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Culturally Competent Nutrition Counseling and Health Outcomes of Patients on Emergency Dialysis

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Abstract

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by

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MPH, University of Texas Health Science Center, 2006

BS, University of Houston, 2002

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Undocumented end stage renal disease (ESRD) patients in the United States only have access to emergency dialysis. To compensate for the lack of regular dialysis these patients must follow strict renal dietary restrictions. However, nutrition counseling by a dietitian is not part of the renal management of patients on emergency dialysis. The purpose of this quantitative quasi-experimental treatment-control study was to assess how the application of nutritional counseling that is both culturally and linguistically competent affects dialysis frequency and biochemical lab values such as serum potassium, phosphorus, and vitamin D of patients in emergency dialysis. The study was grounded on the social cognitive theory and consisted of a secondary data analysis of information collected from electronic medical records. The sample size consisted of 96 emergency dialysis patients, 51 from the intervention group, and 45 from the control group. Results from Quade's test revealed there is statistically significant difference in serum levels of phosphorus [$F(1,94) = 9.616$, $p = 0.003$] and levels of Vitamin D [$F(1,94) = 51.411$, $p = .000$] between the intervention and control groups, controlling for age, gender, and time on dialysis. These findings suggest the implementation of nutrition counseling that is both culturally and linguistically competent can improve phosphorous and vitamin D levels among emergency dialysis patients. The potential social change implication of this study is that its findings may serve to assist health care professionals to design and implement interventions to improve the health status of emergency dialysis patients and reduce their impact on the public health system.

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Dedication

I thank God, the most beneficent, the most merciful, for giving me the patience and perseverance to overcome all challenges of completing the Ph.D. program while also fulfilling my responsibilities as a mother, wife and full time professional. I am also truly thankful to my family, and I dedicate this document to them. I thank my dear husband, Yahya Alghafir and my children Maryam, Jabriel, Obed, and Fatima for consistently supporting me through the challenges of postgraduate school and life. Without their love, understanding, and encouragement this dissertation would never have come to fruition. In addition, I dedicate this work to my parents, Carmen Galindez and Asdrubal Bustamante, whose academic and professional achievements have always inspired me to strive for excellence. I also dedicate this work to my grandparents Rafael Galindez, Carmen Galindez and Rosa Alcala whose good examples have taught me to work hard for the things that I seek to achieve. Finally, I dedicate this work to my emergency dialysis patients. Every day, they teach me lessons about hope, faith, courage, patience. I am humbled by the opportunity to help them feel better in any capacity.

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Chapter 1: Introduction to the Study

Introduction

The population of undocumented immigrants in the United States is steadily growing. Among this population, a large segment has end stage renal disease (ESRD; Campbell, Sanoff, & Rosner, 2010; Raghavan & Sheikh-Hamad, 2011; Raghavan, 2012). Individuals suffering from ESRD or kidney failure need either a kidney transplant or regular dialysis to survive (National Kidney and Urologic Diseases Information Clearinghouse, 2012). However, undocumented patients with kidney failure have no access to either of these treatments. They only receive emergency dialysis in acute care health facilities (Raghavan & Sheikh-Hamad, 2011; Raghavan, 2012).

Emergency dialysis is granted only when life-threatening conditions are present (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007). The lack of dialysis treatment in this population results in more frequent and longer hospital stays, as well as higher morbidity and mortality (Campbell et al. 2010; Coritsidis et al., 2004; Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007). Emergency dialysis also results in higher costs for public hospitals. The only study that has compared the cost of emergency dialysis versus regular dialysis was Sheikh-Hamad and colleagues (2007) who reported that providing emergency dialysis leads to a total cost of care that is 3.7 times higher than providing regular dialysis.

In addition to dialysis, following renal dietary restrictions is an important component of the health management process of patients with ESRD (Hollingdale, Sutton & Hart, 2008). Nutritional management is indispensable when there is not enough dialysis to prevent medical complications related to excess waste and fluid in the blood (Raghavan, 2012). As a result, it is

essential that patients on emergency dialysis follow prescribed evidence-based nutritional plans to manage their health (Kugler, Maeding, & Russell, 2011). It is crucial to ensure that patients on emergency dialysis understand the diet regimen they need to implement and the importance of compliance. It is important for this population to receive nutrition education tailored to their needs and characteristics to promote diet adherence and better health outcomes. However, nutrition education and counseling by a dietitian are not standard components of emergency dialysis (Raghavan, 2012). Undocumented ESRD patients have no access to regular nutrition counseling tailored to their specific cultural and linguistic characteristics, health status, and mode of renal treatment. Consequently, they suffer more health complications and have poor health outcomes compared to patients on regular dialysis with access to consistent dietary advice (Raghavan & Sheikh-Hamad, 2011). This limitation in the treatment of ESRD patients in emergency dialysis indicates an imperative need to investigate treatment modalities more closely.

This chapter provides background information on undocumented immigrants with ESRD in the United States and the renal treatment available to them. I cover the problem addressed by the study and the central purpose of the investigation. I also provide the research questions and hypotheses pursued in the present study, along with descriptions of the theoretical base, definitions, variables, assumptions, limitations, and scope involved in the study.

Background

There is a growing population of undocumented patients with ESRD in the United States. Approximately, 11 million undocumented residents live in the United States (Campbell et al., 2010; Coritsidis et al., 2004). Of this population, about 80% are Hispanics who are mainly from Mexico (57%) and other Latin American countries (23%; Campbell et al., 2010; Coritsidis et al.,

2004). There is also a high prevalence of ESRD in the Hispanic population. For instance, the rate of ESRD in Mexico is 450 per million compared to 360 per million in the United States (Campbell et al., 2010). Consequently, a significant portion of the undocumented individuals entering the United States has or will develop ESRD. As a result, the number of patients on emergency dialysis consistently grows, making it an important public health issue to be addressed.

There is no federal medical assistance available for undocumented residents suffering from ESRD. These patients receive emergent hemodialysis only when conditions such as hyperkalemia, volume overload, hypoxia, metabolic acidosis, and uremia exist (Campbell et al., 2010; Coritsidis et al., 2004; Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2001; Sheikh-Hamad et al., 2007). However, the recommended frequency for hemodialysis treatments is three times per week. Emergent dialysis results in higher mortality than regularly scheduled dialysis (Coritsidis et al., 2004; Raghavan & Sheikh-Hamad, 2011; Raghavan 2012; Sheikh-Hamad, 2007). Patients on emergent dialysis present worse biochemical parameters (albumin, urea, potassium, phosphorus, calcium, hemoglobin), low health care satisfaction, poor quality of life, and more health complications compared to patients receiving regular dialysis (Coritsidis et al., 2004; Raghavan & Sheikh-Hamad, 2011; Raghavan, 2012; Sheikh-Hamad, 2007). Additionally, emergent dialysis results in higher health care costs than regular dialysis as a result of higher use of emergency room services, more frequent and longer hospital admissions, more frequent blood transfusions, and more intensive care unit days (Coritsidis et al., 2004; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad, 2007).

A kidney transplant is more medically effective and cost efficient than emergency and regular dialysis treatments in the long term (Campbell et al., 2010; Hurley et al., 2009; Linden,

Cano, & Coritsidis, 2012; McKinney, 2010; Rodriguez, 2010). Undocumented ESRD patients present favorable characteristics for kidney transplants: young; low prevalence of comorbidities such as heart disease and diabetes at the time of diagnosis with end stage renal disease; and the presence of at least one potential living kidney donor (Linden, et al, 2012). However, this population has no access to kidney transplants in the United States (Linden, et al, 2012). The only recorded research intervention directed particularly to patients on emergency dialysis consisted of a case manager intervention (Weaver, Huffman, Vohito, & Herceg, 2012). The intervention resulted in modest improvement in health status, although still deficient compared to regular dialysis (Weaver et al., 2012).

Research regarding ESRD patients in emergency dialysis is scarce. The few researchers studying this population concentrate on uncovering and describing its characteristics and access to health care in hope of advocating for policy changes regarding dialysis access. There is a lack of literature regarding interventions or programs directed to helping this population achieve a better health status. Researchers indicate that nutrition education and counseling interventions are effective in improving compliance with renal dietary guidelines among patients on regular dialysis, thus promoting better health status (Beto, Ramirez & Bansal, 2014; Kugler et al., 2011, Molfino et al., 2012, Paes-Barreto et al., 2013). However, there are no studies examining the effect of nutrition education and counseling among patients on emergent dialysis. It is necessary to determine whether a nutrition education and counseling intervention can improve health parameters among emergency dialysis patients. The recommendations derived from this study can be implemented to improve the dialysis management of undocumented ESRD patients.

Problem Statement

Undocumented ESRD patients in the United States do not have access to regular dialysis, kidney transplantation, or culturally and linguistically competent nutritional counseling to manage renal disease. Their only option is emergent dialysis, which is provided by hospital emergency departments (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007). Emergency dialysis is only granted when life-threatening conditions are present. However, it can result in poor health status and poor quality of life compared to patients receiving regular dialysis. While such health care is less comprehensive, it costs more than three and half times the cost of regular dialysis, a consequence of increased use of hospital services resulting from more frequent health complications (Sheikh-Hamad et al., 2007).

Research on undocumented ESRD patients receiving emergency dialysis is limited; scholars have focused on policy changes regarding dialysis access (Campbell et al. 2010; Guzmano, 2012; McKinney 2010; Rodriguez, 2010). There is a lack of information on culturally and linguistically competent nutrition interventions or programs targeting this population. Weaver et al. (2012) assessed the effectiveness of a case manager on the health status of undocumented ESRD patients on emergency dialysis and found that involvement of a case manager improved their health outcomes. However, this intervention did not have a nutritional component. Current nutrition education practice for ESRD patients on emergency dialysis is the same as provided to ESRD patients receiving regular dialysis. This type of nutrition education does not adjust to the health implications of infrequent renal treatments and does not take into consideration the language, cultural, and socioeconomic background of the undocumented population. This gap in the literature requires further investigation; there is a need to identify culturally and linguistically competent nutrition education directed to patients on emergency

dialysis. In this research study, I may help fill that gap by examining and comparing two nutrition education interventions and determining whether the introduction of cultural and linguistic competencies results in improved diet compliance and improved health outcomes. In this study, competencies were used that take into consideration the culture, linguistic differences, and educational background of the patient while integrating tailored renal nutritional education and counseling (Betancourt, Green, & Ananeh-Firempong, 2003).

Purpose of the Study

The purpose of this quantitative quasi-experimental treatment-control study was to assess how the application of nutritional counseling that is both culturally and linguistically competent affects dialysis frequency and biochemical lab values such as serum potassium, phosphorus, and vitamin D of patients receiving emergency dialysis. The covariates of the study included age, gender, and time in dialysis. In the present study, I sought to determine if this type of nutrition intervention has a positive impact on the health outcomes of emergency dialysis patients.

Research Questions and Hypotheses

RQ1: Is there a statistically significant difference in frequency of dialysis treatments between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$1: There is no statistically significant difference in dialysis frequency between the intervention and control groups while controlling for age, gender, and time on dialysis

$H_1$1: There is a statistically significant difference in frequency of dialysis treatments between the intervention and control groups while controlling for age, gender, and time on dialysis.

RQ2: Is there a statistically significant difference in levels of serum potassium between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$2: There is no statistically significant difference in serum levels of potassium between the intervention and control groups while controlling for age, gender, and time on dialysis.

$H_1$2: There is a statistically significant difference in serum levels of potassium between the intervention and control groups while controlling for age, gender, and time on dialysis.

RQ3: Is there a statistically significant difference in levels of serum phosphorus between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$3: There is no statistically significant difference in serum levels of phosphorus between the intervention and control groups while controlling for age, gender, and time on dialysis

$H_1$3: There is statistically significant difference in serum levels of phosphorus between the intervention and control groups while controlling for age, gender, and time on dialysis.

RQ4: Is there a statistically significant difference in levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$4: There is no statistically significant difference in levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis.

$H_1$4: There is statistically significant difference in levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis.

Theoretical Framework

The theoretical framework for this study was the social cognitive theory (SCT). Bandura developed the SCT in the 1970s (Bandura, 1977). This theory supports the notion of reciprocal determinism, indicating that humans continuously interact with their environment and that this interaction results in individual and social change. Supporters of SCT propose that human behavior is the interplay of personal, behavioral, and environmental influences (Bandura, 1977). Researchers explain that the SCT premise is that behavioral change is influenced by the individual's perceived ability to execute the behavior (self-efficacy), the expectations that completing the behavior will result in beneficial outcomes (outcome expectations), and the belief that a specific behavior can be modified or controlled (perceived control). Interventions based on SCT have improved compliance with renal diet recommendations among patients on regular dialysis through enhancement of self-efficacy with dietary management, support from family, and self-repressive behavior patterns (Sutton, Hollingdale & Hart, 2008; Thong, Kaptein, Kredeit, Boeshchoten, Dekker, 2007; Zrinyi et al., 2003).

Nature of the Study

A quantitative quasi-experimental treatment-control study design was implemented. Independent variables are those predicted to influence or affect an outcome. Independent variables are the variables that vary during the studies (Creswell, 2013). In this study, the independent variable was the intervention or treatment. This variable was categorical in nature with two levels, intervention or no intervention. The intervention was a culturally tailored and

linguistically competent nutrition counseling program. The treatment group received the nutrition counseling intervention, and the control group did not receive the nutrition counseling. Dependent variables were those believed to be influenced by the intervention. Dependent variables are outcomes or results of the influence of the independent variable (Creswell, 2013). This study had four dependent variables: frequency of dialysis treatments per month, serum potassium levels per month, serum phosphorus levels per month, and vitamin D per quarter, all collected at the medical point of care. These dependent variables were continuous in nature. The values of the dependent variables were used to assess the effectiveness of the nutrition counseling intervention. Less frequent dialysis treatment per month and biochemical lab results within normal range could indicate the success of the intervention. Covariates are measurable variables that have a relationship with the dependent variable. They are secondary variables that may affect the outcome, and they may interact with the independent variable to obscure its relationship with the dependent variable. The present study had three covariates: age, gender, and time in dialysis.

Subjects consisted of undocumented immigrants with ESRD receiving emergency dialysis for a minimum of six consecutive months of follow up renal care in any of the Harris Health System facilities within the past year and a half. They were confirmed as undocumented by a lack of social security number. Data from patient charts consisted of laboratory values associated with poor management of ESRD and frequency of dialysis. The Information Technology (IT) department of the Harris Health System extracted the information. The IT department provided me with the data in the form of an excel sheet contained on a CD.

Definitions

Chronic kidney disease: A condition characterized by a gradual loss of kidney function over time (National Kidney Foundation Kidney Disease Outcome Qualitative Initiative [NKF-KDOQI], 2000).

Emergent dialysis: Hemodialysis that is provided only when life threatening conditions are identified (Raghavan & Sheikh-Hamad, 2011; Raghavan, 2012).

Kidney failure: The last stage of chronic kidney disease (CKD) when kidneys stop functioning (NKF-KDOQI, 2000).

Glomerular filtration rate (GFR): A measure of kidney function (NKF-KDOQI, 2000).

Hyperkalemia: High levels of potassium in the blood (Raghavan & Nuila, 2011).

Hyperphosphatemia: High levels of phosphorous in the blood (Raghavan & Nuila, 2011).

Uremia: High levels of urea in the blood (Raghavan & Nuila, 2011)

Volume overload: An excess fluid in the body resulting in edema and shortness of breath (Sheikh-Hamad et al., 2007).

Assumptions

I assumed that the emergency dialysis centers of both Harris Health System participating hospitals implemented the same criteria to screen patients for eligibility for emergency dialysis and patients received the same emergency dialysis treatment following a consistent protocol. Other assumptions were that blood samples were collected and analyzed accurately, data were reported and recorded correctly, and thus there were no data-related errors. These assumptions were relevant to the present study because to properly evaluate the impact of the culturally competent nutrition intervention on the health status of the undocumented emergency dialysis patients; it was important that all other treatment conditions remain equal between the control

and the intervention group with the exception of the nutrition education aspect. Finally, for a valid assessment, it was imperative that the data collected was free of errors.

Scope and Delimitation of the Study

The scope of the study was limited to the time period in which the study was conducted. Participants in this study were undocumented emergency dialysis patients; therefore, the outcome of this study cannot be generalized to patients on regular dialysis or not on dialysis. The sample consisted of male and female undocumented ESRD patients receiving emergency dialysis who are 20 years of age and older. The sample was limited to undocumented emergency dialysis patients who received emergency dialysis at the two main hospitals of the Harris Health System in Houston, Texas, the Ben Taub General Hospital and the Lyndon B. Johnson Hospital. The outcomes evaluated in the present study consisted only of those that could be influenced by nutrition counseling such as laboratory markers and frequency of dialysis.

Limitations

There were some limitations to the study. First, I examined secondary data coming from electronic medical records; as a result, any data inaccuracy in the medical records could have influenced the outcomes of the study. The sample population for this investigation was a convenience sample consisting of all undocumented emergency dialysis patients receiving renal care at Harris Health System; thus, there was no control over sample size. Moreover, I examined secondary data from a hospital with an already ongoing nutrition intervention program, and these data were compared to a hospital without nutrition intervention. Consequently, randomization of study participants into the control and the intervention group could not take place. The effect of nutrition education on volume status of undocumented kidney failure patients was not assessed because weights were not regularly recorded among emergency dialysis patients. Thus, I was not

able to evaluate the effect of culturally competent nutrition counseling on volume status of emergency dialysis patients. The research mainly concentrated on examining the effect of the intervention on biochemical parameters and frequency of dialysis treatments because this information was regularly collected as part of the medical care of the patients.

Significance

This research study is significant because I addressed some of the health issues among undocumented ESRD patients, a population that is growing in the United States. Because this population only receives dialysis on an emergency basis, properly controlling diet is imperative in avoiding major health complications. Based on the current literature review, no scholars have examined nutrition interventions among ESRD patients on emergency dialysis.

The conclusions derived from this study should assist health care professionals to determine if applying a culturally and linguistically competent nutrition counseling component as part of the ESRD treatment protocol is beneficial. Moreover, the study results may serve as the groundwork for the design and implementation of future interventions directed to address the needs of undocumented patients on emergency dialysis. The findings may also promote and guide further research exploring the health issues and nutritional needs of undocumented ESRD patients. This investigation may promote positive social change by contributing to the provision of better health care to the vulnerable population of ESRD patients on emergency dialysis, thus improving their health status and quality of life.

Summary

This chapter provided an introduction to emergency dialysis among undocumented ESRD patients and the role of nutrition education in their disease management, significance of the

study, and important terms related to the study. Chapter 2 includes a literature review on kidney disease, nutrition therapy, and education for renal patients and undocumented ESRD patients.

Chapter 2: Literature Review

Introduction

The incidence of kidney disease and consequent kidney failure continues to increase in the United States, becoming a significant public health issue. Kidney disease is the ninth most common cause of death in the United States (Centers for Disease Control and Prevention [CDC], 2012). CKD progresses into ESRD or total kidney failure. ESRD has more than doubled in the past 20 years, primarily due to the marked increase of associated risk factors such as diabetes, hypertension, obesity, and the aging of the population (CDC, 2012). CDC databases for surveillance of kidney disease in the United States indicate that 20 million adults (10% of the population) are estimated to have CKD (CDC, 2012). However, these databases do not include information on undocumented patients with kidney disease. The lack of renal disease data related to undocumented patients is a significant public health concern because the immigrant population in the United States continues to grow steadily and does not have proper access to health care (Campbell et al., 2010; Raghavan & Nuila2011).

Patients with ESRD have kidneys that cannot remove waste from their blood, thus needing either transplantation or dialysis to survive. Nutritional management is a vital component of the health care of patients on any renal replacement therapy. As a result, regular nutritional monitoring and customized nutrition education are part of a comprehensive treatment protocol (Abe, Okada & Soma, 2013; Mok, Ang, & Christensen, 2011; Riella, 2013). However, in the undocumented segment of the population, ESRD patients lack access to quality comprehensive treatment options. Their only option is dialysis on an emergency basis in acute care health care settings. Moreover, undocumented ESRD patients have no access to regular nutrition counseling tailored to their particular cultural and linguistic characteristics, health

status, and mode of renal treatment. Consequently, they suffer more health complications and have poor health outcomes compared to patients on regular dialysis. There is limited research available addressing the needs of undocumented ESRD patients on emergency dialysis. The purpose of this study is to examine the effects of a tailored culturally component nutrition counseling intervention on health outcomes of undocumented ESRD patients.

In this review of the literature, I start with a description of kidney disease stages, its different treatment modalities, and clinical care guidelines. Next, I explore the importance of nutrition education as a component of renal disease management across different treatment modalities. Then, I examine whether culturally competent nutrition education tailored to health needs is more effective than generic nutrition education among undocumented ESRD patients receiving emergency dialysis. Following, I provide a description of health care available to undocumented ESRD patients. Finally, I explain the theoretical framework guiding this study.

Literature Search Strategy

The literature review for this study was gleaned from various sources, including government and professional organization publications and peer-reviewed journals. Literature was also retrieved from the following databases: CINAHL full text, MEDLINE full text, CINAHL and MEDLINE full text simultaneously, Cochrane Database of systematic reviews, and Google Scholar. The following keywords were used to retrieve articles: *chronic kidney disease, end stage renal disease, kidney failure, dialysis, diet, nutrition, renal diet, kidney diet, diet education, nutrition education, culturally competent education, culturally appropriate education, culturally sensitive education, tailored education, tailoring, undocumented immigrants,* and *illegal immigrants.* The keywords were used individually and in different combinations. The initial search was limited to the past five years; however, the amount of

information produced by this search was limited, and another search was conducted without date limits to include all available literature. I evaluated 183 articles for this paper. The articles that I referenced consisted of peer-reviewed research articles that were chosen based on their relevance, content, and research methods.

Chronic Kidney Disease

CKD is a condition characterized by a gradual loss of kidney function over time. CKD is defined as a decline of GFR for three or more months caused by kidney damage or abnormality (NKF-KDOQI, 2000). According to the NKF-KDOQI, CKD has been classified into five stages based on GFR. Table 1 demonstrates different stages of kidney disease based on GFR according to NKF-KDOQI.

Table 1

NKF-KDOQI Stages of Kidney Disease Based on GFR

Stage	Description	Glomerular filtration rate (GFR)
1	Kidney damage and normal GFR	More than 90
2	Kidney damage and a mild decrease in GFR	60 to 89
3	Moderate decrease in GFR	30 to 59
4	Severe decrease in GFR	15 to 29
5	Kidney failure, End Stage Renal Disease	Less than 15

Note: Adapted from "National Kidney Foundation, K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification and Stratification" by Am J Kidney Dis., vol 39, suppl 1, p S46. Reprinted with permission

However, in 2012, the Kidney Disease Initiative Global Outcomes (KDIGO) revised the classification terminology for CKD and combined the level of organ function measured in terms of GFR with the level of albumin present in the urine (KDIGO, 2012). As a result, currently health practitioners use the combination of GFR and levels of albuminuria to classify different

stages of CKD. Table 2 demonstrates different stages of kidney disease based on these parameters.

Table 2

KDIGO Stages of Kidney Disease

CKD stages	GFR category	Description and GRF range
1	G1	Normal/high GFR>/90 ml/min/1.73 m2
2	G2	Mildly decreased GFR 60 to 89 ml/min/1.73 m2
3	G3a	Mildly to moderately decreased GFR 45 to 59 ml/min/1.73 m2
3	G3b	Moderately to severely decreased GFR 30 to 44 ml/min/17.3 m2
4	G4	Severely decreased GFR 15 to 29 ml/min/17.3 m2
5	G5	Kidney Failure GFR <15 ml/min/1.73m2
Persistent albuminuria category		
A1		Normal/mildly increased < 30 mg/g or <3 mg/mmol
A2		Moderately increased 30 to 300 mg/g or 3 to 300 mg/mmol
A3		Severely increased >300 mg/g or >30 mg/mmol

Note: Adapted from KDIGO stages of Kidney Disease

End Stage Renal Disease

ESRD, also known as kidney failure, is the last stage of CKD. The kidneys work at or below 10% to 15 % of their normal capacity and cannot effectively remove waste or excess fluid (NKF-KDOQI, 2000). Transplantation is the most recommended therapy. The National Organ Procurement and Transplantation Network (2012) reported that adult recipients on average wait a minimum of 3 to 5 years for an organ after registering with renal registry. When transplantation is not possible, hemodialysis and peritoneal dialysis are the treatments available (National Kidney Foundation [NKF], 2013).

ESRD treatment options. Patients with kidney failure cannot survive without some type of renal replacement therapy. New technology and research continuously develop and improve treatment options for individuals with ESRD such as transplant and dialysis.

Transplantation. This method is the surgical replacement of a deficient kidney with a

functioning one from a living related donor, a living nonrelated donor, or deceased donor (NKF, 2013). Complications associated with the procedure include host-graft rejection and/or secondary infection due to immunosuppressive therapy (NKF, 2013). Despite the life-saving impact of transplantation, the majority of ESRD patients end up receiving dialysis because of the long waiting period to get a kidney (NKF, 2013)

Peritoneal dialysis. In this method, waste and water are removed through the peritoneum as a filter. The peritoneum is membrane like tissue that surrounds the abdominal cavity and covers internal organs. A catheter is placed in the abdomen and slowly filled with a dialysate solution. The dialysate consists of varying dextrose concentrations that create a concentration gradient between the peritoneal cavity and the blood stream (NKF, 2013). The concentration gradient draws the uremic waste into the peritoneal cavity, where they are filtered, drained through the abdominal catheter, and discarded (NKF, 2013). Peritoneal dialysis is performed daily; it can vary from a single long treatment at night to multiple treatments across the day and night (NKF, 2013).

Regular hemodialysis. An artificial kidney called a dialyzer is utilized to remove water and waste from the blood. A dialysis machine delivers blood from the patient to the dialyzer, cleanses the blood using a prescribed bath called dialysate, and returns the blood to the patient. Blood passes through a semi-permeable membrane where waste products are removed by diffusion and fluids by ultra-filtration (NKF, 2013). Regular hemodialysis is administered to patients in a scheduled manner three times per week, the length of each treatment depends on the patient's blood volume and body weight. It can last from 3 to 5 hours.

Emergency dialysis. This treatment involves the same process as hemodialysis but is provided only when life- threatening conditions such as hyperkalemia, fluid overload, metabolic

acidosis, severe anemia, uremia, and hypoxia are present; thus, it is not scheduled or consistent (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007). It is provided to hospital patients who do not have health insurance, and cannot receive federal health insurance assistance. In addition, it is provided to patients who missed their scheduled dialysis sessions (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007). However, the majority of patients receiving emergency dialysis are undocumented individuals with ESRD (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007)

Clinical Practice Guidelines for Renal Care

The care of patients with renal disease is a complex process that needs to be based on accurate and current research information. However, the abundance and complexity of research findings available make it difficult for health care professionals to identify the most valid and reliable evidence to guide their practice. Consequently, standardized clinical guidelines for renal care have been developed to guide practitioners to make the best decisions possible to care for renal patients by stating the best treatment protocols.

National Kidney Foundation's Kidney Dialysis Outcomes Quality Initiative

The management of CKD and ESRD in the United States is dictated by evidence-based clinical practice guidelines developed by the NKF-K/DOQI. The NKF-KDOQI was established in 1995 to improve the quality and outcomes of dialysis care (Inker et al., 2014). The guidelines were developed by more than 70 professionals who, during a 2 year period, reviewed the existent literature on pertinent clinical issues. The NKF established four work groups that were composed of experts from a variety of disciplines.

The work groups reviewed and appraised the quality of all published scientific evidence pertinent to issues about hemodialysis adequacy, peritoneal dialysis adequacy, management of vascular access, and management of anemia to develop standard clinical practice guidelines for treatment of kidney disease (NKF-KDOQI, 2000). In some cases, the work groups found that there was unavailable or inadequate literature regarding a kidney issue being addressed by the initiative. In these cases, they formulated recommendations based on their expert opinions and the feedback received from peer reviewers (NKF-KDOQI, 2000). These guidelines are regularly updated to include the latest research findings related to kidney disease. In addition to the efforts of the NKF to develop standardized clinical care guidelines for kidney disease at a national level, there have been in recent years international efforts to produce such recommendations (NKF-KDOQI, 2000).

Kidney Disease Improving Global Outcomes

In 2003, the organization KDIGO was founded (Inker et al., 2014). The central goal of KDIGO is to promote international cooperation and consolidation in the development and implementation of global kidney disease clinical practice guidelines. The guidelines are developed by first having international conferences where experts discuss their agreements and disagreements regarding kidney disease knowledge and practices. Based on the results of the conferences, topics for further research are identified, and Work Groups composed of experts from around the world are established. The international Work Groups review the literature on the topics, evaluate the evidence, and develop consensus recommendations. These recommendations are then reviewed further by the board of directors of KDIGO and international experts before they are published. After a guideline is established based on international consensus, the KDIGO Implementation Task Force concentrates on disseminating

the recommendations through implementation conferences. The international kidney clinical care guidelines continue to evolve as new research is available. Health practitioners around the world follow the NKF-KDOQI and KDIGO clinical care guidelines to make decisions regarding different aspects of the health management of patients with kidney disease including screening, assessment, treatment, and monitoring.

Nutrition Therapy and Kidney Disease: The Renal Diet

Nutrition therapy is a vital component of ESRD management. The main purpose of implementing nutrition therapy among renal patients is to match dietary intake with kidney function to maintain health. The specific aims of nutrition therapy for ESRD patients include:

- Controlling dietary intake to prevent nutritional deficiencies and maintain good nutritional status through the adequate intake of protein, energy, vitamins, and minerals.
- Managing volume and electrolyte imbalances through the control of sodium, potassium, and fluid intake.
- Preventing or controlling bone disease through the management of calcium, phosphorus, and Vitamin D intake.
- Supporting patients to have a palatable diet that matches their lifestyle and characteristics as much as possible (Kalista-Richards, 2011; Pasticci, Fantuzzi, Pegoraro, McCann, & Bedogni, 2012; Willingham, 2012).

Nutrition therapy entails comprehensive and ongoing nutrition assessment, intervention and monitoring to achieve the best possible outcomes for patients with CKD and ESRD. Nutrition therapy protocols for CKD and ESRD patients are dictated by the NKF-KDOQI

clinical care guidelines. NKF- KDOQI clinical guidelines describe the type of nutrition assessment and intervention that needs to be implemented for different stages of kidney disease and different treatment modalities. In addition, the nutrition therapy of each renal patient is individualized based on residual renal function, laboratory analysis, and overall nutritional status. The NKD- KDOQI guidelines indicate that renal nutrition therapy includes regular examination of albumin, percent of ideal and usual body weight, subjective nutrition global assessments, and diet diaries (NKF-KDOQI, 2000). Additionally, renal labs are completed including hemoglobin, hematocrit, calcium, phosphate, potassium, calcium phosphate, cholesterol, albumin and glucose, and glycosylated hemoglobin for diabetic patients (Noori et al., 2010; Pasticci et al., 2012). Based on the results of the nutritional and biochemical assessments previously mentioned, registered dietitians develop nutrition therapy interventions that are tailored to the nutrition and health status of each renal patient using the National Renal Diet Guidelines dictated by the NKF-KDOQI.

Components of the Renal Diet

The progressive loss of kidney function results in negative metabolic changes that cause fatigue, nausea, vomiting, anorexia, weight loss, and altered mental status (NKF-K/DOQI, 2000). These symptoms negatively affect nutritional status by altering protein and energy intake, acid-base balance, lipid profile, and bone metabolism (NKF-K/DOQI, 2000). These nutrition complications disturb the balance of body fluids, hormones, and electrolytes. Consequently, dietary modifications and restrictions are necessary to maintain overall good health status (Abe et al., 2013; Mok et al., 2011; Riella, 2013). The renal diet involves modification of protein, potassium, sodium, phosphorus, and fluid intake. Dietary changes assist renal patients to prevent and manage uremia; health complications related to the cardiovascular system, bone metabolism,

and soft tissue; and metabolic changes related to abnormal concentrations of serum potassium, sodium, and phosphate (Beto, Ramirez & Bansal, 2014; Kugler et al., 2011).

Protein. Protein is the central nutrient for control of metabolic byproducts that cannot be handled by damaged kidneys. Protein requirements for healthy adults are 0.8 to 1 gram per kilogram of weight per day; however, the protein needs for individuals with kidney disease varies depending on disease stage and treatment modality (Pasticci et al., 2012; Willingham, 2012). CKD patients not on dialysis need low protein intake in order to decrease symptoms of uremia and improve appetite in order to prevent malnutrition while maintaining kidney function as long as possible (Filipowicz & Beddhu, 2013; Willingham, 2012). According to the NKF/KDOQI guidelines, patients with a GFR less than 25 ml/min, no on dialysis should intake 0.6 g/kg/day of protein (NFK-K/DOQD, 2000). However, if patients cannot maintain an adequate caloric intake on this protein recommendation, their protein intake should be increased to 0.75 kcal/kg/day (NKF-K/DOQI, 2000). In both cases, about 50% of protein should be of high biological value (NFK-K/DOQD, 2000; Willingham, 2012). In order to determine protein requirements of renal patients' creatinine, blood urea nitrogen, GFR and albumin are regularly assessed. Patients with kidney disease need to adjust their protein intake according to their degree of kidney function to prevent medical complications. The protein requirements increase when the dialysis treatment begins. Among patients with renal disease, receiving dialysis a common problem is protein-calorie malnutrition and muscle waste related to reduced food intake resulting from issues such as anorexia, depression, and changes in taste (Riella, 2013). As a consequence, the energy and protein requirements for patients in dialysis are higher than that of healthy individuals to allow these patients to maintain a healthy weight status and replenish the protein losses in visceral compartments that are caused by dialysis. The dietary protein needs of

patients in regular hemodialysis are about 1.2 grams per kilogram standard body weight per day with at least 50% high biological value protein, to make up for losses through the dialysate (Mehrotra, 2013; Willingham, 2012). On the other hand, patients on peritoneal dialysis have higher protein needs from 1.2 to 1.5 grams per kilogram because protein losses are greater (Mehrotra, 2013; Willingham, 2012). Patients on emergent hemodialysis need to continue to follow a low protein diet equal to that of CKD patients in order to decrease the amount of urea in the blood caused by a lack of regular dialysis and prevent severe complications (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007).

Sodium and fluid. Sodium and fluid recommendations of renal patients are individualized based on fluid status, blood pressure, interdialytic weight gain, and residual renal function (Pasticci et al., 2012, Willingham, 2012). Generally, patients in hemodialysis have a sodium restriction to 2 grams per day to lower thirst, extracellular fluid, weight, proteinuria and blood pressure. Fluid restrictions take into consideration insensible fluid losses from respiration, perspiration and fecal up to 1,000 ml, plus the urine output of the patient. Patients in hemodialysis with urine output greater than 1,000 ml per day are allowed 2,000 ml of fluid per day. However, patients with a daily urine output of about 500 ml have a fluid restriction of 1,500 ml per day, and patients that do not produce any urine follow a 1,000 ml fluid restriction per day. Patients receiving peritoneal dialysis have more liberal fluid, sodium, and potassium allowances because the therapy is continuous and more of these products are removed (NKF-K/DOQI, 2000). The loss of sodium can be as much as 6 g/day; thus, these patients may need higher sodium intakes (Pasticci et al., 2012). Patients on emergent dialysis need to follow strict sodium and fluid restriction because the lack of regular dialysis results in higher levels of volume overload and is related to complications such as high blood pressure, respiratory failure, and

congestive heart failure (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007).

Potassium. When renal function decreases or stops completely, the balance of potassium in the blood is compromised, causing potassium retention, and leading to hyperkalemia or high serum potassium concentration (NKF-K/DOQI, 2000; Pasticci et al., 2012; Willingham, 2012). This condition is of concern among kidney disease patients because it may result in sudden death related to cardiac arrhythmias (Beto et al., 2014; NKF-K/DOQI, 2000). ESRD patients receiving regular hemodialysis three times per week need to restrict their dietary potassium intake to 2-3 grams/day (NKF-K/DOQI, 2000; Pasticci et al., 2012). Dietary potassium restriction is even stricter among patients on emergency dialysis (2 grams/day) because the lack of regular treatments makes them more susceptible to hyperkalemia and its dangers (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007). On the other hand, patients on peritoneal dialysis have potassium restrictions that are more liberal (3-4 grams/day) because of potassium losses in the dialysate and the frequency of the treatment (Pasticci et al., 2012). Dietary potassium restriction is difficult to follow because potassium is found in a range of commonly consumed food items (Willingham, 2012).

Phosphorus. ESRD also negatively affects bone metabolism because the excretion of excess phosphorus and serum calcium from the body is regulated by the kidneys. Moreover, ESRD results in a high concentration of the serum parathyroid hormone (PTH) and lack of activated vitamin D in the body, causing accelerated bone turnover (Willingham, 2012). All of these changes may result in soft tissue calcification, hyperplasia, cardiovascular disease and osteofibritis among dialysis patients. There is a need for management of phosphorus among dialysis patients through the regulation of dietary phosphorus intake to 800-1000 mg/day,

accompanied with phosphate binding medications that promote the excretion of excess phosphate in the gastrointestinal tract (Pasticci et al., 2012; Willingham, 2012).

Renal diet modifications for each patient with kidney disease vary depending on treatment modality. The renal diet prescription of patients on hemodialysis is different from that of patients on peritoneal dialysis. Hemodialysis requires more dietary modifications than peritoneal dialysis (Noori et al., 2010; Pasticci et al., 2012). Furthermore, the dietary restrictions of patients on hemodialysis vary depending on factors such as adequacy of treatment, frequency of treatment, and the amount of residual kidney function remaining (Pasticci et al., 2012). Patients receiving emergency dialysis need to follow the most restrictive renal diet recommendations to compensate for less frequent dialysis treatments. In the case of peritoneal dialysis, treatments are more frequent, thus, the dietary guidelines are more liberalized, especially regarding potassium and fluid intake.

Table 3

General Dietary Recommendations for Renal Patients

Dietary component	Renal insufficiency	Hemodialysis	Peritoneal dialysis
Protein (g/kg IBW)	0.6 – 0.8	1.1 – 1.4	1.2 – 1.5
Energy (kcal/kg IBW)	35- 40	30-35	25-35
Phosphorus (mg/kg BW)	8-12	<17	<17
Sodium (mg/day)	1000-3000	2000-3000	2000-4000
Potassium (mg/kg IBW)	Typically not restricted	20	Typically no restricted
Fluid (ml/day)	Typically no restrictive	500-700 plus daily urine output or 1000 if anuric	>2000
Calcium (mg/day)	1200-1600	Depends on serum level	Depends on serum level

Note: Adapted from the *Journal of the American Dietetic Association*

Nutrition Education

The nutrition management of CKD and ESRD requires patients to make complex dietary modifications to balance intake of protein, calories, potassium, sodium, fluid and phosphorus according to their health status and treatment mode (Kugler et al., 2011). This intricate dietary regimen can be overwhelming to new patients, and their families making it difficult for them to comply with recommendations (Mok et al., 2011; Riella, 2013). Consequently, it is necessary to provide renal patients with ongoing nutrition education and nutrition counseling (Beto et al., 2014; Kugler et al., 2011). Renal patients need detailed nutrition education on renal diet restrictions to understand how to manage their food intake to protect their health. In addition, they need periodic nutrition counseling and coaching to promote behavioral changes necessary for long-term compliance with the renal diet regime (Beto et al., 2014; Molfino et al., 2012).

Researchers indicate that intense nutrition counseling programs contribute to better compliance with diet recommendations among renal patients than standard dietary education. (Paes-Barreto et al., 2013)

Effective nutrition education incorporates personal, cultural and social issues of patients, such as cost, access, familiarity, health literary, and family setting (Beto et al., 2014; Sussmann, 2001). Nutrition education also takes into consideration the dietary habits and preferences of the patients to determine the barriers and facilitators to dietary compliance (Beto et al., 2014; Sussmann, 2001). Nutrition education is more effective when the patient is actively involved in the process rather than being passive. A self-management health care education approach recognizes that the patient plays a central role in his/her health management (Beto et al., 2014; Milas et al., 1995; Sussmann, 2001). The self-management approach has been effective in changing behavior in renal patients (Beto et al., 2014; Milas et al., 1995; Sussmann, 2001). Therefore, interactive strategies such as health coaching, feedback, motivational interviewing, peer mentoring, and self-management tools can assist patients improving diet adherence (Beto et al., 2014; Milas et al., 1995; Sussmann, 2001). Nutrition education and counseling for renal patients is a complex process that is performed by registered dietitians who are experts on medical nutrition therapy, nutrition education and dietary counseling (Kent et al., 2014).

Role of the Registered Dietitian

Registered dietitians are responsible for monitoring and managing the nutrition status and diet compliance of ESRD patients. They also coordinate nutritional care interventions with other health professionals (Memmer, 2013; Vergili & Wolf, 2010). Dietitians are in charge of providing renal patients with nutrition education. They provide patients detailed instruction on all underlying nutritional issues related to renal disease, their health status and their treatment

type (Gillis et al., 1995; Memmer, 2013; Vergili & Wolf, 2010). Furthermore, dietitians provide ongoing nutrition counseling and coaching to patients and their families to teach self-management skills that promote dietary and lifestyle changes that result in positive health outcomes (Ford, Pope, Hunt, & Gerald, 2004; Gillis et al., 1995; Memmer, 2013; Vergili & Wolf, 2010). The role of the dietitian is to help renal patients learn problem-solving skills that evaluate diet as an important factor for managing their health (D'Alessandro, Piccoli, & Cupisti, 2015; Kent et al., 2014). Researchers have found that medical nutrition therapy provided by a registered dietitian is effective in preventing and treating bone malnutrition; and mineral and electrolyte disorders among dialysis patients (Karavetian et al., 2014). For instance, according to Ford et al, (2004) the provision of 30 extra minutes of nutrition education by a dietitian for six months resulted in significant decrease of phosphorus and phosphorus/calcium product levels among regular dialysis patients. De Brito Ashurst and Dobbie (2003) uncovered that one-to-one teaching session given by a dietitian for three months resulted on lower levels of phosphorus levels among dialysis patients. Cupisti et al., (2004) and Sun et al., (2008) and Reddy et al., (2009) also found that consistent nutrition counseling by a dietitian resulted on reduction of phosphorus levels among dialysis patients.

Dietitians plan nutrition education interventions based on multiple factors. These factors include medical history; medications; height and weight; literary; and educational, economical, psychological, and motivational status. These factors serve as guidance for decisions regarding what educational materials, and strategies are most adequate for different patients (Vergili & Wolf, 2010; Willingham, 2012). Experienced renal dietitians have the knowledge and consistent patient involvement to be able to recognize changes in patients and possible needs for revision in the plan of care. Dietitians provide leadership in regard to communication of concerns to the

renal team, modification of diet therapy, and assurance of timely interventions by clinical team (Kent et al., 2014).The central role of dietitians in the management of kidney disease has been recognized; thus, the Center for Medicare and Medicaid Services approved the provision of medical nutrition therapy for eligible people with kidney disease through the Medicare Reform Act of 2002 (Hollingdale et al., 2008). Patients identify the renal dietitian as the most reliable and trustworthy source of dietary information followed by renal specialist doctors (Hollingdale et al., 2008)

Diet compliance. Dialysis patients report that making dietary changes is the most difficult component of their health management (Ford et al, 2004; Griva et al., 2013, Khalil et al., 2013). Lack of compliance with dietary and fluid restrictions is a leading cause of treatment failure and poor outcomes in ESRD such as deterioration of the cardiovascular system, heart failure, hypertension, and pulmonary edema (Denhaerynck et al., 2007; Griva et al., 2013; John, Alpert, Kawi, & Tandy, 2013; Khalil et al., 2013; Kugler et al., 2011). Researchers indicate that the strongest barriers include: poor knowledge of renal dietary recommendations, fear of giving up favorite foods, concerns about safety, the belief that preparing renal meals is difficult and time consuming, poor communication, lack of control, social pressure (Gerbino et al, 2011; Gillis et al., 1995; Griva et al., 2013) depression and anxiety (Khalil, at al., 2011). Researchers suggest that facilitators to dietary compliance among dialysis patients included: support from family members, social obligation towards others, risk perception, establishment of routines, peer support (Cocolini, et al., 2012; Griva et al., 2013; Milas et al., 1995; Thong et al., 2007) knowledge, attitude, satisfaction, and self-perception of success (Milas et al., 1995).

A significant amount of literature exploring factors that improve compliance with diet modifications found knowledge promotes dietary adherence (Griva et al., 2013; Milas et al.,

1995). However, others (Chen, Lu, & Wang, 2006; Durose, Holdworth, Watson & Przygrodzka, 2004; Ford et al., 2004; Lee & Molassiotis, 2002) indicate that high levels of knowledge did not always correlate with high levels of dietary adherence. Interestingly, in some cases patients with high levels of knowledge demonstrated low levels of dietary compliance (Chen et al., 2006; Durose, et al, 2004; Lee & Molassiotis, 2002). However, the reasons behind those results are yet to be identified. Other psychological factors such as self-perception of success, attitude, and satisfaction correlate with higher levels of dietary adherence (Milas et al., 1995). These findings suggest that in addition to providing traditional nutrition education to renal patients is necessary to implement interventions that motivate them and empower them to make behavioral changes (Gillis et al., 1995).

Strategies of the dietitian to improve diet compliance. In order to assist patients overcoming the challenges of the renal diet dietitians apply different strategies. The Renal Dietitian Dietetic Practice Group of the of the American Academy of Nutrition advices the following teaching methods for renal patients: a) incorporating a variety of learning styles in each session, b) use of visual audio, and hand-on techniques, c) keep teaching sessions short and simple, d) include practice and feedback, and e) provide ongoing educational opportunities (National Kidney foundation program, 2007). Furthermore, dietitians have incorporated the use of a wide range of innovative strategies such as group activities, coaching, contest, teaching videos, cookbooks, newsletters, cooking demonstrations, displays (Gillis et al, 1995; Karalis & Stafford, 2006; Cant, & Aroni, 2008). In addition, the National Kidney Foundation has established support groups and mentor programs through local affiliates to facilitate resources for renal patients and families ([NKF-KDOQI], 2000).

Nutrition education in regular dialysis versus emergency dialysis. Patients on regularly scheduled dialysis receive customized nutrition education and dietary counseling by a renal dietitian as part of their health management protocol. They also receive consistent nutrition counseling or coaching that is tailored to their needs and characteristics (Pasticci, 2012). On the other hand, patients on emergency dialysis often have no access to a registered dietitian and go on without proper renal nutrition instruction. These patients frequently receive limited generic information on what foods to avoid without taking into consideration their particular health needs or personal characteristics (Raghavan, 2012). The lack of proper nutrition education among emergency dialysis patients is a significant problem because in the absence of regular dialysis implementing strict renal diet restrictions is imperative to control symptoms and to avoid complications (Raghavan, 2012).

Proper compliance with the renal diet assists patients on emergency dialysis to better control symptoms such as nausea, vomiting, dizziness, diarrhea, shortness of breath, fatigue, edema, sleeping problems, itching, general body pains, and irregular heart beat (Raghavan, 2012). In addition, following the renal diet allows patients on emergency dialysis to prevent critical health complications such as hyperkalemia, volume overload, blood pressure emergencies, bone damage, metabolic acidosis, and severe uremia (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad et al., 2007). Poor compliance with renal diet recommendations in the absence of regular dialysis results in life-threatening complications such as respiratory failure, cardiac arrest, disequilibrium syndrome, coma, and even death. These health complications among patient on emergency dialysis result in more frequent and longer hospital admissions that increase the expenses of the public health system (Raghavan, 2012).

Cultural and Linguistic Competence and Nutrition Education

Health care disparities are related to a lack of multicultural tools and cultural competency of health care providers, language barriers, discrimination, stereotyping by health care practitioners, and lack of diversity in the health care workforce (Anderson et al., 2003; Heiss et al., 2013; Johnson-Askew, Gordon, & Sockalingam, 2011). The provision of culturally and linguistically competent health care has the potential to reduce racial and ethnic health disparities. Culture involves a number of elements such as personal identification, language, thoughts, communications, actions, customs, beliefs, values, and institutions that are often specific to ethnic, racial, religious, geographic, or social groups (Anderson et al., 2003; Johnson-Askew et al., 2011; National Institutes of Health, 2015; National Center for Cultural Competence, 2015). The providers of health information or health care need to consider how these elements influence beliefs and belief systems surrounding health, healing, wellness, illness, disease, and delivery of health services. Cultural competency has a positive impact on patient care delivery by enabling providers to deliver services that are respectful of and responsive to the health beliefs, practices, and cultural and linguistic needs of diverse patients (National Institutes of Health, 2015; National Center for Cultural Competence, 2015)

Ethnic and cultural background influences dietary habits of individuals. Researchers indicate that many food practices are culturally defined and are consciously or unconsciously sustained to affirm ethnic group identity (Di Noia, Furst, Park, & Byrd-Bredbenner, 2013; Ikeda, Pham, Nguyen & Mitchell, 2002; Kugler et al, 2011). There is evidence that traditional foods have cognitive meaning related to preserving or passing along family traditions, providing a sense of familiarity, and enabling expression of caring and respect (Di Noia et al., 2013). For example, African Americans associate particular food cooking techniques and flavorings with

their African American identity; therefore, dietary advice that differs greatly or contradicts their cultural beliefs is commonly disregarded (Di Noia et al., 2013). Another example is that in the Hispanic population, family dynamics, religious background, folk healing practices, herbal medicine, and spiritualism directly influence dietary habits (Heiss et al., 2013a).

Acceptance of nutritional recommendations and compliance with dietary plans is greater when cultural foods, traditions, and preferences are honored. Cowart et al., (2010) found that implementing a culturally competent intervention to reduce obesity and promote healthy life style among African Americans is effective. The culturally sensitive dietary intervention resulted in healthier food choices and cooking methods, better exercise habits, and increased motivation to improve weight status (Cowart et al., 2010). The authors identified five factors that are important for culturally sensitive interventions: identification between counselors and participants, social support, information provided in a demonstration format, involvement of family and community, and enhancement of program ownership by using participant input (Cowart et al., 2010). Other study results support that culturally sensitive education programs are effective at promoting lifestyle changes and medication adherence among African Americans to improve hypertension (Gross, Anderson, Busby, Frith, & Panco, 2013). The authors found that in order to design culturally competent interventions, a comprehensive assessment of the target population needs to be completed to establish their cultural beliefs, literacy levels, level of knowledge, and economic status (Gross et al., 2013).

These findings are consistent among Hispanics. Araiza, Valenzuela, and Gance-Cleveland (2012) implemented an intervention that incorporated the traditions and values of the Latino community to address obesity among Hispanics. The intervention resulted in an increase of physical activity, increase of knowledge about diet, improved behavior regarding diet, and

decrease in percentage body fat, waist circumference, and body max index (Araiza et al., 2012). Other research has found that tailored nutrition education programs directed to the Hispanic community are effective at altering dietary intake when factors like culture and language are considered (Baquero et al., 2009; Babamoto et al., 2009)**.** The results of these studies suggest that dietary interventions directed to the Latino community must be culturally sensitive, linguistically competent, incorporate family, and use interesting visuals (Baquero et al., 2009; Babamoto et al., 2009)**.** The results of these studies also uncovered that the use of bilingual and bicultural facilitators who know both the culture and language of the target population improve the impact of the intervention (Baquero et al., 2009; Babamoto et al., 2009)**.**

The findings of Kohinor, Stronks, Nicolaou, and Haafkens, (2011) also support the importance of implementing cultural competence in dietary interventions.found that for Surinamese diabetes patients, cooking and eating practices are related to cultural beliefs and values. The wish to maintain their ethnic identity poses difficulty for patient compliance with dietary guidelines, as these are perceived as being based on the habits of the host country. This suggests that immigrants with a long duration of residence in the host country like the Surinamese in the Netherlands who are seen as well integrated, benefit from culturally sensitive nutrition education (Kohinor et al., 2011). Similar findings were obtained by Baumhofer, Rothfus, Yoshimura, Quensell, and Look (2014), who determined that much of the nutrition counseling and education material available was not representative of Native Hawaiians or other Pacific Islanders. These populations have a high risk for cardiometabolic diseases such as obesity, diabetes, and heart disease, which can be improved with increased nutrition education and counseling (Baumhofer et al., 2014). However, barriers to health improvements through effective nutrition education in these populations include limited English proficiency, differences

in social norms related to food, and limited availability of preferred food items. Consequently, development and dissemination of innovative tools, such as culturally relevant food models, are needed to address these barriers (Baumhofer et al., 2014). This intervention developed culturally competent food models that were later disseminated to all the community agencies providing nutrition education to the target population. The authors found that culturally relevant, nonverbal education tools are helpful in demonstrating appropriate meal planning and serving size when working with multicultural and multilingual populations (Baumhofer et al., 2014).

Language is an important part of cultural competency. Language barriers adversely affect compliance with nutrition advice (Araiza et al., 2012; Baquero et al., 2009; Hayashi, Farrell, Chaput, Rocha, & Hernandez, 2010; Heiss et al., 2013; Babamoto et al., 2009; McCloskey & Flenniken, 2010). Limited English proficiency has been identified as a barrier to the receipt of advice about diet among Hispanics (Heiss et al., 2013). Immigrants also identify language and cultural differences as the biggest barriers to receiving health care. Compared to those who speak English fluently, individuals with limited English proficiency experience decreased access to acute care and longer hospital stays, express lower satisfaction with patient care, experience more misdiagnoses and medical errors, have more emergency room visits, and have poorer understanding of their care (Anderson et al., 2003; Heiss et al., 2013). Also, researchers found that cultural and language barriers are significant causes of lack of compliance with insulin regimes among Hispanic diabetics (Caballero, 2006). Another important factor to take into consideration in culturally sensitive nutrition interventions is the level of literacy of the target population (Cowart et al., 2010; Di Noia et al., 2013; Gross et al., 2013; Kannan, Sparks, Webster, Krishnakumar, & Lumeng, 2010). Low literacy and numeracy are associated with poor comprehension of health information and nutrition labels, decreased application of health

information and services, and poor disease knowledge and self-management (Cowart et al., 2010; Di Noia et al., 2013; Gross et al., 2013; Kannan et al., 2010).

Socioeconomic status and lifestyle preferences need to be taken into consideration in culturally competent interventions. Economic factors can be a barrier to dietary regimen compliance (Benavides-Vaello & Brown, 2010; Cowart et al., 2010; Di Noia et al., 2013; Gatenby, Donnelly, & Connell, 2011). Sometimes individuals cannot afford the food recommended or have poor access to the food recommended and easy access to foods that are harmful (Cowart et al., 2010; Di Noia et al., 2013). Lifestyle shopping practices are affected by lack of transportation, child care, time for food shopping, and inadequate food storage conditions (Baquero et al., 2009; Di Noia et al., 2013; Heiss et al., 2013). Overall, the majority of research supports that culturally competent nutrition education interventions are effective at promoting dietary behavioral change because they are presented in the native language of the recipients and reflect their cultural background, socioeconomic status, and lifestyle (Hollingdale et al., 2008; Lopez et al., 2007; Gross et al., 2013)

ESRD patients have to change their diet and adopt new eating behaviors that often differ greatly from their ethnic and cultural food preferences because of the content of specific nutrients (Burrowes, 2004). A large percentage of the ESRD patients in the United States are Hispanic or African American, with cultural food preferences that are particularly high in potassium, phosphorus, and sodium (Burrowes, 2004). Traditional ethnic foods need to be incorporated in the development of appropriate renal diet meal plans and nutrition education materials for Black and Hispanic Americans with ESRD (Burrowes, 2004). Registered dietitians must be sensitive to the different societal, cultural, and economic factors that influence food choices and eating behaviors of the ESRD patients to provide effective dietary counseling (Heiss

et al., 2013). Provision of one-to-one nutrition counseling is associated with improvement of nutrition knowledge and diet practices of patients (Hegazy, El Raghy, Abdel-Aziz, & Elhabashi, 2013; John et al., 2013)

Researchers evaluating the effects of nutrition education interventions on dialysis patients have mainly applied pretest and posttest design of the interventions (Khaddar et al., 2009; Oka & Chaboyer, 2001**,** Su, Lu, Chen, & Wang, 2009; Tsay, 2003; Welch et al., 2013; Zrinyi et al, 2003**)**. All these studies were conducted on ESRD patients receiving regular dialysis treatments. As a result, it was possible to establish the baseline of the patients regarding health outcomes, lab values, and dietary habits before the particular nutrition education intervention (Ghaddar et al., 2009; John et al., 2013; Oka & Chaboyer, 2001**,** Su et al., 2009; Tsay, 2003; Welch et al., 2013; Zrinyi et al, 2003**)**. The baseline information allowed these researchers to determine the impact of the intervention by comparing it to the results of the posttest (Creswell, 2013). Moreover, in these studies, the nutrition education interventions were a new element with a definite time duration that permitted for pre- and post evaluation. This approach is not appropriate for the present study because all patients receiving emergency dialysis at Ben Taub receive culturally-sensitive nutrition education as soon as they start receiving emergency dialysis as part of their treatment protocol. Consequently, baseline data on health outcomes of the emergency dialysis patients without nutrition education intervention are not available at this hospital. The solution is to compare the health outcomes of this patient population with those of the emergency dialysis patients receiving dialysis in other hospitals in the same health system that do not include a nutrition component in their dialysis management.

Undocumented End Stage Renal Disease Patients and Renal Care

Undocumented residents are defined as individuals that crossed the border illegally or legally and have stayed in the country after their visa expired. There are approximately 11 million undocumented residents in the United States (Campbell et al., 2010). Of this, about 80% are Hispanic, mainly from Mexico (57%) and other Latin American countries (23%; (Raghavan & Nuila, 2011). End stage renal disease is more prevalent in the Hispanic than the European American population (Raghavan & Nuila, 2011; Raghavan & Sheikh-Hamad, 2011). Undocumented ESRD patients in the United States do not have access to regular dialysis or medical federal assistance (Sheikh-Hamad et al., 2007). However, the 1986 Federal Emergency Medical Treatment and Active Labor Act (EMTALA) dictates that emergency health care must be provided to all patients, regardless of their residency status(Coritsidis, 2004; Sheikh-Hamad et al., 2007). As a result, undocumented ESRD patients only receive emergency dialysis in hospitals when facing life-threatening health conditions (Coritsidis, 2004; Sheikh-Hamad et al., 2007).

The current state of the provision of renal care to undocumented immigrants with ESRD in the United States is the result of the interpretation of a complicated conglomeration of federal laws and state Medicaid policies (Campbell et al., 2010; Raghavan & Nuila, 2011). In 1972, the Public Law 92-603 provided access to regular dialysis to all individuals with ESRD regardless of residence status (Campbell et al., 2010). However, the Consolidated Omnibus Budget Reconciliation Act (1986) prohibited Medicaid payment for undocumented immigrants with the exception of emergency care through EMTALA. Furthermore, in1996, the Personal Responsibility and Work opportunity Reconciliation Act (PRWORA) denied undocumented immigrants of all state and local public health benefits (Campbell et al., 2010). Consequently,

each state was forced to develop and pass laws that were specific to their state regarding health coverage for undocumented immigrants. Accordingly, the Balance Budget Act provides $ 25 million per year for health care to the 12 states with the greatest number of undocumented immigrants (Campbell et al., 2010). The Medicare prescription Drug, improvement and Modernization Act (2003) was established to provide $250 million per year to hospitals for emergency care of undocumented immigrants (Campbell et al., 2010).The lack of an uniform legislation regarding the care of undocumented ESRD patients has resulted in the provision of substandard health care. This inadequate care negatively affects the wellbeing of undocumented ESRD patients, and disproportionately burdens the health care system particular states such as California, Texas, Florida, and New York (Campbell et al., 2010; Raghavan & Nuila 2011).

Theoretical Foundation

Albert Bandura developed the social cognitive theory (SCT) (Bandura, 1977). The social cognitive theory supports the concept of reciprocal determinism, suggesting that humans constantly interact with their environments, which leads to individual and social change (Bandura, 1977). It suggests that human behavior is the interplay of personal, behavioral, and environmental influences (Bandura, 1977). The social cognitive theory suggests that behavioral change is influenced by the individual's perceived ability to execute the behavior (self-efficacy), the expectations that completing the behavior will result in beneficial outcomes (outcome expectations), and the belief that a specific behavior can be modified or controlled (perceived control; Bandura, 1977). Research about factors that influence compliance with dietary advice among ESRD patients in dialysis is limited (Welch et al., 2013). However, the following factors have relevance to the SCT as presented both conceptually in context and suggested application.

Self-efficacy: Conceptually defined in this context, as the dialysis patient's perceived ability to self-manage the prescribed diet and fluid regimen, has been linked to increase compliance with renal diet and fluid recommendations **(**John et al., 2013; Oh, Park, & Seo, 2013; Lindberg, Wikstrom & Lindberg, 2010; Aliasgharpour et al., 2012**).** Researchers have studied the association between self-efficacy and fluid and dietary compliance among hemodialysis patients. Their results indicated the more self-efficacy the patients reported, the higher the self-reported dietary and fluid restriction compliance (Aliasgharpour et al., 2012; John et al., 2013; Lindberg et al., 2010; Oh et al., 2013)**.** Researchers found out that dietary self-efficacy has an impact in both the laboratory outcomes and behaviors of dialysis patients (Aliasgharpour et al., 2012; John et al., 2013; Lindberg et al., 2010; Oh et al., 2013)**.** Patients with greater dietary self-efficacy presented lower potassium and phosphorus lab values, demonstrated better compliance with diet recommendations, and established relationships that are more positive with health care providers patients (Aliasgharpour et al., 2012; John et al., 2013; Lindberg, Wikstrom & Lindberg, 2010; Oh et al., 2013). The results of these studies supported the effectiveness of the self-efficacy training in controlling mean body weight gains of end-stage renal disease patients receiving hemodialysis. The treatment of ESRD is long-term, and patients manage their illness by engaging in self-care strategies such as dietary and fluid control. Those who have confidence in their ability to manage self-care have better dietary intake compliance **(**Aliasgharpour et al., 2012; John et al., 2013; Lindberg, Wikstrom & Lindberg, 2010; Oh et al., 2013).

Outcome expectations: Defined in this context as expectations that implementing the diet and fluid prescription will lead to positive outcomes which have been associated with greater diet and fluid adherence among dialysis patients (Ghaddar, Shamseddeen, & Elzein, 2009; Lindberg & Fernandes, 2010; Welch et al., 2013).

Self-regulation: In the dialysis context refers to the ability to self-regulate and control diet and fluid intake. Higher levels or self-regulation or perceived control have been associated with better compliance with diet and fluid intake recommendations among dialysis patients (Welch et al., 2013).

Behavioral capability: Research on hemodialysis patients has revealed that higher levels of knowledge regarding their treatment and diet regimen are associated with higher levels of compliance with recommendations (Welch et al., 2013). According to the SCT this phenomenon supports the premises of the behavioral capability construct which states that in order for individuals to perform a behavior properly they need to understand what to do and how to do it (Bandura, 1977). There are more possibilities for individuals to comply to a new behavior if they have the necessary knowledge and skills to do it (Bandura, 1977). For that reason, it is imperative that dialysis patients receive nutrition education lessons and materials that are appropriate to their level of literacy, education, language, and cultural background.

Social support: Besides knowledge, perceived barriers to compliance, and self-efficacy researchers have found that social support improves dialysis patients' adherence with dietary restrictions and treatment recommendations (Cicolini, Palma, Simonetta, & Di Nicola, 2012; Oka & Chaboyer, 2001). Essentially, the active involvement of family, friends with the dietary regimen, medications and treatment of dialysis patients, and the existence of a supportive environment will promote favorable attitudes among dialysis patients and increase their compliance with diet and treatments (Thomas et al. 2001; Oh et al., 2013). Furthermore, positive relationships between dialysis patients and health care providers increase self-reported compliance efforts and behaviors of patients, and enhanced dietary self-efficacy capacities (Zrinyi at al, 2003). In summary, it appears that through better relationships with patients, health

care providers can influence health outcomes among dialysis patients. Health professionals can apply these findings in providing dietary education focused on improving not just knowledge, but attitudes, and family support (Thomas et al, 2001). Moreover, self-efficacy was found to mediate barriers to compliance and family support-compliance relationships. Self-efficacy in combination with family support and health care provider support was found to improve compliance with treatment and diet recommendations among dialysis patients.

Summary

Chronic kidney disease consists of the gradual loss of kidney function until the kidneys stop working completely and are unable to remove waste and fluid from the blood. When patients reach total kidney failure, they need one of the following treatments to survive a transplant, hemodialysis, or peritoneal dialysis. Nutrition therapy is an important component of ESRD management. The renal diet guidelines direct the patients to adjust their dietary intake of protein, sodium, fluid, potassium, and phosphorus according to their kidney disease stage and mode of treatment. The renal diet is often considered the most difficult life-style adjustment that ESRD patients need to achieve. As a result, there is poor compliance with renal diet recommendations among dialysis patients. Consequently, it is important for dialysis patients to receive effective nutrition education interventions. Some of the most effective nutrition education strategies involve tailoring and cultural competence because these approaches take into consideration the characteristics and needs of the target audience while developing and implementing the nutrition education materials. The number of undocumented immigrants with ESRD receiving emergency dialysis in the United States is consistently increasing. This mode of renal replacement treatment results in negative health consequences among undocumented ESRD patients secondary to excess fluid and waste in their blood. Strict nutritional management

assists emergency dialysis patients to compensate for insufficient dialysis and prevent medical complications. Therefore, it is imperative to identify effective nutrition interventions that would promote better renal diet compliance in this population. In this chapter, I reviewed the literature on kidney disease, nutrition therapy, and education for renal patients and undocumented patients with ESRD. In Chapter 3 methods, the research design sampling, data collection, and analysis will be discussed.

Chapter 3: Research Method

Introduction

The purpose of this quantitative quasi-experimental treatment-control study was to assess how the application of nutritional counseling that is both culturally and linguistically competent affects dialysis frequency and biochemical lab values such serum potassium, phosphorus, and vitamin D of patients who undergo emergency dialysis. The covariates of the study included age, gender, and time in dialysis. In the study I sought to determine if this type of nutrition intervention has a positive impact on the health outcomes of emergency dialysis patients.

Compliance with particular diet guidelines is a component of disease management among patients with ESRD on regular dialysis (Mok et al., 2011; Riella, 2013). This becomes more essential when there is not enough dialysis to prevent medical complications related to excess waste and fluid in the blood (Raghavan, 2012). It is imperative that emergency dialysis patients follow prescribed evidence-based nutritional plans (Kugler et al., 2011). To that end, it is important for this population to receive nutrition education that it is tailored to their needs and characteristics in order to promote diet compliance and better health outcomes. Consequently, in this study I compared outcomes such as laboratory makers and frequency of dialysis treatments between two different nutrition education approaches directed toward undocumented emergency dialysis patients.

In this chapter, I discuss methodology and design for the study. In the first section, I state the investigation questions; define the dependent, independent, and control variables; explain the research method, study design, and the rationale of why the research design was appropriate to answer these questions. In the following section, I describe the study population and the

techniques applied to determine the sample size. Finally, I explain the process of data collection, data analysis, and measures taken to protect participant rights in the study.

Research Design and Rationale

Study Design

The present study consisted of a quantitative quasi-experimental treatment-control study. In this type of study design, the experimental group receives a treatment or intervention while the control group does not, in a similar manner to a true experiment. However, the main difference is that the control and the experimental group members are not randomly assigned (Creswell 2013). This study design was the most adequate to answer the questions of the present study because it allowed me to detect differences in outcomes between different interventions applied to the same target population when randomization was not possible (Creswell, 2009; Creswell 2013).

The participants in this study could not be randomized into the intervention or control group because these were two naturally occurring groups of emergency dialysis patients in two different hospitals of the same health system. The two different emergency dialysis units provide the same renal management care. However, they differ regarding the type of nutrition education intervention provided to the patients. This study design allowed me to determine whether there are differences regarding health outcomes between undocumented patients on emergency dialysis receiving culturally and linguistically competent nutrition counseling and the patients not receiving the intervention. I compared biochemical lab results and frequency of dialysis between the intervention and control group (see Table 4). The lab values and frequency of dialysis data of 12 consecutive months were collected retrospectively for both groups. The data were collected from the interval starting November 1, 2014 and finishing November 1, 2015.

This time frame was chosen because of its convenience. I collected data of 12 consecutive months to ensure an effect could be detected.

In this study, I conducted a retrospective secondary data analysis of outcomes contained in electronic medical records. I chose this data collection method over survey data to prevent the study from interfering with the normal functioning of operations in the emergency dialysis units involved in this investigation. Undocumented immigrants on emergency dialysis are a vulnerable population; putting any unnecessary stress on their time of treatment may negatively impact their health. In addition, if survey data regarding diet compliance were gathered, patients might have interpreted that participation in the survey would affect their eligibility for emergency dialysis.

Table 4

Research Questions Along with the Variables in this Study

Research Questions	Independent variable	Dependent variables	Covariates	Statistical Test
Is there a statistically significant difference in frequency of dialysis treatments between the intervention and control groups while controlling for age, gender, and time in dialysis?	Culturally-linguistically competent nutrition counseling (yes or no) (categorical)	Frequency of dialysis treatments per month (continuous)	Age, gender, time in dialysis	ANCOVA (if ANCOVA's assumptions are not met, Quade's test will be implemented)
Is there a statistically significant difference in levels of serum potassium between the intervention and control groups while controlling for age, gender and time in dialysis?	Culturally-linguistically competent nutrition counseling (yes or no) (categorical)	Potassium levels (Positive health outcomes are related to potassium levels between 3.7 and 6.0 mEq⁄l) phosphorus levels between 2.4 and 5(mg/dL) (continuous)	Age, gender, time in dialysis	ANCOVA (if ANCOVA's assumptions are not met, Quade's test will be implemented)
Is there a statistically significant difference in levels of serum phosphorous between the intervention and control groups while controlling for age, gender and time in dialysis?	Culturally-linguistically competent nutrition counseling (yes or no) (categorical)	Phosphorus levels (Positive health outcomes are related to phosphorus levels between 2.4 and 5(mg/dL) (continuous)	Age, gender, time in dialysis	ANCOVA (if ANCOVA's assumptions are not met, Quade's test will be implemented)
Is there a statistically significant difference in levels of Vitamin D between the intervention and control groups while controlling for age, gender and time in dialysis?	Culturally-linguistically competent nutrition counseling (yes or no) (categorical)	Vitamin D levels (Positive health outcomes are related to Vit D equal or above 30 (continuous)	Age, gender, time in dialysis	ANCOVA (if ANCOVA's assumptions are not met, Quade's test will be implemented)

Methodology

Sample Population

The population for this study consisted of undocumented immigrants with ESRD receiving dialysis in one of the two main hospitals of the Harris Health System in Houston, Texas, Ben Taub Hospital and Lyndon B Johnson Hospital. I examined undocumented ESRD patients for this study because this population has no access to regular dialysis. Consequently, the majority of ESRD patients receiving emergency dialysis in public health institutions are undocumented. I completed the study in the two main hospitals of the Harris Health System because these public safety net hospitals take care of a large population of undocumented patients. As a result, the dialysis units of these two hospitals provide emergency dialysis to a large adult population of undocumented ESRD patients from age 20 and up. In addition, this hospital system provides a unique opportunity to evaluate the effect of nutritional counseling on the dietary compliance and health outcomes among patients on emergency dialysis because one of the hospitals offers a nutrition education component as part of their dialysis treatment while the other does not.

In this study, the control group consisted of the patients receiving emergency dialysis at the Lyndon B Johnson Hospital. In this hospital, culturally-linguistically competent nutrition counseling is not a component of the health care provided to ESRD patients on emergent dialysis. The intervention group consisted of the patients receiving emergency dialysis at the Ben Taub General Hospital. At this hospital, culturally and linguistically competent nutrition counseling provided by a registered dietitian is a component of the health management of the patients (Appendix A contains a description of the nutrition counseling intervention).

Sample Size

In order to determine the proper sample size for a study, researchers need to consider level of statistical significance, the amount of power desired in the study, and the effect size (Creswell, 2009). In general, the level of significance or alpha is set at 0.05 and power at 0.80 (Creswell, 2009). Moreover, the effect size can be established by reviewing previous research. According to Lipsey and Wilson's meta-analysis (1993), interventions consisting of education and counseling directed to medical patients have in general a medium sized effect. Moreover, Mazzuca's meta-analysis (1982) regarding patient education interventions and their effect on compliance and health status among people with chronic diseases and other medical problems revealed a medium size effect of 0.52. Finally, Posavac, Sinacore, Brotherton, Helford, & Turpin's (1985) meta-analysis regarding education interventions to increase compliance with medical regimens uncovered an effect size of 0.47. This information served as justification to implement a medium size effect to calculate the sample size for this study.

I used an online sample size calculator, G*Power 3.1.9.2 to calculate the sample size of my study (Faul, Erdfelder, Lang & Buchner, 2007). The focus of the study was to compare two independent groups to determine whether there was a statistically significant difference between the means in two unrelated groups while controlling for covariates that could affect the relationship between the independent and the dependent variable. Consequently, an appropriate statistical test for this study was the *F*-test ANCOVA**.** In order to complete the power analysis and determine the exact sample size required I completed the following steps in the sample size calculator program**.** First, on the test family options drop down, I chose *F* test. Next, on the statistical tests options drop down, I chose ANCOVA with fixed effects, main effects, and interactions. Finally, I chose from the options drop downs an alpha of 0.05, a power of 80% and

a medium effect size for ANCOVA (the medium effect size option for ANCOVA in this program appeared as 0.4). The resulting sample size from this calculation was 80 participants in total, 40 participants in each group. Figure 1 illustrates the required sample size to achieve power levels from to 0.6 to 0.95.

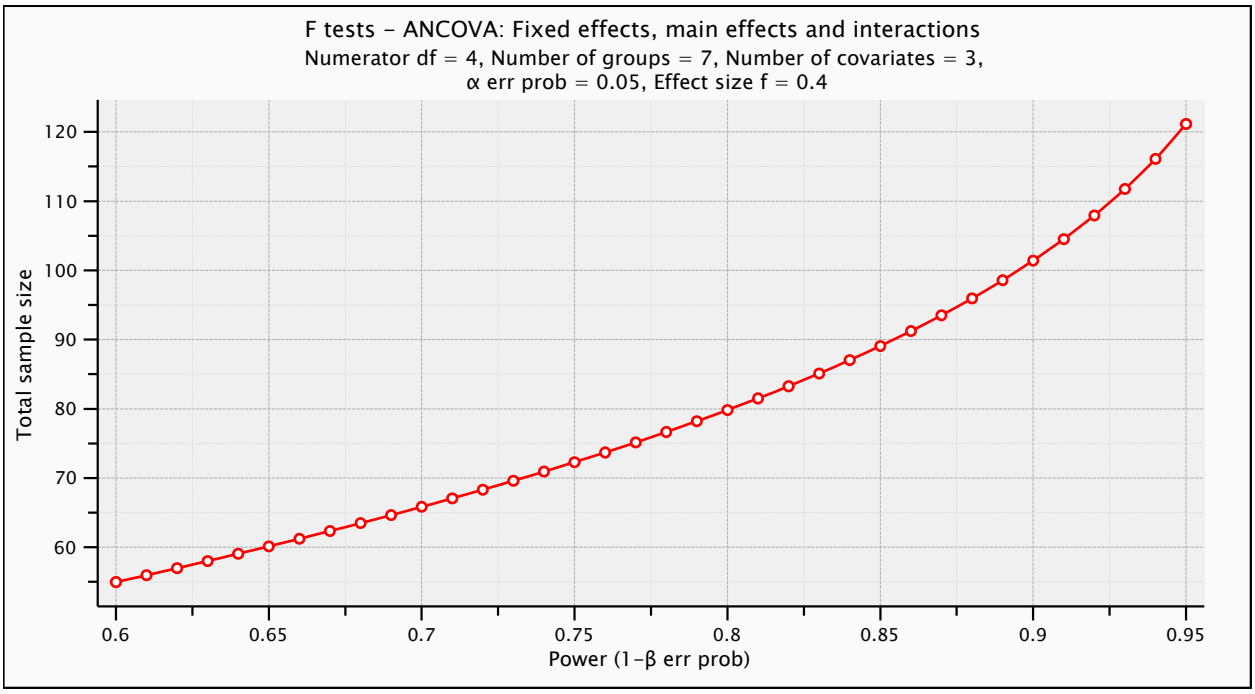

Figure 1. *F*-test ANCOVA: Fixed effects, main effects and interactions.

Sampling and Sampling Procedures

The subjects for this study were not be chosen randomly. The study examined a naturally formed group of ESRD patients receiving emergency dialysis at a public health system. Therefore, the subjects were part of a convenience sample making the study a quasi-experiment (Creswell, 2013). All of the eligible subjects from the convenience sample who met criteria were included in the study. A convenience sample was the most appropriate sampling strategy for this study because the intervention and control groups were already naturally formed based on the

hospital where the patient received dialysis. Patients could not be randomly assigned to an intervention or control group.

The inclusion criteria consisted of undocumented immigrants receiving emergency dialysis in either of the two main hospitals of the Harris Health System, Ben Taub General Hospital and Lyndon B. Johnson Hospital, for a minimum of 12 consecutive months.The exclusion criteria consisted of patients who had been receiving emergency dialysis for less than 12 consecutive months. U.S citizens receiving emergency dialysis because they had missed their regular dialysis appointment or had lost their regular dialysis clinic secondary to treatment noncompliance were excluded from the study. In addition, undocumented ESRD patients receiving dialysis at both hospitals were excluded from the study to prevent problems with data contamination related to diffusion of treatment. Patients were confirmed as undocumented by their lack of social security number in the medical charts. In addition, a review of social worker notes in medical charts indicated a patient's migratory status and eligibility for regular dialysis. All of the medical records of the study subjects were reviewed by members of the information technology department of the Harris Health System to gather information on health outcomes and frequency of use of hospital services.

Data Collection

Once I obtained IRB approval from both Baylor-Harris Health System and Walden University, I requested the extraction of the study data through the manager of research and sponsored programs of Harris Health System. Medical chart data were extracted by the IT Department of the Harris Health System; this process took two months. IT provided me with a disk containing the data regarding the study subjects in the form of excel spreadsheets. Data was assigned unique identification numbers by IT to ensure anonymity of study participants. Data

from patient charts consisted of laboratory marker values associated with poor management of ESRD (serum potassium, serum phosphorus and serum vitamin D) and frequency of dialysis treatments. In addition, information regarding age, gender, and length of time in dialysis was collected. I protected the confidentiality of the study subjects by storing the study data on a password-protected computer to which only I have access.

Data Analysis

The IT department of Harris Health provided me with a disk containing the data for the study in the form of an excel spreadsheet. I analyzed the data using the Statistical Package for Social Sciences (SPSS) statistical software for Windows version 21.0 available to Walden University students (Walden University, 2017). I determined descriptive statistics for all the study variables including percentages for categorical variables and, means, and standard deviations, for continuous variables. Next, I applied inferential tests to examine the study hypothesis. For experimental or quasi-experimental designs with categorical information such as groups (nutrition counseling or no nutrition counseling) on the independent variable, and continuous information on the dependent variable (frequency of dialysis, and lab values) while controlling for covariates, researchers use analysis of covariance (ANCOVA; Creswell, 2013). Consequently, I planned to apply ANCOVA to compare mean outcomes between the intervention and the control group while controlling for covariates. However, the study data was nonparametric; as a result, Quade's test, which is the nonparametric equivalent of ANCOVA, was implemented (Quade, 1967; Quade, 1979).

Threats to Validity

It is important to take into consideration threats to validity when designing a research study to ensure that the conclusions regarding the effects of a particular intervention on outcomes

are directly related to the intervention and not some other factors (Creswell, 2013). Internal threats to validity are related to procedures, treatments, or experiences of the study subjects that can prevent the researcher from drawing the correct conclusion from the data gathered (Creswell, 2013). A threat to internal validity that I may encounter in the present study is diffusion of treatment (Creswell, 2013). Undocumented ESRD patients receiving emergency dialysis in the Harris Health System are free to receive dialysis treatments in either Ben Taub General Hospital or Lyndon B Johnson Hospital at any given time. Consequently, there are instances in which patients that regularly receive dialysis at the LBJ Hospital (the control group) may seek dialysis at Ben Taub Hospital (the intervention group) and have access to culturally-linguistically competent nutrition counseling. Exposure of the control group subjects to culturally-linguistically competent nutrition education a single time or in a sporadic manner may obscure study results. As a result, data were reviewed to identify ESRD patients that have emergency dialysis in both hospitals. Patients receiving emergency dialysis in both hospitals were excluded from the study to ensure the data clearly reflects the differences between the individuals receiving the intervention and the ones not receiving it.

External validity threats take place when researchers generalize the conclusions drawn from their data to other population groups or settings that have different characteristics. The results of this particular study can apply only to undocumented ESRD patients on emergency dialysis. The findings cannot be generalized to patients receiving regularly scheduled dialysis treatments. Consequently, I restricted the claims derived from the findings of this study to this particular population.

Ethical Procedures

Prior to the data collection process I obtained the Institutional Review Board (IRB) approval from both the Baylor-Harris Health System's research office and Walden University IRB. I first obtained the IRB approval from Baylor-Harris Health System to ensure the study could take place. In order to obtain the IRB approval from Baylor-Harris Health System I completed and submitted an IRB application electronically to the Office of Research and Sponsored Programs of Baylor-Harris Health System. After gaining the approval of Baylor-Harris Health IRB, I obtained the IRB approval from Walden University. The IRB approval number for this study is 12-21-16-0284302. In order to apply for Walden's IRB approval I completed and submitted the IRB application after receiving a formal proposal approval notification from the Office of Student Research Support. Once I got Walden's IRB approval letter I submitted it to the IRB Manager for the Harris Health System together with the approved Harris Health IRB application. Following, I applied for administrative approval with the Manager of Research and Sponsored Programs of Harris Health System. Once I acquired administrative approval, the Manager of the Office of Research and Sponsored Programs introduced a ticket to the Information Technology (IT) Department indicating in detail the information that needed to be extracted from the electronic medical records, based on the information I provided in the application. This study examined data that is regularly collected as part of the natural medical care process provided to patients receiving emergency dialysis in the Harris Health System. Health care practitioners collected the original data for this study as they tended to patients. The electronic medical records of the health system contained the relevant data for this study. I focused on secondary data analysis; therefore, I did not approach any of the study subjects to collect any type of data for this particular investigation. Consequently, there

was no known harm associated with participation in this study. Furthermore, the confidentiality of study subjects was protected because I received the data from the Harris Health IT department, and the dialysis team with no patient identifications such as name or medical ID number. Data was reviewed and analyzed in order to answer the research questions. All data was stored in a password-protected computer and only I have access to the data. The data will be kept for 5 years as required by Walden University. Then, all data will be deleted completely from computer. There were no minors or ethically vulnerable participants in this study.

Summary

The goal of this treatment-control study was to examine secondary data extracted from electronic medical records in order to determine the impact of culturally- and linguistically-competent nutrition counseling on dietary compliance and the health outcomes of undocumented immigrants on emergency dialysis. In this study, the biochemical lab results and frequency of dialysis treatments were compared between the treatment group receiving the culturally- and linguistically-competent nutrition counseling, and the control group receiving the standard nutrition information provided in emergency dialysis. All lab value results and frequency of dialysis results were compared using Quade's test (nonparametric equivalent of ANCOVA). In this chapter, I also discussed the research design, data sources and data collection method, and ethical protection of participants. In chapter four, the results of the study were described and each of the study questions answered. In addition, for each question I explained whether results confirm or reject the null hypotheses.

Chapter 4: Results

Introduction

The purpose of this quantitative quasi-experimental treatment-control study was to assess how the application of nutritional counseling that is both culturally and linguistically competent affects dialysis frequency and biochemical lab values such serum potassium, phosphorus, and vitamin D of patients on emergency dialysis. The covariates of the study included age, gender, and time in dialysis. The study objective was to determine if this type of nutrition intervention has a positive impact on the health outcomes of emergency dialysis patients. The research questions and hypotheses for this study were:

RQ1: Is there a statistically significant difference in frequency of dialysis treatments between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$1: There is no statistically significant difference in dialysis frequency between the intervention and control groups while controlling for age, gender, and time on dialysis

$H_1$1: There is a statistically significant difference in frequency of dialysis treatments between the intervention and control groups while controlling for age, gender, and time on dialysis.

RQ2: Is there a statistically significant difference in levels of serum potassium between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$2: There is no statistically significant difference in serum levels of potassium between the intervention and control groups while controlling for age, gender, and time on dialysis.

$H_1$2: There is a statistically significant difference in serum levels of potassium between the intervention and control groups while controlling for age, gender, and time on dialysis.

RQ3: Is there a statistically significant difference in levels of serum phosphorus between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$3: There is no statistically significant difference in serum levels of phosphorus between the intervention and control groups while controlling for age, gender, and time on dialysis

$H_1$3: There is statistically significant difference in serum levels of phosphorus between the intervention and control groups while controlling for age, gender, and time on dialysis.

RQ4: Is there a statistically significant difference in levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis?

$H_0$4: There is no statistically significant difference in levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis.

$H_1$4: There is statistically significant difference in levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis.

Data Collection

The minimum sample size for the study was calculated using G*Power software 3.1.9.2 (Faul et al., 2007) with alpha set at 0.05, power set at 80% (Creswell, 2009), and a medium effect

size (Mazzuca, 1982; Lipsey & Wilson, 1993; Posavac, et al., 1985). Medium effect was 0.4 for ANCOVA in G*Power software 3.1.9.2. The result was a sample size of 80 participants in total, 40 participants for the intervention group, and 40 participants for the control group minimum. I conducted a retrospective secondary data analysis of outcomes contained in electronic medical records. All the emergency dialysis patients from the convenience sample that met study criteria were included in this investigation. The original proposed plan was to collect lab values and frequency of dialysis data from 12 consecutive months retrospectively for all participants who met study criteria, between November 1, 2014 and November 1, 2015. However, preliminary screening uncovered that limiting data collection to this specific time period did not produce enough participants to meet the sample size requirement. As a result, the data collection time was modified to extend from January 1, 2014, to December 31, 2015. With this time expansion, the secondary screening uncovered enough eligible participants to meet the study's sample size requirement. The raw data provided by Harris Health's IT Department included 104 participants in total, 51 from the intervention group and 53 from the control group. During data cleaning I eliminated 8 participants from the control group because of missing vitamin D lab values. Consequently, the final total sample size for data analysis included 96 participants, 51 from the intervention group, and 45 from the control group.

Data Cleaning and Preparation

The raw data provided by Harris Health's IT department were organized into Excel spreadsheets. The data for each participant were assigned a specific identification number that was consistent across all the spreadsheets. Spreadsheet 1 included each participant's gender, age, time in dialysis, number of dialysis treatments in 12 months, and whether the participant was from the control group hospital or the intervention group hospital. Spreadsheet 2 included all the

serum phosphorus lab values collected for 12 consecutive months for each participant. Spreadsheet 3 included all the serum potassium lab values collected for 12 consecutive months for each participant. Finally, spreadsheet 4 included all the Vitamin D lab values collected for 12 consecutive months for each participant.

In order to prepare data for analysis I calculated the average serum potassium, phosphorus, and vitamin D levels for each patient, as well as the average number of dialysis treatments per month using Excel spreadsheet calculations. I compiled all data into a single final data spreadsheet ready for data analysis that included the independent variable of nutrition counseling coded as 1 for the intervention and 0 for the control group, age, gender, time in dialysis, average number of dialysis treatments per month, average potassium levels, average phosphorus levels, and average vitamin D levels.

Before performing the ANCOVA data analysis, I completed statistical tests to ensure the study data met all necessary assumptions for ANCOVA. The testing revealed that the study data were not normally distributed and consequently violated the assumption of normal distribution (see Table 5). Consequently, the data analysis performed was nonparametric Quade's rank analysis of covariance. Quade's distribution-free test was one of the first nonparametric alternatives to ANCOVA. In Quade's test, the residuals from a regression of ranked data are used in a subsequent regression with the grouping factors. Then the test statistic, which is asymptotically distributed as central F, is taken as the squared multiple correlation coefficients from the second regression (Conover, 1980; Rheinheimer & Penfield, 2001).

Table 5

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	*Df*	*P*	Statistic	*df*	*p*
Average number of dialysis treatments per month	.171	96	.000	.932	96	.000
Average phosphorous in 12 months	.063	96	.200*	.984	96	.291
Average potassium in 12 months	.101	96	.017	.934	96	.000
Average vitamin D in 12 months	.067	96	.200*	.941	96	.000

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Results

Descriptive Statistics

Included in this secondary data analysis were a total of 96 patients; 49% were female and 51% were male. The control group included 45 participants of which 60% were female and 40% were male. The intervention group included 51 participants of which 39.2% were female and 60.8% were male (see Table 6). The average age of the study participants was 52 years old, with ages ranging from 23 years to 83 years old (see Table 7). The average time in dialysis for the study participants was 27.50 months (about 2 years), the minimum time was 13 months and the maximum time was 96 months (about 8 years; see Table 8).

Table 6

Gender Distribution

		Gender		
		Male	Female	Total
Nutrition intervention	Control	40.0%	60.0%	100.0%
	Intervention	60.8%	39.2%	100.0%
Total sample		51.0%	49.0%	100.0%

Table 7

Age Distribution in Years

Nutrition intervention	Mean	N	*SD*	Minimum	Maximum
Control	50.98	45	14.045	23	77
Intervention	50.47	51	12.256	30	83
Total sample	50.71	96	13.057	23	83

Table 8

Time in Dialysis in Months

Nutrition intervention	Mean	N	*SD*	Minimum	Maximum
Control	27.29	45	14.122	14	72
Intervention	27.69	51	18.723	13	96
Total sample	27.50	96	16.640	13	96

The average number of dialysis treatments per month was 4.4 for the intervention group and 4.8 for the control group. The average potassium level was 5.7 mmol/L for the intervention

group and 5.9 mmol/L for the control group. The average phosphorus level was 5.6 mg/dL for the intervention group and 6.1 mg/dL for the control group. Finally, the average vitamin D level was 27. 3 ng/mL for the intervention group, and 16.6 ng/mL for the control group (see Table 9).

Table 9

Averages of Dependent Variables

	Nutrition intervention	Mean	*SD*	N
Average number of dialysis treatments per month	Control	4.8093	1.61625	45
	Intervention	4.4167	1.51181	51
	Total Sample	4.6007	1.56576	96
Average phosphorous in 12 months	Control	6.1294	1.07860	45
	Intervention	5.6574	1.18892	51
	Total Sample	5.8787	1.15709	96
Average potassium in 12 months	Control	5.8646	.42082	45
	Intervention	5.7321	.59176	51
	Total Sample	5.7942	.52034	96
Average vitamin D in 12 months	Control	16.6125	5.75765	45
	Intervention	27.3232	8.64228	51
	Total Sample	22.3025	9.13960	96

Data Analysis

SPSS version 23 was used to perform all data computations. The data were not normally distributed, thus applying a parametric statistical test such as ANCOVA was inappropriate. It was necessary to implement a nonparametric statistical test equivalent to ANCOVA in order to be able to compare the outcomes of the intervention and control groups while controlling for

covariates. Consequently, Quade's analysis of covariance was performed according to the steps indicated by Quade (Quade, 1967; Quade, 1979). SPSS does not currently include an explicit option for Quade's rank analysis of covariance. However, it is possible to complete Quade's test in SPSS following a set of particular steps. First, I ranked the dependent variables (frequency of dialysis, levels of phosphorus, potassium, and vitamin D) and covariates (age, gender, and time in dialysis) using the default settings in the SPSS RANK procedure. I did this for all cases while ignoring the independent variable (nutrition intervention). Second, I ran a linear regression of the ranks of the dependent variables on the ranks of the covariates and saved the raw or unstandardized residuals. Again, I ignored the independent variable (grouping factor in SPSS) in this step. Third, I ran a one-way analysis of variance (ANOVA) using the residuals from the regression in the prior step as the dependent variables and the grouping variable as the factor. Finally, the *F* test resulting from this ANOVA was the *F* statistic for Quade's test. All statistical tests used a 0.05 level of significance.

RQ1: Quade's analysis of covariance indicated that there was no statistically significant difference in frequency of dialysis treatments between the intervention and control groups while controlling for age, gender, and time on dialysis [$F(1,94) = 2.644$, $p = 0.107$]. The null hypothesis was accepted (see Table 10).

Table 10

Quade's Test for Frequency of Dialysis

	Sum of squares	*Df*	Mean square	F	p
Between groups	1718.806	1	1718.806	2.644	.107
Within groups	61095.867	94	649.956		
Total sample	62814.672	95			

RQ2: Quade's analysis of covariance indicated that there was no statistically significant difference in serum potassium levels between the intervention and control groups while controlling for age, gender, and time on dialysis [$F(1,94) = 0.793$, $p = 0.375$]. The null hypothesis was accepted (see Table 11).

Table 11

Quade's Test for Potassium Levels

	Sum of squares	*Df*	Mean square	F	p
Between groups	595.350	1	595.350	.793	.375
Within groups	70540.180	94	750.427		
Total sample	71135.529	95			

RQ3: Quade's analysis of covariance indicated that there was a statistically significant difference in serum phosphorus levels between the intervention and control groups while controlling for age, gender, and time on dialysis [$F(1,94) = 9.616$, $p = 0.003$]. The null hypothesis was rejected (see Table 12). The intervention group had statistically significant lower serum phosphorus levels than the control group.

Table 12

Quade's Test for Phosphorus Levels

	Sum of squares	*Df*	Mean square	F	p
Between groups	5787.480	1	5787.480	9.616	.003
Within groups	56573.961	94	601.851		
Total sample	62361.442	95			

RQ4: Quade's analysis of covariance indicated that there was a statistically significant difference in vitamin D levels between the intervention and control groups while controlling for age, gender, and time on dialysis [$F(1,94) = 51.411$, $p = .000$]. The null hypothesis was rejected (see Table 13). The intervention group had statistically significant higher vitamin D levels than the control group.

Table 13

Quade's Test for Vitamin D Levels

	Sum of squares	*Df*	Mean square	F	p
Between groups	24865.086	1	24865.086	51.411	.000
Within groups	45463.598	94	483.655		
Total sample	70328.684	95			

Summary

The present study involved analysis of secondary data extracted from electronic medical records to determine the impact of culturally and linguistically competent nutrition counseling on dietary compliance and the health outcomes of undocumented immigrants on emergency dialysis. Biochemical lab results and frequency of dialysis treatments were compared between

the treatment group receiving the culturally and linguistically competent nutrition counseling, and the control group receiving the standard nutrition information provided in emergency dialysis. The original plan was to compare all lab value results and frequency of dialysis using ANCOVA. However, statistical assumption tests for ANCOVA revealed the data were not normally distributed, thus requiring the application of nonparametric statistical test. Consequently, data analysis was completed with the nonparametric equivalent of ANCOVA, Quade's test. There is no statistically significant difference regarding dialysis frequency and serum levels of potassium between the intervention and control groups while controlling for age, gender, and time on dialysis. However, there are statistically significant differences in serum levels of phosphorus and levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis. Chapter 5 includes a summary of the results, interpretation of the findings, and limitations of the study. Chapter 5 also includes recommendations for future research, implications for positive social change, and conclusions.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

There is a large population of undocumented immigrants in the United States with ESRD. Individuals suffering from ESRD need either a kidney transplant or regular dialysis to survive. However, undocumented ESRD patients have no access to either of these treatments; they only have access to emergency dialysis in acute care health facilities when life-threatening conditions are present. To compensate for the lack of regular dialysis, it is imperative that undocumented ESRD patients follow strict renal dietary restrictions to maintain a good health status. Nevertheless, nutrition education and counseling by a dietitian are not part of the regular renal management of ESRD patients on emergency dialysis. The purpose of this quantitative quasi-experimental treatment-control study was to assess how the application of nutritional counseling that is both culturally and linguistically competent affects dialysis frequency and biochemical lab values such serum potassium, phosphorus, and vitamin D of patients on emergency dialysis. The study goal was to determine if this type of nutrition intervention has a positive impact on the health outcomes of emergency dialysis patients.

The study final total sample size for data analysis included 96 participants, 51 in the intervention group, and 45 in the control group. The study consisted of retrospective secondary data analysis of outcomes contained in electronic medical records. Data analysis uncovered that there is no statistically significant difference regarding dialysis frequency and serum levels of potassium between the intervention and control groups while controlling for age, gender, and time on dialysis. However, there is a statistically significant difference in serum levels of phosphorus and levels of Vitamin D between the intervention and control groups while controlling for age, gender, and time on dialysis. This chapter includes a synopsis of the study

with a review of the results, interpretation of the findings, and limitations of the study. Moreover, I also discuss in this chapter the implications for social change, recommendations for action and future research, and final conclusions.

Interpretation of the Findings

There was a statistically significant difference in serum levels of phosphorus and vitamin D between the intervention and control groups when controlling for age, gender, and time on dialysis. However, the difference in dialysis frequency and serum potassium levels between the intervention and the control group were not statistically significant. The significant results of this study were consistent with findings from research available supporting the positive impact of nutrition counseling by a dietitian on phosphorus and vitamin D levels among regular dialysis patients (e.g., Ash, Campbell, Bogard, & Millichamp, 2014; Fouque, Horne, Cozzolino & Kalantar-Zadeh, 2014; Karavetian, de Vries, Rizk, R & Elzein, 2014), as well as studies supporting the impact of cultural-linguistic competency on nutrition counseling (e.g., Araiza et al., 2012; Babamoto et al., 2009; Baquero et al., 2009; Baumhofer et al., 2014; Cowart et al., 2010; Gross et al., 2013; Kohinor et al., 2011). Nevertheless, there are no studies available where researchers have examined the effect of nutrition education and counseling interventions on serum potassium levels and frequency of dialysis among regular dialysis patients. Commonly, these variables are not a health concern among patients on regular dialysis; thus, there are no studies available with which to compare or contrast to the results of this study. Moreover, the present study is the first assessment of the impact of a nutrition education and counseling intervention on emergency dialysis patients. Previous studies where researchers have focused on emergency dialysis patients are few and have mainly concentrated on exploring the

characteristics of this population and their impact on public healthcare (e.g., Coritsidis et al., 2004; Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad, 2007).

In this study, culturally and linguistically competent nutrition counseling had a positive impact on phosphorus and vitamin D levels among emergency dialysis patients. According to the [NKF (2000), normal serum phosphorus levels range from 2.4 to 5.5 (mg/dL) and normal Vitamin D levels are above 30 ng/mL. The average serum phosphorus and vitamin D levels among the intervention group patients were significantly closer to normal levels than the levels of the control group. These results suggest that receiving nutrition counseling that is linguistically and culturally competent enhanced the patients' compliance with the renal diet resulting in improved lab values. Levels of phosphorus and vitamin D among dialysis patients are significantly influenced by compliance with renal diet restrictions, phosphate binders, and vitamin D supplements. Proper bone management among dialysis patients involves limiting dietary phosphorus intake to 800-1000 mg/day, taking phosphate binders with meals and vitamin D supplements when appropriate (Pasticci et al., 2012; Karavetian et al., 2014;Willingham, 2012). Therefore, regular dialysis patients consistently receive nutrition education and counseling interventions to improve adherence with renal diet recommendations (Pasticci, 2012).

The NKF and the KDIGO foundations recommend dialysis patients receive consistent diet educations and follow-up nutrition counseling (Karavetian et al., 2014). However, nutrition education and counseling are not a component of emergency dialysis care despite the need for strict dietary management to compensate for the lack of dialysis (Raghavan, 2012). In the present study, the emergency dialysis patients received nutrition education and counseling in their native language with educational materials and advice that reflected their cultural background (Anderson et al., 2003; Kreuter et al., 2003). The improvement of phosphorus and vitamin D

laboratory values in the intervention group suggests culturally competent interventions are effective to promote dietary compliance among emergency dialysis patients. The results of this study aligned with previous research indicating that in order to be effective nutrition education and counseling should take into consideration personal, cultural, and social characteristics of patients, such as language, traditions, economics, access to food, educational level, and family situation (Anderson et al., 2003; Beto et al., 2014; Karavetian et al, 2014; Kreuter et al., 2003Sussmann, 2001). Adherence to dietary recommendations is greater when cultural foods, traditions, and preferences are taken into consideration (Araiza et al., 2012; Cowart et al., 2010; Gross et al., 2013). Nutrition education and counseling interventions are more successful influencing dietary intake when variables such as culture and language are addressed (Araiza et al., 2012; Babamoto et al., 2009; Baquero et al., 2009). The literature supports that culturally and linguistically competent nutrition education interventions are effective at promoting dietary behavioral change because they are presented in the native language of the recipients and reflect their cultural background, socioeconomic status, and lifestyle (Anderson et al., 2003; Hollingdale et al., 2008; Kreuter et al., 2003; Lopez et al., 2007; Gross et al., 2013).

In this study, the registered dietitian tailored the content, method of teaching, and educational materials to the needs and characteristics of the patient population. The literature supports that medical nutrition therapy provided by a registered dietitian is effective in preventing and treating malnutrition and mineral and electrolyte disorders among renal patients (Karavetian et al., 2014; Kent et al., 2014). Registered dietitians provide dialysis patients with nutrition education and counseling that takes into consideration the medical, physical, educational, cultural, economic, and psychological characteristics of the patients (Clark, Farrington, & Chilcot, 2014; Gillis et al., 1995; Memmer, 2013; Vergili & Wolf, 2010). The

characteristics of the patient guide the dietitian's choices regarding what educational materials and strategies are most adequate (Ash et al., 2014; Fouque et al., 2014; Karavetian et al, 2014; Vergili & Wolf, 2010; Willingham, 2012). In this study, the dietitian first provided each patient in the intervention group with full education about all the components of the renal diet. Later, the dietitian provided patients with ongoing nutrition counseling based on their laboratory values, symptoms, and health status. Literature on nutrition interventions among dialysis patients suggests intense nutrition counseling interventions contribute to better compliance with diet recommendations than standard dietary education. (Ash et al., 2014; Fouque et al., 2014; Karavetian et al, 2014; Paes-Barreto et al., 2013; Karavetian et al, 2014). Dialysis patients need to follow complex renal dietary modifications (Kugler et al., 2011) that can be overwhelming to patients and their families resulting in poor dietary adherence and adverse health outcomes (Mok et al., 2011; Riella, 2013). Consequently, it is necessary to provide dialysis patients with continuous nutrition education and nutrition counseling (Ash et al., 2014; Beto at al., 2014; Fouque et al., 2014; Karavetian et al, 2014; Kugler et al., 2011). Nutrition education facilitates dialysis patients' understanding of how to manage their food intake to meet renal diet restrictions (Ash et al., 2014; Beto et al., 2014; Karavetian et al, 2014; Molfino et al., 2012). Moreover, nutrition counseling allows dialysis patients to develop the skills necessary to adopt behavioral changes related to long-term compliance with the renal diet regime (Ash et al., 2014; Beto et al., 2014; Karavetian et al, 2014; Molfino et al., 2012). The intervention group having phosphorus and vitamin D levels closer to normal range than the control group suggests that receiving the consistent nutrition counseling that took into consideration their linguistic and cultural characteristics help them improve their compliance with renal dietary restrictions.

The intervention in this study was based on social cognitive theory tenets and therefore concentrated on increasing the knowledge of the patients about the renal diet and also assisting them to develop the skills necessary to follow the diet. The social cognitive theory suggests that behavioral change is shaped by the individual's perceived ability to execute the behavior (self-efficacy), the expectations that completing the behavior will result in beneficial outcomes (outcome expectations), and the belief that a specific behavior can be modified or controlled (perceived control; Bandura, 1977). Nutrition interventions focusing on improving a patient's self-efficacy levels and self-management capacities are successful at promoting dietary compliance among dialysis patients (Clark et al., 2014; Oh et al., 2013). It is necessary to implement interventions that motivate patients to make a behavioral change and teach them how to make those changes (Ash et al., 2014; Gillis et al., 1995; Karavetian et al, 2014). The dietitian in this study promoted dietary compliance by enhancing self-efficacy, outcome expectations, and perceived control. The dietitian enhanced these constructs by providing patients and their families with consistent nutrition education and counseling in their native language while taking into consideration their cultural background to tailor the information and advice provided. This approach allowed the patients to better understand their diet and also feel confident about their ability to follow the diet, as well as better understanding the benefit of compliance. Previous researchers suggest nutrition interventions based on social cognitive theory improve compliance with renal diet recommendations among patients on regular dialysis through enhancement of self-efficacy with dietary management, support from family, and self-repressive behavior patterns (Sutton et al., 2008; Thong et al., 2007; Zrinyi et al., 2003). The results of this study support those findings among emergency dialysis patients. The improvement of phosphorus and vitamin D levels among the intervention group patients in this study suggests that this type of

intervention improved their compliance with renal diet recommendations resulting in improved lab values.

In the current study, the numbers of dialysis treatments per month and serum potassium levels were lower in the intervention group than the control group. However, the difference was not large enough to be statistically significant. There are no previous studies examining the effect of nutrition education or counseling on dialysis frequency or serum potassium levels among dialysis patients. Patients on regular dialysis receive treatments three times per week, as recommended by the NKF-KDOQI (2000) guidelines, and high serum potassium levels are seldom an issue among regular dialysis patients. These two variables are of more relevance among emergency dialysis patients. However, there are no studies available about nutrition education and counseling interventions among emergency dialysis patients with which to compare results. The emergency dialysis patients in this study had an average of one dialysis treatment per week. Further reducing the frequency of their dialysis treatment may be detrimental to their health (Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad, 2007). Generally, serum potassium levels are significantly high among emergency dialysis patients. This is a concerning issue because high serum potassium levels may result in sudden death related to cardiac arrhythmias (Raghavan & Sheikh-Hamad, 2011; Sheikh-Hamad, 2007). Consequently, any reduction in serum potassium levels among emergency dialysis patients is beneficial.

Limitations of the Study

This secondary data analysis relied on the accuracy of data collected from electronic medical records; therefore any data inaccuracy in the medical records could have impacted and altered study outcomes. Furthermore, this study used a convenience sample including undocumented emergency dialysis patients who received renal care at Harris Health System for a

minimum of 12 consecutive months. The patients with less than 12 consecutive months of dialysis were excluded, as well as the patients receiving dialysis in both hospitals, and the patients with missing laboratory values. These issues were barriers to getting a larger sample size for the study. The sample size requirement for the study was met but a larger samples size could uncover stronger results.

In addition, randomization of study participants into the control and the intervention group could not take place because of the ongoing nature of the nutrition intervention. I examined secondary data from a hospital with an already ongoing nutrition education component as part of the management of emergency dialysis patients, and compared it to the data from an equivalent hospital providing emergency dialysis management without a nutrition education component. Moreover, because of the secondary data analysis nature of the study I was limited to examining only variables that were available in the medical records. For instance, I could not assess the effect of nutrition education on volume status of emergency dialysis patients because weights were not regularly collected among emergency dialysis patients. Finally, in order to avoid interfering with the process of emergency dialysis provision there was not direct collection of survey data to assess the effect of the nutrition intervention on knowledge and aptitudes of the patients towards the renal diet and quality of life.

Recommendations for Future Research

Nutrition management is an essential component of the health care of renal patients on regular dialysis. Consequently, nutrition education and counseling interventions to promote nutrition management through compliance with renal dietary guidelines among patients on regular dialysis is essential (Beto, Ramirez & Bansal, 2014; Kugler et al., 2011, Molfino et al., 2012, Paes-Barreto et al., 2013). Patients on emergency dialysis receive less frequent treatments

resulting on health complications, risks and symptoms that require stricter dietary restrictions. However, there was no previous research assessing the effect of nutrition education and counseling interventions among emergency dialysis patients. In this study, the application of nutrition counseling that was both culturally and linguistically competent as a component of the renal management of emergency dialysis patients resulted in significant improvement of phosphorus and vitamin D levels, key elements of bone management and cardiovascular health of dialysis patients. These results suggest that the application of nutrition interventions among emergency dialysis patients can result in significant improvement of health status. Therefore, inclusion of nutrition counseling as a component of the care of emergency dialysis patients deserves consideration and further academic inquiry. With this in mind, future research studies on this topic should be prospective in nature and include pre and post nutrition intervention data. This design would allow researchers to better assesses the impact of the nutrition counseling on the health status of emergency dialysis patients by comparing relevant variable values pre intervention with values post intervention (Khaddar et al., 2009; John et al., 2013; Oka & Chaboyer, 2001**,** Su et al., 2009; Tsay, 2003; Welch et al., 2013; Zrinyi et al, 2003**)**. Moreover, future studies on this topic should include survey data assessing the effect of the nutrition intervention on knowledge and aptitudes towards the renal diet and quality of life of the patients. Finally, future studies on this topic should include a larger sample size and collect data over a longer period of time in order to determine if the effects of the intervention increase, plateau, or decrease with time.

Recommendations for Professional Practice

There are health care stakeholders who would be interested in the results of this study and could take action based on them. Emergency dialysis patients' infrequent treatments result in

higher morbidity, mortality, and health care cost compared to patients receiving regular dialysis (Coritsidis et al., 2004; Raghavan & Sheikh-Hamad, 2011; Raghavan, 2012; Sheikh-Hamad, 2007). There is no federal medical assistance available for undocumented residents suffering from ESRD that would give them access to regular dialysis. Consequently, the burden for their care comes directly upon public health facilities. As a result, it is imperative that these facilities implement interventions to improve the health status of this population thus enhancing their quality of life while reducing their impact on the operations and cost of public healthcare. At short term, it may appear more affordable and convenient for hospitals to limit their care of emergency dialysis patients to strictly providing the dialysis treatment. However, by investing on providing this population with more holistic interventions such as nutrition education and counseling they could significantly improve the health status of these patients that in return would need less medical services at long term. Renal dietitians, nurses and nephrologists tending to emergency dialysis patients can use the information from this study to propose to hospital stakeholders' new nutrition and health interventions directed to emergency dialysis patients.

Implications for Social Change

Following renal dietary restrictions is an important component of the health management of emergency dialysis patients in order to compensate for infrequent dialysis treatment. There was no literature available regarding nutrition interventions among ESRD patients on emergency dialysis. The results from this study suggest that providing nutrition counseling that is both culturally and linguistically competent can improve some laboratory values and consequently the health status of these patients. The findings of this study can assist health care professionals such as dietitians, renal nurses and nephrologists tending emergency dialysis patients to decide if

introducing a culturally and linguistically competent nutrition counseling component as part of the emergency dialysis protocol is beneficial.

In addition, the results of this study may provide the framework for the development and application of future interventions focusing on addressing the needs of patients receiving emergency dialysis as well as encourage new research examining different health issues and nutritional needs of undocumented ESRD patients. This study may promote positive social change by contributing to the provision of better health care to ESRD patients on emergency dialysis. Better health care among this population would result on improved health status and quality of life for the patients and lower cost and more efficient operations for public health care facilities. Incorporating nutrition counseling as component of emergency dialysis care has the potential to improve the health status and quality of life of patients as well as reducing cost to public health care facilities by preventing medical complications related to poor compliance with renal diet recommendations. It is our responsibility as scholars and clinicians to constantly search for and develop new ways to provide people under our care with the best treatments available to ensure they can have best quality of life possible.

Conclusion

Nutrition therapy is an essential component of the health management of ESRD patients receiving regular dialysis. Consequently, regular dialysis patients consistently receive nutrition education and counseling interventions to enhance their compliance with renal diet restrictions. Some of the most effective nutrition education strategies include tailoring and cultural-linguistic competence. These approaches take into consideration the characteristics and needs of the target audience while developing and implementing the nutrition education and counseling intervention. The number of ESRD patients receiving emergency dialysis in the United States is

steadily increasing. This mode of infrequent renal replacement treatment results in negative health consequences secondary to excess fluid and waste in their blood. Strict renal nutrition management assists emergency dialysis patients compensating for insufficient dialysis to prevent medical complications and manage symptoms. Therefore, it is imperative to identify effective nutrition interventions to promote better renal diet compliance in this population.

The findings of this study suggest that the implementation of nutrition counseling that is both culturally and linguistically competent improves phosphorous and vitamin D levels among emergency dialysis patients. Phosphorus and vitamin D levels are important indicators of bone and cardiovascular health among dialysis patients. Thus the implementation of nutrition interventions in this population can improve compliance with dietary recommendations resulting in better health status. The hope is that this study will promote further research exploring ways to improve the health care provided to emergency dialysis patients.

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Appendix A: Protocol for Nutrition Education and Counseling of Emergency Dialysis Patients

A. Renal Nutrition education Process:

The Renal Dietitian may provide full renal nutrition education for emergency dialysis patients when:

- They are first initiated on emergency dialysis treatment.
- They have been initiated on emergency dialysis at other hospital, but are new to Ben Taub renal service care.
- Their health status indicates poor compliance with renal diet guidelines.
- When patients or family request further education or review the renal diet.

Prior to the renal diet education the renal dietitian will:

- Gather information from medical chart or the renal team regarding:
    - Medical history, diet history, anthropometrics, physical examination and chemistries.
- Develop individualized diet prescription/meal pattern for the patient

During the nutrition education the renal dietitian:

1. Introduces herself and explains her connection to the renal team and role on the patient's care
2. Informs patient and/or family that will be explaining the renal diet
3. Gather information regarding:

- Prior knowledge of the patient/family regarding kidney disease, dialysis and the renal diet.
- Patient's language, literacy status, educational level, cultural background, socioeconomic status, family/friends support.
- Use open-ended questions without leading responses.
- Acknowledge patient/family responses.

4. Applies the information gathered to tailor the nutrition education to the needs and characteristics of the patient.

5. Utilizes nutrition education materials that are linguistic and culturally competent to support the educational sections. Provides the materials to patient for future reference.

- The educational materials are in Spanish
- Incorporate food items that are traditional to the Hispanic culture
- Include pictures to ensure easy understanding.

6. The full renal nutrition education sessions takes about 60 minutes

7. The content of the nutrition education includes:

- Contact information of renal dietitian
- Purpose and benefits of the renal diet for dialysis patients.
- Main components of the renal diet: fluid, sodium, potassium, protein and phosphorous.
- For each diet component the patient receives explanation regarding:
    - What are the restrictions or guidelines
    - Why they should be followed

- How to practically comply with the diet recommendations

8. Renal dietitian will follow up with further nutrition counseling and reevaluation during future emergency dialysis treatments.

B. Renal Nutrition Counseling

After initial comprehensive renal nutrition education the renal dietitian will provide the patients and/or family members with consistent nutrition counseling during emergency dialysis treatments.

Prior to the renal diet counseling the renal dietitian will:

- Gather information from medical chart or the renal team regarding:
  - Recent physical examination in emergency room, point of care and monthly chemistries (potassium, phosphorus, vitamin D, intact PTH), and medications.

During the nutrition counseling the renal dietitian:

- Salutes the patient/family member
- Informs patient and/or family that will be providing further nutrition counseling
- Assessment. Gather information regarding:
  - Recent dietary intake (24 hour food recall) or food frequency patterns.
  - Overall health status (symptoms/complains).
  - Medication compliance
  - Use open-ended questions without leading responses.
  - Acknowledge patient/family responses.
- Applies the information gathered to tailor the nutrition counseling session the current needs of the patient. Counseling will:

    - Address issues regarding intake of potassium, sodium, phosphorus, protein, fluid and medications based on the results of the assessment.
    - Provide advice about dietary restrictions, food preparation, eating out, recipes, food portions etc.
- Utilizes nutrition education materials that are linguistic and culturally competent to support the nutrition counseling sections.
- Provides extra materials to patient for future reference.
- Nutrition counseling takes about 15 to 20 minutes each time
- Evaluates patients/family member undertaking of the information with practical questions.
- Ask patient/family member if they have further questions or concerns.