathered by me, meaning that I had no control over the data

collection process and how precise it was. This process left me to assume that the data was accurate while potentially leaving the door open for possible data errors that cannot be predicted. The second limitation also regarded data. Although there is a large sample size that offered strong external validity, the gathered data was only for Medicare and Medicaid patients. The use of only Medicare and Medicaid patients limits the generalization of the results to the full population. The third limitation was that only public data sets were utilized in the study. Private data sets may offer different outcomes, especially regarding race and gender. The final limitation was that the final research question did not explain why disparities may exist between gender and race/ethnicity. While there was a significant relationship between the variables, it only occurred during certain years. Without further research, it is unknown why these years were more important than others.

One issue with the research's internal validity was that there was an inability to create patient inferences due to the nonexperimental approach. The variables of interest are measured and unmanipulated, leaving the research correlational and the associations between the variables uninfluenced. Additionally, the use of real historical hospital data did increase the reliability and external validity of the investigation, as it makes it easier to generalize the results to other patients. However, due to the study's historical timeframe, the reliability and external validity were limited only to the time selected.

Recommendations

This study's results have yielded recommendations that I propose for future research, practical recommendations that could be used to improve health outcomes, and

implications for social change. Much like the theoretical framework suggested, concentrating on smaller aspects of ESRD patients can provide insight into the bigger picture. The new emphasis on gender, race, and socioeconomic status during diagnosis and treatment can reduce complications. Blacks and Hispanic patients and those with reduced resources should be provided with the appropriate knowledge and treatment from the beginning of the diagnosis. A renewed emphasis on studying these demographics could provide further insight into the phenomenon. Further research could focus on how these demographics are treated and what information is given to them throughout their medical diagnosis and treatment. Issues regarding race can further be broken down to better understand how differences affect patients throughout the treatment process. Also, socioeconomic conditions mixed with geographic locations could provide a better understanding of how a lack of resources and availability affects ESRD patients.

Other recommendations for future research would be to replicate the current study, but include more data sets, both publicly available and those created for an individual focus. The result of a study like this could help contribute to the external validity of this study. Data can also come from various countries to help determine the effectiveness of treatment within the United States. Additionally, variables such as education and age can be used to understand the phenomenon further. Like the theoretical framework stated, focusing on smaller subsets can provide greater insight. Finally, a change in research design, such as quantitative to qualitative, can provide greater information. Understanding the process from the doctors' or patients' point of view can help understand the deficits within the treatment process.

A shift to a qualitative study could also explore ESRD. Understanding the patients' and doctors' points of view could shed light on the phenomenon in ways a quantitative methodology just could not. For instance, it would be interesting to compare demographics in relation to the care that they receive. This would provide first hand knowledge of any discrepancies of treatment between races. Another study could qualitatively explore what knowledge and education the patients receive post discharge. Doing so, may indicate ways in which ESRD education can be improved.

Implications for Positive Social Change

This study yielded a variety of options for positive social change. Primarily doctors and healthcare providers can place a much-needed emphasis on these highlighted groups which can now be diagnosed and treated with the appropriate amount of attention. By treating these patients early and often, there could be a less financial burden on the patients and institutions and an increased lifespan in early access to get on a kidney transplant list. An increased lifespan strengthens families and reduces patient stress.
A renewed focus on providing appropriate treatment, knowledge and literature can also help mitigate readmission rates. Knowing that women have a higher readmission rate allows doctors and specialists to place more emphasis on ESRD during the patient's initial visits. More emphasis could be placed on preventative measures and early treatment, such as dialysis, to help reduce readmission rates. Additionally, it would behoove both the doctor and the patient to screen early and often for ESRD, especially as they get older. Women could also be made more aware of the likelihood that they could be diagnosed with ESRD. Patients could be educated on high blood pressure, diabetes

and other diseases which may relate to ESRD. Literature, such as pamphlets, can be distributed early and often highlights the importance and dire consequences of the disease. This knowledge could then be used for preventative measures to help mitigate and reduce the likelihood of contraction. Women are up against barriers that prevent them from receiving the same treatment and knowledge as men. By focusing in the future on women's treatment, this discrepancy can be rectified. Women could be given more knowledge and access, thereby reducing mortality rates.

Conclusion

The purpose of this quantitative nonexperimental historical, correlational design was to determine the extent to which gender and race/ethnicity predict 30-day readmission rates after hospitalization for ESRD patients. The study also examined interactions between these predictors on the overall risk of ESRD-related hospitalization. The study found that gender and race can all be predictors of ESRD hospitalization and therefore readmissions. Future research should further expand the data to understand other variables, and practical implications should focus on giving these groups the treatment of knowledge they need as early as possible.

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