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Implementing the 4Ds (Diet, Drinks, Drugs, and Dialysis) to Lower Hyperphosphatemia Among Outpatient Hemodialysis Patients

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Implementing the 4Ds (Diet, Drinks, Drugs, and Dialysis) to Lower Hyperphosphatemia Among Outpatient Hemodialysis Patients

A DNP Project Submitted to the
Graduate Faculty
of Jacksonville State University
in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Nursing Practice

By

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Abstract

Background: Hyperphosphatemia, also known as excess phosphate in the blood, is a problem that continually causes health issues for the outpatient hemodialysis population. Hyperphosphatemia yields multiple health comorbidities and can increase mortality (Rastogi et al., 2021).

Purpose: Hyperphosphatemia is directly correlated with end-stage renal disease (ESRD) (Goyal & Jialal, 2020). This project aimed to decrease the incidence of hyperphosphatemia in the chronic outpatient hemodialysis setting. The primary objective of this project was to increase adherence levels to diet, drinks, drugs, and dialysis (4Ds) in those receiving chronic outpatient hemodialysis in the pursuance of achieving and maintaining blood serum phosphorus levels between 3.0 and 5.5 mg/dL as recommended by the Centers for Medicare and Medicaid Services. Participation in a standardized motivational education program will aid in lowering phosphorus levels in those on hemodialysis, therefore reducing morbidity and mortality. As a result, this project implements and evaluates how delivering effective teaching will lower the occurrence of hyperphosphatemia in the ESRD population.

Methods: This was an eight-week quality improvement project. A total of ten participants were followed. Pre-intervention and post-intervention questionnaires were administered. During this project, blood serum phosphorus levels were taken at three different time points: before, during (interim), and after the 4Ds patient teaching intervention. The final factor considered for this study was if the 4Ds patient teaching intervention had any impact on dialysis treatment compliance rates.

Results: There was a statistically significant difference ($W = 51.0$, $p = 0.019$) between pre-assessment and post-assessment performance with the average pre-assessment score of 66 out of

100 (standard deviation 19.1) and the average post-assessment score of 78 (standard deviation 13.2). The average phosphorus level before the intervention was 7.3 mg/dL (standard deviation 1.5) with a mid-intervention level of 6.2 mg/dL (standard deviation 2.2), and a post-intervention mean phosphorus level of 6.9 mg/dL (standard deviation of 2.4), no statistical difference was noted ($H = 1.47$, $p = 0.479$). The intervention had no impact on dialysis treatment compliance rates.

Conclusion: The main significant finding of this project was the increase in patient knowledge about phosphorus. Results of the project showed sufficient evidence that the median post-questionnaire score was significantly higher compared to the median pre-intervention score. While this project adds to the existing data supporting the utilization of regularized patient education to increase awareness of phosphate control in the ESRD population, further research is warranted to determine if this intervention can decrease the incidence of hyperphosphatemia for these patients on a long-term basis. Future studies could aid in determining the significance of this project's findings as well as help to ascertain if the limitations of this project are substantial enough to alter patient outcomes.

Keywords: hyperphosphatemia, end-stage renal disease, patient education, 4Ds

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Implementing the 4Ds (Diet, Drinks, Drugs, and Dialysis) to Lower Hyperphosphatemia Among Outpatient Hemodialysis Patients

Hyperphosphatemia is defined as excess phosphate in the blood and is a common and chronic condition found in patients receiving hemodialysis for end-stage renal disease (ESRD) (Goyal & Jialal, 2020). According to Rastogi et al. (2021), by the time a patient begins hemodialysis, statistics reflect many of them will already have hyperphosphatemia. Chronic hyperphosphatemia leads to multiple health comorbidities and increases patient mortality (Rastogi et al., 2021). One study by Karavetian and Rizk (2018) argued that rather than finding new treatments for hyperphosphatemia, delivering existing therapies, which include diet, drinks drugs, and dialysis, in a more effective manner is the best approach for combatting this troublesome issue.

There is limited data available describing the best approaches to controlling blood serum phosphate levels in patients with ESRD; however, Waheed, et al. (2013), describe the importance of diet as a primary source of phosphorus contributing to hyperphosphatemia in patients with ESRD. Given the role of phosphate intake in blood serum levels, an intervention focusing on compliance with a restricted-phosphorus diet regimen may prove effective (Waheed et al., 2013). This Doctor of Nursing Practice (DNP) project evaluated the effects of informative teaching on how it relates to lowering elevated blood serum phosphorus levels, in end-stage renal disease patients. More specifically, how does this intervention impact those with ESRD currently receiving hemodialysis in the chronic outpatient setting?

Background

Chronic kidney disease (CKD) is a prevalent condition in which the kidneys are damaged, resulting in a decrease in the filtration of the blood through the glomerulus (Centers for

Disease Control and Prevention (CDC, 2021). This allows excess fluid and waste from the blood to remain in the body, thus leading to, sometimes extensive, vascular, cardiac, neurological, and integumentary problems. It is estimated that around 37 million people, or 15% of adults in the United States (U.S.), have CKD. Of these, approximately 558,000 have progressed to ESRD and are treated through regular dialysis which can lead to multiple comorbidities, including hyperphosphatemia (Centers for Disease Control, 2021).

Why Hyperphosphatemia Occurs in People with ESRD

According to Goyal and Jialal (2020), phosphorus is in most of the foods and drinks consumed by individuals in the United States on a daily basis. Phosphorus is absorbed into the bloodstream through the upper small intestine during the digestion process. Once absorbed, excess phosphorus is excreted from the body in urine produced by the kidneys. Those without reduced renal function do not excrete the excess phosphorus from the body, which can result in phosphorus accumulation in the blood leading to hyperphosphatemia. (Goyal & Jialal, 2020).

Why People on Hemodialysis have Hyperphosphatemia

The normal adult consumes approximately 1,000 milligrams of phosphorus per day, while hemodialysis removes approximately 900 milligrams of phosphorus with each treatment (Goyal & Jialal, 2020). Each patient on hemodialysis typically receives three hemodialysis treatments per week. Thus, on average, each patient on hemodialysis will consume approximately 7,000 milligrams of phosphorus weekly with only 2,700 milligrams removed via hemodialysis over that same time frame (Goyal & Jialal, 2020).

Health Risks Associated with Hyperphosphatemia

When hyperphosphatemia is left untreated it leads to the subsequent development of multiple health comorbidities and even increases mortality (Rastogi et al., 2021). Uncontrolled

longstanding hyperphosphatemia results in deposits of calcium-phosphate complexes throughout the body resulting in vascular calcification and arteriosclerosis (Goyal & Jialal, 2020). Lack of vasculature flexibility can lead to systolic hypertension, widened pulse pressure, and left ventricular hypertrophy (Goyal & Jialal, 2020). Other problems associated with uncontrolled hyperphosphatemia include severe pruritis, poor bone health, and painful debilitating skin ulcers known as calciphylaxis (Goyal & Jialal, 2020).

Ways to Control Phosphorus

Three approaches exist to control serum phosphorus levels in patients with ESRD on hemodialysis. First, patients must lower phosphorus in the diet by avoiding or limiting foods higher in phosphorus. Foods lower in phosphorus include fresh fruits, fresh vegetables, rice, fish, chicken, and light-colored sodas (Elkins, 2015). Foods higher in phosphorus include dairy products, beans, nuts, processed meats, fast food, and dark-colored sodas (Elkins, 2015). Another way to control phosphorus is through pharmacological intervention. Oral phosphate-binding medications are used to lower phosphorus levels. Examples of these medications include Tums, Fosrenol, Renvela, PhosLo, and Auryxia (Gilbert & Weiner, 2017). Phosphate binders work by adhering to phosphorus in the gut during the digestion process. Once bound by the medication, phosphorus is not absorbed and, instead, excreted from the body via stool. To be effective, these medications must be taken while the patient is eating. The last way to control phosphorus is through hemodialysis (Goyal & Jialal, 2020).

Needs Analysis

More than 100,000 individuals in the U.S. begin hemodialysis annually (Centers for Medicare and Medicaid Services, 2020). Currently, 114 billion dollars per year, or 20% of the Medicare budget, is spent on patients with some degree of kidney disease (Centers for Medicare

and Medicaid Services, 2020). Between 50% and 74% of all patients on hemodialysis in the U.S. have hyperphosphatemia (Goyal & Jialal, 2020). According to Rastogi et al. (2021), by the time a patient begins hemodialysis, they are highly likely to already have hyperphosphatemia, and the trend continues thereafter. Controlling a patient's phosphorus level can be challenging to providers, given that so much of the problem is dependent upon patient adherence. (Goyal & Jialal, 2020).

Uncontrolled hyperphosphatemia leads to greater hospitalization rates due to its effects on the cardiovascular system (Fishbane & Nigwekar, 2021). Longstanding hyperphosphatemia carries with it many negative adverse consequences which can affect a patient's integumentary system, cardiac system, central nervous system, and visual system (Goyal & Jialal, 2020). Those with hyperphosphatemia also carry up to eight times a greater mortality risk than patients with phosphorus levels within the normal limits (Fishbane & Nigwekar, 2021). Other problems associated with uncontrolled hyperphosphatemia include severe pruritis, poor bone health, and painful debilitating skin ulcers known as calciphylaxis (Goyal & Jialal, 2020).

In 1972, President Nixon signed a Social Security amendment that extended Medicare coverage to those with chronic kidney failure (National Academy of Sciences, 1991). As a result, patients with ESRD are automatically eligible for Medicare benefits, reducing the burden of insurance coverage for the patient. This is beneficial to the patient but not beneficial to the Medicare budget. According to the United States Renal Data System's annual report, hemodialysis care cost Medicare $93,191 in 2020 for each patient (United States Renal Data System (USRDS), 2021). This adds up to over $50.0B annually, or 7 2% of Medicare's entire budget (USRDS, 2021). Under the Affordable Care Act enacted in March 2010, patients on hemodialysis are included in a "bundle" plan which covers some of the specialized medications

required. These expenses, compiled with the cost of treating the comorbidities associated with longstanding uncontrolled hyperphosphatemia, make the financial burden even for significant (White et al., 2006). For this reason, Medicare has put in place the ESRD Quality Incentive Program (QIP) in which part of these standards are based on blood serum phosphorus levels (Centers for Medicare and Medicaid Services 2014). In this program, each outpatient facility that provides care for patients with ESRD is scored on the quality of the care it provides (CMS, 2014). Thus, facilities that do not provide the level of care that meets Medicare's standards are paid less for services rendered (CMS, 2014).

Maintaining bone and mineral homeostasis is a crucial aspect of providing care since a normal phosphorus level improves a patient's quality of life and longevity (Fishbane & Nigwekar, 2021). Although this troublesome issue is well documented in the literature and understood by providers (Gilbert & Weiner, 2017), maintaining normal phosphorus levels continues to be a problem. For example, at the outpatient hemodialysis facility where this project was conducted, over 50% of the patient census had a diagnosis of hyperphosphatemia. The current practice at this facility for helping to control phosphorus is randomized teaching. It is for these reasons that this topic and intervention were chosen for this project.

Problem Statement

Hyperphosphatemia is directly correlated with ESRD which leads to further patient complications (Goyal & Jialal, 2020). As a result, this project implements and evaluates how delivering effective teaching will lower the occurrence of hyperphosphatemia in the ESRD population in the pursuance of increasing compliance with recommended and prescribed treatment regimens.

Aims and Objectives

The goal of this project was to reduce the incidence of hyperphosphatemia in this population. In the pursuance of achieving this outcome, this project implemented evidence-based practice with the aspiration of mirroring the results of a previous study completed by Milazi et al. in 2020. Milazi et al. (2020), determined that instituting patient teaching, consisting of the 4Ds curriculum (diet, drinks, drugs, and dialysis), lowers serum phosphorus levels in those suffering from hyperphosphatemia. Controlling phosphorus is crucial for ESRD patients, as those with uncontrolled hyperphosphatemia have a mortality risk between eight and twenty times greater than those with a phosphorus level within normal limits (Fishbane & Nigwekar, 2021).

Over eight weeks, using a step-by-step approach, this project was implemented with the objective of increasing adherence levels to diet, drinks, drugs, and dialysis (4Ds) in the chronic outpatient hemodialysis population in the pursuance of achieving and maintaining blood serum phosphorus levels between 3.0 and 5.5 mg/dL.

1. Increase adherence levels to diet, drinks, drugs, and dialysis in ESRD patients.
    a. Broaden patient knowledge of phosphate in end-stage renal disease.
    b. Support patient self-efficacy for managing phosphate levels.
    c. Increase patient adherence to prescribed treatment regimens (Diet, Drinks, Drugs, and Dialysis).
2. Achieve and maintain a serum phosphorus level between 3.0 and 5.5 mg/dL in chronic outpatient hemodialysis patients.

Review of Literature

A literature review was conducted with the following primary considerations: 1) Best practice for controlling phosphorus in patients with ESRD; 2) Hyperphosphatemia in those currently receiving hemodialysis.

The databases utilized were CINAHL, PubMed, and PsycINFO using master headings and mesh headings. The following key terms were used in CINAHL: hyperphosphatemia, end-stage renal disease, and hemodialysis. A total of 317 potential sources were found. Results were narrowed using peer-reviewed, academic journals, and within the last five years, reducing the potential sources to 18 total findings. Additional articles were eliminated due to content irrelevance, if they were not available in English, or if the interventions did not occur within an outpatient setting resulting in 13 articles. The key terms were applied in PubMed which resulted in 1,766 findings. The same inclusion and exclusion criteria were applied to these articles. References of the selected papers were also searched and evaluated for application to the study question. Results were narrowed using a limit of five years which resulted in a total of 39 findings. The key terms were applied in PsycINFO which resulted in 1,795 findings. The inclusion and exclusion criteria were applied to these articles. References of the selected papers were also searched and evaluated for application to the study question. Results were narrowed using a limit of five years which resulted in a total of 53 findings. Many of the key findings from the literature review included systematic reviews, randomized clinical trials, and quantitative studies. Some of the significant key findings used to shape the methodology of this project are identified below.

Umeukeje et al. (2018) performed a systematic review to determine factors relevant for adherence to phosphate-control strategies in dialysis patients and to explore interventions to

overcome related challenges. The review concluded that compliance with phosphate binders, a low-phosphorus diet, and dialysis prescription is suboptimal at best (Umeukeje et al., 2018). It furthermore concluded that a multicomponent approach simultaneously addressing therapy-related attributes, such as side effects, patient factors targeting self-motivation, and provider components to improve attitudes and delivery of culturally sensitive care, may present the most promise for long-term control of phosphorus levels (Umeukeje et al., 2018). Moreover, the review stressed the importance of identifying those patients at the highest risk for lack of phosphorus control (Umeukeje et al., 2018). These factors include younger age, elderly, non-Caucasian race, poor social-economic status, and unmarried (Umeukeje et al., 2018). In addition, programs should be ready to deliver flexible person-centered plans through training and steadfast resources to correlate with the needs of all patients (Umeukeje et al., 2018).

Milazi et al. (2017) performed a systematic review evaluating the effects of educational and behavioral interventions on achieving phosphate control in adults on hemodialysis. A total of eighteen studies were included in the review which found that both educational and behavioral interventions do increase adherence to phosphate control in this population (Milazi et al., 2017).

Chan et al. (2019) performed a quantitative study to investigate the efficacy of a multidisciplinary education approach to achieving optimal phosphate control among patients on hemodialysis in Malaysia. The authors used a single-arm community trial with a duration of 6 months (Chan et al., 2019). Fifty-seven subjects participated in a small group seminar and individual counseling sessions emphasizing diet and medication adherence (Chan et al., 2019). The educational topics presented in the seminars included basic knowledge about hyperphosphatemia, phosphate binders, and dietary phosphate control (Chan et al., 2019). After completion, the percentage of participants with uncontrolled serum phosphorus levels decreased

from 59.3% to 35.6%, knowledge of hyperphosphatemia increased drastically, and adherence to phosphate binders improved from 17.2% to 41.4% (Chan et al., 2019). The authors concluded that a multidisciplinary patient education program is a viable strategy to manage hyperphosphatemia among patients with hemodialysis (Chan et al., 2019).

Milazi et al. (2020) performed a randomized, controlled trial to evaluate the effectiveness of a bundled self-management intervention (taking control of your phosphate with the 4Ds) on phosphate control among adults receiving hemodialysis who had experienced uncontrolled hyperphosphatemia for at least the past three months (Milazi et al., 2020). The "teach-back" method was utilized to increase participant knowledge of the relationship between phosphate and ESRD in the control group, resulting in 46% of the intervention group achieving reductions that met the target serum phosphate level compared to 33% in the control group (Milazi et al., 2020). The authors concluded that a 4Ds teaching curriculum is an effective tool for improving patient assurance and adherence to phosphate control methods (Milazi et al., 2020).

Chiang et al. (2020) performed a quasi-experimental study to determine if an individualized dietary phosphorus control program delivered by a smartphone application would be effective in achieving phosphorus control in patients on hemodialysis in Taiwan. Sixty participants were included with 30 using the program and the remainder participating in traditional education. The experiment concluded that knowledge of diet phosphate control, self-care efficacy in managing phosphorus, and serum phosphorus control were all improved with the individualized program (Chiang et al., 2020).

Isa et al. (2020) performed a cross-sectional study in Malaysia to determine the barriers between outpatient hemodialysis patients and phosphate compliance. Using a printed questionnaire, the study asked participants questions related to their knowledge of optimal

control of serum phosphate, perceived social support with phosphate compliance (family and professional), and average dietary phosphorus intake. (Isa et al., 2020). A total of seventy-six participants were enrolled in the project. Approximately 60% of the patients enrolled were currently failing to achieve the target serum phosphorus level at the time of the study, which confirmed that hyperphosphatemia is prevalent among hemodialysis patients (Isa et al., 2020). It also noted that half of the participants had a low level of knowledge regarding optimal control of serum phosphate (Isa et al., 2020). The study recommended that healthcare professionals engage in regular nutritional screening and counseling among those patients not meeting phosphate adequacy in pursuance of achieving better outcomes (Isa et al., 2020). The study also recommended developing new and innovative approaches with the aspiration of encouraging self-adherence to serum phosphate control for those receiving chronic hemodialysis (Isa et al., 2020).

Brauer et al. (2019) instituted a study using phosphate education and planning (PEP) talks to determine the effect on the incidence of hyperphosphatemia in patients receiving hemodialysis. All forty-six participants received four PEP talks discussing long-term management of serum phosphate levels resulting in a mean decrease in serum phosphate by 0.31 mg/dL. Self-identified participant barriers to achieving phosphate control included a lack of customization of phosphate binder prescriptions and an insufficient resource for suitable dietary changes. The study furthermore concluded that the PEP talks were an effective intervention to aid in managing persistent hyperphosphatemia in those receiving chronic hemodialysis (Brauer et al., 2018).

Tsai et al. (2016) conducted a study to determine if staff-led diet education which included input from a dietician improved patient phosphorus levels in patients on hemodialysis.

The study was conducted over eight months and had sixty-one participants. The control group received routine dietetic education from nurses and physicians, while the intervention group received the same routine dietetic education as well as added reinforcement education from dieticians. Both groups experienced decreases in blood serum phosphorus levels, with the greatest decrease found in the group receiving teaching that included a dietician. Authors concluded that renal diet education guided either by dietitians plus dialysis staff or dialysis staff alone reduces serum phosphorus levels, with the multidisciplinary approach providing slightly better outcomes (Tsai et al., 2016).

Lim et al. (2018) performed a randomized, controlled trial to study the effects of education on a low-phosphorus dietary adherence and phosphorus binder adherence to control serum phosphorus among those receiving regularized hemodialysis treatments. The study enrolled maintenance hemodialysis patients and then randomized them into an education group, consisting of forty-eight participants, and a control group consisting of twenty-two participants (Lim et al., 2018). After completion, 75% of the intervention group achieved the primary goal compared to 72.7% of the control group (Lim et al., 2018). The study did show limited success in compliance with dietary phosphorus restriction and phosphate binder adherence but ultimately concluded that education did not affect blood serum phosphorus control in those receiving regular maintenance hemodialysis (Lim et al., 2018).

Karavetian and Rizk (2018), state that rather than finding new treatments for hyperphosphatemia, the most effective intervention is to deliver existing therapies more effectively. This writing specifically argues against the previous study performed by Lim et al. (2018) by acknowledging the limitations of the work (Karavetian & Rizk, 2018). Karavetian and Rizk (2018), suggest that both patient-tailored counseling and adequate time with a clinician

improve serum phosphate control when consistently reinforced. Stating that patient education programs can provide valuable opportunities for containing costs in terms of adequate phosphorus control (Karavetian & Rizk, 2018).

Theoretical Model

In 1951, Kurt Lewin developed "Lewin's Theory of Planned Change". This ground-breaking theory is composed of three core components (steps): *Unfreezing, Changing,* and *Refreezing* (Lewin, 1951). *Unfreezing* occurs before the change is implemented and focuses on creating problem awareness (Lewin, 1951, as cited in Wojciechowski et al., 2016). *Changing* occurs when the change is in place, and *Refreezing* occurs after the change (Lewin, 1951). This stage focuses on ensuring that the change will become permanent (Lewin, 1951, as cited in Wojciechowski et al., 2016).

Lewin's Theory of Planned Change was the model chosen for this project based on its alignment with the project objective, which is change. Another reason that this model was chosen was because of its simplistic nature. This project can be broken down into the three basic components of change presented in Lewin's theory. During the *Unfreezing* stage, participants will be made aware of the problem of hyperphosphatemia through education. In the *Changing* stage, coaching and training will occur on how correct the hyperphosphatemia. During this stage, participants will seek alternatives to their current behaviors and implement them throughout their daily processes. And lastly, in the *Refreezing* stage, the newly integrated changes will become a permanent habit. During this stage, reiteration may occur as well as the celebration of success.

Methodology

This was an eight-week quality improvement project aimed at decreasing the incidence of hyperphosphatemia in the chronic outpatient hemodialysis setting. The project used a quantitative quasi-experimental design method with purposive sampling for data collection. The rationale for choosing this design method was to reach as many willing participants as possible in the project's setting. The primary objective of this project was to increase adherence levels to diet, drinks, drugs, and dialysis (4Ds) in those receiving chronic outpatient hemodialysis in the pursuance of achieving and maintaining blood serum phosphorus levels between 3.0 and 5.5 mg/dL as recommended by the Centers for Medicare and Medicaid Services. Upon initiation of this project, all participants had a blood serum phosphorus level greater than 5.5 mg/dL. Thus, 100% of the participants had a diagnosis of hyperphosphatemia. This information was based on each of the participant's latest lab draw results which were a part of routine care provided by the clinic and occurred one week before project initiation.

Setting

The project was conducted at a chronic outpatient hemodialysis unit in an urban area in Central Alabama. Staff at the unit included one physician, one nurse practitioner, one clinic manager, one dietician, one social worker, one facility assistant, one biomedical technician, two registered nurses, and six certified clinical hemodialysis technicians. Patients at the clinic are seen once monthly by the physician, three times a month by the nurse practitioner, and weekly by the dietitian and social worker; every treatment is performed by a registered nurse and certified clinical hemodialysis technician.

Population

The target population for this project consisted of patients with blood serum phosphate levels greater than 5.5 mg/dl between the ages of 20- and 80 years receiving outpatient hemodialysis at the outpatient hemodialysis center. The unit had 24 chairs, dialyzes three separate shifts of patients per day, and runs three days per week. The first shift was composed of 24 patients, the second shift was also composed of 24 patients, and the third shift had two patients. This made a total of 50 possible candidates for the project.

Inclusion/Exclusion Criteria for Participants

The following were the inclusion and exclusion criteria for participants in this project:

Inclusion Criteria: Patients eligible for inclusion in this study had the following characteristics.

- 20 to 80 years of age
- Receiving chronic outpatient hemodialysis at the time of the study
- Measured serum phosphorus level greater than 5.5 mg/dL
- Fluent in English

Exclusion Criteria:

- Residency within a long-term care facility (e.g., nursing home).
- Current diagnosis of delirium or dementia (e.g., Alzheimer's, dementia, delirium).

Recruitment

Based on the project's inclusion and exclusion criteria, a list of potential candidates was presented to the principal investigator (PI) by the unit dietician. Recruitment was done on a face-to-face basis by the principal investigator (PI). After determining which candidates were eligible for the project, the PI approached each potential participant while he or she was

receiving his or her hemodialysis treatment. The PI verbally explained the project and its purpose to each potential candidate by reading and referring to the information in the project consent form (Appendix A). Each potential candidate was offered a project consent form for reading at his or her discretion, then allowed as much time as needed to decide. It was emphasized that there was no pressure in deciding whether to or whether to not participate in this study.

Consent

Written consent was obtained from all study participants before project intervention (Appendix A). It was iterated to all potential participants that the goal of this project was to lower the incidence of hyperphosphatemia in the chronic outpatient hemodialysis setting. Participants were notified that participation was strictly voluntary and that they could withdraw from the study at any point without penalty.

Design

This project was implemented to increase adherence levels to diet, drinks, drugs, and dialysis (4Ds) in the chronic outpatient hemodialysis population. This quality improvement project was completed with the aspiration of achieving and maintaining blood serum phosphorus levels between 3.0 and 5.5 mg/dL. The project was conducted to determine if the 4Ds patient teaching intervention had an impact on any of the following factors: (1) a patient's knowledge of phosphorus (2) a patient's blood serum phosphorus level, and (3) a patient's compliance with dialysis treatments.

Participants in the project were given a pre-curriculum phosphorus assessment composed of twenty multiple-choice questions covering the content to be taught throughout the project (Ford et al, 2004) (Appendix B). The questionnaires were scored by the PI and recorded on a

spreadsheet (Appendix C). After completing a baseline knowledge assessment, participants participated in face-to-face, one-on-one educational sessions provided by the principal investigator and the clinical dietician at each of their regularly scheduled hemodialysis sessions. There was a total of four steps to the education with newly presented content limited to no more than five minutes in duration. During the first three dialysis sessions, participants were educated on the dangers and health issues related to uncontrolled hyperphosphatemia. During the next three dialysis sessions, participants were educated on popular foods and drinks containing higher phosphorus content. During the following three dialysis sessions, participants were educated on the importance of taking their phosphorus-controlling medications as prescribed. During the next three dialysis sessions, participants were educated on the importance of attending all their dialysis treatments in their entirety. These concepts build on one another, thus a comprehensive review of previously discussed content occurred weekly. This accounted for the first four weeks of the project, then repeated in its entirety during the second four weeks of the project.

The impact of education was assessed based on three outcomes: blood serum phosphorus levels post-education sequence, repeat questionnaires post-education sequence, and dialysis treatment adherence rates post-education sequence. Once complete, blood serum phosphorus levels were drawn before each participant's next dialysis treatment. The pre-intervention and post-intervention serum phosphorus levels were then compared. Next, a post-intervention questionnaire was administered, scored, and compared to the results of the pre-intervention questionnaire. Lastly, pre-intervention dialysis treatment adherence rates and post-intervention dialysis treatment adherence rates were compared.

The results were analyzed using descriptive statistics. Given the limited number of available participants for this project, and to ensure ethical standards were held for all possible

participants, only one group of participants was utilized for data analysis. Thus, to ensure validity, a pre-/post measurement of data was obtained on the same group of participants. The independent variable for this project was patient education and the dependent variables were blood serum phosphorus levels and dialysis treatment adherence rates.

Chart Review

After gaining permission from the Institutional Review Board (IRB) (Appendix D) as well as consent from the participating medical corporation a pre-intervention chart review was performed to determine participant eligibility based on serum phosphorus levels. Out of the fifty possible candidates for this project, 26 of those had a blood serum phosphorus level greater than the target of 5.5 mg/dL. Of those possible 26 candidates, 10 did not meet the criteria, and six refused project participation. This left a total sample size of 10 participants for the project.

There were three total chart reviews for this project: pre-intervention, 4-weeks into intervention implementation, and 2-weeks after completion of the intervention (Appendix F). The electronic health record (EHR) system utilized at this outpatient hemodialysis unit was *eCube Clinicals*; this was the only system utilized in this project. Information was collected from the EHR by the PI and the unit dietician. No names, dates of birth, or medical record numbers were recorded from the EHR. The only data extracted from the EHR was each participant's blood serum phosphorus levels and dialysis treatment adherence rates. Each participant was assigned a project-specific number based on the alphabetical order of their last names. One hand-written list of these names and assigned numbers was created. This hand-written list along with the questionaries, blood serum phosphorus results, and dialysis treatment adherence rates were locked in a file cabinet within the facility. The PI and the clinic dietician were the only people involved in retrieving this data, and all the data was destroyed via

shredding three weeks after project completion. No identifiable participant information was disclosed during, after, or for the project at any time.

Risks and Benefits

Minimal to no expected harm could have occurred from participating in this project. The main benefit of this project was lowering the incidence of hyperphosphatemia in the outpatient hemodialysis community. If effective, this intervention/project could benefit the health of the patients, their dialysis facilities (via higher QIP scores), and the overall cost of healthcare by lowering the occurrence of the comorbidities associated with longstanding hyperphosphatemia.

Compensation

There was no compensation provided before, during, or after the project to either the participants or the consenting medical corporation.

Timeline

Planning and proposal development for this project began in June of 2021. To ensure that all standards of the research process were met, the PI completed the Collaborative Institutional Training Initiative course in September of 2021 (Appendix E). In November of 2021, the Jacksonville State University Institutional Review Board awarded consent for the project. Also in November of 2021, the outpatient hemodialysis unit where this project was implemented granted the project a Letter of Support. Data collection and project implementation occurred between January 2022 and March 2022. Data analysis for this project occurred between January 2022 and April 2022. The project manuscript was written between April 2022 and June 2022. The results of this project were presented during the Jacksonville State University's Doctor of Nursing Practice Dissemination Day on July 15, 2022 (Appendix F).

Budget and Resources

Total projected costs for this project were less than $600. This total included fees for statistical analyses, writing consultation, unit staff involvement, and paper copies. The writing consultation for this project was provided free of charge by Jacksonville State University. The unit dietician volunteered her time for this project. The statistician for this project charged $150 for the data analysis portion and the copies for the project costs $20. This resulted in a total actual cost of $170 for the project (Appendix G).

Evaluation Plan

Statistic Considerations

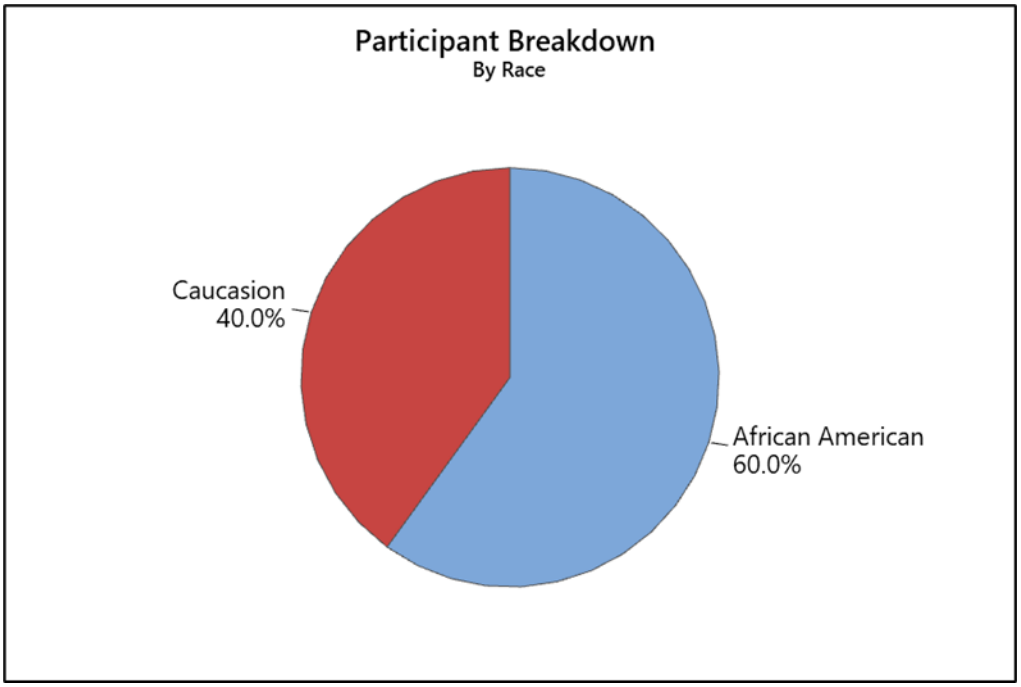
Descriptive statistics (means, standard deviations) were used to describe the demographics of the study participants and changes in outcomes for this study. Non-parametric tests were conducted to compare averages of all factors of interest due to the small sample size available for this research. The Wilcoxon-signed rank test was used to analyze pre-and-post questionnaire scores, serum phosphate levels, and hemodialysis treatment adherence rates. The statistical software Minitab® 19 was used to perform all analyses.

Results

Intervention and Demographics

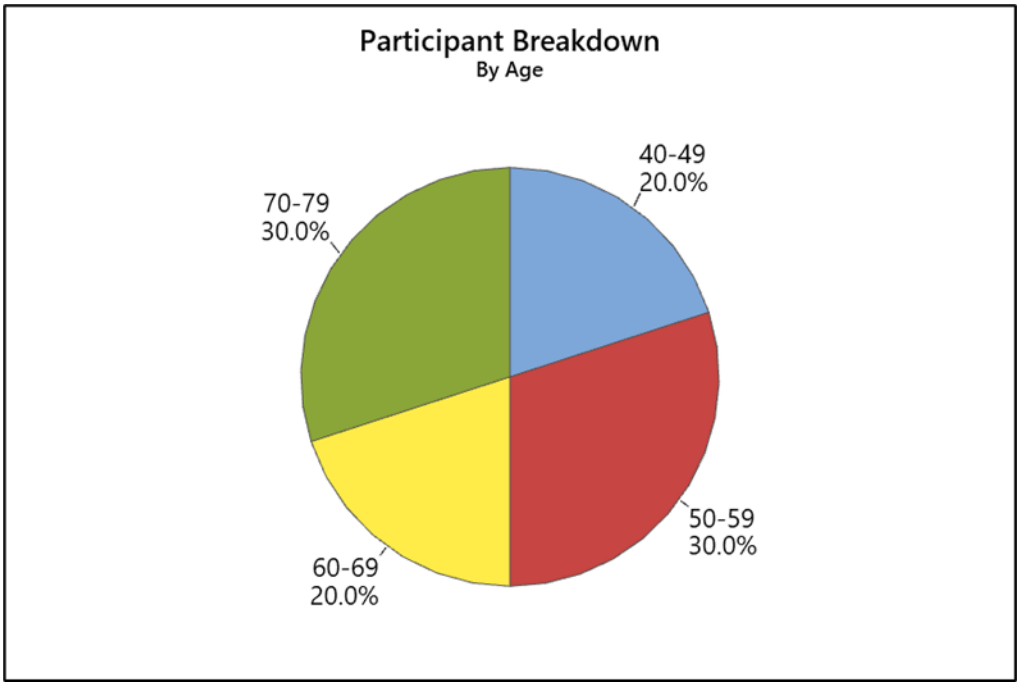
A total of ten participants met inclusion criteria and consented to participate in the study. All participants were male with six (60%) selecting African American as their primary race and four (40%) of the men selecting Caucasian. Figure 1 illustrates the participant breakdown by race.

Figure 1



The average age of participants was 60.5 with a standard deviation of 10.8. The youngest participant was 46 years old, and the oldest participant was 78 years old. Figure 2 illustrates the participant breakdown by age.

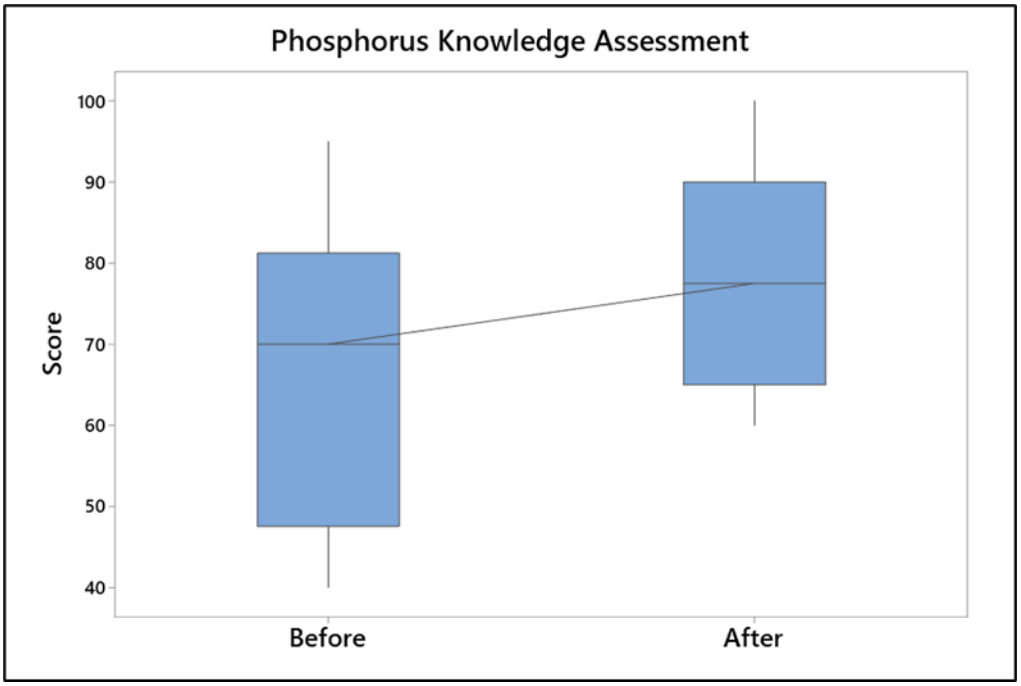
Figure 2



Results of Participant Questionnaires

There was a statistically significant difference (W = 51.0, p = 0.019) between pre-assessment and post-assessment performance with the average pre-assessment score of 66 out of 100 (standard deviation of 19.1) and an average post-assessment score of 78 out of 100 (standard deviation of 13.2). Figure 3 displays the scores of the Phosphorus Knowledge Assessment.

Figure 3



Results of Blood Serum Phosphorus Levels

The average phosphorus level before the intervention was 7.3 mg/dL (standard deviation 1.5) with a mid-intervention level of 6.2 mg/dL (standard deviation of 2.2), and post-intervention mean phosphorus level of 6.9 mg/dL (standard deviation of 2.4), though no statistical difference was noted ($H = 1.47$, $p = 0.479$).

Results of Dialysis Treatment Compliance

Before the intervention, the average number of shortened sessions of hemodialysis treatment (sessions started but not completed) was 3.2 over an eight-week time frame with a standard deviation of 4.3, while the average number of shortened sessions after the intervention was 2.2 with a standard deviation of 2.2, showing no statistical difference after intervention ($W = 12.00$, $p = 0.441$). Similarly, no difference in missed hemodialysis sessions was found before the intervention was 0.8 with a standard deviation of 1.6 compared to 0.7 (standard deviation of 0.9)

after the intervention Together, the results of both tests imply that the intervention had no impact on dialysis treatment compliance rates.

Discussion

This project sought to address the lack of consistency in delivering patient teaching on hyperphosphatemia in the outpatient hemodialysis population as it relates to compliance with recommended blood serum phosphorus levels.

The main significant finding of this project was the increase in patient knowledge about phosphorus, suggesting that the intervention increased patient awareness of the relationship between phosphorus and ESRD. This furthermore demonstrates that regularized patient teaching on phosphorus improves comprehension of basic concepts related to adequate phosphate control in this population. These findings are similar to the existing data set forth by Milazi et al. (2020).

However, the intervention did not prove effective in lowering the incidence of hyperphosphatemia nor increasing compliance to prescribed treatment regimens. These two desired outcomes are also equally important, if not more so important, than improving the knowledge deficit in terms of long-term success. It is undetermined by the project why these two outcomes were not met or what barriers prevented their obtainability during the project. Consequently, the overall goal of this project was not met by the instituting of this intervention in this sample of the outpatient hemodialysis population.

Implications for Clinical Practice

This project's aims were partially met as evidenced by a greater patient knowledge base of phosphorus. This included information such as the desired blood serum phosphate level as well as how to physically obtain that goal. Although the other two objectives for this project

were not met as anticipated, this information remains relevant in the battle against hyperphosphatemia in the outpatient hemodialysis setting. This project can contribute to existing evidence supporting that regularized patient teaching increases awareness of hyperphosphatemia in this population.

Decreasing the incidence of hyperphosphatemia in the outpatient hemodialysis setting is a long-term goal. As existing evidence suggests, motivational or standardized teaching practices possess the potential to produce a positive effect on phosphorus control. As with anyone, ESRD patients must be made aware of a problem before they can correct it. Increasing their knowledge of phosphorus, or making them more phosphate aware, does just this. This project aided in addressing the issue of hyperphosphatemia in this clinical setting. Through intervention, this project increased awareness of this problem and therefore allowed its participants the opportunity to correct it; if not immediately, then possibly in the future.

Implications for Healthcare Policy

While there are standards in place concerning the desired goal of blood serum phosphorus levels in ESRD patients by dialysis corporations and the Centers for Medicare and Medicaid Services, there is currently no policy in place on how to achieve this outcome adequately and consistently. This project further exemplifies the knowledge deficit of phosphorus control in the outpatient hemodialysis setting. This single inadequacy could be a primary factor in the current shortcomings of bone and mineral health in this population. It is for this reason that the results of this project, as well as existing evidence, could be used as a cornerstone in the argument for future policy creation.

Implications for Quality

This quality improvement project demonstrated an increased initiative with staff-led patient education. The teaching occurred consistently with each participant receiving educational sessions three times per week during their regularly scheduled hemodialysis treatments throughout the entirety of this project. This consistency was only compromised if a participant missed a treatment. While the PI and the facility dietician were the only two staff involved with patient teaching during this project, other adjunct staff showed interest in participating in any future endeavors. Some of the participants also showed initiative by welcoming each session for new information in addition to enjoying the fellowship with the staff. Implementing this intervention company-wide could show promise in improving the quality of care delivered by decreasing the knowledge gap associated with hyperphosphatemia while inviting patient-to-staff interaction.

Implications for Education

Similar studies have displayed the effectiveness of patient education in relation to improving phosphate control among hemodialysis patients. While this project does not support this evidence in its entirety, it does, however, further support the concept of patient education as a means of increasing knowledge of phosphate control in this setting. This is evident in the improved post-intervention questionnaire scores after project completion. After conclusion, median questionnaire scores rose by 12 points, from 66 pre-intervention to 78 post-intervention.

Limitations

The two main limitations of this project were its sample size and its time constraints. The sample size was very small in contrast to the number of patients with ESRD who also suffer from hyperphosphatemia. Due to the project's exclusion criteria as well as participant refusal,

the sample size was only composed of ten people, all of whom were men, and which only accounted for two ethnicities (African American and Caucasian). Also, given the limited number of eligible and willing participants for this project, only one group of participants was utilized for data analysis. Because of this, to ensure validity, a pre-/post measurement of data was performed on the same group of participants. This means the control group was the intervention group, only at two different intervals in time: pre-intervention and post-intervention. Had this project been implemented at a larger outpatient hemodialysis clinic or with multiple clinics simultaneously, the outcomes may have differed tremendously. This would have allowed for a separate control group as well as greater diversity within the project sample.

Time constraints also limited the results of this project. This was a short-term project which could only demonstrate short-term effects. This project was completed over only an eight-week time interval, whereas the study it was mirroring by Milazi et al. (2020) was completed over a twelve-week time interval. As previously stated, decreasing the incidence of hyperphosphatemia in the outpatient hemodialysis setting is a long-term goal. Therefore, a longer-term intervention may show more success in decreasing blood serum phosphorus levels and improving adherence rates to dialysis prescriptions, like that of the study by Milazi et al. (2020). Given this project's results, it is unclear if a longer intervention interval would or would not be beneficial.

Dissemination

The findings for this project will be disseminated via poster, presentation, and paper. This paper will be presented at Jacksonville State University's Annual Virtual Dissemination Day by either poster or presentation on July 15, 2022. This paper will also be presented at the agency where the project was implemented.

Sustainability

This project did not end after completion. The findings of this project were presented during a monthly Quality Assurance and Improvement Committee meeting at the facility where it was implemented. The members of this local Quality Assurance and Improvement Committee are currently reviewing the results of this project. If the findings of this project are found to be significant by this committee, the paper will be forwarded to the company's corporate office. Then, if deemed appropriate by corporate officials, a company-wide written policy will be created standardizing staff-led patient phosphate control education. If this intervention becomes a policy, it will be instituted nationally.

Plans for Future Scholarship

While this project adds to the existing data supporting the utilization of regularized patient education to increase awareness of phosphate control in the ESRD population, further research is warranted to determine if this intervention can decrease the incidence of hyperphosphatemia for these patients on a long-term basis. Future studies could aid in determining the significance of this project's findings as well as help to ascertain if the limitations of this project are substantial enough to alter patient outcomes. The small sample size of this project leaves notable gaps in patient demographics. Different age groups, genders, and ethnicities may benefit more from this intervention than others. Future studies could assist in discovering this and additionally determine whether the time limitations of this project contributed to its outcomes or lack thereof.

Hyperphosphatemia has been a pinnacle problem in the outpatient hemodialysis setting for years. Thus, underlying barriers may contribute to the lack of success in mastering this issue. Future endeavors could aid in identifying and addressing these barriers. This project only

utilized a staff floor nurse and the facility dietician. More success may be possible if the patient care technicians and other adjunct staff delivered patient education as well. If there are more people involved, there may be greater success.

Conclusion

Hyperphosphatemia (excess phosphate in the blood) is a problem that continually causes health issues for the outpatient hemodialysis population. According to Rastogi et al. (2021), by the time a patient begins hemodialysis, statistics reflect many of them will already have hyperphosphatemia and the trend continues thereafter. Multiple studies have documented the adverse effects related to hyperphosphatemia in the ESRD population, as well as how to best correct this issue, however, the problem remains. Controlling a patient's phosphorus level can be challenging to providers, given that so much of it is dependent upon patient adherence. One study by Karavetian and Rizk (2018), found that instituting a regularized patient education program as a primary intervention proved effective in lowering phosphorus levels in the ESRD population. Over eight weeks, using a step-by-step approach, this project was implemented with the objective of increasing adherence levels to diet, drinks, drugs, and dialysis (4Ds) in the chronic outpatient hemodialysis population in the pursuance of achieving and maintaining blood serum phosphorus levels between 3.0 and 5.5 mg/dL.

The main significant finding of this project was the increase in patient knowledge about phosphorus. Results of the project showed sufficient evidence that the median post-questionnaire score was significantly higher compared to the median pre-intervention score. However, the intervention did not prove effective in lowering the incidence of hyperphosphatemia nor increasing compliance to prescribed treatment regimens. The two main limitations of this project were its sample size and its time constraints.

While this project adds to the existing data supporting the utilization of regularized patient education to increase awareness of phosphate control in the ESRD population, further research is warranted to determine if this intervention can decrease the incidence of hyperphosphatemia for these patients on a long-term basis. Future studies could aid in determining the significance of this project's findings as well as help to ascertain if the limitations of this project are substantial enough to alter patient outcomes. Hyperphosphatemia has been a pinnacle problem in the outpatient hemodialysis setting for years. Thus, underlying barriers may contribute to the lack of success in mastering this issue. Future endeavors could aid in identifying and addressing these barriers.

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Appendix A

Participant Consent Form

TITLE OF STUDY: Implementing the 4Ds (diet, drinks, drugs, and dialysis) to lower hyperphosphatemia among outpatient hemodialysis patients

Principal Investigator: Morgan Atchison, MSN, RN

This consent form is part of an informed consent process for a Doctor of Nursing Practice (DNP) student project, and it will provide information that will help you decide whether you wish to volunteer for this project. It will help you to understand what the study is about and what will happen during the project.

If you have questions at any time during the project, feel free to ask them with the expectation to be given answers that you understand entirely.

Why is this project being done?

Hyperphosphatemia is a problem that affects the outpatient hemodialysis population. This could be related to a lack of patient knowledge concerning the negative effects of hyperphosphatemia on the body as well as how to effectively control phosphorus levels due to only receiving randomized teaching. The purpose of the project will be to implement regularized patient teaching to those currently receiving outpatient hemodialysis who also suffer from hyperphosphatemia on the 4Ds criteria (diet, drinks, drugs, and dialysis) in the pursuance of achieving targeted serum phosphorus levels of 3.0 to 5.5 mg/dL over the next eight weeks.

What will you be asked to do if you take part in this DNP project?

Participants will be asked to complete a pre-intervention phosphorus knowledge questionnaire. This will be a short, concise multiple-choice quiz. After which, participants will receive one-on-one teaching throughout the next eight weeks on controlling their blood serum phosphorus level. Once the eight-week curriculum is completed, participants will be asked to complete a post-intervention phosphorus knowledge questionnaire.

Outcomes of this project will be based on three factors: blood serum phosphorus levels post-intervention, repeat questionnaires post-intervention, and dialysis treatment adherence rates post-intervention.

By agreeing to be a part of this project you are giving your consent for the principal investigator (Morgan Atchison) to view, record, and use the results of your pre-and-post intervention serum phosphorus levels and pre-and-post intervention dialysis treatment adherence rates. These

results will not contain your name or any identifying information and will remain completely confidential at all times.

What are the potential benefits of this project?

The main benefit of this project is lowering the incidence of hyperphosphatemia in the outpatient hemodialysis community. If proven effective, this intervention/project could benefit the participants, their dialysis facilities, and the cost of healthcare by lowering the occurrence of the comorbidities associated with longstanding hyperphosphatemia.

What are the risks or discomforts you might experience if you take part in this project?

No expected harm can occur from participating in this project. Participation in this project is of no cost to you.

How will information about you be kept private or confidential?

All efforts will be made to keep your personal information confidential. No identifiable participant information will be disclosed during, after, or for the project at any time. Participants will be numbered; thus, your name will remain confidential. Questionnaires, lab results, and treatment adherence rates will remain locked within the facility, and information will not be removed from the premises unless all identifiable information has been removed. Once the project is completed, these records will be permanently destroyed via shredding.

What will happen if you do not wish to participate in the project or if you later decide not to stay in the project?

Participation in this project is voluntary only. Thus, either consent or non-consent to participation in the project will not affect your current treatment regimen or facility demeanor in any positive nor negative form. If you decide to stop participating, you have the right to discontinue the project and withdraw consent at any time during the project without reproach or discrimination. We do however request a written statement withdrawing your consent.

Where will this project be done?

Right here at your dialysis facility during your assigned treatment time. It should be noted however that this is an independent project that is in no way affiliated with Fresenius Kidney Care.

Who can you call if you have any questions?

If you have any questions about taking part in this project, you can call or write the principal investigator:

Morgan Atchison, MSN, RN
Fresenius Kidney Care – Cahaba Valley
120 Cahaba Valley Parkway, Suite 150
Pelham, AL 35124
(205)-988-0469
matchison@stu.jsu.edu

X _____

Participant Signature

X _____

Witness Signature

Appendix B

Phosphorus Knowledge Assessment Participant Questionnaire

Phosphorus Knowledge Assessment ***Patient #*** _____

1. Good phosphorus control depends on:
   a. Dialysis
   b. Diet
   c. Taking a phosphorus binder with meals
   d. All of the above

2. Which of the following foods are high in phosphorus?
   a. Tomatoes
   b. Rice
   c. Milk
   d. Green beans

3. Which of the following may happen when phosphorus levels are too high?
   a. Itching
   b. Dizziness
   c. Irregular heartbeat
   d. Cramping

4. What happens when your phosphorus levels are high?
   a. Calcium in your blood will get low
   b. Calcium is taken out of your bones
   c. Your bones may become weak
   d. All of the above

5. Which of the following contains the most phosphorus?
   a. Whole milk
   b. 2% milk
   c. Skim milk
   d. All of the above

6. When should you take your binder?
   a. Between Meals
   b. 8 am, 12 pm, and 6 pm
   c. With all meals and snacks
   d. Before bedtime

7. What is the best way to control your phosphorus?
   a. Taking your binder
   b. Consistently following your diet
   c. Starving yourself
   d. A & B

8. Which of the following foods is low in phosphorus?
   a. Cheese
   b. Milk
   c. Potatoes
   d. Coke

9. What is the desired level for phosphorus?
   a. > 8
   b. < 6
   c. > 11
   d. < 1

10. How much phosphorus should you eat in foods in one day?
    a. 4000 mg
    b. 1000 mg
    c. 12 mg
    d. 300 mg

11. Which of the following problems can develop if the amount of phosphorus in your blood is increased?
    a. Liver disease
    b. High blood pressure
    c. Bone disease
    d. Heart disease

12. Why should you cut back your dietary intake of phosphorus?
    a. There is no reason to cut back the dietary intake of phosphorus.
    b. Because your kidneys cannot properly clear phosphorus from your body.
    c. Because your liver cannot properly clear phosphorus from your body.
    d. You should increase your intake of phosphorus.

13. Which of the following foods contain large amounts of phosphorus?
    a. Fruits such as strawberries, bananas, and oranges.
    b. **Dairy products, meat, and cola beverages**.
    c. Bread, pasta, and rice.
    d. Vegetables such as carrots, green beans, and corn.

14. What are phosphate binders?
    a. Medications that decrease the level of potassium in your body.
    b. Medications that increase the level of magnesium in your body.
    c. Medications that decrease the level of phosphorus in your body.
    d. Medications that decrease the level of calcium in your body.

15. Complete the statement: "Phosphate binders work by . . ."
    a. Preventing potassium from entering your body in the stomach.
    b. Allowing phosphorus to enter the body in the stomach.
    c. Preventing calcium from entering your body in the stomach.
    d. Preventing phosphorus from entering your body in the stomach.

16. Which of the following is a phosphate binder?
    a. Rolaids
    b. Mylanta
    c. Tums
    d. Alka-Seltzer

17. All of the following bind phosphorus EXCEPT:
    a. Calcium
    b. Zinc
    c. Aluminum
    d. Magnesium

18. Which of the following foods is low in phosphorus?
    a. Rice
    b. Yogurt
    c. Cheese
    d. Pecans

19. Which of the following foods is high in phosphorus?
    a. Apples
    b. Watermelon
    c. Peanut butter
    d. Peaches

20. Who is responsible for your phosphorus control?
    a. The doctor
    b. You
    c. The dietitian
    d. The nurse

This questionnaire was provided with permission from Ford et al. (2004). The test will be administered pre-and-post intervention.* ***Bold* *responses represent the best answer.*

Appendix C

Pre- and-Post-Questionnaire Tracking Form

Patient ID Number	Number of Questions Answered Correctly Pre-Intervention	Number of Questions Answered Incorrectly Pre-Intervention	Total Score Pre-Intervention	Number of Questions Answered Correctly Post-Intervention	Number of Questions Answered Incorrectly Post-Intervention	Total Score Post-Intervention

Appendix D

Letter of Approval by the Jacksonville State University Institutional Review Board

JSU | INSTITUTIONAL REVIEW BOARD
JACKSONVILLE STATE UNIVERSITY

Institutional Review Board for the Protection of Human Subjects in Research
203 Angle Hall
700 Pelham Road North
Jacksonville, AL 36265-1602

November 10, 2021

Morgan Atchison
Jacksonville State University
Jacksonville, AL 36265

Dear Morgan:

Your protocol for the project titled "Implementing the 4Ds (diet, drink, drugs, and dialysis) to lower hyperphosphatemia among outpatient hemodialysis patients" 11102021 has been granted exemption by the JSU Institutional Review Board for the Protection of Human Subjects in Research (IRB).

If your research deviates from that listed in the protocol, please notify me immediately. One year from the date of this approval letter, please send me a progress report of your research project.

Best wishes for a successful research project.

Sincerely,

Lynn Garner
Associate Human Protections Administrator, Institutional Review Board

Appendix E

CITI Training Completion Report

CITI PROGRAM

Completion Date 18-Sep-2021
Expiration Date 17-Sep-2024
Record ID 44743886

This is to certify that:

Morgan Atchison

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Social and Behavioral Responsible Conduct of Research
(Curriculum Group)

Social and Behavioral Responsible Conduct of Research
(Course Learner Group)

1 - RCR
(Stage)

Under requirements set by:

Jacksonville State University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w7d7c7e1a-0a40-407b-92fa-01404a735b88-44743886

Appendix F

Project Timeline

***TASK* (06/21-07/22)**	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
Project planning/proposal development														
Proposal Approval by PERC*														
Obtain Agency Letter of Support														
JSU IRB** Submission/Approval														
Implementation														
Data Collection														
Data Analysis														
Writing DNP Manuscript Results, Discussion, and Implications														
Final Presentation and Dissemination														

*Project Ethical Review Committee

**Jacksonville State University Institutional Review Board

Appendix G

Project Budget and Resources Form

PROGRAM EXPENSE	PROJECTED COST	ACTUAL COST
Salaries, wages *(Admin support, practitioners, statistics, or writing consultation)*	$500.00	$150.00
Start-up costs *(copies, charts, displays)*	Less than $100.00	$20.00
Capital costs *(hardware, equipment)*	$0.00	$0.00
Operational costs *(heat/electricity)*	$0.00	$0.00
Other: None expected	$0.00	$0.00
Total Project Expenses	**Less than $600.00**	**$170.00**