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Evaluating the Evidence and Assessing Registered Dietitian Nutritionists' Perceptions of the Complex Renal Dietary Restrictions

Alyssa Lee Welte
Illinois State University, alyssa.l.welte@gmail.com

EVALUATING THE EVIDENCE AND ASSESSING REGISTERED DIETITIAN NUTRITIONISTS' PERCEPTIONS OF THE COMPLEX RENAL DIETARY RESTRICTIONS

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The renal diet is often regarded as challenging to teach and follow and can easily lead to additional complications, including malnutrition. Recent trends in the literature have suggested a liberalization in the renal diet, though no studies have assessed whether Registered Dietitian Nutritionists (RDNs) are comfortable making this change. An original, cross-sectional survey was created for this study. A total of 187 renal dietitians completed the survey, which revealed that overall, RDNs feel confident in their abilities to interpret and apply evidence-based literature into practice, and that they are moderately comfortable liberalizing the renal diet. The participants were generally more comfortable liberalizing the phosphorus restriction than the potassium restriction, and the sodium restriction remains important to control interdialytic weight gain and hypertension. Future research is needed to establish efficacy of a liberalized diet as well as interventions to help RDNs feel more comfortable implementing the liberalization of the renal diet.

KEYWORDS: Renal diet; Potassium; Phosphorus; Sodium; Fluid restriction; Dietitian

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ALYSSA L. WELTE

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ALYSSA L. WELTE

COMMITTEE MEMBERS:

Jennifer Barnes, Chair

Julie Schumacher

Tammy Harpel

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CHAPTER I: EVALUATING THE EVIDENCE AND ASSESSING REGISTERED DIETITIAN NUTRITIONISTS' PERCEPTIONS OF THE COMPLEX RENAL DIETARY RESTRICTIONS

Often referred to as the most challenging diet to teach and follow, the renal diet for end-stage renal disease (ESRD) patients on hemodialysis (HD) requires restriction of sodium, potassium, phosphorus, and fluids based on individual patient needs. Patients with ESRD experience chronic renal failure where the kidneys lose all function. This results in an inability to maintain fluid balance, electrolytes, and organic solutes. These patients must rely on HD or peritoneal dialysis (PD) to remove these waste products from the blood. The majority of dialysis patients use HD. Typically, HD is done in an outpatient setting and takes place thrice weekly, lasting three to five hours each treatment (Wilkens, Juneja, & Shanaman, 2012). Unfortunately, HD is not a cure for ESRD but rather a life-sustaining maintenance that must be continued for the duration of the patient's life unless they receive a kidney transplant (National Kidney Foundation, 2013). Without HD, the waste remains in the blood, creates an excess of electrolytes, and causes numerous other health issues including death (Wilkens et al., 2012).

Upon starting HD, patients are educated to follow a diet called the renal diet set forth by the National Kidney Foundation's (NKF) Kidney Disease Outcomes Quality Initiative (KDOQI). This medical nutrition therapy for ESRD currently recommends less than two grams of sodium, three grams of potassium, and one gram of phosphorus based on the patient's specific needs (National Kidney Foundation, 2003). These restrictions result in minimal acceptable food options and a severely restricted diet, including only one serving of dairy per day, limiting fruits and vegetables to six servings per day of low-potassium options, limiting water and fluids, and avoidance of all convenience foods. Whole grains, beans and legumes, and nuts are often restricted due to their phosphorus content (Wilkens et al., 2012). According to Khoueiry et al. (2011), the restrictive nature of the renal diet is counterintuitive to a generally healthy diet, especially when this ESRD population would benefit from a heart-healthy diet.

The efficacy of this diet has recently been evaluated through multiple literature reviews, revealing a lack of quality evidence supporting these restrictions. Concerns include attempts to control interdialytic weight gain (IDWG) through a focus on fluid rather than sodium restriction, lack of differentiation between the types of dietary phosphorus, and even a potentially overly restrictive potassium guideline (Biruete, Jeong, Barnes, & Wilund, 2016; Calvo & Uribarri, 2012; Noori et al., 2010; St-Jules, Goldfarb, & Sevick, 2016). Not only are these restrictions difficult to understand, but the dietary prescription results in a very minimal list of remaining acceptable foods. This also poses the issue that the renal diet does not support choices for heart health, which would endorse renal-restrictive fruit and vegetables, whole grains, and other high fiber, antioxidant-rich foods like beans and legumes (Khoueiry et al., 2011). Liberalizing the renal diet as suggested by current trends in the research would promote a more heart healthy intake in patients who are already at a higher risk of cardiovascular disease (CVD). In fact, CVD is the most prevalent cause of death in dialysis patients. Per the most recent data from the United States Renal Data System, 41% of deaths in ESRD patients were related to CVD (2016). However, these guidelines have been the standard for many years, and dietitians and other healthcare professionals may be hesitant to liberalize the guidelines due to lack of knowledge of the recent research, or they may be skeptical of changing their practice.

Extensive research has been carried out to understand if health professionals, such as Registered Dietitian Nutritionists (RDNs) and nurses, stay current on research in general and the barriers that hinder the important task of reading scientific literature. In particular, research has investigated the barriers that many healthcare professionals encounter in staying current on research within their fields (Burrowes, Russell, & Rocco, 2005; Hall-McMahon & Campbell, 2012; Johnston et al., 2016). Common barriers include time, resources, and support. Often the demands of the job keep professionals from taking the time to read the current literature (Burrowes et al., 2005; Hall-McMahon & Campbell, 2012; Johnston et al., 2016). Even if these practitioners do stay current with the literature they may be unaware of the lack of evidence available to justify the efficacy of the renal diet they have always taught. Furthermore, it is important to note that the NKF's KDOQI guidelines do currently recommend the conservative restrictions (National Kidney Foundation, 2003).

Even with the recent trend in literature supporting liberalization of strict diet, there are currently no assessments to show if RDNs feel comfortable incorporating a more liberalized diet into their patient education. The literature is also so new that some professionals may not be aware of the data. The proposed research will fill these gaps by uniquely assessing nutrition professionals' awareness of the topic and their level of comfort regarding liberalization of the renal diet.

The purpose of this research was to determine the likelihood of RDNs staying current on evidenced-based research and applying this knowledge in their practice, specifically related to medical nutrition therapy of ESRD utilizing HD. Currently, thorough research has not been completed to determine if health professionals feel comfortable changing the practices based on the new research proposing that the renal diet may be too restrictive. This study will answer the following research questions:

1. How confident are practitioners in their ability to stay current on research?

2. How often do RDNs recommend that their patients consume fruits and vegetables, whole grains, and beans and legumes despite their potassium and phosphorus content
3. How comfortable do practitioners feel liberalizing the renal diet?

Methodology

Survey Development

The objectives of this study were assessed though a cross-sectional survey created for this research. The survey, titled Assessing Professional Perceptions of the Renal Dietary Restrictions Questionnaire, was formatted online using SelectSurvey software (ClassApps, Version: v4.162.022). A team of professionals involved in HD care and/or research reviewed this survey, including three RDNs and four researchers with expertise in survey validation, hemodialysis, and/or statistics. Each individual in this group was asked to evaluate the questionnaire for possible misinterpretation and conciseness. Further, individuals were asked to identify which construct each question applied to, either ability to comprehend evidence-based practice, current practices, or comfort level and willingness to liberalize the diet.

Survey Instrument

The first two items on the survey address practitioners' utilization of evidence based practice (EBP). These EBP questions were adapted from the Evidence-Based Practice Profile Questionnaire (McEvoy, Williams, & Olds, 2010). Additional questions investigating practitioners' current practices and feelings toward the renal diet were developed and further assessed for construct validity, as previously described. The questionnaire consisted of 23 five-point Likert scale questions. This tool also collected information on eight demographics such as age, gender, and years of practice. Along with these ordinal questions, participants also had the option to add comments about their responses in available free-text boxes. These comments were included in the data collection to note any responses that may have offered insight into the participants' answers.

The self-administered survey assessed the RDN's current practices when educating HD patients on their diet and measured their comfort level and commitment to liberalizing the diet in favor of more wholesome foods such as fresh fruits and vegetables, beans and legumes, and whole grains. Example questions included the following:

How often do you recommend that patients consume beans and legumes?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

How likely are you to instruct patients that it is acceptable to relax or "liberalize" the standard dietary restrictions on fresh fruits and vegetables?

Extremely Unlikely	Unlikely	Neutral	Likely	Extremely Likely
1	2	3	4	5

Each survey question was specifically associated to one of the three research questions. Three questions related to the first research question regarding how EBP. These questions included, "How confident do you feel regarding your ability to find and review evidence-based literature?," "How confident do you feel regarding your ability to apply current research findings to individual cases (i.e. integrate research evidence with personal preferences, concerns, expectations)?," and, "Prior to this questionnaire, how familiar were you with current trends in the literature suggesting liberalization of the renal diet?" Seventeen items corresponded to the second research question concerning current practices with recommendations to consume fruit and vegetables, whole grains, and beans and legumes. Examples of these questions included, "How often do you recommend that your patients consume whole grain products?" and, "How often do you recommend whole foods rather than processed foods in order to reduce sodium and/or inorganic phosphorus additives?" Finally, six items related to the third research question pertaining to likelihood to liberalize the renal dietary restrictions and overall comfort level. A sample question from this section includes "How strongly do you agree or disagree with the statement: "I feel comfortable liberalizing the potassium restriction of the renal diet to include more fruits, vegetables, whole grains, beans, and legumes to increase fiber, micronutrient, and antioxidant intake."

Sample

The Academy of Nutrition and Dietetics (AND) approved the survey prior to distribution. RDN members of the AND's Renal Practice Group (RPG) working primarily with HD patients were asked to participate in this study. The AND's Dietetic Practice Group manager coordinated the distribution of this survey. The survey was initially sent out via a weekly newsletter to the RPG members. One week later, a follow-up reminder was sent through the same newsletter, and the survey was kept open for an additional two weeks. Participants were provided with a consent form at the beginning of the questionnaire, and those who did not give consent were then directed to the end of the survey. Upon completion of the survey, participants also had the option to sign up for a random drawing for one of two $50 gift cards as an incentive. The information for the drawing was gathered through a separate online survey and was not tied to the original survey responses. All procedures were approved by the Illinois State University Institutional Review Board.

Statistical Analysis

The responses to each question were analyzed using the IBM SPSS Statistics 23 software to assess potential relationships between perceived ability to interpret EBP, current practice, and level of comfort to liberalize the renal diet. Regression analysis was used to statistically evaluate if various responses could predict the outcome of how comfortable the sampled RDNs felt liberalizing the diet. The demographic data was utilized to characterize the sampled population and also assessed using regression analysis and chi square tests to measure relationships between years in practice, highest degree obtained, and feelings toward liberalizing the diet.

Results

Sample

A total of 187 RDNs working primarily with HD patients participated in this study. The average age of the participants was 51 (±13) years with 24 (±13) years of practice as an RDN and 15 (±11) years of renal practice. The majority, 74.3%, worked in an outpatient dialysis center. Table B-1 shows the demographic data of those who participated in this study.

Evidence-Based Practice

Throughout the survey, participants were asked to select a response from a five-point Likert Scale. For the first two questions, the scale indicated that 1 represented "not confident at all," and 5 meant "very confident." Participants were asked to rate their confidence level regarding their ability to find and review evidence-based literature. The mean response was 3.99 (SD = .831). When asked about their confidence level regarding their ability to apply current research findings to individual cases, the mean response was 3.94 (SD = .842). The distributions of these responses can be seen in Table B-2. The final question of the survey assessed the participants' familiarity with current trends in the literature suggesting liberalization of the renal diet with 1 meaning "not familiar at all" and 5 indicating "extremely familiar." The average response was 3.53 (SD = 1.105).

Correlation tests were used to examine the relationship between the first two questions assessing EBP and the comfort level towards liberalizing various aspects of the renal diet. There was no significant relationship between the participants' ability to find evidence based literature and their feelings towards accepting organic phosphorus in the diet. However, there was a significant relationship between the ability to find literature and their level of comfort toward liberalizing the phosphorus (r=.16, p=0.04) and potassium restrictions (r=.18, p=0.02). The participants' perceived ability to apply literature in their practice was not significantly related to their feelings towards liberalizing organic phosphorus (r=.03, p=0.70), phosphorus in general (r=.08, p=0.30), or potassium (r=.11, p=0.15).

Regression analyses showed that neither the participants' confidence in their ability to find literature or their ability to interpret literature were good predictors of how the participant felt about liberalizing organic phosphorus considering favorable micronutrient and fiber profiles (p=0.38) with R^2 of .01. These variables were not significant predictors of how the participant felt about incorporating more whole grains, beans, legumes, and nuts in the diet despite the phosphorus amounts (p=0.10) with R^2 of .03. In addition, these variables were not significant predictors of the participants' comfort level toward liberalizing the potassium restriction (p=0.07) with R^2 of .03. However, the participants' perception of their ability to apply research findings was a statistically significant but weak predictor of familiarity with current trends in the literature suggesting liberalization of the renal diet (p=0.011) with R^2=.142.

Current Practices

Responses from the questions regarding current practices can be found in Table B-3. Multiple regression analysis showed that the response to questions regarding recommending beans and legumes, avoiding inorganic phosphorus, and avoiding organic phosphorus were significant predictors of how likely the participant was to liberalize the standard restriction on these types of foods ($p<0.001$) with $R^2=.39$. The frequency that participants recommended that their patients consume whole grain products was a significant predictor of how strongly they felt about accepting organic phosphorus in the renal diet ($p<0.001$) with $R^2=.29$.

Views of Liberalizing Renal Dietary Restrictions

Table B-4 shows the responses from all questions regarding views of liberalizing the renal diet. Familiarity with current trends in the literature regarding liberalization of the renal diet was a good indicator of how strongly participants agreed with the statements considering the acceptability of organic phosphorus consumption ($p<0.001$) with $R^2=.13$. This was also a significant predictor of comfort level toward liberalizing the phosphorus restriction ($p<0.001$) with $R^2=.20$ and liberalizing the potassium restriction ($p<0.001$) with $R^2=.13$. Years in renal practice was not a significant predictor of the participants' willingness to liberalize the potassium restriction, ($p=0.74$) with $R^2=.00$, or the phosphorus restriction ($p=0.35$) with $R^2=.01$.

Discussion

The purpose of this study was to assess the confidence of RDNs related to staying current on research, current practices, and comfort level towards liberalizing the renal diet. A total of 43.3% of participants felt "quite confident" in their ability to find, interpret, and apply literature into their practice. A minority, 3.2% and 4.8% respectively, responded "not confident at all" or “a little confident” which indicates that overall RDNs perceived themselves to be able to understand current literature regarding their practice. Previous research looking at RDNs as well as physiotherapists, speech and language therapists, and occupational therapists showed that nearly all participants, 97%, reported knowing the importance of reading literature; however, a large portion of the responders reported not understanding the statistics of the study and not fully knowing how to put the research into practice (Metcalfe, Lewin, Wisher, Perry, Bannigan, & Moffett, 2001). The questions regarding EBP in this research did appear to agree with this in that the majority of healthcare professionals know the importance of reading literature, though this study did not ask the RDNs for specific barriers. Insight from Metcalfe, et al.’s research may show why some RDNs reported low confidence in their abilities to interpret literature.

In regards to knowledge of current literature, the question assessing familiarity with current trends in the literature suggesting liberalization of the renal diet revealed that the average response was between “moderately familiar” and “very familiar.” The average level of familiarity with this topic could be a positive sign for change, though there may still be a barrier to advancing to this liberalized diet due to some RDNs responding with less than “moderately familiar.” Though this research did not investigate reasons why RDNs are not familiar with the topic of liberalizing the renal diet, previous research may indicate reasons and barriers to explain these findings. A lack of time or confidence typically plays a large role in why RDNs do not follow EBP and literature. Others struggle to keep up-to-date on literature based on availability of resources, workload, and inconvenience (Burrowes et al., 2005; Hall-McMahon & Campbell, 2012; Hand et al., 2013; Johnston et al., 2016). Regardless, the KDOQI guidelines remain the standard of nutritional care in this population. Until recommendations change, RDNs may rightfully hesitate to make more liberal dietary prescriptions. Further, RDNs also need support from physicians. Metcalfe et al. (2007) emphasized the importance of physician support, and without this, renal RDNs may find it challenging to update their practices.

Based on statistical analysis, confidence levels related to interpreting and applying this information was not a good predictor of their likelihood to liberalize the phosphorus and potassium restrictions of the diet. Confidence levels were, however, significant predictors of participants' familiarity with the topic of liberalizing the renal diet. Perhaps those who felt confident in their ability to find and interpret information had a good understanding of the reasoning behind liberalization of the diet, but there may be additional barriers to change that this questionnaire did not address. However, due to a lack of quality research to show the benefits of the current restriction, maybe this hesitation is warranted.

Furthermore, if RDNs are aware of the trends in the literature but unwilling to liberalize in their practice, this presents a compelling argument for a need for future randomized controlled trials to the show efficacy of liberalization. For those RDNs that are not comfortable with the literature, this shows that this is a needed area of further education in undergraduate programs and continuing education for RDNs to become more proficient in interpreting research. Finally, if RDNs do not have time to review literature, this directly contradicts the purpose of EBP principles. RDNs need to study current on literature to individualized interventions based on emerging literature. Therefore, work needs to be done to rectify this issue of lack of time.

A large portion of this study assessed current practices involving recommendations to consume or avoid certain food groups. RDNs are more likely to recommend avoiding high-potassium fruits and vegetables if the patient has a history of hyperkalemia; however, some RDNs still recommend avoiding these foods even without a history of hyperkalemia. This may show that RDNs are overly-restrictive towards fresh fruits and vegetables because of their potassium content, disregarding additional benefits of these whole foods. Some studies have indeed shown that serum potassium is not significantly correlated with dietary potassium intake in the HD population, indicating that these RDNs may be creating excessive restrictions for their patients (Noori et al., 2010; St-Jules, et al., 2016). Furthermore, by unnecessarily eliminating potassium foods, there may be an increase in blood pressure and salt sensitivity in some populations, and these patients will also miss the important micronutrients and fiber that accompany fresh fruits and vegetables (Gallen et al., 1998; Kalantar-Zadeh et al., 2015; Khoueiry et al., 2011; Morris, Sebastian, Forman, Tanaka, & Schmidlin, 1999).

Most RDNs reported that they “sometimes” recommend avoiding whole grain products, beans, and legumes. The response to this question was also indicative of how comfortable the RDN felt incorporating organic sources of phosphorus in the diet, as whole grains, beans, and legumes do provide some of this organic micronutrient. Over half of the participants said they always recommend avoiding inorganic phosphorus, though others still recommend avoiding organic phosphorus regularly. These findings do not conclude that RDNs are encouraging inorganic phosphorus, but rather they may not be informing their patients as often to avoid it. Avoidance of inorganic phosphorus is warranted, as nearly 100% is absorbed by the body, where only about 60% of organic phosphorus is absorbed; therefore, the micronutrient profile and fiber content of these foods may outweigh the phosphorus content, considering its lower bioavailability (Wilkens et al., 2012). There are still some RDNs who do not frequently differentiate between the two types of phosphorus. By not differentiating between the types and continuing to excessively restrict organic phosphorus, patients are unnecessarily limited with these food groups which causes the elimination of foods such as whole grains that offer a variety of other nutrients and phytochemicals that would be beneficial for this population (Khoueiry et al., 2011).

Results of this study indicate that RDNs are more likely to recommend limiting sodium as opposed to fluids to avoid IDWG. Most RDNs also recommend whole foods rather than processed foods to limit sodium and inorganic phosphorus additives. These practices align with research by Carrigan et al. (2013) that concluded that diets higher in processed foods, which in turn are higher in food additives, contain 60% higher total phosphorus and sodium amounts than low-additive foods. Multiple studies (Rigby, Scribner, & Ahmad, 2000; Chazot, 2009; Charra, Chazot, Jean, & Laurent, 1999; Kayikcioglu et al., 2009) demonstrated the relationship between fluid and sodium restrictions concluding that patients with very low sodium intake are able to control IDWG and hypertension better than those patients with higher sodium intakes and stricter fluid intakes. Since the sodium restriction is so vital to ESRD dietary needs, the findings of this study show a positive trend in sodium education.

The final research question assessed RDNs' likelihood to liberalize the renal diet. Responses showed that not all RDNs are ready for this change in practice. Only 15.3% of participants reported they felt it was acceptable to liberalize the standard restriction on fruits and vegetables, and 13.6% of responders said the same about the bean and legume restriction. Similarly, 19.9% were extremely likely to liberalize the whole grain restriction. Many participants did not have an opinion either way, selecting the "neutral" response. By not having an opinion or not feeling confident liberalizing the renal diet, limited progress can be made in this area of practice. Several participants, however, did note that they did not feel they should rate their comfort level any higher as they felt that each patient will require various levels of restrictions based on lab data.

Limitations

A possible limitation of this study involves the education level of the participants. Roughly half, 51.3%, of the participants reporting having education past a bachelor's degree. This could affect their responses as they may be more likely to respond to a research survey, or they may be more likely to have certain feelings toward this topic. In summary, larger response rate with varying levels of education could have provided more precise results for the overall population. Perhaps those RDNs who did respond are also professionals who are more proactive in their practice and more likely to follow guidelines based on research. However, future research could still be conducted using the findings of this study by creating an educational intervention for renal RDNs and assessing practices and opinions after the education.

An additional limitation was discussed by several participants in the comments section of the questionnaire. One diet cannot be suitable for every patient. Some participants noted that they did not feel comfortable rating their likelihood to liberalize the diet higher because not every patient is appropriate for a more liberalized restriction. For example, some patients may be more sensitive to potassium, therefore the RDN would not feel as comfortable allowing them to have more fresh fruits and vegetables containing potassium. Liberalizing the current renal dietary restrictions may need to be in combination with clinical judgement to tailor the diet for individual patients.

Strengths

The strengths of this study include its originality to the field of renal nutrition as there is currently very limited information available on this topic. The survey created for this study was carefully designed to examine current practice and comfort level regarding the major topic. The participants were from a variety of backgrounds including years of practice and location, and this likely created a more accurate depiction of the renal RDN population.

Future Research

This research brings attention to the lack of significant evidence to support the current renal diet guidelines. This may affect the direction of future research, the continuing education of RDNs, and the way they educate patients. In addition, it will reveal the awareness of practitioners in relation to the renal diet and evolution of practice. By exposing the comfort level of practitioners to liberalize the diet, it could lead to further research regarding ways to change current practice. This exposure will improve practice by addressing the deficiencies in translating research to clinical application while working to promote confidence in practitioners to liberalize the renal diet. This could ultimately lead to improved patient quality of life and decreased severity of co-morbidities, as mentioned previously. Specifically, patients could benefit from these changes by increasing heart healthy food choices and decreasing complications due to inadequate intakes (Khoueiry et al. 2011; Biruete et al. 2016; Roy, Shetty, & Urooj, 2013). Further, this work can influence future studies, including clinical trials, to improve the renal diet and, possibly, promote changes to the standardized ESRD diet prescription to benefit overall health for the HD population.

CHAPTER II: LITERATURE REVIEW

The renal diet is often referred to as a diet that is very challenging to follow due to the stringent restrictions on potassium, phosphorus, sodium, and fluid. Current trends within the literature have questioned the limitations of the renal diet and assessed the available research on each component. The potassium and phosphorus restrictions are especially of concern due to a lack of research justifying the necessity of strictly limiting fresh fruits and vegetables, whole grains, beans, and legumes. Furthermore, these restricted foods could also contribute many other beneficial nutrients that this population needs for overall health. To date, there is currently minimal research published to assess how Registered Dietitian Nutritionists (RDNs) feel about liberalizing the diet that they prescribe for their patients.

Barriers to Staying Current on Evidence-Based Practice Research

It is the responsibility of healthcare professionals to stay current on research and evidence-based practice (EBP), practice based on results of credible research to achieve effective and efficient care for the patient (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). Johnston et al. (2016) examined reasons that encourage healthcare practitioners to implement EBP into their work, as well as barriers that interfere with their implementation of EBP. Through focus group interviews with community nurses, Johnston et al. (2016) found that support from management and team members greatly influenced the nurses' commitment to utilize EBP tools in a positive way. Furthermore, if the work setting lacked that support, the nurses found it difficult to apply EBP tools.

Other barriers from research included limited availability of resources, lack of time, overwhelming workload, lack of confidence, and inconvenience (Burrowes et al., 2005; Hall-

McMahon & Campbell, 2012; Hand et al., 2013; Johnston et al., 2016). Numerous studies have indicated that lack of time significantly inhibits proper use of EBP (Hall-McMahon & Campbell, 2012; Hand et al., 2013; Wolfe, 2012). Understaffing and disproportionate practitioner to patient ratios greatly affect the amount of time spent working with individual patients (Wolfe, 2011). In Hand et al.'s (2013) analysis of the time barrier, it was roughly estimated that dietitians often oversee more than 120 dialysis patients and can only spend 0.8 ± 0.51 hours per month with each individual patient. Dietitians are recommended to analyze patients' intakes biannually or more often in the outpatient dialysis setting when lab data is abnormal (Hand et al., 2013). This individual time with patients can often be problematic given the complexity of the renal diet and the emphasis that EBP places on individualized treatments for HD patients. This time constraint limits the amount of analyzing and educating the dietitian can accomplish before the patient's appointment is over (Burrowes et al., 2005; Hall-McMahon & Campbell, 2012; Hand et al., 2013).

Research including dietitians, occupational therapists, physiotherapists, and speech and language therapists revealed a lack of confidence in reading and interpreting literature and what specific parts of reading literature hindered their use of evidence based guidelines. Many reported their lack of understanding of statistical analyses and the inability to clearly understand what the research is implying related to future practice. In addition to the previously mentioned barriers, 36% of the participants reported the barrier of physicians not supporting changes in procedures (Metcalfe et al., 2001). These findings may describe common obstacles to RDNs liberalizing the renal diet.

Renal dietitians, in particular, encounter specific barriers to implementing the set of nutritional guidelines produced by the National Kidney Foundation (NKF) titled Kidney Disease

Outcomes Quality Initiative (KDOQI). These guidelines include, but are not limited to, thoroughly assessing nutrient and energy intake, body composition, anthropometrics, and lab data, where most of these measurements are assessed monthly (Burrowes et al., 2005). Through questionnaires, Burrowes et al. (2005) discovered that only 5% of participants implemented the guidelines in their entirety in their practice. Hand, Steiber, and Burrowes (2013) found that as work experience and advanced education level increased in dietitians, the compliance with the guidelines regarding the frequency of analyzing dietary intake decreased. If these practitioners are encouraged and assisted to overcome common barriers, they may have a better approach to learning new information and more success implementing it into their practice.

Current Restrictions

The current medical nutrition therapy for ESRD is defined by the NKF's KDOQI Guidelines and leaves little room for variety. These guidelines indicate a need to restrict sodium, potassium, and phosphorus. The potassium and phosphorus restrictions exclude many fresh, whole foods, and the potassium restriction limits many fruits and vegetables such as tomatoes, bananas, oranges, beans, legumes, and potatoes to name a few (National Kidney Foundation Potassium, n.d.). Phosphorus occurs in the food supply from two different sources. First, naturally-occurring phosphorus, referred to as organic phosphorus, is found in dairy products, beef, chicken, pork, fish, organ meats, and whole grains. Second, inorganic phosphorus is found most commonly in the form of phosphorus additives (National Kidney Foundation Phosphorus, n.d.). The varied sources of phosphorus are rarely differentiated. Together these nutrient restrictions lead to an extremely limited diet while also taking away many healthy foods that can put patients at increased risk for malnutrition and other health concerns (Roy et al.,2013).

Sodium

The ESRD diet traditionally limits both fluid and sodium, with an emphasis on minimal fluid intake in order to control interdialytic weight gain (IDWG). KDOQI guidelines recommend two to three grams of sodium per day depending on severity of hypertension and fluid retention (National Kidney Foundation, 2005). Because sodium is the primary extracellular cation, it is closely associated with intra- and extracellular fluid balance as well as the thirst mechanism. This suggests that an increased focus on sodium intake, rather than fluid consumption, may be more effective as large amounts of fluid consumption may be secondary to excess sodium intake. This results in excessive IDWG, or fluid retention between HD treatments, and a corresponding increased risk of fluid overload, hypertension, and other complications (Wilkens et al., 2012).

On average, the American adult consumes approximately 3,529 milligrams of sodium per day (US Department of Agriculture, n. d.). The typical American consumes a large amount of their sodium intake from processed foods. An analysis by Carrigan et al. (2014) discovered that processed foods with additional additives contribute approximately 30 to 40% more sodium than similar, low-additive, fresh foods. For the renal diet, Biruete et al. (2016) stated that the most recent guidelines do not quantify a specific sodium limit; however, past guidelines recommended a prescription of less than 2,000 milligrams per day, nearly half of what the average American typically consumes.

Phosphorus

Normal functioning kidneys remove excess phosphorus from the blood for elimination through urine. However, failing kidneys, such as those in a dialysis patient, cannot filter this mineral properly leading to an excess amount in the blood. Additionally, due to the weight of the molecule, phosphorus is difficult to remove from the body during dialysis (Wilkens et al., 2012).

If uncontrolled, excess phosphorus in the blood causes weaker bones by extracting calcium out of the bone structure, and it can also form calcium deposits in various parts of the body including organs and blood vessels further preventing that part of the body from fulfilling its purpose (National Kidney Foundation Phosphorus, n.d.).

The National Kidney Foundation (2003) recommends a phosphorus restriction of 800 to 1,000 milligrams per day without differentiating between the two types of phosphorus: organic and inorganic (Calvo & Uribarri, 2012). From the data collected by the United States Department of Agriculture (n.d.), the average phosphorus intake for Americans is approximately 1,399 milligrams, well over the NKF’s recommendation for chronic kidney disease patients. Most of the phosphorus intake in the American diet comes from milk and dairy products (Calvo, Moshfegh, & Tucker, 2014). Furthermore, phosphorus intake comes in various forms with phosphorus from animal-based products being more absorbed than plant-based foods (Noori et al., 2010). This poses a separate challenge as HD patients are required to increase protein intake, and many protein foods contain organic phosphorus. Although fresh meat provides phosphorus, it is also an excellent source of high biological value protein as well as provides the organic form of phosphorus. Only 60% of this organic phosphorus is absorbed by the body. In comparison, virtually 100% of inorganic phosphorus is absorbed by the body (Wilkens et al., 2012). Noori et al. (2010) also referenced inorganic phosphorus that comes from supplements, medications, and food additives. As the body absorbs this additive form of phosphorus at a much higher rate compared to organic phosphorus, it becomes a larger concern for the renal diet (Biruete et al., 2016; Noori et al., 2010).

León, Sullivan, and Sehgal (2013) analyzed the ingredients of foods in a typical American grocery store and found that 44% of products assessed contained phosphorus additives. Further, 72% of prepared and frozen products contained phosphorus additives. Other categories of foods included packaged meat at 65% and yogurt at 51% (León et al., 2013). Sarathy and colleagues (2008) analyzed menu items at 15 fast-food restaurants to assess how many items on their entrée and side item menus would be acceptable on the renal diet given sodium, potassium, and phosphorus contents. Of the entrée items from these restaurants, 52% had an acceptable amount of sodium, potassium, and organic phosphorus; however, only 16% of these entrees did not contain inorganic phosphorus. Similarly, 23% of the side dishes fit into the sodium, potassium, and organic phosphorus criteria, but only 17% did not contain inorganic phosphorus. Three of the fast-food chains did not have any suitable entrees, and five of the chains did not have any appropriate side dish options (Sarathy, Sullivan, Leon, & Sehgal, 2008). This study concludes that the use of inorganic phosphorus-containing additives creates a large barrier for hemodialysis patients and shows its overuse in the fast-food industry.

Potassium

Common dietary sources of potassium include fruits and vegetables as well as beans and legumes. For HD patients, potassium is often restricted to two to three grams per day and sometimes as low as 1,500 milligrams because too much of this mineral in the body can cause muscle weakness, arrhythmia, and heart attack (National Kidney Foundation Potassium, n.d.; Pani, Floris, Rosney, & Ronco, 2014; St-Jules et al., 2016). The average American consumes about 2,658 milligrams of potassium daily (US Department of Agriculture, n.d.). In a healthy individual, nearly all the potassium from foods exits the body with assistance of the renal system via urine. A small amount, 5-10%, is eliminated through stool. Given the importance of the kidneys in the process of excreting potassium, it is evident how ESRD patients are at a higher risk of hyperkalemia (Putcha & Allon, 2007).

Concerns Regarding the Current Restrictions

Malnutrition and protein-energy wasting (PEW) are serious concerns for many chronic illnesses; however, patients with CKD are especially at risk due to multiple factors associated with the disease and the difficulty in meeting estimated nutrition needs. CKD is known to alter metabolic processes within the body to create a more catabolic state. In addition, the process of dialysis results in nutrient losses due to frequent inflammation and oxidative stress, creating a hypermetabolic state requiring increased nutrition intakes to compensate for this nutrient loss. Dialysis interferes with nitrogen balance, requiring an increase in protein needs. With these factors contributing to higher nutrition needs, dialysis patients often have poor appetites due to changes in appetite mediators within the body or simply a lack of energy to prepare food after dialysis treatments (Carrero et al., 2013). Patients may also experience uremia due to high levels of nitrogen and metabolic waste in the body. This can induce symptoms of nausea and vomiting, metallic taste, and malaise which can all affect oral intakes. In addition, uremia can significantly hinder protein intake as these patients may experience aversions to foods, especially red meat (Wilkens et al., 2012). When intakes decrease in a patient undergoing HD, the body reacts in a more detrimental way by going into a metabolic acidosis state, cachexia and protein breakdown, and insulin resistance. Considering the struggles to maintain good nutrition status, the restrictive nature of the renal diet adds a significant barrier to staying adequately nourished and preventing PEW (Carrero et al., 2013).

Experts have also critiqued the renal diet as not promoting cardiovascular health. With cardiovascular disease (CVD) as a frequent comorbidity of renal failure, this should be a large concern and reason to liberalize the diet (Khoueiry et al., 2011). Currently, 68.8% of patients 66 years of age and older with chronic kidney disease (CKD) have CVD. This rate is essentially

200% higher than the 34.1% prevalence among people that age without CKD. CVD not only contributes to overall health complications in an already at-risk population, but it also drastically increases the risk of mortality, causing 41% of deaths in dialysis patients (United States Renal Data System, 2016). Additional comorbidities may increase the chance of poor nutrition status and PEW, leading to higher morbidity rates (Carrero et al., 2013). The cardiovascular and renal systems can cause stress on each other given the right conditions, and perhaps the restrictive nature of the renal diet could exacerbate the progression of CVD. After eliminating many fresh fruits and vegetables, beans and legumes, and whole grains from the renal diet, patients often struggle to consume adequate fiber and other micronutrients that promote heart health. Nutrient deficiencies can include various vitamins such as vitamin C, vitamin D, vitamin B_6, iron, and folate (Kalantar-Zadeh et al., 2015; Khoueiry et al., 2011). Kalantar-Zadeh et al. (2015) also summarized information from nephrologists who found that patients who are less compliant with their dietary prescriptions often lived longer than those who followed the limited diet, leading many to question the purpose of the highly restrictive guidelines and further illustrating the need for future research.

While the renal dietary restrictions may create a barrier to meeting nutritional needs and eating foods for heart health, this diet is also thought to have a biological effect on the body by altering the microbiota. The dietary restrictions for ESRD patients inhibit the gut environment from thriving and benefitting the health of the patient. By restricting food groups such as fresh fruits and vegetables, whole grains, and beans, HD patients often do not consume adequate fiber. Fiber is needed by the gastrointestinal tract to create a healthy environment. Without these essential nutrients in the body, the microbiota begins to adapt in a harmful manner and create further complications (Vaziri et al., 2013). Some research has suggested that the increased risk of

CVD in this population is not only caused by traditional risk factors, but changes within the microbiota of the patient may play a significant role in development of CVD. It is thought that protein-bound uremic toxins like indoxyl sulfate affect the cells of the gastrointestinal tract and lead to vascular inflammation in the body, ultimately developing atherosclerosis (Ito & Yoshida, 2014). This change that leads to CVD could be linked to the lack of fiber, as fiber has been shown to have beneficial effects on decreasing amounts of indoxyl sulfate in the plasma and may reduce p-cresol sulfate as well (Sirich, Plummer, Gardner, Hostetter, & Meyer, 2014).

Lack of Evidence to Support the Current Guidelines

Within the recent years, scholarly reviews have revealed the lack of evidence supporting the efficacy of the current dietary restrictions of the renal diet (Lynch, Lynch, Curhan, & Brunelli, 2011; Noori et al., 2010; St-Jules et al., 2016). Biruete et al. (2016) thoroughly reviewed the available research to consider the rationale behind the common nutrient restrictions: sodium, organic and inorganic phosphorus, and potassium. While the sodium restriction seems to be necessary, the current restrictions on phosphorus and potassium appear to need further research to justify the current guidelines.

Sodium

One study by Rigby (2000) found that patients with very low sodium intakes along with unrestricted fluid intakes had lower IDWG than when they followed their typical diets, which were higher in sodium and included fluid restrictions. Indeed, HD clinics in other countries report significant success in controlling hypertension and IDWG by focusing on sodium rather than fluid (Chazot, 2009; Charra et al., 1999; Clark-Cutaia, Sommers, Anderson, & Townsend, 2016; Kayikcioglu et al., 2009; McMahon et al., 2013). In addition, patients who consume larger amounts of sodium often require more ultrafiltration during their HD treatment, and the high sodium consumption increases their risk of mortality (McCausland, Waikar, & Brunelli, 2012). Chazot (2009) investigated salt intake in HD patients and the significant correlation with fluid intake and IDWG. The researcher also mentioned the utilization of providing "a full low-salt meal (including salt-free bread)" during HD treatments to emphasize the importance of a low-sodium diet and assist the patients in meeting their nutritional goals.

McCausland et al. (2012) noted that patients with higher sodium intake had increased risk of mortality and referenced several other studies examining the benefits of a sodium restriction related to IDWG and hypertension (Kayikcioglu et al., 2009; Ozkahya, et al., 2006; Maduell & Navarro, 2001). Still, a limited number of randomized control trials, such as research by Rodriguez-Telini et al. (2014) and Sevick et al. (2016), have studied the effects of sodium restrictions on HD patients, which indicates the need for additional high-quality research.

By restricting sodium as indicated by the KDOQI guidelines, many convenience and processed foods will then be eliminated from the diet. These foods often include a significant number of phosphorus-containing additives, which can be harmful for this population (Carrigan et al., 2014). After thorough analysis, the sodium restriction of the renal diet seems appropriate and necessary, while the potassium and phosphorus restrictions lack sufficient information. With newer research available and the current concerns associated with the renal diet, it is vital that practitioners continue to stay current on EBP to understand how to properly and effectively treat and educate their patients.

Phosphorus

Given the ubiquitous nature of phosphorus additives in the food supply and their high bioavailability compared to naturally-occurring phosphorus, additives should take precedence in the phosphorus restriction. A cross-sectional study by Sullivan et al. (2009) analyzed the effect of strictly limiting inorganic phosphorus, and the results were positive. The intervention group worked closely with a RDN to nearly eliminate phosphorus additives by learning how to read ingredients lists and nutrition facts labels as well as locate which restaurant foods contained the additive. As a result, serum phosphorus levels after three months were lower in the intervention group, and these patients had a better knowledge of which foods contained inorganic phosphorus.

Differentiating between phosphorus sources can further increase the number and types of foods available to ESRD patients by allowing more whole grains, beans, and legumes. This is supported by Lynch et al.'s (2011) research which indicated that current, strict phosphorus restrictions often correlate with greater mortality. This increase in mortality may be related to the overall restriction of many healthful food options.

Potassium

Noori et al. (2010) and St-Jules et al. (2016) concluded that serum potassium is not significantly correlated with dietary potassium intake in HD patients, indicating that the current strict potassium guidelines could be liberalized to promote a healthier, well-balanced diet. In addition, Gallen et al. (1998) discovered that potassium intake had an inverse relationship with blood pressure, and as indicated previously, this population is already at an increased risk of cardiovascular complications.

In addition to dietary potassium, it is also important to understand potential causes of hyperkalemia in ESRD patients that do not include dietary intakes. Dialysis itself and the composition of the dialysate bath affect serum potassium (Wilkens et al., 2012). Various medications or a deficiency in insulin can cause serum potassium to shift to extracellular space.

Abnormal potassium levels are of eminent concern due to the consequences on muscle, especially that of cardiac tissue (Putcha et al., 2007).

Reviewing the Literature

Currently, the movement in the renal community to consider liberalization of the renal diet can create a better outcome for the patient. The restrictive potassium guidelines eliminate many fruits and vegetables from the diet, which also eliminates many other micronutrients, phytochemicals, and fiber beneficial for overall health. Limiting phosphorus, especially organic phosphorus, eliminates the entire dairy group along with beans, legumes, and whole grains. The sodium restriction, however appears to be very beneficial to prevent fluid overload, decrease hypertension, and other cardiovascular problems commonly associated with ESRD and HD. Overall, new research is suggesting a change of focus in the renal diet from vast restrictions to liberalization of fresh foods, on an individual basis. Moe et al. (2016) summarized a new mindset titled “Good Food First” focusing on fresh, whole foods rather than processed foods. By switching to a less restrictive, fresh food diet and limiting processed foods, this population may have better health outcomes. The switch to whole foods could ultimately decrease sodium and inorganic phosphorus with a concomitant increase in vitamins, minerals, phytochemicals, and fiber. With more varieties in food options, incidences of cardiovascular disease, malnutrition, and other comorbidities may see a decrease in this population.

Although there is evidence for a more liberalized renal diet, dietitians and other practitioners may feel uncomfortable changing the current guidelines, especially if they are unaware of the current trends in the research. This study analyzes renal RDN’s current practices and the likelihood of liberalizing the renal diet to benefit their patients.

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APPENDIX A: ASSESSING PROFESSIONAL PERCEPTIONS OF THE RENAL DIETARY RESTRICTION QUESTIONNAIRE

Are you a Registered Dietitian Nutritionist who works primarily with hemodialysis patients? If so, we invite you to participate in the following survey. The responses from this questionnaire will be used in research to assess professional perceptions of the renal diet. Once this anonymous data is collected the responses will be analyzed to answer multiple research questions. Confidentiality will be maintained by only gathering the necessary demographic information not including personal identifiers such as age or location. Demographics will be analyzed as part of the research. Foreseeable risks are very minimal. Participation is voluntary, and you may remove yourself from this research at any time with no penalty.

If you have any questions or concerns about this questionnaire or research please contact Jennifer Barnes, PhD, RD, LDN at jlbarn2@ilstu.edu or (XXX) XXX-XXXX. Additional questions about your rights as a research participant can be directed to the Research Ethics and Compliance office at rec@ilstu.edu or (309) 438-2529.

These questions are about your daily practice working in a hemodialysis center. When responding to the following questions, please consider how you currently interact with your typical hemodialysis patient. Additional free-response spaces are available if you wish to provide any comments about your answers. This questionnaire will take approximately 10-15 minutes to complete. Thank you for your time and participation.

1. How confident do you feel regarding your ability to find and review evidence-based literature?

Not Confident at All	A Little Confident	Somewhat Confident	Quite Confident	Very Confident
1	2	3	4	5

2. How confident do you feel regarding your ability to apply current research findings to individual cases (i.e. integrate research evidence with personal preferences, concerns, expectations)?

Not Confident at All	A Little Confident	Somewhat Confident	Quite Confident	Very Confident
1	2	3	4	5

What comments do you have about your responses?

3. How often do you recommend that your patients consume whole grain products?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

4. How often do you recommend that your patients consume dairy products?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

5. How often do you differentiate between organic and inorganic phosphorus when educating your patients?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

6. How often do you recommend that your patients consume beans and legumes?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

7. How often do you recommend that patients avoid dietary sources of inorganic phosphorus such as those found in food additives?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

8. How often do you recommend that your patients avoid dietary sources of organic phosphorus such as milk, beans, nuts, and whole grains?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

9. How often do you recommend that your patients avoid high potassium fruits and vegetables, without a history of hyperkalemia?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

10. How often do you recommend that your patients with a history of hyperkalemia avoid high potassium fruits and vegetables?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

11. How often do you discuss the sodium content of processed foods with your patients?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

12. How often do you counsel your patients that their thirst is caused by eating salty foods?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

13. How often do you recommend that your patients ignore thirst to adhere to a fluid restriction?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

14. How often do you recommend that your patients lower sodium intake rather than rather than strictly limiting fluids?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

15. How often do you recommend that your patients strictly limit fluids rather than lowering sodium intake?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

16. How often do you to recommend whole foods rather than processed foods in order to reduce sodium and/or inorganic phosphorus additives?

Never	Rarely	Sometimes	Very Often	Always
1	2	3	4	5

<u>What comments do you have about your responses?</u>

17. How likely are you to instruct patients that it is acceptable to relax or "liberalize" the standard dietary restrictions on fresh fruits and vegetables?

Extremely Unlikely	Unlikely	Neutral	Likely	Extremely Likely
1	2	3	4	5

18. How likely are you to instruct patients that it is acceptable to relax or "liberalize" the standard dietary restrictions on beans and legumes?

Extremely Unlikely	Unlikely	Neutral	Likely	Extremely Likely
1	2	3	4	5

19. How likely are you to instruct patients that it is acceptable to relax or "liberalize" the standard dietary restrictions on whole grain products?

Extremely Unlikely	Unlikely	Neutral	Likely	Extremely Likely
1	2	3	4	5

<u>What comments do you have about your responses?</u>

20. How strongly do you agree or disagree with the statement: "Organic phosphorus consumption is acceptable when considering the favorable micronutrient and fiber profile of these foods and the relatively low bioavailability of organic phosphorus."

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

21. How strongly do you agree or disagree with the statement: "I feel comfortable liberalizing the phosphorus restriction of the renal diet to include more whole grains, beans, legumes, and nuts to increase fiber, micronutrient, and antioxidant intake."

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

22. How strongly do you agree or disagree with the statement: "I feel comfortable liberalizing the potassium restriction of the renal diet to include more fruits, vegetables, whole grains, beans, and legumes to increase fiber, micronutrient, and antioxidant intake."

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

23. Prior to this questionnaire, how familiar were you with current trends in the literature suggesting liberalizing of the renal diet?

Not at All Familiar	Slightly Familiar	Moderately Familiar	Very Familiar	Extremely Familiar
1	2	3	4	5

<u>What comments do you have about your responses?</u>

Demographics

24. What is your age? _________

25. With what gender do you identify?

    Male Female Other Prefer to not answer

26. With what ethnicity do you identify?
    a. Caucasian
    b. Hispanic or Latino
    c. African American
    d. Native American or American Indian
    e. Asian/Pacific Islander
    f. Other _____________

27. What year did you earn your undergraduate degree? ____________

28. What is your highest degree obtained?

    a. Bachelors
    b. Graduate

c. Masters – Thesis
d. Masters – Non-Thesis
e. Doctorate, PhD
f. Other: ____________

29. How long have you been practicing as a dietitian-nutritionist (in years)? ________

30. How long have you been working as a dietitian-nutritionist with renal patients (in years)?

31. In which area have you mainly worked in the past year?

a. Outpatient Family Practice
b. Inpatient/Acute Care
c. Outpatient Dialysis Center
d. Community-Based Agency
e. Other: ________________________

APPENDIX B: TABLES

Table B-1

Demographic Data

	n (total =187)	%
Gender		
Male	5	2.7
Female	162	86.6
Did not Answer	20	10.7
Ethnicity		
Caucasian	155	82.9
Hispanic or Latino	5	2.7
African American	2	1.1
Native American or American Indian	0	0
Asian/Pacific Islander	3	1.6
Other	1	0.5
Missing	21	11.2
Highest Degree Obtained		
Bachelors	73	39.0
Graduate/Masters	91	48.6
Doctorate	6	2.7
Missing	18	9.6
Main Area of Practice		
Outpatient Family	1	0.5
Inpatient/Acute Care	10	5.3
Outpatient Dialysis Center	139	74.3
Community-Based Agency	1	0.5
Other	17	9.1
Missing	19	10.2

	Mean (± SD)
Age	50.56 (±13.361)
Years as RDN	24.44 (±13.208)
Years in Renal Practice	14.72 (±11.198)

Table B-2

Evidence-Based Practice Responses

	Likert Scale Rating						
	Not confident at all	A little confident	Somewhat confident	Quite confident	Very confident	Mean	SD
Confidence finding/reviewing EB literature (n=185)	0.5%	2.7%	23.2%	43.8%	29.7%	3.99	.83
Confidence applying current research to individual cases (n=186)	0%	4.8%	24.2%	43.5%	27.4%	3.94	.84
	Not at all familiar	Slightly familiar	Moderately familiar	Very familiar	Extremely familiar		
Familiarity with current trends suggesting liberalizing the renal diet (n=187)	5.8%	9.9%	29.7%	33.7%	20.9%	3.54	1.11

Table B-3

Current Practices Responses

	Likert Scale Rating						
	Never	Rarely	Sometimes	Often	Always	Mean	SD
Recommend whole grain products (n=183)	2.7%	13.1%	45.4%	30.1%	8.7%	3.29	.90
Recommend dairy products (n=180)	2.8	24.4	51.1	16.1	5.6	2.97	.86
Differentiate between organic and inorganic P (n=181)	4.4	6.1	16.6	34.3	38.7	3.97	1.10
Recommend beans and legumes (n=182)	2.7	17.0	56.6	21.4	2.2	3.03	.77
Recommend avoiding inorganic P (n=183)	1.1	1.6	6.6	33.3	57.4	4.44	.78
Recommend avoiding organic P (n=1840	3.8	16.8	56.5	19.6	3.3	3.02	.81
Recommend avoiding high K+ fruit and vegetables without history of hyperkalemia (n=180)	6.1	22.8	46.1	20.0	5.0	2.95	.94
Recommend avoiding high K+ fruit and vegetables with history of hyperkalemia (n=180)	0	1.1	13.9	42.8	42.2	4.26	.74
Discuss sodium content of processed foods (n=180)	0	0.6	9.4	48.9	41.1	4.31	.66
Discuss that thirst is caused by eating salty foods (n=177)	0	0	15.8	50.5	33.3	4.18	.68
Recommend ignoring thirst to adhere to fluid restriction (n=180)	18.9	31.1	35.6	13.9	0.6	2.46	.97
Recommend lowering Na+ intake rather than strictly limiting fluids (n=178)	1.1	12.4	29.8	36.5	20.2	3.62	.98
Recommend strictly limiting fluids rather than lowering Na+ intake (n=177)	23.2	41.8	26.6	8.5	0	2.20	.89
Recommend whole foods rather than processed foods to reduce Na+ and/or inorganic P additives (n=179)	0.6	1.1	7.8	51.4	39.1	4.27	.70

Table B-4

Views of Liberalizing Renal Diet Responses

	Likert Scale Rating						
	Extremely Unlikely	Unlikely	Neutral	Likely	Extremely Likely	Mean	SD
Instruct patients that it is acceptable to "liberalize" standard restrictions on fresh fruits and vegetables (n=176)	0%	13.6%	33.0%	38.1%	15.3%	3.55	.91
"Liberalize" standard restrictions on beans and legumes (n=176)	0	13.1	28.4	44.9	13.6	3.59	.88
"Liberalize" standard dietary restrictions on whole grain products (n=176)	1.1	10.2	22.7	46.0	19.9	3.73	.93
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
"Organic P consumption is acceptable when considering the favorable micronutrient and fiber profile of these foods and the relatively low bioavailability of organic P." (n=173)	1.2%	2.3%	15.0%	53.2%	28.3%	4.05	.79
"I feel comfortable liberalizing the P restriction of the renal diet to include more whole grains, beans, legumes, and nuts to increase fiber, micronutrient, an antioxidant intake." (n=173)	0.6	9.8	19.1	48.6	22.0	3.82	.91
"I feel comfortable liberalizing the K+ restriction of the renal diet to include more fruits, vegetables, whole grains, beans, and legumes to increase fiber, micronutrient, and antioxidant intake." (n=173)	2.3	19.1	33.5	36.4	8.7	3.30	.95