COMPARATIVE ANALYSIS OF EMERGENCY ROOM VISITS AND INPATIENT ADMISSIONS FOR PATIENTS WITH CHRONIC KIDNEY DISEASE

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ABSTRACT

BACKGROUND:

Emergency Department (ED) is a zone of a hospital created to provide emergency care, and 3.5% of adult visits to the ED in the United States are often made by those with Chronic Kidney Disease (CKD). The purpose of this study is to examine ED visits and their association with age, gender, race, Socioeconomic status (SES), number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, severity of illness, and number of chronic conditions in a cohort of patients with CKD.

METHOD:

The research methodology for this study is a quantitative correlational design study. The quantitative correlational research design measures the relationship between two variables, ED visits, and the 13 independent variables. Patient data is retrieved from the National Emergency Department Sample (NEDS). The researcher uses a Medical Loss Ratio (MLR) and Analysis of Variance (ANOVA) data tools to analyze the data collected from the study participants.

RESULTS:

There are 197,779 patients with CKD in the dataset. The results reveal that age is a significant predictor of likelihood of morality \((p < .001)\), gender is not a significant predictor of likelihood of morality \((p = .172)\), the overall logistic regression model is not statistically significant \((p = .127)\) for SES, the number of comorbidities is a significant predictor of likelihood of morality \((p < .001)\), the number of procedures is a significant predictor of likelihood of morality \((p < .001)\), severity is a significant predictor of
likelihood of morality ($p < .001$), and all predictors with the exception of SES were significant to predictors of length and hospital stay.

**CONCLUSION:**

According to the findings of the study, (a) an increase in age by one year would result in increased odds of mortality by $1.002$ times, (b) gender was not a significant predictor of morality, (c) SES was a significant predictor of morality, (d) the number of comorbidities was a significant predictor of morality, (e) the number of procedures was a significant predictor of mortality.
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Chapter I: INTRODUCTION

Chronic kidney disease (CKD) is a longstanding disease of the kidneys, which can lead to failure and a gradual loss of kidney function over time (Patel et al., 2017). CKD results in significant dyslipidemia and profound changes in lipid and lipoprotein metabolism (Chen et al., 2017). The associated dyslipidemia can cause progression of CKD and cardiovascular complications (Chen et al., 2017). CKD is also an important risk factor for coronary artery disease (Patel et al., 2017). In the United States, 15% of adults or approximately 37 million people have CKD while nearly 90% of them do not know they have CKD (Centers for Disease Control and Prevention [CDC], 2019).

Emergency Department (ED) is a zone of a medical clinic particularly arranged and staffed for emergency or trauma care administration (Rabbiyah & Zeeshan, 2019). 3.5% of adult visits to the ED in the United States were made by those with CKD during 2015-2016 (CDC, 2019). The focus of this study is ED visits and their association with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, severity of illness, and number of chronic conditions in a cohort of inpatients with CKD in the US. Chapter I will focus on introduction. The researcher will introduce and discuss the background of the problem, the statement of the problem, the definitions, the hypotheses, and the need for the study.

Background of the Problem

CKD is more common among people aged 65 years or older than in people aged 45–64 years or 18–44 years (Carrero et al., 2018; CDC, 2019; Curiati et al., 2020; Kim et
McQueen et al. (2017) indicated the estimated Medicare spending for patients with CKD over 65 years old exceeded $50 billion in 2014, which represented 20% of all Medicare spending for that age group. Carrero et al. (2018) found elderly women were more inclined to choose conservative care instead of renal replacement therapy. Koyner et al. (2018) used demographics, vital signs, diagnostics, and interventions in a Gradient Boosting Machine algorithm to predict serum creatinine–based Kidney Disease Improving Global Outcomes stage 2 chronic kidney injury. Koyner et al. suggested readily available electronic health record data could be used to predict impending chronic kidney injury prior to changes in serum creatinine with excellent accuracy across different patient locations and admission serum creatinine. Curiati et al. (2020) employed a retrospective cohort study of patients aged 70 years or older who visited a geriatric ED for a total of 5,025 visits in Brazil. Curiati et al. revealed hospital admission was best predicted by a model including male sex, aged 90 years or older, hospitalization in the previous 6 months, weight loss greater than or equal to 5% in the previous year, acute mental alteration, and chronic functional decline (Curiati et al., 2020). Rapp et al. (2021) examined the pathophysiology of the chronic respiratory syndrome in the setting of coronavirus disease 2019 (COVID-19) and revealed older age and CKD were significantly associated with increased risk of death.

CKD is more common in women than men (Carrero et al., 2018; CDC, 2019; Curiati et al., 2020; Golestaneh et al., 2018; Kim et al., 2018; McQueen et al., 2017). While a higher percentage of visits were made by men with CKD than women (CDC,
2019). CKD epidemiology differs by sex, affecting more women than men, especially about stage G3 CKD (Carrero et al., 2018). However, Carrero et al. (2018) indicated kidney function declined faster in men than women due to unhealthier lifestyles and the protective effects of estrogens in women or the damaging effects of testosterone. Carrero et al. also found dissimilarities between men and women in the outcomes of CKD (Carrero et al., 2018). In patients with predialysis CKD, mortality is higher in men than women (Carrero et al., 2018). In national samples drawn from the United States Renal Data System (USRDS), Golestaneh et al. (2018) explored the association of gender with avoidable ED visits and revealed female patients utilized the ED and inpatient services at a higher rate than their male counterparts and had a higher rate of re-hospitalization (Golestaneh et al., 2018). Golestaneh et al. also indicated female sex was not significantly associated with a higher rate of avoidable ED visits in the total cohort. Golestaneh et al. also suggested the association of gender with hospitalization outcomes were not consistent across different types of populations with some mediation possible by SES and marital status in poorer neighborhoods. According to the Centers for Disease Control and Prevention (CDC), a higher percentage of visits were made by men with CKD than women (CDC, 2019).

CKD is more common in non-Hispanic blacks than in non-Hispanic whites or non-Hispanic Asians (CDC, 2019). A higher percentage of ED visits were made by non-Hispanic black men with CKD than women (CDC, 2019). In total, about 14% of Hispanics have CKD (CDC, 2019). Golestaneh et al. (2018) explored the association of
gender with avoidable ED visits made by a cohort of patients on hemodialysis in a mostly minority, lower socioeconomic status (SES), population in the Bronx. Using Montefiore’s clinical database to build a cohort of patients on hemodialysis with a first ED visit between 2013 and 2017, Golestaneh et al. also tested the association of demographic and clinical variables with gender and revealed female patients on hemodialysis in the cohort were older, more commonly black, had lower SES scores, less commonly had commercial insurance, and were less commonly married than their male counterparts. Golestaneh et al. further indicated marital status, SES, and hemoglobin levels possibly mediated the association of sex and outcome in the population. Meghani et al. (2020) aimed to identify independent predictors of the type of opioid prescribed to cancer outpatients and determine if race and CKD independently predicted prescription type, adjusting for relevant sociodemographic and clinical confounders. Meghani et al. revealed racial disparities in the analgesic adverse effects of patients were partially mediated by the type of opioid prescribed to African Americans despite the presence of certain comorbidities, such as renal disease. Meghani et al. also indicated the estimated odds for African Americans to receive morphine were 2.573 times that for Whites after controlling for insurance type, income, and pain levels.

CKD almost universally occurs in individuals with other medical problems (Bowling et al., 2017; McQueen et al., 2017). Over 70% of the $50 billion spent on CKD was incurred by patients with comorbid diabetes, heart failure, or both (McQueen et al., 2017). Conducting a retrospective cohort study at veterans’ affairs (VA) medical centers,
Bowling et al. (2017) examined 821,334 VA patients aged between 18 and 100 years with at least one outpatient visit and incident CKD for at least three months between 2005 and 2008. Using mortality, hospitalizations, and ED visits as measurements, Bowling et al. found higher risks of death, hospitalization, and ED visits were associated with higher number of chronic conditions, among those with and without discordant or unrelated conditions. Bowling et al. suggested the presence of one or more discordant or unrelated conditions was associated with increased risk for adverse health outcomes, beyond the effect of multi-morbidity. McQueen et al. (2017) indicated a large portion of patients with diabetes had comorbid CKD in the United States.

Patients with CKD and diabetic retinopathy showed the highest mortality rate (Li et al., 2018). Patel et al. (2017) retrospectively analyzed the 2006-2012 National Inpatient Sample Database and found percutaneous coronary intervention was associated with a lower risk of hospital mortality across all degrees of CKD. The performance of percutaneous coronary intervention independently predicted lower in-hospital mortality. Li et al. (2018) investigated the effects of diabetic retinopathy and CKD on mortality in type 2 diabetic patients with norm albuminuria. Li et al. indicated the patients with CKD and diabetic retinopathy showed the highest mortality rate. The risks of all-cause mortality and cardiovascular mortality were significantly greater in patients with CKD and diabetic retinopathy than in those without CKD or diabetic retinopathy, after adjusting for the associated risk factors (Li et al., 2018). Kim et al. (2018) explored the risk factors for the development of CKD in septic shock patients with Chronic Kidney
Injury. Employing a single-site, retrospective cohort study using a registry of adult septic shock patients, Kim et al. found in patients with stage 1 Chronic Kidney Injury, 10% developed CKD, and mortality was 13% at one year; in patients with stage 2 and 3 AKI, the CKD rate was 6%, and the mortality rate was 42% and 47%, respectively. Employing a retrospective cohort study of patients aged 70 years or older who visited a geriatric ED for a total of 5,025 visits in Brazil, Curiati et al. (2020) found overall, 57% of the participants were women, 31% were hospitalized, and 1% died in the hospital.

Curiati et al. (2020) developed prediction models for hospital admission and prolonged length of stay in older adults admitted from the ED. Curiati et al. indicated the prediction of prolonged length of stay retained the same variables, except male sex, which was substituted for fatigue. Curiati et al. suggested the PRO-AGE scoring system could predict hospital admission and prolonged length of stay in older adults with good accuracy.

The economic burden of CKD is a significant contributor to overall healthcare spending in the United States (McQueen et al., 2017). Medicare spending for patients with CKD over 65 years of age exceeded $50 billion in 2014, which represented 20% of all Medicare spending for that age group (McQueen et al., 2017). McQueen et al. (2017) demonstrated an increased economic burden as kidney function declined further supported early intervention with strategies that deterred disease progression in patients with diabetes, at least starting in stage 3A CKD, if not earlier. Golestaneh et al. (2018) revealed female patients on hemodialysis in the cohort were older, more commonly
black, had lower SES scores, less commonly had commercial insurance, and were less commonly married than their male counterparts. Meghani et al. (2020) indicated the presence of private health insurance was negatively associated with the prescription of morphine and positively associated with prescription of oxycodone. Meghani et al. suggested both race and insurance type independently predicted type of opioid selection for cancer outpatients.

A review of the literature pertaining to ED visits and CKD reveals it remains unclear about the associations of ED visits with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, severity of illness, and number of chronic conditions in a cohort of inpatients with CKD in the US. In response, the researcher aims to explore this phenomenon using a retrospective cohort study. In an attempt to fill the gap in research and the literature, the findings of this study could advance knowledge.

**Statement of the Problem**

To problem to be addressed in the study are the ED visits and their association with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions in a cohort of inpatients with CKD in the US. CKD can lead to renal failure, a gradual loss of kidney function over time, and significant dyslipidemia and profound changes in lipid and lipoprotein metabolism (Chen et al., 2017; Patel et al., 2017). In the United States, 15% of adults or approximately 37 million people have CKD
(CDC, 2019). 3.5% of adult visits to the ED in the United States were by those with CKD during 2015-2016 (CDC, 2019). The general problem is inappropriate medication dosing and ineffective treatment for patients with CKD have led to their development of related adverse events (Saad et al., 2019). The specific problem is it remains unclear the associations of ED visits with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions among inpatients with CKD.

**Definitions**

*Chronic kidney disease (CKD).* Also known as chronic kidney failure is a longstanding disease of the kidneys leading to renal failure and a gradual loss of kidney function over time (Patel et al., 2017).

*Comorbidity.* In medicine, comorbidity is the presence of one or more additional conditions often co-occurring with a primary condition (McQueen et al., 2017).

*Emergency Department (ED).* Also known as an emergency room, the emergency department is a zone of a medical clinic particularly arranged and staffed for emergency or trauma care administration, prevalently called emergency or crisis room (Rabbiyah & Zeeshan, 2019). A crisis is expressed as a circumstance that represents an impending danger to human life, property, or condition (Rabbiyah & Zeeshan, 2019).

*Inpatient.* A patient who stays in a hospital while under treatment (Bovonratwet et al., 2017).
Socioeconomic status (SES). Socioeconomic status (SES) encompasses income, educational attainment, financial security, subjective perceptions of social status and social class, quality of life attributes, and the opportunities and privileges afforded to people within society (Golestaneh et al., 2018).

Hypotheses

The purpose of this quantitative study is to examine ED visits and their association with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, severity of illness, and number of chronic conditions in a cohort of inpatients with CKD.

The researcher developed the following research questions with hypotheses:

**RQ1.** Are ED visits associated with age among inpatients with CKD in the United States?

H1\_O. ED visits are not associated with age among inpatients with CKD in the United States.

H1\_A. ED visits are associated with age among inpatients with CKD in the United States.

**RQ2.** Are ED visits associated with gender among inpatients with CKD in the United States?

H2\_O. ED visits are not associated with gender among inpatients with CKD in the United States.
H2_A. ED visits are associated with gender among inpatients with CKD in the United States.

**RQ3.** Are ED visits associated with race among inpatients with CKD in the United States?

H3_O. ED visits are not associated with race among inpatients with CKD in the United States.

H3_A. ED visits are associated with race among inpatients with CKD in the United States.

**RQ4.** Are ED visits associated with SES among inpatients with CKD in the United States?

H4_O. ED visits are not associated with SES among inpatients with CKD in the United States.

H4_A. ED visits are associated with SES among inpatients with CKD in the United States.

**RQ5.** Are ED visits associated with number of procedures among inpatients with CKD in the United States?

H5_O. ED visits are not associated with number of procedures among inpatients with CKD in the United States.

H5_A. ED visits are associated with number of procedures among inpatients with CKD in the United States.
RQ6. Are ED visits associated with insurance type among inpatients with CKD in the United States?

H6O. ED visits are not associated with insurance type among inpatients with CKD in the United States.

H6A. ED visits are associated with insurance among inpatients with CKD in the United States.

RQ7. Are ED visits associated with comorbidities among inpatients with CKD in the United States?

H7O. ED visits are not associated with comorbidities among inpatients with CKD in the United States.

H7A. ED visits are associated with comorbidities among inpatients with CKD in the United States.

RQ8. Are ED visits associated with length of stay among inpatients with CKD in the United States?

H8O. ED visits are not associated with length of stay among inpatients with CKD in the United States.

H8A. ED visits are associated with length of stay among inpatients with CKD in the United States.

RQ9. Are ED visits associated with admission type among inpatients with CKD in the United States?
H9o. ED visits are not associated with admission type among inpatients with CKD in the United States.

H9A. ED visits are associated with admission type among inpatients with CKD in the United States.

**RQ10.** Are ED visits associated with risk of mortality among inpatients with CKD in the United States?

H10o. ED visits are not associated with risk of mortality among inpatients with CKD in the United States.

H10A. ED visits are associated with risk of mortality among inpatients with CKD in the United States.

**RQ11.** Are ED visits associated with CKD type among inpatients with CKD in the United States?

H11o. ED visits are not associated with CKD type among inpatients with CKD in the United States.

H11A. ED visits are associated with CKD type among inpatients with CKD in the United States.

**RQ12.** Are ED visits associated with severity of illness among inpatients with CKD in the United States?

H12o. ED visits are not associated with severity of illness among inpatients with CKD in the United States.
H12\textsubscript{A}. ED visits are associated with severity of illness among inpatients with CKD in the United States.

**RQ13.** Are ED visits associated with number of chronic conditions among inpatients with CKD in the United States?

H13\textsubscript{O}. ED visits are not associated with number of chronic conditions among inpatients with CKD in the United States.

H13\textsubscript{A}. ED visits are associated with number of chronic conditions among inpatients with CKD in the United States.

**The Need for the Study**

This study could advance knowledge and contribute to the scholarship of ED visits and CKD. Meghani et al. (2020) recommended larger clinical studies to fully understand the sources and clinical consequences of racial differences in CKD. Moreover, a review of the literature pertaining to ED visits and CKD reveals it remains unclear about the associations of ED visits with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, severity of illness, and number of chronic conditions in a cohort of inpatients with CKD in the US. As such, this study could fill the gap in research and the findings of this study could benefit researchers and scholars in the fields of clinical research, critical care, and CKD studies.

This study could also make practical implications. McQueen et al. (2017) highlighted the importance of early identification and clinical intervention for CKD in
patients with diabetes as a strategy to mitigate progression of CKD. Carrero et al. (2018) suggested an improved understanding of sex and gender-specific differences in the etiology, mechanisms, and epidemiology of CKD could help nephrologists better address the needs of their patients. Carrero et al. also called for addressing the differences in the underlying pathophysiology of disease as well as societal factors to reduce disparities in access to care and outcomes for patients with CKD. Kim et al. (2018) suggested physicians focus on the recovery of renal function and ensure the careful follow-up of patients with risk factors for the development of CKD. Therefore, the results of the study could benefit patients with CKD, nephrologists, physicians, and the local communities.
Chapter II: LITERATURE REVIEW

Introduction

Chronic Kidney Disease (CKD) is a kidney disease characterized by the kidney's malfunctioning over a period of over three months. In the US and globally, CKD is considered a global medical state. Nearly 10% of the population globally suffers from Chronic kidney disease (Pavkov et al., 2018). The condition is less threatening and has increased as an overwhelming medical burden. Failure to diagnose and treat CKD in its early stages risks its progression in the advanced stage (Peleg et al., 2020). In the advanced stage, the progression of CKD becomes a complex issue as the kidney becomes malfunctions. In such instances, patients are to enroll for dialysis. Other complications may include adverse health outcomes among individuals, increased hospitalization rate, and the emergency department's overutilization (Chang et al., 2018). This literature review focuses on exploring the possible link between emergency department visits and social demographic factors such as age, income, gender, and race. To address these objectives, the literature review section will be divided into different sections. The sections include literature strategy, theoretical model.

The overall prevalence of chronic kidney disease in a study conducted by Tonelli et al. (2020) was 61.9%. The prevalence was higher in males than females. The findings compelled researchers to conclude that CKD was more prevalent in males than females. In addition to the results, the researchers established that pre-existing conditions were responsible for increasing chronic kidney diseases. For instance, Swanepoel et al. (2020)
reported that patients suffering from CKD were more likely to have increased severity of CKD if they had a pre-existing condition. Paini et al. (2019) also shared a shared understanding and reported that patients with pre-existing conditions such as high blood pressure and diabetes were more likely to suffer from kidney failure than patients without pre-existing conditions. Pavkov et al. (2018) also noted that the prevalence of CKD was higher in risky groups of patients with HIV and AIDS with a 4.8% severity rate, 112.3% in hypertensive patients, and 32% in patients with diabetes.

Pre-existing conditions, according to Swanepoel et al. (2020), weaken an individual’s immune system making them vulnerable to liver-related complications. With a weakened immune system, patients suffering from kidney-related conditions are more likely to die from it than patients without a pre-existing medical condition. To help patients minimize the risk of CKD, it is suggested that they observe a healthy lifestyle and adhere to medication (Chang et al., 2018). As an illustration, Abdelraheem (2017) recommended that patients maintain their blood pressure within the blood levels if the purpose is to limit liver-related problems into advanced stages. A different study established that the majority of the people dying from CKD are low individuals.

In view of Henry and Lippi (2020), individuals are likely to suffer from CKD if they have prolonged exposure to kidney-related diseases for a considerable at least two weeks (Peleg et al., 2020). One factor that may lead to a decrease in the screening of kidney-related conditions is the high expenses incurred by patients (Abdelraheem, 2017; Paini et al., 2019). In most cases, patients from low social-economic backgrounds may
find it expensive to pay for screening processes frequently (Paini et al., 2019). The implication is that there is a high probability that screening and diagnosis of renal diseases will be delayed.

As Paini et al. (2019) explained, a delayed diagnosis of renal disease may result in the progression of the disease to chronic stages that are difficult to manage. According to Henry and Lippi (2020) advanced renal kidney problems are associated with the increased medical financial burden, including costly dialysis. The expensive nature of dialysis makes it impossible for patients from low social-economic status to afford such medical services, thereby resulting in early mortality. Comparable findings were reported by Fakhouri and Deltombe (2017) who noted that low social-economic status made it difficult for individuals to pay for dialysis, thereby increasing their mortality rate.

On the contrary, individuals with high-income labels have access to quality medical services, making them have a low mortality rate. In a study conducted in the US, it was established that there was a significant relationship between income level and prevalence and chronic kidney disease among individuals (Peleg et al., 2020). In particular, Lima-Posada et al. (2017) reported a direct link between social-economic status and CKD incidences among individuals. Henry and Lippi (2020) also found that individuals from low social-economic backgrounds could not support home-based self-management care, which was linked to emergency department visits. On the other hand, Paini et al. (2019) reported that access to health care services among the rich reduced
their mortality rates because they could afford dialysis expenses and additional medical costs linked to the management of CKD.

Self-related health care practices and perceptions have also been limited to patients' quality of life with renal problems. Patients suffering from renal issues are advised to maintain self-related health practices that could promote their health. In particular, patients are recommended to ensure that they adopt a healthy lifestyle and positive perception about life and ensure that they have adopted healthy lifestyle practices. Physical activities have also been linked to reducing risks of chronic kidney disorder. As explained by Paini et al. (2019), CKD is a combed condition whose risk factors can be linked to underlying conditions, including high blood pressure and obesity.

**Literature Search Strategy**

In this study, the researcher conducted comprehensive literature research to establish factors that cause increased hospitalization and emergency department visits among individuals. Researchers use the university’s library and World Wide Web to search for articles from different databases that link to the topic. In this study, the researcher explored the following databases: PubMed Central, Database of Abstracts of Reviews of Effects, PsycINFO, UpToDate, PubMed, Psycharticles, ProQuest, PsychoInfo, Academic Premier, Sage, JSTOR, ResearchGate, EMBASE, ScienceDirect, Google Scholar, Cochrane Library, Emerald, EBSCO, and Elsevier. Different keywords were used to search the databases. The key words include chronic kidney, kidney failure, chronic kidney, risk factors for kidney failure, kidney failure, renal
disease, risk factors for CKD, management of CKD, strategies to manage chronic kidney failure, and risk factors for chronic kidney disease. Inclusion and exclusion criteria were used to identify the articles to be used in the study.

The inclusion-exclusion criteria included the following:

1. If the articles addressed chronic kidney disease.
2. If the articles addressed the risk factors for chronic kidney disease.
3. If the articles were published from the year 2017.
4. If the articles were peer-reviewed articles.

Articles that were excluded:

1. If the articles were not clear reviewed.
2. If the articles were published before 2017.
3. If the articles did not address chronic kidney disease.
4. If the articles did not address risk factors for chronic kidney disease.

**Theoretical Framework**

The study is guided by the Transtheoretical Model (TTM). The TTM model aims to support people to be aware of behaviors that can help them mitigate different practices to manage chronic conditions (Prochaska & DiClemente, 1983). According to Hayotte et al. (2020) scholars have widely used TTM to understand how behavior influences health-related decisions. For instance, Hayotte et al. (2020) used the TTM model to understand how behaviors affect medication adherence and its impact on emergency department
visits. The four main variables of the TTM model include self-efficacy, decisional balance, behavior, and change process.

Advocates of the TTM theory argued that individuals are likely to reduce medical conditions' progression into chronic stages by changing their behavior and improving their self-efficacy. The implication is that after changing behavior, individuals can increase medication adherence that results in improved quality health and reduced emergency department visits (Hayotte et al., 2020). TTM acts as a foundational guideline that individuals can use to initiate behavior change if the intention is to develop positive health behaviors that are characterized by optimum medication adherence and minimum emergency visits (Liu et al., 2017).

Self-efficacy, a key construct to the TTM theory pertains to a patient’s inclination to return to their problem behavior, is an important aspect in influencing not only behavior, but also medication adherence, and reducing emergency department visits. Researchers such as Lu et al. (2019) argued that self-efficacy allows individuals to develop resiliency that can help them overcome challenges linked with chronic conditions. In addition, self-efficacy plays an important role in influencing individuals to learn new behaviors related to their medical condition. Adopting new behaviors can control individual lifestyle practices, which can increase or reduce the likelihood of emergency department visits. Researchers have employed TTM theory to understand the effect of lifestyle change on health behavior and its impact on medication adherence and emergency department visits (Hayotte et al, 2020).
**Review of Themes**

**Chronic Kidney Disease**

Chronic kidney disease has been classified as one of the leading causes of death among individuals globally. Current data suggest that the hospitalization rate among patients with CKD is estimated to range around 8% depending on risk factors (Porter et al., 2017). CKD is a medical condition characterized by the long term loss of the excretory function of an individual’s kidney. In most cases, Tampe et al. (2017) contended that CKD is characterized by an increase in the concentration of blood urea nitrogen of urine. The increased level of chemical in urine causes an individual to experience an abnormality in kidney function, making it difficult for them to have normal kidney function.

CKD has several medical symptoms that are common among individuals with the condition. According to Lima-Posada et al. (2017), CKD is characterized by limited urine output, fluid retention that causes swelling in the legs, ankles and feet, as well as shortness of breath. Moledina et al. (2018) also identified nausea, confusion, and fatigue as other key symptoms of CKD. Scholars such as Peleg et al. (2020) acknowledged irregular heartbeat, chest pain, and seizure as the main symptoms of CKD.

Chronic kidney failure may occur in different instances. For instance, researchers maintain that CKD may happen when a medical condition obstructs blood to an individual’s kidney (Abdelraheem, 2017). Moledina et al. (2018) argued that CKD may also occur in cases where there is direct damage to the kidney, or the urine drainage tube
becomes blocked, making it impossible to allow urine out of the body. Different conditions are likely to cause impaired blood flow to the kidneys (Swanepoel et al., 2020). While there are no universally accepted risk factors for CKD, researchers have identified acute kidney injury (AKI) as an independent risk factor for the development of CKD among individuals (Lu et al., 2019). Tampe et al. (2017) identified blood or fluid loss, blood pressure medications, heart diseases, liver infections, and severe dehydration as some of the factors that may impair blood flow to kidneys. Paini et al. (2019) identified blood clots in veins and arteries in and around the kidneys, cholesterol deposits that block blood flow from kidneys, and infection as some of the conditions that damage the kidneys. With prolonged exposure to such risk factors, an individual is likely to develop chronic kidney disease (Lima-Posada et al., 2017).

**Prevalence of CKD Disease in the United States**

Chronic kidney disease has become one of the leading cause of death in the United States (Chang et al., 2018). According to Moledina et al. (2018) chronic kidney disease is considered a global medical problem affecting nearly 10% of individuals globally. Statistics suggest that chronic kidney disease is anticipated to increase to the fifth rank by 2040 in the United States (Pavkov et al., 2018). According to Peleg et al. (2020), CKD chronic disease refers to the abnormality of kidney functions for more than three months, and causing a considerable health burden on an individual and entire society. As an illustration, CKD reported that CKD leads to increased hospitalization among individuals, loss of productivity, morbidity, and early mortality rates. Additional
data demonstrate that 15% of adults in the US, 37 million, are estimated to have chronic kidney disease in US (Pavkov et al., 2018). Limited screening facilities have resulted in 9 in 10 adults with chronic illness determining if they are affected by the disease (Chang et al., 2018). Vallabhajosyula et al. (2019) also suggested that one in every two people with low kidney functions and are not enrolled in dialysis if they are suffering from CKD.

Further evidence suggests that CKD is more prevalent in individuals aged 65 years and older than in individuals aged 30 and younger. Statistics released by CDC project that more women, approximately 16% suffer from the chronic kidney disease than 12% in men. Additional data exhibit that chronic renal disease is common in non-Hispanic blacks 16%) than in non-Hispanic whites 13% or non-Hispanic Asians 12% (Pavkov et al., 2018). It is estimated that about 14% of Hispanics have chronic kidney disease (Vallabhajosyula et al., 2019).

In 2016, it was estimated that approximately 125000 individuals in the US were treated for chronic kidney disease, and more than 726000 were on dialysis. Statistics estimate that more than 240 individuals on dialysis die every day (Wallace et al., 2017). For every two females who suffer from chronic disease, three males are likely to develop chronic disease complications (Vallabhajosyula et al., 2019). African Americans are more likely to suffer from chronic kidney disease than whites. For every three non-Hispanics who have chronic kidney disease, four Hispanics are likely to develop a complication. In the US, in individuals aged 18 years and older, diabetes and high blood pressure are among the factors that cause CKD (Pavkov et al., 2018). The risk of CKD
can be reduced through different practices; Peleg et al. (2020) recommended blood sugar pressure management to reduce CKD risks. Other strategies relate to maintaining a healthy lifestyle, avoiding smoking, and other conditions that predispose one to risk factors causing CKD.

**Hospitalizations Trends in Patients with Chronic Kidney Disease**

Chronic kidney disease is among the leading global health-related issues affecting nearly 10% of the global population (Peleg et al., 2019). Researchers have identified hypertension, diabetes, and advanced age as some of the risk factors that result in the sudden decreases in kidney performance within a few hours or days (Lima-Posada et al., 2017; Pavkov et al., 2018). Due to its comorbidities, chronic kidney disease is considered an in-hospital complication that requires constant medication and care (Vallabhajosyula et al., 2019). The advanced stage of a chronic kidney disease is characterized by frequent dialysis and other self-care management interventions deigned to increase quality of life by reducing suffering (Lu et al., 2019). Scholars such as Moledina et al. (2018) and Swanepoel et al. (2020) have linked chronic kidney disease to long-term care, early mortality, and medical costs.

Current literature suggests that there has been an upward increase in the number of patients suffering from chronic kidney disease since 1990 (Pavkov et al., 2018). After examining patients' data from 2000-2014, CDC estimated that the age-standardized rate of chronic kidney disease hospitalizations increased by 139% from 2000-2014 (Vallabhajosyula et al., 2019). The data reflected an increase from 23.1 to 55.3 per 1,000
individuals diagnosed with CKD in the United States from 2000-2014 (Vallabhajosyula et al., 2019).

Further statistics suggest that there have been at least 35 million emergency department visits reported in patients with chronic kidney diseases in the United States since 2004 (Pavkov et al., 2018). The overall hospitalization rates of patients with kidney-related problems increased from 953,926 in 2000 to 1,823,054 in 2006 and 3,959,560 in 2014 (Pavkov et al., 2018). During the same period, Pavkov et al. (2018) reported that the number of patients hospitalized in emergency department units in patients with diabetes increased by 139% (23 to 55 per 1,000 individuals) (Pavkov et al., 2018).

Data also suggest that there has been an increase in the hospitalization rates for both men and women from 2000-2014 (Correa et al., 2018). For instance, it is estimated that that hospitalization rates for men and women increased by 165% from 23 to 60 per 1000 individuals in men and 114% from 23 to 49 in women (Correa et al., 2018). The statistics show that men are more likely to develop chronic kidney complications than females (Pavkov et al., 2018). However, important to emphasize is that there has been a surge in the number of hospitalizations among patients with chronic kidney complications from 2000-2014. As Vallabhajosyula et al. (2019) explained the increased hospitalization rates across age groups and genders result in an increased strain on healthcare facilities whereby many people seek to be admitted to the emergency department units. Equally, patients with chronic kidney complications are three times
more likely to have increased emergency department visits than those with other chronic illnesses.

**Emergency Department**

Different factors constitute an inappropriate use of the emergency department. The emergency department has different definitions that make it applicable to other conditions and scenarios. The most important definition relates to the severity and acuity of patients’ sickness (Chawla et al., 2017). The implication is that patient’s health emergency and the need for urgency medication services play an important role in determining the emergency department's definition. Patient’s admission to the emergency department has been increasing since 2000 (Guzzi et al., 2019). According to CDC, a total of 130 million visits were recorded in the US in 2018. Of these, 16.2 million visits resulted in hospitalization (Correa et al., 2018).

Further statistics suggest that the total number of emergency department visits that result in admission in intensive critical units is 2.3 million (Lalji et al., 2020). The emergency department, therefore, serves an important role in medical care. In 2011, it was estimated that over 131 million individuals visited the emergency department (Selewski et al., 2018). In 2016, it was estimated that 146 million individuals visited emergency departments 2016. The same statistics apply to individuals with acute, chronic kidney disease, whereby their hospitalization has significantly increased in the past 20 years from 2000 (Lu et al., 2019). The high hospitalization rates of patients suffering from CKD have placed a significant burden on the current health care system (Guzzi et
al., 2019). The burden includes constrained hospital resources and overutilization of the emergency department (Tampe et al., 2017). Between 2005 and 2016, individuals suffering from chronic kidney-related diseases increased by 10%, and the hospitalization rates to emergency department units also surged.

**Consequences of Inappropriate Emergency Department Use**

As elucidated by Lalji et al. (2020), the use of emergency department visits for non-emergency issues is likely to lead to emergency department crowding. Such scenarios occur when emergency departments cannot meet the increased need for patients within the limited resource budget. The review of existing literature suggests that the increase in low-acuity emergency department presentation has been associated with emergency department crowding (Guzzi et al., 2019). Kim et al. (2019) reported that the link between increased low-acuity visits and emergency department crowding could be attributed to limited access primary care services.

Lalji et al. (2020) found that the limited access to primary renal care access among individuals contributed to unnecessary emergency department visits. Comparable thoughts were reported by Kim et al. (2019) who argued that patients with well-managed primary care services were five times less likely to utilize emergency department visits. Reducing emergency department crowding is a fundamental issue within the health care system (Selewski et al., 2018). Crews et al. (2018) argued that crowding of emergency department could lead to delayed interventions, increased medical errors, and adverse health outcomes in patients with chronic illness. It is therefore recommended that
emergencies by the department be utilized for medical urgencies that are highly life-threatening (Lu et al., 2019). Patients with long-time chronic conditions are advised to adopt self-care management practices to improve their medication adherence and reduce the need to have frequent emergency department visits.

The increased use of emergency departments on an urgent medical need also results in unnecessary health care expenditure. Statistics suggest that avoidable department visits are worth 64 billion US Dollars in an avoidable health care cost of total emergency department care. In view of the above analysis, it is recommended that patients adopt self-care management practices that are likely to reduce unnecessary emergency department individuals (Gunnerson, 2019). A systematic review of 63 articles revealed that 67% of all emergency department visits were unnecessary (Kim et al., 2019). As explained by (Selewski et al., 2018), the implication is increased health care costs among patients and overburdening of the emergency department, which significantly reduces their effectiveness. Therefore, it is suggested that individuals with kidney problems develop self-management strategies that effectively reduce the need for frequent emergency departments.

In regard to demographics, studies suggest that individuals with CKD are frequent emergency department visits. As explained by Guzzi et al., (2019), the visits are higher in white individuals than in other racial groups. The high admission of white patients in the emergency department is linked to Medicare and Medicaid. Statistics suggest that 25-45 of individuals admitted to emergency department units are 65 years and older
(Gunnerson, 2019). This shows that individuals using emergency departments are older than youthful patients. Statistics also suggest that emergency department visits are higher in individuals with low social-economic status and minorities. The implication is that individuals from low-income levels will find it expensive to be admitted to the emergency department (Lu et al., 2019).

Scholars have suggested different recommendations to reduce the utilization of emergency departments and the overburdening healthcare systems. The use of outpatient clinics increases accessibility medical services that patients would otherwise obtain from normal hospital sessions. Therefore, encouraging patients to use outpatient clinics provides an opportunity for only emergency medical conditions to be admitted to the emergency department. Gunnerson (2019) reported a 21% decrease in emergency department visits after recommending patients to outpatient clinics. Additional findings suggest that 4 out of 6 patients were more likely to use outpatient clinics and avoid hospitalization costs that could increase their medical cost if hospitalized.

Researchers have also suggested implementing a patient-centered medical home-based models in the outpatient clinic to reduce emergency department visits (Fu et al., 2019). Patients can have quality healthcare services in a primary care setting and reduce overcrowding in the emergency department through the model (Crews et al., 2018). In primary care settings, primary caregivers can have constant communication with physicians on managing patient position, which significantly increases medication adherence and reduces the need for emergency visits.
Economic and Clinical Cost of CKD

The medical and societal costs linked to CKD in the US are approximated to be $294 billion (Qiu et al., 2018). Statistics predict an increase in the costs of caring for CKD by approximately 18% from 2001 to 2036 (Hall et al., 2018). As such, it can be justified that as long as the medical effects of CKD continue to increase, the monetary and societal burden associated with the condition will also increase. In a recent study, Suh et al. (2021) reported that the annual economic burden on CKD was €35 billion in four European states: Italy, Germany, the United Kingdom, and France. Characterized by such a massive economic and clinical burden, which is likely to surge in the next two decades, CKD is projected to pose an insurmountable hurdle to society (Silver & Chertow, 2017). For example, research conducted by Câmara et al. (2017), including 1002 Medicare beneficiaries diagnosed with CKD who were hospitalized in 2010, established that the average annual total payment per patient was approximately $11,000.

In a different study including over 20,000 patients, Ibarra et al. (2017) established that CKD patients who were beneficiaries of Medicare from 2005-2010 reported a sharp surge in annual charges for CKD for patients in 2005 of at least $2,634 to 5,152 in 2010. To better understand the economic burden associated with CKD, current projections portray that the Medicare claims in the United States are expected to rise from the current $104 billion to $198 billion, including both economic and societal costs (Kashani et al., 2019; Ibarra et al., 2017). Collectively, the literature reviewed above suggests the significance of contextualizing the financial burden and the societal costs associated with
CKD. As such, Pereira et al. (2017) recommended enhanced screening and detection to warrant early therapeutic intervention.

CKD is a condition that has been linked to many health-related challenges. According to Ibarra et al. (2017), approximately 66 million people in the United States and 53 million people in the United Kingdom are reported to be diagnosed with the disease. This depicts a global increase in the number of CKD patients and other related illnesses such as Nonalcoholic fatty liver sickness compared to the number of patients suffering from other medical conditions or diseases regarded as chronic (Silver & Chertow, 2017). In view of Ibarra et al. (2017), the surge has resulted in the discernment of individuals suffering from CKD. Important also is to underscore that these patients are at the highest risk of developing liver problems.

Persons with obesity or those with metabolic syndrome need to have their steatosis biomarkers measured or undertake ultrasonography (Hall et al., 2018). Hall et al. also noted that the development of HCC in Nonalcoholic greasy liver ailment is a considerable issue. It occurs even in the absence of cirrhosis, where no treatment exists internationally.

Globally, the susceptibility and prevalence of CKD have increased significantly in the recent past, particularly in the last two decades. Some non-obtrusive techniques are accessible for examining Nonalcoholic greasy liver disorder globally, notwithstanding the current standard liver biopsy symptomatic test (Chen et al., 2019; Suh et al., 2021). Chen et al. (2019) argued that the utilization of aminotransferase as the main laboratory test for
liver-based complications and the prevalence of CKD saw an increase of aminotransferases to 8.1% in the United States from 1988 to 1992, with incomprehensible liver conditions in about 71% of the participants who took part in the study. Furthermore, aminotransferase rates were used as an assessment research center for liver ailment examination. The certainty of increased aminotransferases was 8.1% in the US population with undefined liver problems in over 71% of the study respondents.

The use of hepatic ultrasonography in the diagnosis, in view of a meta-analysis conducted by Kalantar et al. (2017), has offered an opportunity for more accurate and reliable detection of severe CKD and is presently considered the most effective screening technique globally. Study findings from past researchers such as Elhoseny et al. (2018) and Porter et al. (2017) demonstrate that CKD ultrasound analysis dominance is at least 46% in the United States and 16% in India. South and Central America also report the most significant CKD rate at 32% and 33%, with the lowest rate in Africa at 14%. Currently, Asia is going up against the most significant weight issue and, in this way, has experienced an abrupt surging rate of Nonalcoholic fatty liver sickness (Elhoseny et al., 2018). The differences in the prevalence of CKD are linked to the variations in the sample sizes used in the study, lifestyle practices, dietary, and diagnostic methods (Porter et al., 2017; Silver & Chertow, 2017).
**Chronic Kidney Disease Risk Factors**

Risk factors have been related to chronic kidney disease. Among these factors include gender, income level, and age. In this section, the researcher discusses some of these risk factors and how they link to CKD among individuals.

**Age and Gender Disparities in CKD.** Researchers have reported mixed findings over the years relating to the relationship that exists between gender and CKD (Selewski et al., 2018). Chou et al. (2018) linked the differences in prevalence to CKD among individuals to gender differences. Systematic reviews and meta-analyses conducted previously have suggested that the youths are less likely to suffer from renal diseases than the aged (Paini et al., 2019). As an illustration, Gunnerson (2019) conducted a systematic review to establish the prevalence of CKD across gender. The study findings demonstrated that there was a statistically significant relationship between gender CKD incidences. Similarly, Kim et al. (2019) established that CKD was more prevalent among men than females. The differences in CKD instances across genders, as described by (Lima-Posada et al., 2017) can be linked to differences in hormonal factors and medication responses, which differ across gender.

Chou et al. (2018) also related the variations in CKD across genders to disease progression, differences in biological, chemical, and psychological aspects across gender. Porter et al. (2017) examined studies assessing the role that gender had in kidney disease progression to understand the differences between CKD and gender factors among patients. According to the study findings, Lima-Posada et al. (2017) established
significant differences in CKD incidences across the gender and linked it to difference in sex hormones.

Although Yong et al. (2017) demonstrated that CKD was more prevalent in men than women, Porter et al. (2017) reported conflicting results. In particular, the researcher found that CKD was more prevalent in women than men. However, the investigators could not provide possible reasons for the differences in CKD incidences across genders and recommended further research. Additional studies establish that end-stage renal failure was higher in men than women, which could be linked to hormone differences and physiological variations (Dennis & Witting, 2017). As explained by Chou et al. (2018), the differences in CKD incidences can be linked to variations in psychological, chemical, and physiological differences between men and women. Based on their findings, Lima-Posada et al. (2017) also suggested that gender plays a significant role in predicting CKD incidences among individuals. The articles reviewed demonstrate mixed findings relating to how gender influences CKD prevalence among individuals. Researchers have nonetheless continued to explore the relationship that exists between gender and renal disease (Porter et al., 2017).

For instance, Carrero et al. (2018) investigated studies that reported on the effect of gender on the progression of CKD. According to the study findings shared by Porter et al. (2017), there is a strong relationship between gender and the progression of kidney-related disease and female have low incidences of CKD than men. The dissimilarities in CKD incidences can be attributed to hormonal variations, particularly sex hormones that
cause gender variations in renal disease progression. Lima-Posada et al. (2017) cautioned
the link of CKD incidences to sex hormones and suggested the need for further researcher
on CKD hormones because their results were inconclusive. In another cohort study,
Porter et al. (2017) investigated the differences in CKD incidences among 112 patients.
Of these, 62 percent of them were female with low incidences of CKD. The researchers
concluded that CKD was more prevalent in males than females (Dennis & Witting,
2017). However, there has been no research examining how gender-related factors
influence CKD incidences among individuals and hospitalization rates or emergency
department visits. Lima-Posada et al. (2017) underscored that while there are inconsistent
results about gender and CKD incidences, several studies report a significant increase in
men's CKD incidences than women (Kim et al., 2019; Lima-Posada et al., 2017). With
such findings, researchers have called for additional research to be conducted to
understand how hormonal differences has on CKD incidences across the gender.

A different but related study Portolés et al. (2020) conducted a meta-analysis of
25 articles to assess the relationship between CKD and gender differences. In this study,
the researcher examined over 2 million participants reported in different articles
reviewed. The participants were subdivided into three groups, including general
population, high risk, and CKD. After conducting the analysis, the researchers found that
CKD was more prevalent among men than females (Dennis & Witting, 2017). The study
findings compel the researchers to conclude that men were at a higher rate of CKD than
the female gender. Important to underline is that the researchers did not provide reasons for the differences in CKD incidences among individuals.

Kidney function is significantly affected by age. Typically, kidney function is regarded as stable after infancy until late adulthood (Porter et al., 2017). As Kashani et al. (2019) expressed, the GFR decreases by 1 ml/min/1.73 m² yearly after the age of 30 in healthy individuals. According to elucidation presented by Kashani et al. (2019), the decrease in kidney function might be a result of the variations in the kidney structure related to aging. In an empirical study conducted by Alicic et al. (2017), the elderly reported a noticeably higher CKD prevalence. The prevalence surged with age in all populations, especially among older people aged 70 years or more. This sharp increase in the CKD prevalence in older adults might partially result from related comorbidities of CKD, such as diabetes or cardiovascular diseases (Kalantar et al., 2017).

A gender-different prevalence of CKD was established in research conducted by Pereira et al. (2017), including 106 females and 113 males. According to this study, females showed a higher CKD prevalence than their male counterparts. Pereira et al. argued that females have less muscle mass than males and the muscular physique is a significant predictor of serum creatinine concentration. In a different but similar study, Alicic et al. (2017) reported some of the risk factors for CKD prevalence in favor of males are less likely to explain the difference between males and females.

Furthermore, the serum creatinine concentration remains within the standard range until a substantial decrease of kidney function, particularly in the elderly (Silver &
Chertow, 2017). As opined by Chawla et al. (2017), serum creatinine is not a sensitive predictor of GFR in the elderly. In addition to the considerable impact of age on the kidney structure and kidney function, the GFR level is likely to have different pathophysiologic or non-pathophysiologic effects on kidney function in diverse age groups.

Gender differences in the prevalence of CKD has been reported in many studies. In this study, researchers have underscored that CKD is higher in males than females. As provided by Lima-Posada et al. (2017), one explanation for the differences in CKD incidences has been linked to muscle mass. Portolés et al. (2020) noted that females have less muscle mass than males, making them less vulnerable to CKD because of the more extensive the muscle mass, the higher the serum creatinine concentration (Yong et al., 2017). Fakhouri and Deltombe (2017) linked the prevalence of CKD in males to personal factors among individuals, such as smoking and alcohol consumption. A study conducted by Carrero et al. (2018), established that the prevalence of CKD was higher in males than females due to risk behaviors, such as smoking and alcohol consumption common among men.

Comparable findings were reported by Gao et al. (2020) who also argued that the high level of CKD among men could be linked to poor lifestyle habits that negatively impaired kidney functions. Portolés et al. (2020) further provided evidence arguing that lifestyle practices among men exposed them to a higher risk of developing CKD than females. Fakhouri and Deltombe (2017) attributed the increased incidences of CKD
among men to poor lifestyle habits such as heavy drinking and smoking, which are all risk factors for CKD. Withstanding the above findings, it is important to maintain that there are limited studies that provide direct evidence of how gender, specifically hormonal differences, influence the incidence of CKD across the gender. Researchers such as Gao et al. (2020) have continued to report significance difference between CKD incidences across the gender.

Fakhouri and Deltombe (2017) conducted a cohort study to investigate the differences in renal disease among Americans and how it is linked to gender. In their study, 2000 individuals were surveyed. Of these, 1300 were women and 700 men (Fakhouri & Deltombe, 2017). The study results established a significant difference in the number of patients suffering from CKD across the gender. Compared to 60 percent of CKD incidence in men, the researcher found that CKD incidences was only among 20 percent among women (Wu et al., 2019). In view of the findings, the researcher concluded that CKD was higher in men than female. A study by Carrero et al. (2018) sought to investigate the relationship between lifestyle differences and the prevalence of CKD. The study findings established that low lifestyle among men, such as alcohol consumption, poor eating habits, and smoking, increased their vulnerability to CKD. Based on the study findings, it can be concluded that CKD prevalence is higher in men than in women (Johnson et al., 2018). Although researchers have reported CKD incidence is higher in men than female, their limited study explaining how gender influences CKD.
**Race and Ethnicity.** Ethnicity is another risk factor for CKD. Researchers have recorded different findings linking race to CKD incidences. For instance, Gao et al. (2020) reported that CKD is more prevalent in Hispanic groups, followed by non-Hispanic groups, and higher in Africa Americans. Recent statistics support the past findings by demonstrating that the prevalence of CKD in Hispanic patients has doubled (48 – 58) than in Africa Americans with 24 to 35 percent. Crews et al. (2018) also reported that chronic renal disease was higher in black Americans than white counterparts. However, there has been no official report to explain the relationship between blacks and whites' high prevalence rate (Laster et al., 2018).

Levey et al. (2020) also reported that African Americans and Hispanics are linked to increased CKD incidences than other races in the US. Comparable thoughts were reported by Johnson et al. (2018), who offered conflicting results relating to racial differences and CKD. In their study Laster et al. (2018) did not establish a significant relationship in mortality references between black and whites. The study results were consistent with previous results demonstrated inconclusive findings relating to the CKD incidences and race. On the contrary, scholars such as Crews et al. (2018) have linked the prevalence of CKD to other factors that increase the vulnerability of minorities to chronic medical conditions.

Other researchers such as Laster et al. (2018) have reported widespread kidney failure across races in the US. In particular, Johnson et al. (2018) reported that one in three kidney failures reported in the US is Africa America. Africa Americans are three
times more likely to suffer from renal failure than whites. The same findings are also reported by Akkilagunta et al. (2018) who noted that 2 in every 5 Americans are likely to suffer from renal failure. The study findings imply that race has its significant predictor of CKD prevalence across races in the US (Hirsc et al., 2020). However, it is also important to note that no study has explained the direct impact that race has on CKD prevalence.

According to Porter et al. (2017), the age-adjusted end-stage renal disease rate for Black Americans was about five times higher than that for American Caucasians. In a different empirical research, Kashani et al. (2019) expressed that the racial disparities in the prevalence of ESRD are likely to occur as a result of a higher prevalence of primary causal illnesses of ESRD such as hypertension and diabetes as well as lower access to health care interventions among black Americans as compared to Caucasians. Chawla et al. (2017) also researched ethnic differences of CDK in individuals 45 years or older. This study’s findings reported that African Americans exhibited a lower prevalence of CKD in the early stages of this disease, though they had a high prevalence of renal diseases.

Chawla et al. projected that this difference in ethnicity might be triggered by poor control of other related risk factors, different access to medical care, disparities in genetic factors, lifestyle, or environmental exposures. Previous studies assumed that the lower CKD dominance in Black Americans than American Caucasians in most cases happened due to weakened renal development and lessened nephrons due to a more considerable
prevalence of low birth weight among African Americans (Câmara et al., 2017). This might also be an outcome of hyperfiltration and quicker progression of CKD in Black Americans. Furthermore, in view of Chen et al. (2019), the lower prevalence of CDK in African Americans might also be an outcome of lifestyle differences, different comorbidity, or genetic differences, but the precise mechanisms remain uncertain.

Wu et al. (2019) investigated ethnic differences in CKD in a population-based cohort consisting of participants aged 45 and older. The study findings suggested that Africa Americans had a lower prevalence in early stages than Whites who reported higher incidences of CKD in an advanced stage (Akkilagunta et al., 2018). The prevalence of CKD among races could be explained in terms of health care access, genetic factors, and environmental exposures that increase the likelihood of minorities suffering from CKD (Gesualdo et al., 2017). This shows that CKD has statistical differences across the ethnic groups whereby a majority of the minority are likely to suffer from CKD than the white counterparts. Additional studies conducted in the US have confirmed the increased rate of CKD in Africa Americans than in Asians.

African Americans are more affected by CKD than other races in the US. However, Laster et al. (2018) recommended additional studies to assess the factors that increase African Americans' vulnerability to suffering from CKD than other racial groups. Similar findings were reported by (Hirsc et al., 2020) who established that the prevalence of CKD was higher in Africa Americans that racial minorities in the United
States. Crews et al. (2018) argued that the disparity has been linked to differences in generics and other social-economic factors across the gender.

In general, despite the increased incidences of CKD among Africa Americans, the prevalence data suggests that early stages of CKD incidences are less common among African America. Laster et al. (2018) also noted that CKD was lower in whites than Africa Americans. Of particular importance to emphasize is that Hirsc et al. (2020) also argued that CKD has increasingly become an increasing health concern issue in Africa Americans in the progression stage. Other factors that have been linked to high CKD incidences in black Americans include access to treatment. Luyckx et al. (2017) maintained that minorities in the US, such as Hispanic and black Americans, are less likely than whites to have delayed treatment or referral to experts. Such factors increase the progression rate of CKD in minorities in the United States. This implies that accessibility to medication plays a vital role in determining the prevalence of CKD among individuals. The assumption is supported by Wu et al. (2019) who argued that the increased medical cost of treating blacks and other minorities provides a platform over which the CKD progress from less threatening stages to the chronic stages that have negative impacts on an individual’s health. Porter et al. (2017), however, recommended additional research to investigate the instances between ratio group and CKD prevalence.
Social-Economic Status. Income has been identified as a key factor influencing the prevalence of CKD among individuals. Studies have suggested that individuals with high social-economic status are less likely to suffer from chronic disease than low-income earners (Henry & Lippi, 2020; Tonelli et al., 2020). The implication is that individuals who have more money can have increased access to medication than those without money (Luyckx et al., 2017). A study conducted by Wu et al. (2019) established that an individual social-economic status played an important role in determining the capability to access medical services.

Individuals from a low social-economic background are more likely to suffer from CKD than wealthy individuals with high-income levels. This, according to Santin et al. (2019), can be attributed to the capacity of rich individuals to secure medication than the low-income earner. Similar findings were reported by Panitchote et al. (2019) who found that low-income individuals' inability to access proper medication or self-care training increased the likelihood that minorities were three times more likely to suffer from CKD than individuals with high-income levels. Luyckx et al. (2017) explained this and argued that individuals from disadvantaged backgrounds have low income to warrant them accessibility to guarantee them access to quality medication.

Disposable income among the wealthy and middle-income earners provides them with the capacity to access regular screening that can detect CKD in its early stages compared to the less rich, who may find it costly to run periodic screening (Abdelraheem, 2017). Similar findings were reported by Henry and Lippi (2020) who also argued that
access to financial resources among the rich provided them with a competitive age of conducting regular screening, access to better health care services, and the capacity to afford self-help management care. In reference to Santin et al. (2019), individuals with low income are likely to find it challenging and expensive to finance regular clinical check-ups and afford self-care management to manage CKD. The analysis conducted suggests that individuals with a high-income level are more likely to suffer from CKD than wealthy individuals who have access to financial resources that can be used to fund their healthcare cost.

Wealthy individuals have a low mortality rate of CKD patients than the less rich ones. As explained by Panitchote et al. (2019), the rich have low mortality rate from CKD because they can afford complex health care management tools than those from low social-economic backgrounds. Low income is associated with increased CKD among individuals from low social-economic backgrounds (Malhotra et al., 2017). On the contrary, Kashani et al. (2018) reported that CKD incidences were lower in individuals with higher income levels.

Exciting results were reported by Santin et al. (2019) who linked CKD incidences to education level. In particular, Moore et al. (2018) reported that income level predicted accessibility to education and an individual's ability to be cognizant of the different factors that cause CKD and how to mitigate them. Ruwanpathirana et al. (2019) provided additional evidence suggesting that individuals with a high-income level were more likely to access training programs on self-manage CKD. Malhotra et al. (2017) cautioned
that individuals with a low-income level find it difficult to engage in educational programs on managing, coping, and treating CKD and making them difficult for them to diagnose and treat CKD in an early stage.

Comparable findings were also reported by Shin and Han (2018) who also found that individuals with high-income levels were associated with a low risk of developing CKD because they could afford the medical expenses required to treat and manage the condition. Overall, the study findings are consistent with Fu et al. (2019) who established that CKD differs among individuals depending on their income level. The implication is that individuals with high-income levels are likely to access medical services and early diagnosed CKD that deters the progression of CKD into the early stages (Câmara et al., 2017).

An individual's social-economic status and its link to CKD incidences are determined by an individual’s levels of wealth, occupation, education, and housing situation. Moore et al. (2018) contended that an individual's social-economic status is a determining factor that can be used to determine the effectiveness of CKD treatment practices. People with low social-economic status have worse self-reported health management practices than those with higher social-economic status (Sa’adeh et al., 2018). The increased income level among individuals makes it easier for them to get more diagnosed tests and medications for several diseases (Chawla et al., 2017). Individuals with low social-economic status will have limited access to medical care due
to medical costs, making it difficult for them to have healthcare insurance and other self-care management interventions that can be used to support timely treatment of CKD.

Similar to other chronic diseases, studies have continued to report a strong relationship between social-economic status and the prevalence of CKD. In a survey of 79943 Africa Americans and white counterparts, Câmara et al. (2017) established that low social-economic status was linked to a 50% likelihood of increased link of CKD in African Americans, and threefold increase in black-white CKD incidences. Just like low income, homelessness might have a significant impact on CKD risk. Porter et al. (2017) also investigated CKD death in over 1400 individuals. The researchers establish that the CKD mortality rate was higher in Africa Americans with low social-economic status (Chawla et al., 2017).

The above findings are supported by Moore et al. (2018) who also reported that individuals with a low-income level are three times less likely to secure health insurance plans than those with high-income groups, which gives them the capability to afford quality health care services. Likewise, Chartier et al. (2018) established that minorities in United States come from low social-economic backgrounds that limited their capacity to secure quality medical service, such as insurance policies that could support the effective treatment and management of CKD.

Although health insurance is linked to improved survival in the cohort study, access to primary services plays a significant role in ensuring that every person has access to quality health care (Abdelraheem, 2017). However, this may be untrue when
individuals from low social-economic backgrounds find it challenging to purchase the required medication or insure themselves for better access to health care (Ruwanpathirana et al., 2019). According to Chartier et al. (2018), the implication is that individuals with high-income levels are more likely to access quality healthcare services than those with low-income levels.

Thus far, there is a probability that social-economic status determines the hospitalization rate with CKD and the resulting emergency department visit (Kashani et al., 2018). Failure to access quality health care services, including insurance policies, significantly risks individuals from low social-economic status being admitted to the emergency department (Chawla et al., 2017). Considering this knowledge, the current study will seek to establish the relationship between social-economic status and emergency department visits (Abdelraheem, 2017). It is presumed that patients with low social-economic status are more likely to be hospitalized in emergency department units because they cannot afford self-care management therapy independently.

**Lifestyle Practices.** Research has documented the relationship between healthy lifestyle practices and chronic medical conditions. A healthy lifestyle can be defined as a state of behavior that an individual maintains to promote good health in regard to specific motivation, norms, values, and capabilities (Lalji et al., 2020). Lifestyle practices include health risk behaviors, including smoking alcohol, and health-promoting practices such as regular physical exercise, health management, spirituality, and interpersonal interactions
(Wu et al., 2019). Ruwanpathirana et al. (2019) suggested that health is directly linked to individual lifestyles in a different social contexts.

For instance, Abdelraheem (2017) found that poor health practices were ranked as the leading cause of death in the United States in 2018 (Chawla et al., 2017). Individuals who observe healthy lifestyle practices are more likely to have better health than those with risky behavior. Chen et al. (2019) reported that individuals engaging in risky health behaviors such as drinking alcohol were more likely to suffer from CKD than those with healthy behaviors related to frequent exercise and eating a balanced diet. Chartier et al. (2018) claimed that individuals who smoke frequently are five times more likely to suffer from CKD conditions than those who do not smoke.

Inconsistencies among genders as far as CKD are concerned to have linked to lifestyle practices. A recent study conducted in New Zealand established that adult individuals who adopted healthier lifestyles were more likely to have optimal health status than those who engaged in risky health lifestyle behavior (Hall et al., 2018). The views are supported by Kashani et al. (2018) who also noted that individuals consuming alcohol and smoking were six times vulnerable to develop CKD than individuals who do not participate in unhealthy lifestyle practices. The findings imply that individuals with a strict lifestyle have a low chance of suffering from CKD than those engaging in risky health behaviors that increase their vulnerability to CKD. Chen et al. (2019) recommended individuals to observe a healthy lifestyle because most of the chronic conditions are related to lifestyle practices.
A study to investigate the differences in the prevalence of CKD across genders by Zubair and Butt (2017) linked the high prevalence of CKD in men to unhealthy behaviors such as smoking and alcohol consumption. Smoking is another health factor that has been linked to health care problems among individuals suffering from CKD. A study conducted by Chartier et al. (2018) reported that individuals are more likely to suffer from CKD if they continually smoke. Consistent with the above findings, Ibarra-Hernández et al. (2017) said that drinking alcohol as well as smoking is a precast to kidney failure. In this case, individuals who engage in smoking are three times more likely to suffer from CKD than those who do not smoke or consume alcohol. Collectively, Hall et al. (2018) summarized a need for researchers to investigate the link between healthy behaviors and CKD prevalence.

Sleep deprivation has also been linked to CKD as a critical lifestyle practice that individuals should observe. Lack of sleep is a health problem that affects millions of people globally (Zubair & Butt, 2017). Epidemiological researchers demonstrate that insomnia is linked to overweight that plays a sign dance role in CKD pathogenesis (Kashani et al., 2018). Specialists have noted that the lack of enough sleep is linked to increased risks of CKD, ranging from 1.28 percent and 1.7 in females. A recent finding reported by Kalantar-Zadeh et al. (2017) suggested a statistically significant relationship between sleep disorder and CKD.

Although the exact mechanisms of sleep depreciation and its association to CKD remains unknown, researchers have provided some explanation in recent studies. For
example, (Ibarra-Hernández et al., 2017) argued that sleep disturbance between short periods of time would signal reduced glucose tolerance. Comparable studies have also suffered that sleep deprivation may also induce insulin resistance, changes in heartbeat rate, which directly affect blood flow to the kidney. In summary, it is recommended that individuals observe healthy lifestyle practices that will limit their exposure to CKD risk factors.

**Obesity and Chronic Kidney Disease (CKD).** Previous research has documented that the prevalence of Chronic Kidney Disease in obese individuals globally is about 30% -37%. Nonetheless, in their study, Lakkis and Weir (2018) reported that abdominal obesity associated with an increase in the waist's circumference is significantly associated with CKD. Recent research by Suh et al. (2021) established that Chronic Kidney Disease was strongly correlated with visceral adiposity, suggesting that obesity is a crucial risk factor of Chronic Kidney Disease. The above findings are reported by Câmara et al. (2017), who explained that visceral adipose is a high-risk factor for CKD.

Obesity is regarded to be a global health care problem. As Kovesdy et al. (2017) expressed, over 300,000 deaths related to obesity are reported annually in the United States. Therefore, Kovesdy et al. recommend that obesity surge the risks of developing chronic illnesses such as cardiovascular complications, insulin resistance, high blood pressure, and CKD. A study by Câmara et al. (2017) defined obesity as an excess amount of body fat. This study shows that the normal level or amount of body fat ranges from
18%-23% in men and 25%-30% in females. As such, men with 25% body fat and females have at least 30% of body fat and are categorized as obese (Lakkis & Weir, 2018; Kovesdy et al., 2017).

**Diabetes and CKD.** Pre-existing medical conditions, primarily type 2 diabetes, are statistically associated with the prevalence of CKD (Alicic et al., 2017). According to this study’s findings, over three-quarters of patients diagnosed with type 2 diabetes are reported to have CKD. Similar findings are reported by Pavkov et al. (2018), who argued that type 2 diabetes is linked to insulin resistance resulting in CKD. Furthermore, Alicic et al. (2017) expressed that type 2 diabetes is a significant risk factor for CKD.

**Genetic factors and CKD** Recent research suggests a positive correlation between genetic factors and the prevalence of CKD (Qiu et al., 2018). In view of a different study by Ko et al. (2017), hereditary factors substantially impact individuals’ susceptibility to CKD and other advanced chronic disorders’ subsequent development. A considerable and statically notable inter-individual adjustment in terms of genes and vulnerability to CKD has been established, and its prevalence rate among the affected individuals is alarming (Ko et al., 2017; Qiu et al., 2018). Studies such as Ko et al. (2017) and Pavkov et al. (2018) have established how genetic factors may cause persons only to have CKD while in others, the conditions may progress to fibrosis, NASH, and its chronic stage, which is liver cirrhosis.

Qiu et al. (2018) argued that gene proteins play a significant role in regulating hepatic metinalom, particularly among the four types of genes, namely PNPLA3,
TM6SF2, PPP1R3B, and NCAN. As expressed by Qiu et al., these genes facilitate the progression of CKD into its advanced stage. It is essential to underscore that genes such as TM6SF2 and PNPLA3 tend to replicate in different locations and ethnicities differently, thus influencing the prevalence and severity of CKD among individuals (Pavkov et al., 2018).

Previous researchers such as Yu and Bonventre (2018) and Silver and Chertow (2017) have also argued that lifestyle practices, obesity, and insulin resistance are the leading risk factors of CKD. Nonetheless, it is apparent that gene materials and environmental factors significantly influence CKD’s prevalence and progression in personality differences (Silver & Chertow, 2017). In a similar but different study, Suh et al. (2021) argued that the interethnic variants susceptibility and the heritability depict that genetic factors could play a considerable role in dictating the phenotypic appearance and the overall hazards related to CKD. As Yu and Bonventre (2018) reported, CKD clutters for families exhibiting individual genetic variations on PNPLA3, TM6SF2, PPP1R3B, and NCAN genes are likely to increase their hereditary chances of CKD by 26% among family members. The most common genetic variant associated with CKD, in view of assertions by Câmara et al. (2017), is the missense mutation.

Reliable evidence from familial-aggregation and epidemiological research and twin sites has offered rich and extensive knowledge on CKD and its related outcome as far as genes are contextualized (Kovesdy et al., 2017). This study’s results indicated that the heritability estimations vary from 22% to -71%, depending on the study design used,
the research methodology used, ethnicity or race, and the technology used in the study. Kovesdy et al. reported that most studies have demonstrated that ALT levels, which most often reflect the liver's fat content, are regarded to be a heritable characteristic expressed by up to 61% of the genetic factors. Taken together, the literature reviewed above suggests that genetic factors are key risk factors for CKD.

As elucidated by Pereira et al. (2019), eating habits could strengthen steatohepatitis by modifying antioxidant digestion and hepatic triglyceride absorption and indirectly by impacting post-prandial triglyceride absorption and insulin levels. Diverse cultures and cultural categories have a significant nutrition variation (Kovesdy et al., 2017; Yu & Bonventre, 2018). In view of Yu and Bonventre (2018), Latinos in the United States significantly consumed starch and strength collectively with a smaller amount of potency, dissimilar to whites and African Americans. The massive power for Hispanics, Whites, and African Americans was 35.6%, 38.7%, and 38.4% (Yu & Bonventre, 2018; Qiu et al., 2018). Study findings by Qiu et al. (2018) also established that native Americans had lower cholesterol consumption than the other two races, and African Americans had relatively high sweets consumption.
Summary

Practicing a healthy lifestyle, such as regular exercise, makes it possible for patients to mitigate the risk of worsening renal problems from underlying conditions. Zubair and Butt (2017) established that increased physical activities directly result in improved quality of life in patients with renal problems. In a different survey, Carrero et al. (2018) could not find a positive link between age, gender, and chronic renal disease. Swanepoel et al. (2020) suggested that age was an essential factor in influencing the pervasiveness of CKD. Comparable results by Ruwanpathirana et al. (2019) linked the increased risks of CKD to age. Tonelli et al. (2020) also concluded that the increased risk of CKD in adults was related to the aging of the body parts and organs susceptible to chronic conditions. The vulnerability of chronic diseases among the age increases the likelihood of developing malfunctions than in youths worse body system could fight against chronic illnesses (Lalji et al, 2020).

Race is another factor linked to high incidences of CKD across gender. A study conducted by Abdelraheem (2017) established that the social-economic status of minorities in the US is significantly related to the increased risk of CKD. According to the researchers, CKD prevalence increases among individuals with low social-economic status because they cannot afford expensive medication. Swanepoel et al. (2020) claimed that lack of employment among the low social class in individuals makes it challenging for individuals to mitigate against risk factors of CKD. As explained by Henry and Lippi (2020), individuals with high-income levels are likely to lead a healthy lifestyle that
could limit their exposure to CKD risk factors. This includes leading a healthy lifestyle in terms of diet and other health-related activities that could limit their vulnerability to CKD. In addition, individuals with a high-income level were more likely to access sophisticated home care services that increased their resilience in managing CKD personally at their home (Tonelli et al., 2020). In such instances, individuals with high income could work renal problems in their homes without requiring an emergency hospital visit.

On the other hand, due to limited financial resources in low-income individuals, there is the possibility of frequent hospital visits and admission into emergency departments. Based on the analysis conducted above, the following conclusions can be drawn (Henry & Lippi, 2020). First, the social-economic status of an individual determines their ability to fund health care expenses. The implication is that individuals from low social-economic may find it challenging to afford increased financial burdens attached to renal problems (Tonelli et al., 2020). On the other hand, individuals with high-income levels may find it affordable to secure sophisticated and expensive therapies that would improve their mortality rate. It can also be deduced that older individuals are at risk of developing CKD complications than younger individuals. With aging body organs and reduced capacity to defend the body against diseases, the older individuals are at high risk of developing CKD complications and the resulting increased emergency department hospitalization.
Chapter III: METHODOLOGY

Subjects

The purpose of this study is to investigate the emergency department (ED) visits and their association with age, gender, race, socioeconomic status (SES), number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, chronic kidney disease (CKD) type, the severity of illness, and number of chronic conditions in a cohort of inpatients with CKD in the United States. In the United States, approximately 3.5% of adult visits to the ED are by those with CKD (CDC, 2019). The general problem is inappropriate medication dosing and ineffective treatment for patients with CKD have led to their development of related adverse events (Saad et al., 2019). The specific problem is it remains unclear the associations of ED visits with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions among inpatients with CKD in the United States. In this study, demographics, socioeconomic status (ZIPINC), gender, hospital type, length of stay (1st outcome), DIED (2nd outcome), and TOTALCHG (3rd outcome) from NEDS 2018 will be collected and analyzed.

Correspondingly, the following research questions with hypotheses were developed:

**RQ1.** Are ED visits associated with age among inpatients with CKD in the United States?
H1$_{O}$. ED visits are not associated with age among inpatients with CKD in the United States.

H1$_{A}$. ED visits are associated with age among inpatients with CKD in the United States.

**RQ2.** Are ED visits associated with gender among inpatients with CKD in the United States?

H2$_{O}$. ED visits are not associated with gender among inpatients with CKD in the United States.

H2$_{A}$. ED visits are associated with gender among inpatients with CKD in the United States.

**RQ3.** Are ED visits associated with race among inpatients with CKD in the United States?

H3$_{O}$. ED visits are not associated with race among inpatients with CKD in the United States.

H3$_{A}$. ED visits are associated with race among inpatients with CKD in the United States.

**RQ4.** Are ED visits associated with SES among inpatients with CKD in the United States?

H4$_{O}$. ED visits are not associated with SES among inpatients with CKD in the United States.
H4<sub>A</sub>. ED visits are associated with SES among inpatients with CKD in the United States.

**RQ5.** Are ED visits associated with number of procedures among inpatients with CKD in the United States?

H5<sub>O</sub>. ED visits are not associated with number of procedures among inpatients with CKD in the United States.

H5<sub>A</sub>. ED visits are associated with number of procedures among inpatients with CKD in the United States.

**RQ6.** Are ED visits associated with insurance type among inpatients with CKD in the United States?

H6<sub>O</sub>. ED visits are not associated with insurance type among inpatients with CKD in the United States.

H6<sub>A</sub>. ED visits are associated with insurance among inpatients with CKD in the United States.

**RQ7.** Are ED visits associated with comorbidities among inpatients with CKD in the United States?

H7<sub>O</sub>. ED visits are not associated with comorbidities among inpatients with CKD in the United States.

H7<sub>A</sub>. ED visits are associated with comorbidities among inpatients with CKD in the United States.
**RQ8.** Are ED visits associated with length of stay among inpatients with CKD in the United States?

**H8O.** ED visits are not associated with length of stay among inpatients with CKD in the United States.

**H8A.** ED visits are associated with length of stay among inpatients with CKD in the United States.

**RQ9.** Are ED visits associated with admission type among inpatients with CKD in the United States?

**H9O.** ED visits are not associated with admission type among inpatients with CKD in the United States.

**H9A.** ED visits are associated with admission type among inpatients with CKD in the United States.

**RQ10.** Are ED visits associated with risk of mortality among inpatients with CKD in the United States?

**H10O.** ED visits are not associated with risk of mortality among inpatients with CKD in the United States.

**H10A.** ED visits are associated with risk of mortality among inpatients with CKD in the United States.

**RQ11.** Are ED visits associated with CKD type among inpatients with CKD in the United States?
H11o. ED visits are not associated with CKD type among inpatients with CKD in the United States.

H11a. ED visits are associated with CKD type among inpatients with CKD in the United States.

RQ12. Are ED visits associated with severity of illness among inpatients with CKD in the United States?

H12o. ED visits are not associated with severity of illness among inpatients with CKD in the United States.

H12a. ED visits are associated with severity of illness among inpatients with CKD in the United States.

RQ13. Are ED visits associated with number of chronic conditions among inpatients with CKD in the United States?

H13o. ED visits are not associated with number of chronic conditions among inpatients with CKD in the United States.

H13a. ED visits are associated with number of chronic conditions among inpatients with CKD in the United States.

The research methodology and design for this study is a quantitative correlational design study. A quantitative research methodology uses numerical data that allows for statistical analyses, helps reduce biases, and is based on an objectivity paradigm (Bowers, 2017). Quantitative research measures include statistical, mathematical, or numerical
analyses of data collected through questionnaires and surveys or by the manipulation of pre-existing statistical data using computational techniques (Bowers, 2017).

A correlational research design measures the relationship between two variables without the researcher’s controlling either of them (McCusker & Gunaydin, 2015). A quantitative correlational design study is an appropriate venue for conducting this study because the purpose of this study is to identify and evaluate the relationship between the dependent variable, ED visits, and the 13 independent variables. The target population of interest in this study includes 50 inpatients with CKD in the United States. This sample of participants is appropriate for conducting this study because the purpose of the study is to investigate the ED visits and their association with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions in a cohort of inpatients with CKD in the United States.

**Instrument**

The instrument for data collection of this study will be archival data, or the patient records of the selected inpatients with CKD in the United States. The researcher targets to recruit the data from NEDS 2018. Specifically, demographics, socioeconomic status (ZIPINC), gender, hospital type, length of stay (1st outcome), DIED (2nd outcome), and TOTALCHG (3rd outcome) will be collected and analyzed. The researcher targeted this instrument because the data available on this site is suitable for addressing the research problem under study.
Reliability

Reliability refers to the consistency of a measure (Twycross & Shields, 2004). One feature of the correlational research design is neither variable is manipulated, and it does not matter how or where the variables are measured (McCusker & Gunaydin, 2015). Therefore, the study is reliable from the design perspective. Moreover, archival data will be used as the instrument or sources of data collection. Since archival data are the data that have already been collected by the research site, the data collection and measurement are straightforward. As such, this study is reliable from the instrument perspective.

Validity

Validity refers to the extent to which the scores from a measure represent the variable they are intended to (Thanasegaran, 2009). Firstly, the developed constructs of interest are valid because the one dependent variable and the 13 independent variables are consistent with the specific problem of the study, the purpose of the study, and the research questions with hypotheses that were developed. The purpose of this study is to investigate the ED visits and their association with age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions in a cohort of inpatients with CKD in the United States.

Secondly, in terms of content validity, which is the extent to which a measure converts the constructs of interest (Dixon et al., 2008), this study is also valid. The researcher will recruit a sample of 50 inpatients with CKD in the United States and
recruit their data on their ED visits, age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions. This data collection will convert the constructs of interest.

Moreover, from the perspective of criteria, the researcher will particularly target those with complete data on their ED visits, age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions. Therefore, this study is valid from the criterion validity. Further, a quantitative methodology with a correlational design is particularly appropriate for conducting this study. Under this design, the researcher will not manipulate the independent variables.

**Procedures**

This section covers the procedures for conducting his study. No site permission will be required for this study because the NEDS is publicly accessible database. Moreover, the researcher does not need to know the real names of any participant either and they will not be used in the any phase of the study.

The researcher will then start selecting the target sample of 50 inpatients with CKD in the United States. The researcher will particularly target those with available data on their age, gender, race, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions. The researcher will continue the participant selection until
a total of 50 inpatients with complete data to be required are recruited. Specially, during this process through the NEDS 2018, demographics, socioeconomic status (ZIPINC), gender, hospital type, length of stay (1st outcome), DIED (2nd outcome), and TOTALCHG (3rd outcome) will be collected and analyzed.

Next, the researcher will conduct data analysis. The researcher will run Multiple Linear Regression (MLR) and ANOVAs for numerical outcomes such as LOS and Total Charges. Logistic Regression and Chi Square tests will then be conducted for DIED or presence/absence of CKI(CKD). The researcher will also interpret, summarize, and conclude the results. Lastly, the researcher will write up the practical implications and recommendations of this study.

Data Analysis

A quantitative correlational design study will be used for conducting this study. Considering the nature of the 13 research questions developed and their associated hypothesis, the researcher will conduct a MLR and ANOVA analyses to analyze the data to be collected. The researcher will also conduct Logistic Regression and Chi Square tests for DIED or presence/absence of CKI(CKD). MLR analysis is used to predict a continuous dependent variable based on multiple independent variables (Mertler & Vannata, 2013). In this study, the researcher aims to predict the dependent variable, ED visits, based on 13 independent variables. The 13 independent variables are (a) age, (b) gender, (c) race, (d) SES, (e) number of procedures, (f) insurance type, (g) comorbidities, (h) length of stay, (i) admission type, (j) risk of mortality, (k) CKD type, (l) severity of
illness, and (m) number of chronic conditions. Additionally, MLR can also determine the overall fit and the relative contribution of each of the predictors or independent variables to the total variance explained (Mertler & Vannatta, 2013). The approach for the study includes MLR analyses to test for the effects of the independent variables on the dependent variable, ED visits.
Chapter IV: RESULTS AND ANALYSIS

Introduction

The purpose of this study was to investigate the emergency department (ED) visits and their association with age, gender, socioeconomic status (SES), number of procedures, comorbidities, length of stay, risk of mortality, chronic kidney disease (CKD) type, and the severity of illness in a cohort of inpatients with CKD in the United States. The instrument for data collection of this study was archival data, specifically the patient records of the selected in patients with CKD in the United States. In this study, demographics, socioeconomic status (ZIPINC), gender, hospital type, length of stay, DIED, and TOTALCHG from NEDS 2018 were collected and analyzed.

What now follows are the demographic characteristics of the sample. This includes information on age, gender, socioeconomic status (SES), number of procedures, comorbidities, length of stay, risk of mortality, chronic kidney disease (CKD) type, and the severity of illness.

Demographic characteristics and health information

Age

There were $N = 197,779$ patients with CKD in the dataset. The ages of patients among CKD diagnosis ranged from X to X ($M = 65.34$, $SD = 16.93$). The ages appeared to follow a normal distribution as assessed by visual inspection of a histogram (Figure 1). Additionally, skewness and kurtosis values were computed with SPSS. All values were within acceptable ranges in order to assess normality. Hair et al. (2010) and Bryne (2010)
argued that data is considered to be normal if skewness is between -2 to +2 and kurtosis is between -7 to +7.

Figure 1.

Histogram Depicting Distribution of Ages among CKD Patients
**Gender**

Among CKD patients, there were 94,596 (47.8%) females (Female = 1) and 103,180 (52.2%) males (Male = 0). There were more males than females in the CKD sample. Figure 2 below provides a bar chart that depicts this information.

**Figure 2**

Bar Chart Representing Sex of CKD Patients

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**SES**

SES was measured by using the median household income national quartile for patients’ zip code. Most were in the first quartile, 74,892 (38.5%). This was followed by the second quartile, 51,154 (25.9%); the third quartile, 37,505 (19.0%); and the fourth
quartile, 31, 186 (15.8%). There were 3042 (1.5%) instances of no response. The bar chart in Figure 3 depicts this information.

**Figure 3.**

Median Household Income National Quartile of CKD Patients

![Bar chart with median household income quartiles for CKD patients.]

**CDK Type and Severity**

Among CDK patients, there were six types of CDK diagnoses: N181 stage 1, 803 (0.41%); N182 stage 2, 4744 (2.4%); N183 stage 3, 3899 (19.7%); N184 stage 4, 27,933 (14.1%); N185 stage 5, 4079 (2.1%); and end stage, 78,387 (39.6%). There were 42,834 (21.7%) CDK types that were unspecified. Figure 4 depicts this information.
Out of the $N = 197,779$ CKD patients, 2459 (1.2%) died and 195,217 (98.81%) did not die. The bar chart in Figure 5 depicts this information.
**Figure 5**

Bar chart Depicting Mortality of CKD Patients

**Length of stay and total charge**

Length of stay of patients with CKD ranged from zero to 242 days ($M = 5.07$, $SD = 5.92$). The total charge for ED services ranged from $101.00$ to $354,465$ ($M = 5844.35$, $SD = 8069.30$). Both length of stay and total charge for ED services were highly positively skewed as depicted in Figure 6 and 7 histograms.
Figure 6

Histogram of Length of Stay of CKD Patients

Figure 7

Histogram of Total Charge for ED Services for CKD Patients
**Number of procedures**

The number of procedures ranged from zero to 15 ($M = 1.78$, $SD = 2.62$). The skewness and kurtosis values suggested that the deviation from normality, as shown in Figure 8, is not severe. As skewness and kurtosis values were in acceptable ranges.

![Histogram of the Number of Procedures](image)

**Number Comorbidities**

The number of comorbidities ranged from three to 35 ($M = 11.99$, $SD = 6.76$) as assessed by the number of diagnoses. The skewness and kurtosis values suggested that the deviation from normality, as shown in Figure 9, is not severe. As skewness and kurtosis values were in acceptable ranges.
Figure 9

Histogram of the Number of Comorbidities

CKD Mortality and demographic characteristic

Binary logistic regression was conducted in order to assess the relationship between mortality, age, gender, SES, number of comorbidities, number of procedures, and severity. Binary logistic regression analysis is used to predict a dichotomous dependent variable, mortality (died or not died) in this case, based on independent variables (Mertler & Vannata, 2013). Additionally, binary logistic regression analysis also determines the overall fit and the relative contribution of each of the predictors to the total variance explained (Mertler & Vannatta, 2013). However, prior to conducting binary logistic regression, there were assumptions that must be met. These include the absence of multicollinearity, and absence of significant outliers (Laerd Statistics, 2021).
Multicollinearity only applies to multiple binary logistic regression, i.e., binary regression with two or more independent variables. As each predictor was assessed separately, multicollinearity did not apply. Regarding outliers, there were no regression residuals that were significant outliers. What now follows are the results of the binary logistic regressions that were conducted.

**Mortality and Age**

Binary logistic regression was conducted in order to assess the relationship between mortality and age among CKD patients. The overall logistic regression model was statistically significant, $\chi^2(1) = 295.962, p < .001$. Age was a significant predictor of the likelihood of mortality ($B = 0.002$, $OR = 1.002$, $p < .001$). An increase in age by one year results in increased odds of mortality by 1.002 times. Tables 1 and 2 depict this information.

**Table 1**

*Omnibus Tests of Model Coefficients*

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<th>$p$</th>
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Table 2

Variables in the Equation

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<th>Wald</th>
<th>df</th>
<th>p</th>
<th>OR</th>
<th>95% C.I. for EXP(B) Lower</th>
<th>Upper</th>
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<td>.000</td>
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</table>

Mortality and Gender

Binary logistic regression was conducted in order to assess the relationship between mortality and gender among CKD patients. The overall logistic regression model was not statistically significant, \( \chi^2(1) = 1.871, p = .171 \). Gender was not a significant predictor of the likelihood of mortality (\( B = 0.056, OR = 1.057, p = .172 \)). Tables 3 and 4 depict this information.

Table 3

Omnibus Tests of Model Coefficients

<table>
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<th></th>
<th>( \chi^2 )</th>
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<th>p</th>
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<td>.171</td>
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Table 4

Variables in the Equation

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<th>Wald</th>
<th>df</th>
<th>p</th>
<th>OR</th>
<th>95% C.I. for EXP(B) Lower</th>
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<td>1</td>
<td>.000</td>
<td>.012</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Mortality and SES**

Binary logistic regression was conducted in order to assess the relationship between mortality and SES among CKD patients. The overall logistic regression model was not statistically significant, $\chi^2(3) = 5.703, p = .127$. However, SES was a significant predictor of the likelihood of mortality. Specifically, those individuals within the $2^{nd}$ quartile of household income had decreased odds of dying compared with those in the $4^{th}$ quartile by 0.858 times ($B = -.153, OR = 0.858, p = .017$. Tables 5 and 6 depict this information.

Table 5

**Omnibus Tests of Model Coefficients**

<table>
<thead>
<tr>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.703</td>
<td>3</td>
<td>.127</td>
</tr>
</tbody>
</table>

Table 6

**Variables in the Equation**

<table>
<thead>
<tr>
<th>ZIPINC_QRTL</th>
<th>$B$</th>
<th>S.E.</th>
<th>Wald</th>
<th>$df$</th>
<th>$p$</th>
<th>OR</th>
<th>95% C.I.for EXP(B) Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZIPINC_QRTL</td>
<td>5.781</td>
<td>.049</td>
<td>7693.429</td>
<td>1</td>
<td>&lt;.001</td>
<td>.014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZIPINC_QRTL(1)</td>
<td>-0.099</td>
<td>.059</td>
<td>2.809</td>
<td>1</td>
<td>.094</td>
<td>.960</td>
<td>.870</td>
<td>.973</td>
</tr>
<tr>
<td>ZIPINC_QRTL(2)</td>
<td>-1.53</td>
<td>.064</td>
<td>5.732</td>
<td>1</td>
<td>.017</td>
<td>.858</td>
<td>.758</td>
<td>.973</td>
</tr>
<tr>
<td>ZIPINC_QRTL(3)</td>
<td>-0.098</td>
<td>.068</td>
<td>2.118</td>
<td>1</td>
<td>.146</td>
<td>.906</td>
<td>.794</td>
<td>1.035</td>
</tr>
<tr>
<td>Constant</td>
<td>-4.279</td>
<td>.049</td>
<td>7693.429</td>
<td>1</td>
<td>&lt;.001</td>
<td>.014</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mortality and Number of Comorbidities

Binary logistic regression was conducted in order to assess the relationship between mortality and number of comorbidities among CKD patients. The overall logistic regression model was statistically significant, \( \chi^2(1) = 1862.361, p < .001 \). Number of comorbidities was a significant predictor of the likelihood of morality \((B = 0.115, \text{OR} = 1.222, p < .001)\). An increase in number of comorbidities by one unit results in increased odds of mortality by 1.222 times. Tables 7 and 8 depict this information.

Table 7
Omnibus Tests of Model Coefficients

<table>
<thead>
<tr>
<th></th>
<th>( \chi^2 )</th>
<th>df</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1862.361</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Table 8
Variables in the Equation

<table>
<thead>
<tr>
<th></th>
<th>( B )</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>( p )</th>
<th>( \text{OR} )</th>
<th>95% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>.115</td>
<td>.003</td>
<td>1901.346</td>
<td>1</td>
<td>&lt;.001</td>
<td>1.122</td>
<td>1.116</td>
</tr>
<tr>
<td>Constant</td>
<td>-6.097</td>
<td>.052</td>
<td>13695.142</td>
<td>1</td>
<td>&lt;.001</td>
<td>1.122</td>
<td>1.116</td>
</tr>
</tbody>
</table>

Mortality and Number of Procedures

Binary logistic regression was conducted in order to assess the relationship between mortality and number of procedures among CKD patients. The overall logistic regression model was statistically significant, \( \chi^2(1) = 1234.546, p < .001 \). Number of
procedures was a significant predictor of the likelihood of morality ($B = 0.214$, $OR = 1.239$, $p < .001$). An increase in number of procedures by one unit results in increased odds of mortality by 1.239 times. Tables 9 and 10 depict this information.

Table 9

*Omnibus Tests of Model Coefficients*

<table>
<thead>
<tr>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1234.546</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Table 10

*Variables in the Equation*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>S.E.</th>
<th>Wald</th>
<th>$df$</th>
<th>$p$</th>
<th>OR</th>
<th>95% C.I. for EXP(B)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Procedures</td>
<td>.214</td>
<td>.005</td>
<td>1592.075</td>
<td>1</td>
<td>&lt;.001</td>
<td>1.239</td>
<td>1.226</td>
<td>1.252</td>
</tr>
<tr>
<td>Constant</td>
<td>-4.277</td>
<td>.033</td>
<td>16862.910</td>
<td>1</td>
<td>&lt;.001</td>
<td>.014</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Mortality and Severity*

Binary logistic regression was conducted in order to assess the relationship between mortality and severity among CKD patients. The overall logistic regression model was statistically significant, $\chi^2(1) = 937.481$, $p < .001$. Severity was a significant predictor of the likelihood of mortality ($B = 0.576$, $OR = 1.779$, $p < .001$). An increase in severity of CKD type by one unit results in increased odds of mortality by 1.779 times. Tables 9 and 10 depict this information.
**Table 9**

*Omnibus Tests of Model Coefficients*

<table>
<thead>
<tr>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>937.481</td>
<td>1</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

**Table 10**

*Variables in the Equation*

<table>
<thead>
<tr>
<th></th>
<th>$B$</th>
<th>S.E.</th>
<th>Wald</th>
<th>$df$</th>
<th>$p$</th>
<th>OR</th>
<th>95% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Severity</td>
<td>.576</td>
<td>.022</td>
<td>676.953</td>
<td>1</td>
<td>&lt;.001</td>
<td>1.779</td>
<td>1.703</td>
</tr>
<tr>
<td>Constant</td>
<td>-7.222</td>
<td>.125</td>
<td>3358.862</td>
<td>1</td>
<td>&lt;.001</td>
<td>.001</td>
<td>1.858</td>
</tr>
</tbody>
</table>

*Predictors of length of hospital stay*

Multiple regression was conducted in order to assess the relationship between length of stay and age, gender, SES, number of procedures, number of comorbidities, and severity among CKD patients. There was approximate normality of regression residuals (Figure 10) as well as homoscedasticity and collective linearity (Figure 11). Figure 10 shows an approximate symmetric distribution that is mound shaped which justifies approximate normality. Additionally, the non-random pattern in the scatter plot of Figure 11 suggests homoscedasticity as well as collective linearity between the independent variables and the dependent variable. There were no significant outliers in the regression residuals as well as no multicollinearity as suggested by all variance inflation factors below 5.0.
Figure 10

Histogram of Regression Residuals (DV: length of stay)
The overall model was statistically significant, $F(6, 68426) = 4305.530, \ p < .001$. The predictors explained 27.4% of the variation in predicting length of stay ($R_{adj} = .274$). All predictors with the exception of SES were significant. Specifically, an increase in age by one unit results in a mean increase in length by 0.005 ($B = 0.005, \ p < .001$). Being female increases mean length of stay by 0.204 ($B = 0.204, \ p < .001$). An increase
in the number of procedures by one unit results in a mean increase in length of stay by 1.047. An increase in the number of comorbidities by one unit results in an increase length of stay by 0.148 ($B = 0.148, p < .001$); Finally, an increase in severity by one unit results in an overall mean decrease in length of stay ($B = -0.103, p < .001$). The predictor with the most influence, however, was the number of procedures which had the largest standardized regression coefficient ($\beta = 0.466$). This was followed by the number of comorbidities with the second largest standardized regression coefficient ($\beta = 0.152$). The least contribution was the severity with the smallest standardized regression coefficient ($\beta = -0.022$). Tables 11, 12, and 13 provide this information.

Table 11 Model Summary

<table>
<thead>
<tr>
<th></th>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2_{adj}$</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.524$^a$</td>
<td>.274</td>
<td>.274</td>
<td>5.081</td>
<td>1.989</td>
</tr>
</tbody>
</table>

Table 12

ANOVA

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>666942.406</td>
<td>6</td>
<td>111157.068</td>
<td>4305.530</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>1766418.162</td>
<td>68420</td>
<td>25.817</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2433360.568</td>
<td>68426</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 13 Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>β</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>.652</td>
<td>.138</td>
<td>4.731</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.005</td>
<td>.001</td>
<td>.014</td>
<td>4.126</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Gender</td>
<td>.204</td>
<td>.039</td>
<td>.017</td>
<td>5.229</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Quartile of Income (SES)</td>
<td>-.022</td>
<td>.018</td>
<td>-.004</td>
<td>-1.263</td>
<td>.206</td>
</tr>
<tr>
<td>Number of procedures</td>
<td>1.047</td>
<td>.008</td>
<td>.466</td>
<td>126.322</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>.148</td>
<td>.004</td>
<td>.152</td>
<td>41.829</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Severity</td>
<td>-.103</td>
<td>.018</td>
<td>-.022</td>
<td>-5.629</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

**Predictors of total charges**

Multiple regression was conducted in order to assess the relationship between total charges and age, gender, SES, number of procedures, number of comorbidities, and severity among CKD patients. There was approximate normality of regression residuals (Figure 12) as well as homoscedasticity and collective linearity (Figure 13). Figure 12 shows an approximate symmetric distribution that is mound shaped which justifies approximate normality. Additionally, the non-random pattern in the scatter plot of Figure 13 suggests homoscedasticity as well as collective linearity between the independent variables and the dependent variable. There were no significant outliers in the regression residuals as well as no multicollinearity as suggested by all variance inflation factors below 5.0.
Figure 12

Histogram of Regression Residuals (DV: Total Charge)
The overall model was statistically significant, $F(6, 51539) = 92.568$, $p < .001$. The predictors explained 1.1% of the variation in predicting total charge ($R_{adj} = .011$). All predictors with were significant. Specifically, an increase in age by one unit results in a mean decrease in total charge by 2.132 ($B = -.132, p = .001$). Being female decreases mean charge by 42.884 ($B = -42.884, p = .030$). An increase in quartile of household income (SES) by one quartile results in a mean decrease in total charge by 49.123 ($B = -49.123, p < .001$). An increase in the number of procedures by one unit results in an increase in charge by 43.717 ($B = 43.717, p < .001$). In increase in the number of comorbidities results in a mean decrease in total charge by 7.198 ($B = -7.198, p < .001$).
Lastly, the predictor with the greatest contribution to the model is severity. An increase in severity results in an average increase in charge by 111.351 ($B = 111.351, p < .001$).

Tables 14, 15, and 16 provide this information.

### Table 14

**Model Summary**

<table>
<thead>
<tr>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2_{adj}$</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>.103$^a$</td>
<td>.011</td>
<td>.011</td>
<td>2223.17797</td>
<td>1.954</td>
</tr>
</tbody>
</table>

### Table 15

**ANOVA**

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>6</td>
<td>457518950.860</td>
<td>92.568</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>51533</td>
<td>4942520.288</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>51539</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 16

**Coefficients**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>$T$</th>
<th>$p$</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>2757.055</td>
<td></td>
<td>39.516</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-2.132</td>
<td>-.015</td>
<td>-3.200</td>
<td>.001</td>
<td>.868</td>
</tr>
<tr>
<td>Gender</td>
<td>-42.884</td>
<td>-.010</td>
<td>-2.177</td>
<td>.030</td>
<td>.990</td>
</tr>
<tr>
<td>(Female)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-49.123</td>
<td>-.025</td>
<td>-5.503</td>
<td>&lt;.001</td>
<td>.965</td>
</tr>
<tr>
<td>Procedures</td>
<td>43.717</td>
<td>.053</td>
<td>10.568</td>
<td>&lt;.001</td>
<td>.776</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>-7.198</td>
<td>-.019</td>
<td>-3.974</td>
<td>&lt;.001</td>
<td>.811</td>
</tr>
<tr>
<td>Severity</td>
<td>111.351</td>
<td>.063</td>
<td>11.953</td>
<td>&lt;.001</td>
<td>.699</td>
</tr>
</tbody>
</table>
Summary

The purpose of this study was to investigate emergency department (ED) visits and their association with age, gender, socioeconomic status (SES), number of procedures, comorbidities, length of stay, risk of mortality, chronic kidney disease (CKD) type, and the severity of illness in a cohort of inpatients with CKD in the United States. Binary logistic regression as well as multiple regressions was employed in order to assess these relationships. Binary logistic regression was first conducted in order to assess the relationship of each variable with mortality. Results were that an increase in age by one year results in increased odds of mortality by 1.002 times. Those individuals within the 2nd quartile of household income had decreased odds of dying compared with those in the 4th quartile by 0.858 times. An increase in number of comorbidities by one unit results in increased odds of mortality by 1.222 times. An increase in number of procedures by one unit results in increased odds of mortality by 1.239 times. An increase in severity of CKD type by one unit results in increased odds of mortality by 1.779 times.

Multiple regression was conducted in order to assess the relationship between length of stay and age, gender, SES, number of procedures, number of comorbidities, and severity among CKD patients. All predictors with the exception of SES were significant. Specifically, an increase in age, the number of procedures, the number of comorbidities, and being female increases the length of stay. An increase in severity results in an overall mean decrease in length of stay. The predictor with the most influence, however, was the number of procedures which had the largest standardized regression coefficient.
This was followed by the number of comorbidities with the second largest standardized regression coefficient. The least contribution was the severity with the smallest standardized regression coefficient.

Multiple regression was conducted in order to assess the relationship between total charges and age, gender, SES, number of procedures, number of comorbidities, and severity among CKD patients. All predictors with were significant. An increase in the number of procedures and severity results in a mean increase in total charge. However, an increase in age, being female, an increase in quartile of household income (SES), the number of procedures and comorbidities result in a mean decrease in charge. The predictor with the greatest contribution to the model is severity. This was followed by the number of procedures. The least impact on total charge was being female.
Chapter V: DISCUSSION AND STUDY LIMITATIONS

Discussion of Research

This chapter presents the discussions, interpretations, and limitations regarding a study that examined ED visits and their association with age, gender, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, Chronic Kidney Disease (CKD) type, the severity of illness, and number of chronic conditions in a cohort of inpatients with CKD. The research gap that was under investigation was the lack of appropriate medication dosing and ineffective treatment for CKD patients thus resulting in the development of adverse related events (Saad et al., 2019).

The specific problem under inquiry was that the associations between ED visits with age, gender, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions among inpatients with CKD in the US were yet to be fully acknowledged. Existing research related to CKD illustrated that it can lead to renal failure, significant dyslipidemia and profound changes in lipid and lipoprotein metabolism, and the gradual loss of kidney functions in the long run (Chen et al., 2017; Patel et al., 2017).

This study was purposefully conducted to investigate emergency department (ED) visits and their association with age, gender, socioeconomic status (SES), number of procedures, comorbidities, length of stay, risk of mortality, chronic kidney disease (CKD)
type, and the severity of illness in a cohort of inpatients with CKD in the US. This chapter is composed of two main parts; the discussions and the limitation sections. The discussion section comprises the results of the study, the implications for theory, policy, and practice, and the correlation between the theoretical framework, the literature review, and the findings retrieved from chapter 4.

The limitations sections will comprise the characteristics of the methodology of the research design that influenced the interpretations of study outcomes from the research (Queirós et al., 2017). They often revolve around the constraints on applications of practice, generalizability, and the utility of findings that are the results of ways through which the researcher opted to choose the study and the methods deployed in establishing the external and internal validity of the study, inclusive of the anticipated challenges (Queirós et al., 2017).

**Patients’ demographic characteristics and health information**

There was a total of 197,779 patients in the study dataset. The ages of these patients ranged from X to X ($M = 65.34$, $SD = 16.93$) and followed the normal distribution as assessed by visual inspection of a histogram. In the study sample, 103,180 patients were males while 94,596 patients were females. From a socioeconomic status perspective that was analyzed using the median household income national quartile for patients’ zip code, 74,892 patients were in the first quartile, 51,152 in the second quartile, while 37,505 in the third quartile, while 31,186 of these patients belonged to the second quartile.
Furthermore, the analysis revealed that there were six types of CKD types that existed among the patients under study. According to the analysis, there were 803 patients with N181 stage 1, 4744 with N182 stage 2, 3899 with N183 stage 3, 27,933 N184 stage 4, 4079 with N185 stage 5, and 78,387 with N185 stage 6. Besides, 42,834 had an unspecified CKD type. Conversely, out of the 197,779 CKD patients, 2459 died while 195,217 did not die. The length of stay of patients with CKD ranged from zero to 242 days while the total charge for ED services ranged from $101.00 to $354,465. Moreover, the number of procedures ranged from zero to 15 while the number of comorbidities ranged from 3 to 35 as was assessed by the number of diagnoses.

**Patients’ CKD Mortality and demographic characteristics**

To analyze the relationship between mortality, age, gender, SES, number of comorbidities, number of procedures, and severity, a binary logistic regression was performed.

**Age as a predictor of CKD Mortality**

With regards to the age of participants, the overall logistic regression model was statistically significant implying that age was a significant predictor of the likelihood of mortality. An increase in age by one year would result in increased odds of mortality by 1.002 times. This finding is in line with findings from a meta-analysis and systematic review conducted by Paini et al. (2019) that stated that youths are less likely to be diagnosed with renal diseases compared to their elderly counterparts.
While discussing the effect of age on the mortality of CKD, Porter et al. (2017) asserted that kidney function was significantly affected by age and its function was regarded as stable after infancy until late adulthood. Kashani et al. (2019) also supported by expressing that the GFR of individuals often decreases by 1 ml/min/1.73 m² annually after the age of 30 in healthy people. An elucidation demonstration presented by Kashani et al. (2019) also illustrated that the decrease in kidney function might be a result of the variations in the kidney structure related to aging. Empirical research conducted by Alicic et al. (2017) also supported this outcome by stating that the elderly reported a noticeably higher CKD prevalence compared to the youth. They added that the prevalence surged with age in all populations, especially among older people aged 70 years or more. Kalantar et al. (2017) also sensitized by asserting that the sharp increase in the CKD prevalence in older adults might partially result from related comorbidities of CKD, such as cardiovascular diseases and diabetes.

**Gender as a predictor of CKD Mortality**

In the gender context, the overall logistic regression model was not statistically significant implying that gender was not a significant predictor of the likelihood of morality. This finding was supported by study outcomes by Gunnerson (2019) which illustrated that there was a statistically significant relationship between gender CKD incidences. An almost similar study was conducted by Kim et al. (2019) and revealed that CKD was more prevalent among men than females. According to a study by Lima-Posada et al. (2017), the differences in CKD instances across genders can be linked
to differences in hormonal factors and medication responses, which are different across gender. This study established significant differences in CKD incidences across the gender and linked it to the difference in sex hormones. A study by Chou et al. (2018) also complimented this finding by demonstrating the variations in CKD across genders to disease progression, differences in biological, chemical, and psychological aspects across gender.

On the contrary, Porter et al. (2017) conducted a similar study assessing the role that gender had in kidney disease progression to understand the differences between CKD and gender factors among patients. Porter et al. (2017) revealed that CKD was more prevalent in women than men. However, they did not mention the reasons for the differences in CKD incidences across genders and recommended further research. Additional studies by Dennis and Witting (2017) established that end-stage renal failure was higher in men compared to women. This difference was linked to physiological variations and hormone differences, while the differences in CKD incidences were linked to variations in psychological, physiological, and chemical differences between women and men. Due to the presence of contradictory findings by Porter et al. (2017), Lima-Posada et al. (2017) concluded that gender plays a critical role in predicting CKD incidences among different individuals and recommended additional research regarding the relationships between various predictors of CKD mortality.
**Socioeconomic Status (SES) as a predictor of CKD Mortality**

In the socioeconomic status (SES) context, the overall logistic regression model was statistically significant implying that SES was a significant predictor of the likelihood of morality. In particular, those individuals within the 2\textsuperscript{nd} quartile of household income had decreased odds of dying compared with those in the 4\textsuperscript{th} quartile by 0.858 times. Findings from various studies supported the outcomes that race is one of the key predictors of CKD mortality. Research by Tonelli et al. (2020) and Henry and Lippi (2020) revealed that Income was identified as a primary factor that influenced the prevalence of CKD among individuals since individuals who have more money can have increased access to medication than those without money. Tonelli et al. (2020) further explained that SES was a significant factor because people who had more money increased their access to medication than those without any financial muscle. This finding also aligns with findings by Luyckx et al. (2017) and Wu et al. (2019) who documented that people of higher social-economic status played an important role in determining the capability to access medical services.

The positive association between CKD mortality and socioeconomic status was also dissected by some researchers demonstrating the same results found in the present study. For instance, Santin et al. (2019) revealed that Individuals from a low social-economic background were more likely to suffer from CKD than their wealthy counterparts. In their explanation, they stated that this difference could be attributed to the capacity of rich people to secure medication than the low-income earner. Similar
findings were reported also by Panitchote et al. (2019) who documented that the inability of low-income individuals to access proper medication or self-care training low-income increased the likelihood that minorities were three times more likely to suffer from CKD than individuals with high-income levels.

In the view of Luyckx et al. (2017) individuals from disadvantaged backgrounds had a lower income to warrant them the accessibility to guarantee them access to quality medication. Abdelraheem (2017) also supported this finding by stating that disposable income among the wealthy and middle-income earners provided them with the capacity to access regular screening that can detect CKD in its early stages compared to the less rich, who may find it costly to run periodic screening. Lastly, Panitchote et al. (2019) concluded that wealthy individuals have a low mortality rate of CKD patients than the less rich ones, and the rich have a low mortality rate from CKD because they can afford complex health care management tools than those from low social-economic backgrounds.

**Number of comorbidities as a predictor of CKD Mortality**

In examining the relationship between mortality and the number of comorbidities, the researcher found that the overall logistic regression model was statistically significant, implying that the number of comorbidities was a significant predictor of the likelihood of mortality. An increase in the number of comorbidities by one unit results in increased odds of mortality by 1.222 times. Suh et al. (2021) defined comorbidity as the simultaneous presence of two or more diseases or medical conditions in a patient. This
finding was supported by Lakkis and Weir (2018) who documented that the prevalence of Chronic Kidney Disease in obese individuals globally is about 30% -37%. They also added that abdominal obesity associated with an increase in waist circumference is significantly associated with CKD. Findings by Suh et al. (2021) also revealed that chronic kidney disease was strongly correlated with visceral adiposity that obesity is a crucial risk factor of Chronic Kidney Disease. Studies by Kovesdy et al. (2017) also sensitized the existing correlation between CKD mortality and the number of comorbidities by documenting that obesity surges the risks of developing chronic illnesses such as cardiovascular complications, insulin resistance, high blood pressure, and CKD. On the other hand, Alicic et al. (2017) illustrated that pre-existing medical conditions, primarily type 2 diabetes, were statistically associated with the prevalence of CKD.

**Number of procedures and severity as a predictor of CKD Mortality**

In examining the relationship between mortality and the number of procedures, the findings stated that the overall logistic regression model was statistically significant. This finding illustrated that the number of procedures was a significant predictor of the likelihood of morality. Besides, an increase in the number of procedures by one unit results in increased odds of mortality by 1.239 times. In an attempt to examine the relationship between mortality and severity of CKD, the overall logistic regression model was statistically significant. This finding implied that severity was a significant predictor of the likelihood of morality. This finding revealed that an increase in severity of CKD
100
type by one unit results in increased odds of mortality by 1.779 times. This finding was supported by Qiu et al. (2018) who researched to determine the correlation between genetic factors and the prevalence of CKD. They found that gene proteins play a significant role in regulating hepatic metinalom. As expressed by these researchers, these genes often facilitate the progression of CKD into its advanced stage. Pavkov et al. (2018) also sensitized that it was essential to underscore that genes such as TM6SF2 and PNPLA3 tend to replicate in different locations and ethnicities differently, thus influencing the prevalence and severity of CKD among individuals.

**Predictors of length of hospital stay**

The research investigated the relationship between the length of stay and age, gender, SES, number of procedures, number of comorbidities, and severity among CKD patients. Multiple regression was conducted to assess the relationship between the length of stay and the aforementioned predictors. There was approximate normality of regression residuals, homoscedasticity, and collective linearity. In this analysis, the overall model was statistically significant. All predictors (age, gender, number of procedures, number of comorbidities, and severity among CKD patients) except for SES were significant.

An increase in age by one unit results in a mean increase in length by 0.005. Being female increases the mean length of stay by 0.204. An increase in the number of procedures by one unit results in a mean increase in length of stay by 1.047. An increase in the number of comorbidities by one unit results in an increased length of stay by 0.148.
Finally, an increase in severity by one unit results in an overall mean decrease in length of stay. The predictor with the most influence, however, was the number of procedures that had the largest standardized regression coefficient. This was followed by the number of comorbidities with the second-largest standardized regression coefficient. The last contribution was the severity with the smallest standardized regression coefficient.

**Predictors of total charges**

Multiple regression was also conducted to examine the relationship between total charges and age, gender, SES, number of procedures, number of comorbidities, and severity among CKD patients. In this analysis, the overall model was statistically significant and the predictors explained 1.1% of the variation in predicting total charge implying that all predictors were significant. In particular, an increase in age by one unit results in a mean decrease in total charge. Being female decreases the mean charge by 42.884. An increase in the quartile of household income (SES) by one quartile results in a mean decrease in total charge by 49.123. An increase in the number of procedures by one unit results in an increase in charge by 43.717. An increase in the number of comorbidities results in a mean decrease in total charge by 7.198. Lastly, the predictor with the greatest contribution to the model is severity. An increase in severity results in an average increase in charge by 111.351.

This finding aligns with study findings by Ibarra et al. (2017) who documented that CKD patients who were beneficiaries of Medicare from 2005-2010 reported a sharp surge in annual charges for CKD for patients in 2005 of at least $2,634 to 5,152 in 2010.
Ibarra et al. (2017) added that to understand the economic burden associated with CKD, current projections revealed that the Medicare claims in the United States are expected to rise from the current $104 billion to $198 billion, including both economic and societal costs. The literature reviewed above suggests the significance of contextualizing the financial burden and the societal costs associated with CKD. Through the existing studies, Pereira et al. (2017) recommended enhanced screening and detection to warrant early therapeutic intervention.

**Study limitations**

The limitations of the research are the characteristics of design and methodology that impacts or influences the interpretation of the outcomes from a study (Creswell & Clark, 2017). They are also described as the constraints on generalizability, applications to practice, and the utility of findings that are the result of how the researcher initially chose to design the research or the methodology used to establish internal and external validity of the result of unanticipated challenges that emerged during the study (Creswell & Clark, 2017).

This study adopted a quantitative correlational design study to aid in the collection and analysis of quantitative data regarding ED visits and their association with age, gender, SES, number of procedures, insurance type, comorbidities, length of stay, admission type, risk of mortality, CKD type, the severity of illness, and number of chronic conditions in a cohort of inpatients with CKD. A quantitative methodology involves the use of quantitative methods that often emphasize objective measurements
and mathematical, statistical, and numerical analysis of data that was collected from NEDS 2018. One of the primary limitations resulting from this methodology was the aspect of generalizability (Creswell & Clark, 2017). In this case, the quantitative techniques that were adopted by the researcher introduced the generalizability aspect leading to an exaggeration of the study outcomes. Queirós et al. (2017) defined generalizability as the extension of research outcomes and conclusions from the research conducted on a sample population to the larger population.

A second limitation resulted from the study sample that consisted of a total of 197,779 patients in the study dataset due to the wider coverage of the target population. A large study sample is strenuous and often influences the outcomes of the study. According to Creswell and Clark, (2017) a larger sample size does not significantly improve the accuracy of statistics, or significantly decreases the margin of error in systematic random sampling or polling. Besides, the sampling methods used in quantitative techniques for larger data samples are also time-consuming since the researcher was compelled to follow a due process such as an initial identification of appropriate data and a proper selection of participants who were able to produce relevant data for the study. In general, the selection of an appropriate sample in the case of larger samples such as the present study results in monotony since the researcher repeatedly assigned numbers to aid in obtaining the required information (Creswell & Clark, 2017).
References


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