THE EFFECT OF BEHAVIORAL CONTRACTING ON ILLNESS INTRUSIVENESS, SELF-EFFICACY, AND DIETARY ADHERENCE IN CHRONIC DIALYSIS PATIENTS

By

LESLEY KATHRYN RAMSEY

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Iowa State University Of

Science and Technology

Ames, Iowa

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Thesis Approved:

Kathryn S. Kemp
Thesis Advisor

Gail Gates

Lee L. Zbro

Alfred Larkin
Dean of Graduate College

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CHAPTER I

INTRODUCTION

Patients with end stage renal disease who are on hemodialysis must follow a strict regimen including dialysis schedule, medication, a special diet, and fluid restriction. These regimen conditions, especially the diet, require a significant lifestyle change for the patient. Between 20 to 78% of hemodialysis patients are non-adherent with their diet and fluid restriction because of this alteration in their long-standing personal habits (1). Non-adherence to the diet was the direct cause of death in 4% of hemodialysis patients, with 80% of the dialysis patients who died not following their renal diet (2). Patients who make the appropriate lifestyle changes necessary for the adjustment to hemodialysis, may improve their health and quality of life while on dialysis.

The dietary restrictions while receiving hemodialysis are very demanding, leading to a high rate of non-adherence (3). Patients with end stage renal disease must limit and control their intake of fluid and other elements of their diet such as protein, potassium, and phosphorus (4). These nutrients are found in many foods that are a regular part of the diet.

Inability to follow all regimen requirements is common among people living with chronic diseases (5). Adherence with dietary, fluid, and medication guidelines was an important factor in the continued health and well-being of the patient undergoing

chronic hemodialysis (6). Adherence with dietary restrictions, however was the most difficult part of the entire medical regimen because it affected long-standing personal habits and lifestyle. Patient non-adherence remained a very significant threat to the value of recommended and prescribed treatments. Research has shown a few methods to increase dietary adherence among the hemodialysis population (2,7).

Few educational tools and counseling methods have been studied when conducting dietary counseling with the end stage renal disease (ESRD) population. Lewis et al. (7) developed a Spice of Life program that was implemented at one outpatient hemodialysis center to facilitate the acceptance of the required renal dietary sodium restriction. Hegel et al. (2) used a reinforcement-based intervention which consisted of incentives to follow the renal diet (e.g. lottery tickets, private television and videotapes during dialysis). The Spice of Life program and reinforcement based intervention were successful in dialysis patients (2, 7).

Illness intrusiveness and self-efficacy are psychosocial concepts hypothesized to have an effect on adherence to medical regimens among persons with chronic diseases (8, 9). Few research studies have been conducted investigating these psychosocial theories among the ESRD population.

Behavioral contracts have been used in a wide variety of disease states in order to increase adherence with a variety of behaviors (10, 11, 12, 13). A few behavioral contracts have been used with the hemodialysis population, however the effect of behavioral contracting among dialysis patients has remained unconclusive (5, 14).

Purpose and Objectives

The purpose of this study was to determine if behavioral contracting was an effective method to use when counseling hemodialysis patients to improve dietary adherence. The following objectives were formulated for this study:

1. To determine if behavioral contracting improves dietary adherence of hemodialysis patients.
2. To determine if behavioral contracting increases self-efficacy of hemodialysis patients to follow the renal meal plan and take phosphorus binders.
3. To determine if behavioral contracting will decrease illness intrusiveness of hemodialysis patients.

Assumptions

The following assumptions were made:

1. It was assumed that the subjects completed all survey forms honestly.
2. It was assumed that the subjects in the control group did not alter their eating habits during the study.
3. It was assumed that the subjects completely reported daily food intake and these records reflected their actual daily intake.

CHAPTER II

REVIEW OF THE LITERATURE

The Renal Diet as Part of the Hemodialysis Regime

The kidneys clear waste products from the blood. When the kidneys are not working properly, these waste products build up in the blood. Dialysis is administered to patients in order to rid the body of these waste products. These waste products are derived from food consumed in the diet and metabolic processes. Several dietary restrictions need to be applied in order to prevent an excessive accumulation of waste products in the blood between dialysis treatments. Blood potassium and phosphorus are two main blood parameters monitored in dialysis patients. Fluid weight gain is monitored due to a decrease in urine output resulting from declined kidney function. Protein nutritional status is monitored in the dialysis patient as protein waste products can accumulate and the patient loses protein with each dialysis treatment.

The main source of potassium in the diet comes from fruits and vegetables (4). Dialysis patients need to limit the intake of potassium to avoid a myocardial infarction. The fruits and vegetables are divided into categories of low, medium, and high potassium content. Many common fruits and vegetables, such as potatoes, tomatoes, bananas, and

oranges fall into the high potassium list and must be limited to very small amounts in the patient's diet. Potassium is controlled because it can lead to hyperkalemia, causing cessation of the heart in the renal patient. The recommended potassium intake ranges from 50-80 milliequivalents (2500-3000mg) per day (4). The amount of potassium a person can tolerate depends on individual residual kidney function, body size, presence of anabolism, catabolism, infection, and potassium content of the dialysate.

The main source of phosphorus in the diet is found in dairy products (4). The dietary restriction for phosphorus requires the renal patient to limit their consumption of dairy products to one serving per day. Patients are instructed to keep the dietary phosphorus intake to 1000 to 1200 milligrams per day (4). Phosphorus can cause bone disease if a patient remains non-adherent to the dietary restriction. This restriction is vital because of the increased level of high-phosphorus meats the patient must consume to maintain an adequate protein intake and keep their albumin level within a normal range. Phosphorus retention, resulting in hyperphosphatemia, plays a major role in the development of secondary hyperparathyroidism and renal osteodystrophy. In addition to phosphorus dietary restrictions, patients need to consume phosphorus binders with every meal to help keep blood phosphorus levels within acceptable range. The phosphorus binder binds to phosphorus in foods consumed, preventing absorption of phosphorus into the body.

The protein requirement of a patient undergoing chronic hemodialysis is greater than the Recommended Dietary Allowance because some amino acids and peptides are removed during dialysis (4). The National Kidney Foundation recommended a protein intake of 1.2-1.4 grams/kilogram ideal body weight, depending on the patient's

nutritional status. Good sources of high biological value protein come from animal products. Most dialysis patients consume chicken, eggs, fish, turkey, and red meat in order to meet their protein requirement.

Most dialysis patients become oliguric or anuric after beginning dialysis treatments. As urine output decreases, fluid is retained in the body. This fluid retention can lead to congestive heart failure, edema, and elevated blood pressure. Therefore, a fluid restriction must be given to the patient to avoid fluid overload. A typical fluid restriction falls between 1000 to 1500 milliliters per day, or four to six cups of fluid per day based on the patient's urine output (4). The fluid restriction is determined by adding urine output to one liter, resulting in the total fluid allowance for the day.

Factors Influencing Adherence

Adherence with dietary, fluid, and medication guidelines is a significant factor in the continued health and well-being of the patient undergoing hemodialysis (6). Adherence is defined as the extent to which an individual chooses behavior that coincides with a clinical prescription. The lifestyle of hemodialysis patients is severely altered by the treatment regimens of kidney failure. Adherence with the dietary restriction is probably the most difficult part of the whole medical regimen because it affects long-standing personal habits and alters lifestyle much more than taking pills. To obtain adherence there must be: 1) motivation; 2) individualization; 3) presentation of the diet by qualified and motivated people; and 4) suitable forms (ex. weekly menus). Several factors have been found to influence a patient's level of dietary adherence, such as

psychological stress, economics, social situations, demographics, and personal characteristics (6).

Food and fluid limitations create considerable psychological stress, as well as detracting from the quality of life (6). Wright et al. (15) defined three categories of psychosocial stress experienced by ESRD patients. The first stress was due to the real or threatened decrease in economic status, possibly due to a lost job (6, 15). Also connected to the economic status was the accumulating medical expenses with dialysis and the loss of social roles (15). The second category of stress the patient experienced as a result of hemodialysis included physical injury, pain, loss of urinary function, sexual dysfunction, and the lack of acceptance of the dialysis shunt (15). The last stress has to do with the frustration of drives. The frustration of drives can be explained by the restrictions that are placed on the diet, medicine, and increased dependency on the medical staff and family (15). Nilofer et al. (1) concluded that depression was also a psychosocial factor contributing to non-adherence. Patients feel blocked in their desire to deal with emotional consequences of their role in the dialysis process (15). Devins et al. (16) found that physical, demographic, and psychosocial variables contributed to the prediction of survival in ESRD. King (17) concluded psychosocial factors associated with non-adherence among the elderly involved social isolation, home environment, lack of transportation, limited income, illiteracy, mental status, and family dynamics.

Several patient characteristics can influence dietary and medical treatment adherence. Eddins (18) identified certain patient characteristics that tended to increase dietary and medication adherence among dialysis patients. These characteristics included acceptance of the illness, no placement of blame was put on others, and the

acceptance of the responsibility of care (18). Non-adherent patients viewed their illness as an enemy or burden that rendered them defenseless (18). Non-adherent patients experienced negative feelings predictive of non-adherent tendencies with diet and medication recommendations (18). Non-adherent patients displayed a stronger tendency than adherent patients to affirm their positive self attributes or accomplishments (1). Non-adherent patients use "defensive distortion" or blaming the illness, medical staff, or lifestyle changes for their non-adherence to the dietary and medication regimen (1). A patient's gender and role in their health care also played a role in their level of adherence. A study by Nilofer et al. (1) found that predictors of non-adherence to diet and fluid regimens include: male gender, and not feeling responsible for one's own well-being.

One factor that consistently predicts adherence is locus of control (19). Locus of control refers to the degree to which individuals perceive events in their lives as being consequences of their own actions. Patients with an internal locus of control believe their actions have causal relationships which produce consequences. While patients with an external locus of control relate events to external forces such as fate and chance. Dialysis patients with an internal locus of control have been found to comply more with their medical regimen.

Age as an influence on adherence

King (17) and Lewis et al. (7) discovered factors that affected the degree of dietary adherence among elderly hemodialysis patients. The elderly patients experienced events that occur with the aging process such as vision and hearing loss, decrease in mental activity, and loss of manual dexterity (7,17). These events tended to decrease the elder's level of adherence, despite their knowledge of dietary restrictions (7). Social isolation increased with age due to death of friends, family, and significant others causing a tendency to be nonadherent (17).

Nilofer et al. (1) also found that being older decreased the level of dietary adherence among ESRD patients. Teal et al. (20) found that an increase in age was a predictor of non-adherence as measured by serum potassium and albumin. Lack of patient education has also been directly associated with non-adherence in the elderly population (7).

Devins et al. (16) found that longer survival times were associated with patients who had fewer serious comorbid non-renal illnesses (diabetes, hypertension, pulmonary diseases), were younger, engaged in a higher number of leisure activities on a regular basis, and experienced an even mixture of happiness and unhappiness (16).

Demographic factors as an influence on adherence

Several demographic factors have been shown to influence dietary adherence in the ESRD population. Several studies found that patients who were married were more dietary adherent than single patients (1, 5, 6, 16). O'Brien (21) also found that married patients tended to adhere to the diet, while single patients had higher levels of non-adherence (21). In contrast, patients who had never been married before demonstrated the lowest levels of dietary adherence (21).

Less education has also been found to be a predictor of nonadherence (1, 5, 6, 7, 22). Patients who received more education in school tended to have higher levels of dietary adherence. The most compliant patients tended to be skilled professionals with a high level of self-concept (6, 7).

Dialysis patients with a lower socio-economic status were frequently found to be non-adherent (6, 7). Wichowski and Kubsch (22) found that an inability to afford treatment and limited access to treatment resulted in a higher level of dietary non-adherence.

Patient education regarding the dietary restrictions for hemodialysis may not be associated with dietary adherence. Hoover (6) found that a patient's level of knowledge regarding dietary and fluid regimens was not significantly associated with adherence.

Family dynamics and social support have been shown to have an effect on adherence in ESRD patients. O'Brien (21) found that the type of household had some effect on the level of adherence among dialysis patients. Persons living with other adults

and children were more adherent to the renal diet, while those living alone were least adherent to the diet (21). Caregiver and family support also contributed to higher levels of adherence (21). Wichowski and Kubsch (22) identified lack of family support as a contributor to dietary non-adherence. Pijls et al. (23) found that patients with type 2 diabetes who lived alone tended to have a higher rate of dietary adherence to a lower protein intake of 0.8 grams per kilogram ideal body weight than the patients who lived with other people.

Measuring Adherence

Adherence to the treatment regimen in hemodialysis patients is most often measured by monitoring blood levels of urea nitrogen (BUN), potassium, phosphorus, and by observing the amount of weight gained between dialysis treatments or interdialytic weight gain, and assessing food intake (5, 20). Adherence or non-adherence to the dietary and fluid regimen can be difficult to determine. For example, a patient's blood potassium level can increase with infection or muscle breakdown. In addition, if the patient consumes too much potassium in their diet, their blood potassium level will rise. The blood potassium level could also decrease due to no muscle wasting and lower potassium in the diet. Gentile et al. (24) suggested biochemical data can evaluate both nutritional status and dietary adherence. Gentile et al. (24) suggested anthropometric data, biochemical data, and diet records be integrated into the adherence process.

Gentile et al. (24) published an article that analyzed the available instruments for measuring dietary adherence in ESRD patients. Biochemical data can serve to evaluate

both nutritional status and compliance. Biochemical tests are available to measure potassium, phosphorus, and albumin levels. Diet history can be used to evaluate the dietary habits of patients. A diet history can uncover food choices which have an effect on a patient's level of dietary compliance (24). Adherence to a diet was not a simple task, and required a lifestyle change.

Blood potassium was used as an adherence indicator because it represented both dietary protein, fruits, vegetables, and high potassium desserts. Dietary potassium was not the only factor that could cause the potassium level to rise. Some other contributing factors leading to increased blood potassium were muscle wasting and infection. Blood potassium has been used in multiple studies as an indicator of potassium adherence in the diet (19, 25, 26, 27). Brown and Fitzpatrick (19) used blood potassium levels to assess potassium intake and adherence points were assigned to subjects based on their blood potassium level. Blackburn (25) used blood potassium to determine potassium dietary adherence among hemodialysis patients. Blackburn (25) defined a patient to be adherent with dietary potassium restrictions when their blood potassium was 3.5 to 5.0 millequivalents per liter. Research by Kobrin et al. (26) involved obtaining a monthly serum potassium level to determine dietary adherence levels among hemodialysis patients.

Patients are instructed to consume one dairy product per day, keeping the dietary phosphorus intake at 1000 to 1200 milligrams per day (4). Studies defined subjects as being dietary phosphorus adherent when blood phosphorus was 3.5 to 5.0 milligrams per 100 milliliters (21), less than 8.0 milligrams per deciliter (27), and less than 5.9 milligrams per deciliter (5). Blackburn (25) and Kobrin et al. (26) included

blood phosphorus as an indicator of dietary phosphorus consumption. Shoenfeld et al. (27) also determined patients' phosphorus adherence by using the laboratory parameters for phosphorus of less than 8 milligrams per deciliter derived from the National Cooperative Dialysis Study (NCDS) (27).

Dietary protein is essential to maintain adequate nutritional status. Dialysis patients need to consume more protein than the average person due to the protein lost from the dialysis treatments. Compher (28) defined adequate nutritional status when albumin levels were 3.1 to 4.2 milligrams per deciliter. Compher (28) used serum albumin and body weight as part of their regimen to assess the nutritional status in chronic renal failure patients. The study used the laboratory parameters for albumin, 3.5 to 5.5 grams per deciliter, derived from the National Cooperative Dialysis Study (NCDS) (27).

Interdialytic weight gain has been used as an indicator of fluid adherence in studies (26). Interdialytic weight gain was calculated by figuring the difference between the predialysis weight and post dialysis weight from the previous treatment (26). Excessive fluid weight gain in between dialysis treatments placed a patient at greater risk for cardiac stress, edema, and pulmonary complications (26). If the patient exceeded the dietary sodium restriction, the level of thirst increased (26). Most of the fluid consumed to quench thirst was retained within the hemodialysis patient due to an inability to produce urine, reflecting in an increased interdialytic weight gain (26). Studies have defined fluid adherence as when the following interdialytic weight gains were measured: 4 pounds per day (27), or less than 6.6 pounds per treatment on weekdays and less than 8.8 pounds per treatment over the weekend (5). Blackburn and Kobrin (26) calculated

interdialytic weight gain to determine fluid and sodium adherence. Schoenfeld et al. (27) used an interdialytic weight of less than or equal to 3.5 kilograms between treatments as derived from the National Cooperative Dialysis Study (NCDS).

Dietary assessment is a necessary part of evaluating a patient's nutrient intake and is also used for assessing adherence to the renal diet (1). Dietary assessment measures the quantity and quality of food consumed over a period of time. The accuracy of dietary assessment instruments to measure changes in dietary behavior of the patient population under study should be considered in nutrition-intervention research (29). There are two types of dietary records: the food record a patient completes and the food record filled in by an experienced interviewer (31). A diet record kept by a patient does not have good reliability because it can be difficult to quantify one's dietary intake (23, 29, 32). Food records that cover more than three days might not be as reliable due to the problem of a fading memory with recall(31). A questionnaire filled in by an experienced interviewer proved to be more reliable, but needed a registered dietitian or nurse to administer it (32). The twenty-four hour recall can be quick and easy to administer, but does not record typical intake due to daily variations in intake (32). Food models, pictures, and analogies can help patients quantify serving sizes, increasing the validity of the twenty-four hour diet recall (32). An analogy compares a food portion to an everyday object. For example, comparing a three ounce serving of meat to the size of a deck of cards.

The food frequency questionnaire (FFQ) consists of a list of food items for which average frequency of consumption was determined by the subject in reference to a specified time (33, 34, 35, 36, 37). Information on serving size as well as frequency of consumption allowed for estimations of nutrient intake (33). FFQ can be used to

determine habitual intake and therefore was especially effective in studies relating to diet and chronic diseases (37). The FFQ appeared imprecise for estimating absolute nutrient intakes but useful for identifying extremes of intake and monitoring trends in dietary patterns over time (33). Although FFQ's have a tendency to overestimate intake, their strength was in their high reproducibility (33, 36).

Counseling Methods and Tools

Lewis et al. (7) developed a program titled "Spice of Life: A Strategy to Enhance Dietary Compliance". This program consisted of a pamphlet describing herbs and spices and how to use them in cooking to enhance the flavor of food. The packets of spices and herbs mentioned in the pamphlet were given to the patients to use in cooking. Eighty-two percent of the 35 patients reported the pamphlet was helpful and the use of the spices made the diet more palatable 75% or more of the time. This program encouraged experimentation with seasonings and afforded the patients an opportunity to determine their flavor preferences without the costly purchase of any undesired spices.

Hegel et al. (2) used a reinforcement-based intervention which consisted of incentives to follow the renal diet and treatment regimen. Four chronic fluid overloaders who gained more than 2 kilograms per 24 hours were selected to participate in the study. If a patient succeeded in achieving an interdialytic weight gain of less than 2 kilograms per 24 hours, they received a reward. The rewards included lottery tickets, private television, and private videotapes. The rewards were provided to the patient during the dialysis treatment. The rewards were ranked by preference, the patient who met the most

stringent fluid weight gain, received the most preferred reward. Subjects signed a behavioral contract stating they would meet the minimum weight gain criteria. The patient received the preferred incentive if they met their individualized 24 hour interdialytic weight gain goal. The results of this study indicated that the incentives helped to promote well-maintained and stable improvements in decreasing interdialytic weight gain, but were not significant ($p < .02$).

Behavioral contracting as a counseling method

Kirschenbaum and Flanary (11) define a behavioral contract as an explicit agreement specifying expectations, plans, and/or contingencies for the behavior(s) to be changed. Epstein and Wing (12) define the behavioral contract as a written agreement specifying operationally defined behaviors and contingencies designed to promote behavior change.

The four central elements of a behavioral contract include: 1) the form of the contract; 2) contract participants; 3) target behaviors; and 4) consequences (11, 12). The form of the contract depends on whether or not the agreement is written or verbal, negotiated or non-negotiated, individualized or standard, public or private (11). A negotiated contract implies that the participant involved in the contract may alter the contract, such as the target behaviors or performance expectations defined in the contract. An individualized contract is used when the contract is tailored to meet the specific needs of the participant. When the conditions of a behavioral contract are only known to the

participant, the contract is considered to be private (11). The contract participants are the individuals to whom the contract applies. The target behaviors are the behaviors to be changed. The target behavior may include changing eating and drinking habits to alter the outcome of laboratory values and interdialytic weight gain, and this type of behavior change is defined as a process goal. After the target behaviors have been defined, the consequences must be decided if the target behavior was not achieved. Positive reinforcement and negative reinforcement are most commonly used in the behavioral literature as consequences to a behavioral contract (11). Some examples of positive reinforcement found in the literature include money, lottery tickets, verbal praise, and coupons (5, 10, 11, 12, 28, 29, 30, 31, 32, 37). A patient experienced negative reinforcement if the elements of positive reinforcement were not applied. For example, the patient would not receive any praise from the dialysis staff (5).

Behavioral contracts have been used to facilitate behavioral changes in a wide variety of health behaviors (11). Behavioral contracts have also been used in several other areas of the health care field. The growing popularity of the behavioral contracts may be due to the fact that contracts contain many factors that are suited to promoting behavioral change. The development of a behavioral contract defines the treatment elements and target responses so it is possible to determine if the contract outcome was met.

Many case studies have shown behavioral contracts to be useful in the attainment of medical or dietary regimen (12, 13, 14, 38, 39, 40, 41). Several studies have linked behavioral contracts with the ability to lose weight (11, 41, 42, 43, 44). A contingency contract defines a reward or reinforcer that will be received by the individual or group if

the outcome defined in the contract was reached (12). Contingency contracts have been used to produce changes in eating habits or weight (12).

Several researchers successfully aided clients in losing weight using behavioral contracts (12, 45). Jeffrey et al. (45) treated four subjects with behavioral contracts which promoted weight loss. The client specified the magnitude of money to be deposited, their goal weight, and the amount of weight to be lost each week. Subjects lost an average of 27 pounds in 24 weeks, but only two maintained the weight loss at the six month follow-up (45).

Monti et al. (46) illustrated the use of a contingency contract in the treatment of a patient with bulemia and anorexia nervosa. The contract produced a period of weight stabilization and calorie intake of 1800 to 2300 calories per day over a six month period, with only six violations of the contract during this time.

A between group design using an experimental and control group was used by Harris and Hallbauer (47) that compared contracting and self-control procedures for changing eating habits to promote weight loss. The subjects were divided into three groups, eating behavior contract group, exercise and eating behavior contract group, and a control group. Contracting subjects determined the amount of weight to be lost in return for money. The money was deposited into each subject's account in return for every pound lost. After twelve weeks, subjects in all three groups lost approximately the same weight, but the subjects in the two contracting groups lost significantly more weight than subjects in the control group at the seven month follow-up.

Schlenk and Boehm (30) used contingency contracting persons with type 2 diabetes to promote positive behavior changes in their health care regimen. The behavior

changes included: food intake, exercise, blood glucose monitoring, medication taking, appointment keeping, smoking cessation, and self-reinforcement. Subjects self-reported that they successfully performed 90.9% of all the above mentioned behaviors in the contingency contracts. Patients were educated regarding their diabetic diet by a registered dietitian and were supposed to participate in a specified amount of exercise every week. Almost 60% of the subjects successfully followed the diet and exercise behaviors.

Koch et al. (48) examined the use of behavioral contracting to improve medication adherence in patients with thalassemia. An individual contract was drawn up and signed by each patient. The contract defined the number of empty desferrioxamine vials patients would return to the activity room to count towards fufillment of the contract. Each time the patient returned with the pledged number of vials, a reward was given and a new contract was made. The new contract challenged the patient to maintain or increase the number of vials for the next two week period in between visits. Patients who returned fewer vials than contracted, were not rewarded and encouraged to set a more realistic goal for the next contract period. Twenty-three patients in the clinic contracted and increased the use of their medication by an average of 1.23 days per week. Four patients out of the contracting group that used the behavioral contract did not increase the use of their medicine but maintained themselves at their initial adherence level.

Behavioral contracting has also been tested as a method for promoting cardiovascular health behaviors in families (49). The families involved in the study contracted to change their eating behaviors. Parents in the contract group decreased their

blood pressure and body weight but not significantly more than the control group. Alterations in blood pressure and the ponderex index of their children did not significantly change. Blood pressure decreased by an average of 10 mm Hg and no increase in weight was observed in the children.

Stark et al. (50) wrote a case study conducting a behavioral contract with a cystic fibrosis patient in order to increase adherence with the chest physiotherapy treatments. The patient was not completing the three chest physiotherapy treatments per day as the doctor had prescribed. The patient and her mother signed a nine week behavioral contract agreeing to a reward of skating or a movie if the patient completed three treatments per day. As a result of the contract, the patient increased and maintained the three physiotherapy treatments per day during the contract period. In addition, the patient was still maintaining the treatment schedule after the contract period was terminated at the nine week follow-up.

Solanto et al. (51) looked at using behavioral contracts with patients with anorexia nervosa. The behavioral contracts were signed by the patient upon admission and specified an amount of weight to be gained by the patient within the first four days. The patient would gain more ward privileges if the weight was gained. The two contracts differed only in the weight gain criterion of either 0.8 pounds in four days with contract 1 and 1.2 pounds in four days with contract 2. Patients that received contract 2 (1.2 lbs) gained more weight than those receiving contract 1 (0.8 lbs) over the four days.

Research involving the use of behavioral contracting in chronic hemodialysis patients is lacking. Keane et al. (52) reported two case studies involving behavioral contracts with two dialysis patients in order to improve their dietary adherence. Each

patient received different contingency contracts to improve the degree of adherence to their respective dietary restrictions. Subject one had a history of not restricting fluid intake between dialysis sessions. The criteria of adherence for this patient was set at an interdialytic weight gain of 2.5 kilograms for Monday sessions and 1.5 kilograms for Wednesday and Friday sessions. A behavioral treatment program consisted of 1) staff praise and social interaction reward when the criteria was met, 2) the patient graphing interdialytic weight gains, and 3) a behavioral contract between the patient and the nurse. Subject two had a history of uncontrolled interdialytic weight gains. The weight gain for the criteria of adherence was set at a 3 kilogram weight gain for Wednesday and Friday sessions and 3.5 kilograms weight gain for the Monday session. Through interviews with the patient the dialysis staff learned that meals would be a powerful reinforcer for the fluid gain in this patient. The dialysis staff offered the patient preferred foods in the dialysis center in return for restricting fluid intake and meeting interdialytic weight goals. Failure to meet the criteria resulted in the staff offering a breakfast that did not contain the foods the patient desired. Behavioral contracting between the dialysis patient and the staff of the treatment unit effectively reduced interdialytic weight gain by an average of .75 kg for the two dialysis patients.

Tanner et al. (5) used behavioral contracts in ESRD patients to determine the effect on self-efficacy and adherence to phosphorus and fluid restrictions in the diet. A monthly written contract was used by the investigator to assist the patients in developing one or two monthly goals to improve their fluid and blood phosphorus levels by restricting fluid intake and phosphorus, respectively. Patients received positive social reinforcement from the dietitian and staff if they met their contract goal. The benefits of

using a behavioral contract as a means of increasing self-efficacy in this population were inconclusive. No significant differences between the control and experimental group were found. The behavioral contracts had little effect on patient self-efficacy and health beliefs.

Illness intrusiveness

End stage renal disease and its treatment by dialysis is believed to introduce significant psychosocial issues and adaptive demands for the patient. One of these psychosocial issues is the concept of illness intrusiveness. Illness intrusiveness relates to the degree to which an illness and its treatment may interfere with important facets of a person's life (8). Increased patient involvement in self-care has been encouraged because it is believed that patient participation may reduce the negative emotional impact of end stage renal disease by restoring a sense of control to the patient, thereby, reducing stress (53). Patient involvement in their care is proposed to increase their perception of control over their illness, health, and over other life dimensions. In this way, increased patient participation in treatment is believed to promote positive psychosocial adjustment and contribute to the individual's subjective well-being and quality of life. Intrusiveness derives from illness-produced disruptions. Common stressors to all ESRD patients include the constant threat of death, reduced life expectancy, dependencies on medical machinery and personnel, and decreased physical strength and stamina. A variety of illness variables have been hypothesized to contribute to illness intrusiveness.

Disruptions may be introduced as a result of the illness, which interrupts the ongoing involvement of activities and interests that are important to the patient. Some of the disruptions in end stage renal disease are diet, fluid restrictions, medicine, dialysis treatments, and sensory deficits (53).

Illness intrusiveness is measured by the "Illness Intrusiveness Rating Scale" developed by Gerald Devins (54). This scale was developed to measure illness-induced interference with lifestyle, activities, and interests. When the scale was applied to end stage renal disease patients, this self-reporting questionnaire obtained ratings of the extent to which the illness and its treatment "interfere" with each of thirteen life domains, related to quality of life. Another study measured illness intrusiveness scores over eight life domains, such as family life, work, recreation, etc. (55).

Several research studies were conducted to understand the role illness intrusiveness (II) plays in ESRD. One study examined 101 ESRD patients to test the hypothesis that the psychosocial impact of restless sleep was mediated in chronic illness by illness intrusiveness (56). Results indicated that individuals who had restless sleep reported a significantly higher level of illness intrusiveness (II score = 43.8) versus those subjects who had good sleep (II score = 32.5) (56).

Quality of life studies investigated the hypothesis that patients who have previously experienced the failure of a transplanted kidney are characterized by lower levels of quality of life than patients that have not experienced a failed transplant (55, 57, 60, 61). The first study measured illness intrusiveness in terms of pain by using the McGill Pain Questionnaire (57). The second study expanded the illness intrusiveness survey to measure eight life domains (55). The eight life domains included health, diet,

work, active recreation, passive recreation, financial situation, spousal relationship, and sex life (55). Higher levels of perceived illness intrusiveness were found in these studies but did not reach a level of statistical significance (57, 60, 61).

A study by Devins et al. (58) compared the level of perceived illness intrusiveness among ESRD patients who were on hemodialysis, continuous ambulatory peritoneal dialysis, or were a kidney transplant recipient. Post transplant patients' reported perceived illness intrusiveness (II) scores (24.4) that were significantly lower ($p < .01$) than the hemodialysis patients' mean score of 35.9 and the CAPD patients mean score of 37.1. This study also found that the life domains of diet and physical well-being were affected the most by end stage renal disease. Total II was significantly associated with perceived time requirements ($r=.32$, $p<.001$), uremic symptoms ($r=.44$, $p<.001$), non-renal health problems ($r=.37$, $<.001$), fatigue ($r=.45$, $p<.001$), and difficulties in daily living ($r=.53$, $p< .001$). Satisfaction and happiness indicators of perceived II were significantly correlated with decreased levels of life satisfaction ($r=-.25$, $p<.025$), positive affect or pessimism ($r=-.24$, $p< .050$), and self-esteem ($r=-.37$, $p< .01$). Increased levels of intrusiveness were also found with higher levels of pessimism ($r=.24$, $p< .025$) and illness related concerns ($r=.55$, $p<.001$). Elevated levels of perceived II were significantly associated with increased levels of depression ($r=.33$, $p< .010$) and negative affect ($r=.33$, $p< .01$).

One study assessed whether a person's self concept as a chronic kidney patient controls the psychosocial impact of illness intrusiveness across the life span (59). Some investigators have speculated that the day to day experience of a chronic illness and its treatment exert an influence on the patient's self concept, leading patients to define

themselves in terms of their chronic disease and its treatment (59). The psychosocial impact of illness intrusiveness is moderated in ESRD by the self-concept as a chronic kidney patient and by age (59). The relation between illness intrusiveness and psychosocial well-being differed significantly between younger and older patients depending on whether they perceived themselves as similar or dissimilar to the chronic kidney patient (59).

Another research study hypothesized that multiple episodes of headaches and muscle cramps in ESRD patients increased their perceptions of illness intrusiveness and decreased their quality of life (62). The levels of illness intrusiveness were significantly higher when both muscle cramps and headaches occurred during one or more assessment intervals (62). Illness-related concerns and general feelings of negativity were also significantly higher among patients who experienced multiple episodes of muscle cramping (62).

Self-efficacy

Self-efficacy was defined as a personal conviction that one has the specific ability to execute a certain behavior or perform adequately in a given situation (9, 63, 64, 65). Self-efficacy reflects people's thoughts about their capability to perform certain behaviors (65). It was hypothesized that expectations of personal self-efficacy, or one's belief in their ability to perform a task, determined whether coping behavior will be initiated, how much effort will be expended, and how long it will be sustained in the face

of obstacles and aversive experiences (9). Bandura (65) postulated four principal sources of self-efficacy information: 1) past and present performance accomplishments; 2) vicarious experience of observing others perform; 3) verbal persuasion and other kinds of social influence; and 4) states of physical arousal. Perception of self-efficacy influences choice of activities. People avoid activities that they believe exceed their coping capabilities (67). For example, if a dialysis patient believed dietary adherence was beyond their capability, dietary non-adherence would be maintained.

There is little research on the effect of ESRD on dietary self-efficacy. Lower levels of dietary self-efficacy over time have been associated with increased depression and low self-esteem in hemodialysis patients (68). Hemodialysis patients' dietary self-efficacy scores have been found to be significantly correlated with actual past dietary adherence and current dietary adherence (69).

Caesar (70) conducted a study on predicting dietary adherence in hemodialysis patients by examining locus of control and self-efficacy. Twenty-four hemodialysis patients completed the patient self-efficacy questionnaire (PSQ). The PSQ was used to determine the patient's self-efficacy for fluid intake restrictions. A high PSQ score meant the patient had a higher fluid self-efficacy beliefs. Test/retest correlation coefficients over one week and one month intervals were r=.80 and r= .70, respectively. Fluid adherence was defined by an average interdialytic fluid weight gain of less than two kilograms. The mean PSQ self-efficacy score for the hemodialysis patients was 80.3. The results indicated that fluid restriction self-efficacy was not correlated with fluid restriction adherence.

Tanner et al. (5) used a self-efficacy/ health belief survey to assess the

perceptions of self efficacy for self-monitoring of phosphorus intake and interdialytic weight gain, and subjects' beliefs and attitudes toward health before and after receiving an intervention. In an attempt to improve phosphorus dietary adherence, the intervention group participated in a monthly behavioral contract with the dietitian. The experimental group also received a "report card" that dealt with phosphorus and fluid adherence. The control group did not have the behavioral contract, but received a monthly laboratory report that included the same dietary counseling as before. The behavioral contract served as a tool to help the patient to set a dietary goal. Forty hemodialysis patients participated in the study. The self-efficacy/health belief survey was administered during the first and sixth month of the study to both the experimental and control group. The survey was used to assess self-efficacy at baseline and post-intervention. If self-efficacy was related to adherence, each time the patient achieved the dietary goal on the behavioral contract, their self-efficacy or belief that dietary adherence could be achieved should increase. Therefore, if a patient met their behavioral contract goal, they would have a higher level of self-efficacy and increased dietary adherence. The phosphorus and fluid values were reported to the patients on a report card. The patient received a smiley face if adherent to the phosphorus or fluid restriction and a frown if they were non-adherent to the phosphorus or fluid restriction. Adherence was said to be present if interdialytic weight gain was less than 3 kilograms on weekdays and less than 4 kilograms on weekends. Phosphorus adherence was present if blood phosphorus was 5.9 milligrams per deciliter or less. The self-efficacy scores were interpreted as follows: 13 to 14 = high self-efficacy, 15 to 26 = moderate self-efficacy and 27 to 29 = low self-efficacy. Results indicated that the control and intervention

group had similar phosphorus and fluid self-efficacy beliefs at baseline (18.80 and 18.43, respectively). A slight decrease in fluid and phosphorus self-efficacy occurred in the control group, but was not significantly lower than the intervention group (17.90 versus 18.43, respectively). Patient adherence levels remained the same throughout the study. These results indicate that the usefulness of behavioral contracts as self-monitoring tools among ESRD patients remains unclear.

Summary of Review of Literature

Behavioral contracting has been successful among a wide variety of health conditions. Behavioral contracting among the ESRD population has proven to be inconclusive (2, 5). Improved fluid adherence has been found in cases where behavioral contracting was successful (2). Behavioral contracting could prove to be an effective tool in improving dietary adherence among the ESRD population.

Limited research has been conducted with self-efficacy and health beliefs in the ESRD population. The effects of self-efficacy/health beliefs on dietary adherence among the ESRD population remains inconclusive. If self-efficacy/health beliefs increase with behavioral contracting, dietary adherence might improve among the ESRD population.

Illness intrusiveness levels have been defined among the ESRD population. ESRD subjects who experienced complications with their hemodialysis treatment had a higher level of illness intrusiveness than those subjects who did not experience complications with hemodialysis. If illness intrusiveness levels decrease with behavioral contracting, dietary adherence might improve among the ESRD population.

CHAPTER III

METHODS

Purpose and Objectives

The purpose of this study was to determine if behavioral contracting was an effective method to use when counseling hemodialysis patients to improve dietary adherence. The following objectives were formulated for this study: to determine if behavioral contracting improves dietary adherence of hemodialysis patients, to determine if behavioral contracting increases self-efficacy/health belief of hemodialysis patients to follow the renal meal plan and take phosphorus binders, and to determine if behavioral contracting will decrease illness intrusiveness of hemodialysis patients.

Research Design

Subjects

Twenty-four volunteers from the hemodialysis unit at Saint Francis Hospital participated in the study. Two subjects who volunteered for the study were not enrolled because they had not been on dialysis for a year which resulted in twenty-two subjects being randomized into the control or intervention group. The subjects were recruited by flyers (Appendix A) and the dialysis staff. Inclusion criteria included being on dialysis for at least a year, 35-90 years old, not on enteral or parenteral nutrition, and able to

communicate with the dietitian and complete the required surveys. After explaining the study to subjects, a signed informed consent was obtained from each subject (Appendix B). The protocol was approved by the Institutional Review Board of Oklahoma State University and Saint Francis Hospital (Appendix C).

Experimental Design

This study was an experimental repeated measures design with an intervention and control group. The subjects were randomly assigned to the experimental or control group after the collection of baseline data. Subjects names were randomly drawn out of a hat by the principal investigator in order to determine randomization to the experimental or control group. Measurement of data took place monthly for some measures, and 0 or baseline, month 3 or mid-point, month 6, and month 8 or post for other measures (Table 1). The study lasted approximately 10 months. Subjects completed a food frequency questionnaire every month with assistance from the dietitian. After collection of the delayed post measures, the control group had the option of entering into a behavioral contract with the dietitian.

Control and Behavioral Groups

The control group received their regular regimen of dialysis treatment including medications, diet, fluid restriction, monthly laboratory review, food frequency questionnaire, and treatment schedule. The behavioral group received their regular regimen of dialysis treatment, monthly laboratory review, and in addition made a behavioral contract with the renal dietitian (Appendix D) and received feedback from the renal dietitian regarding the results of the food frequency questionnaire (FFQ) during months 0 to 6 of the study. In the contract the patient defined a dietary behavior to meet dietary potassium, phosphorus, phosphorus binder, or fluid restriction goals. If a patient was determined to be non-adherent to this self-selected potassium, phosphorus, or fluid restriction goal, another dietary food goal was incorporated into the behavioral contract to promote adherence.

Behavioral Contract

The dietitian and subject reviewed monthly laboratory data for adherence. If a subject had a non-adherent lab value, the subject defined a dietary behavior change. The dietary behavior change was to be conducted during the month in order to achieve an adherent lab value for the following month. If the subject completed the dietary behavior change and an adherent lab value was achieved, the dietitian marked the goal was met on

the behavioral contract. Positive reinforcement in the form of verbal praise from the dietitian or dialysis nurse was used to reward patients for meeting their dietary goals on the behavioral contract.

Survey Instruments

The illness intrusiveness survey used in this study covered thirteen life domains such as health, diet, work, family relations, etc. Each subject rated the degree to which ESRD and it's treatment interfered with each of these thirteen life domains. Scores ranged from one to seven for each life domain. An answer of one was defined as not very much, where an answer of seven was defined as very much. Scores for the illness intrusiveness survey ranged from thirteen to ninety-one. A score of thirteen was interpreted as a low level of illness intrusiveness, where a score of ninety-one was interpreted as a high level of illness intrusiveness. Mean scores in ESRD tend to center around 36 for dialysis patients. Internal consistency reliability, indicated by coefficient alpha (.80 to.88) was high in ESRD patients (8, 54). The instrument has been validated in chronically ill patients and can be completed within ten minutes (8, 53, 54, 55, 56, 57, 58).

The self-efficacy/health belief survey used in this study contained twenty-two questions relating to ESRD dietary, fluid and phosphorus binder beliefs (5). The survey was divided into two sections. The first nine questions were related to health beliefs, with the remaining questions relating to self-efficacy. For the first nine questions, subjects responded by circling a number between one and three. One was defined as very

important, two was sometimes important, and three was not important. The remaining questions were also answered by circling a number between one and three. However, these answers were defined as one being all of the time, two being some of the time, and three being none of the time. Scores on the self-efficacy/health belief survey ranged from twenty-two to sixty-six. A score of twenty-two was interpreted as a high level of self-efficacy/health belief, where a score of sixty-six was interpreted as a low level of self-efficacy/health belief.

The food frequency questionnaire used in this study was modified for renal patients (Appendix H). This food frequency questionnaire estimated dietary intakes of potassium, phosphorus, and protein in grams. If the subject did not consume a food everyday, but consumed it at least three times per week, it was counted as one daily serving on the FFQ.

Overall Plan of Data Collection

Data collected from all subjects in this study included monthly laboratory data, self-efficacy/health belief scale towards following the renal diet, illness intrusiveness scale, dietary adherence using a FFQ, and phosphorus binder adherence. Blood samples were drawn monthly from the patients in the dialysis unit and analyzed for levels of potassium, phosphorus, and albumin. Potassium, phosphorus, albumin, and fluid weight gain were reviewed four months retrospectively to provide the baseline data for the

patients. The blood draws for laboratory data were part of the standard operating procedure of the dialysis unit.

At baseline (month 0) all of the subjects completed a personal information sheet (Appendix E), the illness intrusiveness scale (Appendix F), self-efficacy/health belief scale (Appendix G), and a FFQ (Appendix H).

The following demographic data was collected at baseline using the personal information sheet (Appendix E): respondent age, dry weight, gender, racial or ethnic origin, household income, primary diagnosis leading to dialysis, length of time on dialysis machine during each treatment, marital status, current medications affecting dietary adherence, and primary nephrologist.

During months 0 to 6 and 8 all subjects completed a FFQ (Appendix H) that determined dietary adherence. The renal dietitian determined phosphate binder adherence during the monthly interview with each patient involved in the study during months 0 to 6 and 8. The dietitian determined phosphorus binder adherence by asking the patient if they were taking their phosphorus binder with each meal and snack and confirming the number of binders the patient was taking with each meal and snack. Dry weight, height, and interdialytic weight gain were measured during baseline or month 0, with dry weight and interdialytic weight gain measured during months 1 to 6 and 8. These measurements were part of the standard operating procedures of the dialysis unit.

Baseline data collection took place during the month of June. Month six, the last month of behavioral contracting, took place during the month of December. Post data collection took place during the month of February. All subjects started and finished the study at the same time.

Table 1. Data collection plan of study.

Measurement	**4 months retrospective**	**Time (months)**							
		0	1	2	3	4	5	6	8
Blood samples K, P, Alb	X	X	X	X	X	X	X	X	X
Self-efficacy/health belief Scale		X			X			X	X
Illness Intrusiveness Scale		X			X			X	X
FFQ		X	X	X	X	X	X	X	X
Phosphorus Binder		X	X	X	X	X	X	X	X
Behavioral Contract[2]		X	X	X	X	X	X	X	

[1]An X means the measurement was conducted during that time.
[2]Behavioral contracts took place in behavioral group only.

Blood Collection and Biochemical Analysis

Every month blood samples were drawn from each patient to measure blood values. Ten milliliters of blood was obtained from the arterial side of the fistula or catheter by the dialysis nurse. The blood sample was drawn through a Beckton Dickinson 18 gauge needle, into a Beckton Dickinson syringe, and placed into a 4.5 ml blood collection tube vacutainer (Beckton Dickinson, Franklin Lakes, NJ). The blood collection tubes used a combination of PST gel and Lithium Heparin as the anticoagulant,

tubes were sent to the laboratory for analysis at Saint Francis Hospital. All laboratory values are plasma values.

Albumin, potassium, and phosphorus concentrations in the blood samples were determined using the Aeroset System (Abbott Laboratories, Abbott Park, IL). The albumin BCG procedure was based on the binding of bromescal green to human albumin to produce a colored complex. The colored complex was measured at 628 nanometers (nm) using the Aeroset System to reveal the albumin concentration (grams per liter) in the blood sample. During the month of September 1999, the laboratory changed the method of determining albumin concentration. As a result, the new normal albumin level was set at > 4.2 gms per deciliter instead of $\geq$ 3.5 gms per deciliter between month two and three of the study. The biochemical analysis of phosphorus (milligrams per deciliter) included organic phosphate reacting with ammonium molybdate to form a heteropolyacid complex. The absorbance level at 340 nm was directly proportional to the inorganic phosphorus concentration in the plasma sample. Potassium concentration (millimoles per liter) in the plasma sample was determined by ion-selective electrodes for potassium. An electrical voltage was developed across the membranes between the reference and measuring electrodes in adherence with the Nernst equation. The voltage was compared to previously determined calibrator voltages and converted into an ion concentration for potassium. The patient was considered adherent to the potassium restriction if the plasma potassium level was between 3.5 to 5.5 millimoles per liter according to Saint Francis Hospital's Laboratory. Plasma phosphorus was used to measure excessive intake of high phosphorus foods and adherence to phosphorus binder use. Adherence was obtained with

a plasma level of 3.5 to 6.0 milligrams per deciliter according to Saint Francis Hospital's Laboratory.

Anthropometric Data

Body weight in kilograms was obtained by weighing the patient on a Scaletronix 5005 stand on scale before and after the dialysis treatment. The interdialytic weight gain was obtained by subtracting the predialysis weight from the previous post dialysis weight. The interdialytic weight was measured in kilograms.

Dietary Intake Data

A food frequency questionnaire (FFQ) is a retrospective review of intake frequency than can describe intake over the past day, week, or month (29). The FFQ organizes food into groups that have common nutrients. Data collected on the FFQ can be analyzed by the dietitian, resulting in estimates of grams of protein, milligrams of potassium, and milligrams of phosphorus consumed. The amounts of protein, potassium, and phosphorus were compared with the recommended intakes of 1.2 to 1.4 grams protein per kilogram ideal body weight, 2500 to 3000 milligrams potassium, and 1000 to 1300 milligrams of phosphorus in order to determine dietary adherence. Subjects were

assisted and given verbal instructions by a registered dietitian when answering the FFQ. A set of non-biasing food models was used by each subject to complete the FFQ. The food models for one cup, half cup, and one-fourth cup were prepared following the instructions provided by Oklahoma State University's Cooperative Extension Service. Bags made from colored nylon net with a measured volume of dried beans were used to code for different amounts. A green nylon net circle of 10 1/8 inches in diameter was used for the one cup measurement. A red nylon circle of 7 ½ inches in diameter was used for a half cup measure, and a blue nylon net circle 6 ½ inches in diameter was used for a 1/4 cup measure. A double layer of nylon net was hand sewn together on the outer edge and filled with the corresponding amount of dried pinto beans. The thread was pulled together to close the net bag and was tied shut. A rubber food model representing a 3 ounce hamburger patty was used to estimate protein servings.

Subjects estimated their daily intake of different foods represented on the daily FFQ (Appendix H). If a subject did not consume a food every day, but consumed a food at least 3 times a week, it was recorded as a serving on the food frequency form. An additional question regarding adherence with phosphorus binders was added at the end of the form. The dietitian determined that a patient was required to have taken their phosphorus binder at least 90% of the time in order to circle the yes and to be considered phosphorus binder adherent. The amounts of protein, potassium, and phosphorus were totaled and recorded at the bottom of the survey. The experimental group was informed of the total amounts of protein, phosphorus, and potassium consumed according to the FFQ, while the control group was not.

Adherence Score

A total adherence score was developed using the monthly FFQ and laboratory values. For the dietary adherence score, subjects received one point if their protein intake was between 1.2 to 1.4 grams per kilogram ideal body weight, if potassium intake was between 2500 to 3000 milligrams per day, and phosphorus consumption was between 1000 to 1200 milligrams per day. A maximum of three points was possible and a minimum score of zero meant dietary non-adherence. Subjects also received a maximum of three points for biochemical and fluid measures of adherence. One point was received for a plasma potassium value of 3.5 to 5.5 millimoles per liter, interdialytic fluid weight gain of 1 to 3 kilograms, and a plasma phosphorus level of 3.5 to 6.0 milligrams per deciliter. The minimum laboratory adherence score was zero with a maximum score of three. The dietary and laboratory adherence scores were added together for a total adherence score for the behavioral and control group. The total adherence scores ranged from zero (non-adherent) to six (adherent).

Data Analysis

The illness intrusiveness rating scale used was developed by Devins (55). Cronbach's alpha coefficient for the illness intrusiveness (II) scale for the present study was .84. This compares favorably with work done by others where the Cronbach's alpha for the II scale was found to be .80 to .88 (8, 55).

The self-efficacy/health belief scale used in the present study was derived from Tanner et al. (5). The Cronbach's alpha coefficient for the total self-efficacy/health belief

scale for the present study was found to be .78. Tanner et al. (5) did not report an alpha coefficient for the total self-efficacy/health belief scale. The Cronbach's alpha for the health belief portion of this survey in the present study was found to be .53. Tanner et al. (5) did not report an alpha coefficient for the health belief portion of the survey. Tanner et el. (5) reported a Cronbach's alpha coefficient of .84 for the self-efficacy portion of the survey.

Hypothesis

1. Potassium intake of behavioral group subjects will be lower than those in the control group.
2. Phosphorus intake of behavioral group subjects will be lower than those in the control group.
3. Protein intake (gms per IBW) of behavioral group subjects will be higher than those in the control group.
4. Phosphorus binder compliance with prescription will be higher in the behavioral group subjects than the control group.
5. Fluid weight gain values of the behavioral group subjects will be lower than those in the control group.
6. Potassium laboratory values of the behavioral group subjects will be lower than those in the control group.

7. Phosphorus laboratory values of the behavioral group subjects will be lower than those in the control group.
8. Illness intrusiveness scores of the behavioral group subjects will be lower than the control group.
9. Self-efficacy/health belief scores for following the renal meal plan and take phosphorus binders of the behavioral group subjects will be higher than the control group.
10. Total adherence scores of the behavioral group will be higher than the control group.

The statistical analysis was completed using the SPSS version 9, Chicago Illinois, 1999. Independent t-tests between the behavioral and control groups were conducted at baseline, month 6, and post (month 8). The level of significance was set at $p < .05$ for the one tailed t-tests. The independent t-test was conducted due to the small number of subjects participating in the research. Main outcome variables studied were illness intrusiveness, self-efficacy/health belief, interdialytic weight gain, dietary phosphorus, dietary potassium, dietary protein, plasma phosphorus, plasma potassium, dietary adherence, laboratory adherence, and total adherence.

CHAPTER IV

RESULTS

Characteristics of Subjects

Of the 24 subjects who volunteered for the study, 18 or 82% of the subjects completed all phases of the study. Two subjects left the study because they received transplants. One subject had a stroke and was omitted. One subject expired during the study. Two additional subjects were dropped from the study due to extended hospitalizations. Of the 18 subjects who participated in the study, 11 were male.

The majority of subjects involved in the study were white. Most of the subjects in the behavioral group were single (67%), whereas most of the control group subjects were married (58%). Most of the subjects took Phoslo as their phosphorus binder, with an average of two taken with each meal and one with snacks. Approximately half of the subjects in the behavioral group had a primary diagnosis of other, with 42% of the control group subjects having a primary diagnosis of diabetes. Household income tended to be lower in the behavioral group compared to the control group. Mean age was 65 years in the behavioral group and 58 years in the control group. The behavioral group had been receiving dialysis for a significantly longer length of time (115 ± 62 months) compared to the control group (52 ± 38 months) ($p<.05$). Duration of daily dialysis treatments were not significantly different between groups. Current dry weight was significantly different

between groups ($p<.05$) with the behavioral group dry weight significantly lower than the control group.

Dietary Intake Values

Estimated dietary potassium was found to be significantly different between groups at month six using an independent t-test at $p<.05$ (Table 3). The behavioral group estimated potassium intake was greater than the control group at month six. The estimated potassium intake of the behavioral group was adherent at month six. (Dietary potassium intake was considered adherent when between 2500 to 3000 milligrams per day.)

Estimated dietary phosphorus intake was significantly lower in the control group compared to the behavioral group at month six using an independent t-test at $p<.05$ (Table 4). Estimated dietary phosphorus intakes were not adherent in the behavioral group during baseline, month six, and month eight. (Dietary phosphorus intake was considered adherent when between 1000 to 1200 milligrams per day.)

Tables 5 and 6 summarize estimated dietary protein intake. Total estimated dietary protein intake was significantly lower in the control group compared to the behavioral group at month six using independent t-test analysis ($p<.05$) (Table 5 and 6). The behavioral group was adherent to protein intake in grams per ideal body weight during month 6. The control group was adherent to the protein intake in grams per ideal

body weight at baseline. Adherence to the protein intake in grams per kilogram ideal body weight was set at 1.2 to 1.4 gms protein per kg IBW.

Phosphate Binder Adherence

The behavioral group reported taking their phosphorus binders as prescribed 100% of the time throughout the duration of the study. The lowest percent of phosphorus binder adherence was reported by the control group, with phosphorus binders being taken only 83% of the time during months three, four, and five.

Interdialytic Fluid Weight Gain and Laboratory Values Between Groups

Interdialytic weight gain was not significantly higher in the control group compared to the behavioral group at month eight using an independent t-test ($p<.05$) (Table 7). The behavioral group remained adherent to the interdialytic weight gain at baseline, month six, and month eight. The interdialytic weight gain by the control group was non-adherent at baseline, month six, and month eight. (Interdialytic weight gain was considered adherent when between one to three kilograms.)

The plasma potassium levels were not significantly different between the behavioral and control groups using an independent t-test ($p<.05$) (Table 8). The behavioral and control groups plasma potassium was considered adherent at baseline,

month six, and month eight. (Plasma potasium values between 3.5 to 5.5 millimoles per liter were considered adherent).

Plasma phosphorus levels were not significantly different between the behavioral and control groups using an independent t-test ($p<.05$) (Table 9). The behavioral and control groups plasma phosphorus was considered adherent at baseline, month six, and month eight.

Plasma albumin remained constant throughout the study, with the exception of the change in normal albumin level between month two and three (Table 10). The behavioral group and control group plasma albumin levels were considered adequate nutritional status. Plasma albumin was not significantly different between the behavioral and control groups using an independent t-test ($p<.05$). The increase in albumin between month two and month three was due to methodology changes in the lab.

Scale Scores

The II scores were not significantly different between the behavioral and control groups using an independent t-test at baseline, month six, and month eight ($p<.05$) (Table 11). Self-efficacy/health belief scores were not significantly different between the behavioral and control groups using an independent t-test at baseline, month six, and month eight ($p<.05$) (Table 12).

The laboratory adherence score was significantly greater in the behavioral group compared to the control group at month eight using an independent t-test ($p<.05$) (Table

13). The control group was considered non-adherent with interdialytic weight gain at baseline, month six, and month eight resulting in a lower laboratory adherence score.

The dietary adherence score was significantly greater in the behavioral group compared to the control group at month eight using an independent t-test ($p<.05$) (Table 14). Both the behavioral and control groups had non-adherent dietary protein intakes the majority of the time. Estimated dietary potassium intake was considered adherent in the behavioral group while in the control group it was non-adherent because estimated potassium intake was below recommendations.

The total adherence score was significantly greater in the behavioral group compared to the control at month eight using an independent t-test ($p<.05$) (Table 15). Total adherence scores were below two throughout the study, with the exception of the behavioral group scoring above three at month eight.

Table 2. Demographic characteristics of subjects by behavioral and control groups[1].

Characteristics	Dropped Subjects		Behavioral		Control	
	%	n	%	n	%	n
Gender						
Female	50	3	50	3	33	4
Male	50	3	50	3	67	8
Ethnic Origin						
White	84	5	67	4	75	9
Black	16	1	33	2	8	1
Asian / Pacific Islander	0	0	0	0	0	0
American Indian/ Alaska Native	0	0	0	0	0	0
Hispanic	0	0	0	0	8	1
Other	0	0	0	0	80	1
Marital Status						
Single	33	2	67	4	42	5
Married	67	4	33	2	58	7
Current Phosphorus Binder						
Tums	67	4	17	1	27	3
Phoslo	33	2	67	4	73	8
Other	0	0	17	1	0	0
Primary Diagnosis						
Polycystic Kidney	17	1	17	1	17	2
Diabetes	67	4	0	0	42	5
Hypertension	17	1	33	2	17	2
Other	0	0	50	3	25	3
Household Income						
<14,000 to 19,999	33	2	67	4	27	3
20,000 to 34,999	33	2	0	0	46	5
35,000 to > 45,000	33	2	33	2	27	3
	Mean±SD		Mean±SD[2]	n	Mean±SD	n
Age (years)	65 ± 24		64.5 ± 16[a]	6	57.8 ± 12[a]	12
Length of Time on Dialysis (months)	108 ± 104		115 ± 63[a]	6	53 ± 38[b]	12
Duration of Dialysis Treatments (hours)	3.8 ± 0.3		3.9 ± 0.2[a]	6	4.0 ± 0.1[a]	12
No. of Treatments per Week	3		3[a]	6	3[a]	12
No. of Binders Taken						
Breakfast	2.3 ± 1.7		2.0 ± 0.6[a]	6	2.3 ± 0.9[a]	12
Lunch	2.6 ± 1.4		2.0 ± 0.6[a]	6	2.1 ± 1.1[a]	12
Dinner	2.5 ± 1.5		2.0 ± 0.6[a]	6	2.3 ± 0.9[a]	12
Snacks	0.8 ± 1.2		0.9 ± 0.7[a]	6	0.8 ± 0.8[a]	12
Current Dry Weight (kg)	70.2 ± 30.8		61.2 ± 9.8[a]	6	74.8+14.3[b]	12

[1]Percents were not significantly different between groups using Chi square analysis at $p < .05$.
[2]Mean ± standard deviation
[a]Means with different superscripts were significantly different between groups using independent t-test at $p < .05$.

Table 3. Estimated dietary potassium intake by study group.

Month	Behavioral (n=6)	Control (n=12)
	mg	mg
Baseline	3083.3 ± 752.1[1, a]	2875.0 ± 118.7[a]
Month 1	2933.3 ± 1036.7	2260.0 ± 531.7
Month 2	2233.3 ± 656.3	2450.0 ± 639.9
Month 3 (midpoint)	2816.7 ± 154.1	2440.0 ± 747.1
Month 4	2083.3 ± 248.3	1970.0 ± 565.8
Month 5	2233.3 ± 776.3	1880.0 ± 722.3
Month 6 (last contract)	2850.0 ± 625.3[a]	1983.3 ± 798.7[b]
Month 8 (post)	2550.0 ± 493.0[a]	2260.0 ± 823.5[a]

[1]Mean ± standard deviation.

[a]Means with different superscripts are significantly different by group using independent t-test at $p < .05$.

Table 4. Estimated dietary phosphorus intake by study group.

Month	Behavioral (n=6)	Control (n=12)
	mg	mg
Baseline	1283.3 ± 471.9[1, a]	1654.2 ± 684.4[a]
Month 1	1350.0 ± 649.6	1105.0 ± 282.3
Month 2	991.7 ± 305.6	1200.0 ± 323.2
Month 3 (midpoint)	1133.3 ± 310.9	1015.0 ± 326.6
Month 4	1175.0 ± 356.0	985.0 ± 231.0
Month 5	1108.3 ± 381.3	825.0 ± 307.5
Month 6 (last contract)	1558.3 ± 504.4[a]	1154.2 ± 310.3[b]
Month 8 (post)	1400.0 ± 375.5[a]	1235.0 ± 450.3[a]

[1]Mean ± standard deviation.

[a]Means with different superscripts are significantly different by group using independent t-test at $p < .05$.

Table 5. Estimated dietary protein intake by study group.

Month	Behavioral (n=6)	Control (n=12)
	gms	gms
Baseline	71.2 ± 33.5[1,a]	98.5 ± 44.9[a]
Month 1	75.8 ± 45.5	64.9 ± 17.4
Month 2	52.7 ± 21.6	66.8 ± 16.1
Month 3 (midpoint)	66.7 ± 19.8	56.5 ± 15.7
Month 4	65.5 ± 22.0	57.3 ± 14.7
Month 5	54.2 ± 13.6	45.3 ± 20.2
Month 6 (last contract)	85.5 ± 37.6[a]	59.33 ± 19.8[b]
Month 8 (post)	70.3 ± 31.0[a]	69.0 ± 23.3[a]

[1]Mean ± standard deviation.
[a]Means with different superscripts are significantly different by group using independent t-test at $p<.05$.

Table 6. Estimated protein intake in grams per kg ideal body weight by study group.

Month	Behavioral (n=6)	Control (n=12)
	gms/IBW	gms/IBW
Baseline	1.1 ± 0.4[1, a]	1.3 ± 0.6[a]
Month 1	1.2 ± 0.5	0.9 ± 0.3
Month 2	0.8 ± 0.2	1.0 ± 0.3
Month 3 (midpoint)	1.1 ± 0.3	0.8 ± 0.3
Month 4	1.0 ± 0.3	0.8 ± 0.3
Month 5	0.9 ± 0.2	0.8 ± 0.4
Month 6 (last contract)	1.3 ± 0.4[a]	0.8 ± 0.3[b]
Month 8 (post)	1.1 ± 0.4[a]	0.9 ± 0.4[a]

[1]Mean ± standard deviation.
[a]Means with different superscripts are significantly different by group using independent t-test at $p<.05$.

Table 7. Interdialytic fluid weight gain by study group.

Month	Behavioral (n=6)	Control (n=12)
	kgs	kgs
Pre month 4	2.3 ± 1.5[1]	3.3 ± 1.1
Pre month 3	2.4 ± 1.8	3.4 ± 1.4
Pre month 2	2.9 ± 2.0	3.7 ± 1.2
Pre month 1	2.5 ± 1.5	3.7 ± 0.9
Baseline	2.8 ± 1.6[a]	3.7 ± 1.0[a]
Month 1	2.7 ± 1.9	3.3 ± 0.9
Month 2	2.9 ± 1.5	3.0 ± 1.3
Month 3 (midpoint)	2.2 ± 1.5	3.8 ± 1.3
Month 4	2.6 ± 1.5	3.4 ± 1.3
Month 5	2.4 ± 1.3	3.3 ± 1.0
Month 6 (last contract)	2.9 ± 1.7[a]	3.7 ± 0.8[a]
Month 8 (post)	2.3 ± 1.3[a]	3.8 ± 1.2[b]

[1]Mean ± standard deviation.
[a]Means with different superscripts are significantly different by group using independent t-test at $p<.05$.

Table 8. Plasma potassium by study group.

Month	Behavioral (n=6)	Control (n=12)
	mmol/L	mmol/L
Pre month 4	5.1 ± 0.8[1]	5.0 ± 0.7
Pre month 3	4.9 ± 0.5	4.8 ± 0.7
Pre month 2	4.4 ± 0.4	4.4 ± 0.5
Pre month 1	4.9 ± 0.5	4.9 ± 0.4
Baseline	4.9 ± 0.6[a]	5.0 ± 0.7[a]
Month 1	5.3 ± 0.6	4.8 ± 0.5
Month 2	5.2 ± 0.8	4.6 ± 0.4
Month 3 (midpoint)	5.0 ± 0.6	4.7 ± 0.5
Month 4	4.9 ± 0.4	4.9 ± 0.4
Month 5	5.6 ± 0.7	4.7 ± 0.5
Month 6 (last contract)	5.0 ± 1.1[a]	4.8 ± 0.5[a]
Month 8 (post)	4.9 ± 0.7[a]	4.8 ± 0.6[a]

[1]Mean ± standard deviation.
[a]Means with different superscripts are significantly different between group using independent t-test at $p<.05$.

Table 9. Plasma phosphorus by study group.

Month	Behavioral (n=6)	Control (n=12)
	mg/dl	mg/dl
Pre month 4	5.0 ± 1.3[1]	5.1 ± 1.9
Pre month 3	5.1 ± 1.2	5.0 ± 1.1
Pre month 2	4.5 ± 1.1	5.0 ± 1.4
Pre month 1	4.4 ± 1.3	4.9 ± 1.8
Baseline	4.3 ± 1.6[a]	5.4 ± 1.3[a]
Month 1	6.1 ± 0.8	6.5 ± 2.1
Month 2	6.0 ± 1.6	5.9 ± 1.7
Month 3 (midpoint)	4.8 ± 0.7	6.5 ± 2.6
Month 4	4.9 ± 1.2	6.6 ± 2.4
Month 5	4.4 ± 1.2	6.1 ± 2.0
Month 6 (last contract)	4.8 ± 1.7[a]	5.5 ± 1.6[a]
Month 8 (post)	5.0 ± 0.9[a]	5.4 ± 1.4[a]

[1]Mean ±standard deviation.

[a]Means with different superscripts are significantly different by group using independent t-test at p,.05.

Table 10. Plasma albumin by study group.

Month	Behavioral (n=6)	Control (n=12)
	gms/dl	gms/dl
Pre 4 months	3.9 ± 0.4[1]	3.9 ± 0.3
Pre 3 Months	3.7 ± 0.3	3.7 ± 0.3
Pre 2 Months	3.8 ± 0.2	3.8 ± 0.2
Pre 1 Months	3.7 ± 0.5	3.7 ± 0.4
Baseline	3.7 ± 0.1[a]	3.8 ± 0.2[a]
Month 1	3.8 ± 0.4	3.8 ± 0.3
Month 2	3.8 ± 0.3	3.8 ± 0.3
Month 3 (midpoint)	4.3 ± 0.4[2]	4.4 ± 0.3
Month 4	4.5 ± 0.3	4.5 ± 0.3
Month 5	4.4 ± 0.5	4.4 ± 0.3
Month 6 (last contract)	4.5 ± 0.3[a]	4.4 ± 0.2[a]
Month 8 (post)	4.2 ± 0.3[a]	4.2 ± 0.2[a]

[1]Mean ± standard deviation.

[2]Normal value for albumin changed due to a change in laboratory procedure

[a]Means with different superscripts are significantly different by using independent t-test at p<.05 .

Table 11. Illness intrusiveness score by study group.

Month	Behavioral (n=6)	Control (n=12)
Baseline	42.8 ± 17.0[1,a]	35.2 ± 14.9[a]
Month 3 (midpoint)	46.7 ± 17.8	40.4 ± 18.3
Month 6 (last contract)	41.7 ± 14.9[a]	41.4 ± 16.2[a]
Month 8 (post)	46.4 ± 21.7[a]	46.8 ± 22.0[a]

[1]Mean ± standard deviation.

[a]Means with different superscripts are significantly different by group using independentt-test at $p<.05$.

Table 12. Self-efficacy/health belief score by study group.

Month	Behavioral (n=6)	Control (n=12)
Baseline	29.5 ± 5.8[1,a]	27.5 ± 3.8[a]
Month 3 (midpoint)	33.0 ± 6.4	28.8 ± 4.3
Month 6 (last contract)	28.5 ± 4.6[a]	28.0 ± 4.3[a]
Month 8 (post)	31.0 ± 6.3[a]	31.2 ± 6.4[a]

[1]Mean ± standard deviation.

[a]Means with different superscripts are significantly different by group using independent t-test at $p<.05$.

Table 13. Laboratory adherence score by study group.

Month	Behavioral (n=6)	Control (n=12)
Baseline	0.7 ± 0.5[1,a]	0.7 ± 0.5[a]
Month 6 (last contract)	0.7 ± 0.8[a]	0.8 ± 0.7[a]
Month 8 (post)	1.8 ± 1.0[a]	0.5 ± 0.7[b]

[1]Mean ± standard deviation.

[a]Means with different superscripts are significantly different by group using independent t-test at $p<.05$.

Table 14. Dietary adherence score by study group.

Month	Behavioral (n=6)	Control (n=12)
Baseline	$0.8 \pm 0.4^{1,a}$	0.9 ± 0.8^{a}
Month 6 (last contract)	1.0 ± 0.9^{a}	0.5 ± 1.1^{a}
Month 8 (post)	1.7 ± 1.0^{a}	0.4 ± 0.7^{b}

[1]Mean ± standard deviation.

[a]Means with different superscripts are significantly different by group using independent t-test at $p<.05$.

Table 15. Total adherence score by study group.

Month	Behavioral (n=6)	Control (n=12)
Baseline	$1.5 \pm 0.5^{1,a}$	1.6 ± 1.2^{a}
Month 6 (last contract)	1.7 ± 1.5^{a}	1.4 ± 1.8^{a}
Month 8 (post)	3.5 ± 1.9^{a}	1.0 ± 1.3^{b}

[1]Mean ± standard deviation.

[a]Means with different superscripts are significantly different by group using independent t-test at $p<.05$.

CHAPTER V

DISCUSSION OF RESULTS AND IMPLICATIONS

Behavioral contracting did not significantly change illness intrusiveness or self-efficacy in the present study. However, behavioral contracting did significantly improve adherence levels at month six. Behavioral contracting significantly improved dietary and laboratory adherence in the behavioral group at month six.

This study was conducted to determine if behavioral contracting was effective method to use when counseling hemodialysis patients to improve dietary adherence. Total adherence scores were significantly higher in the behavioral group compared to the control group at month six. Interdialytic weight gain, plasma phosphorus, and dietary potassium intake were primarily responsible for the higher total adherence score of the behavioral group at month six. Interdialytic fluid weight gain tended to be lower in the behavioral group compared to the control group throughout the entire study (Table 7). Plasma phosphorus was not significantly lower in the behavioral group at post and delayed post (Table 9). The control group had several non-adherent plasma phosphorus levels throughout the study, while the behavioral group had one non-adherent level. The control group received no dietary adherence points for the non-adherent and low estimated dietary potassium intake at delayed post (Table 3), resulting in a lower dietary adherence score when compared to the behavioral group. The illness intrusiveness and self-efficacy/health belief scores did not increase significantly over the length of the study and were not significantly changed by behavioral contracting. It is difficult to

determine if behavioral contracting was an effective counseling method to use among the hemodialysis population due to the small number of subjects in this study.

Estimated Dietary Intake and Phosphate Binder Adherence

Estimated dietary potassium intake was significantly higher in the behavioral group than the control group at month six (Table 3). Different factors may have influenced the estimated potassium intakes. Overestimation of potassium intake in the behavioral group or underestimation of potassium intake in the control group could be one reason. Over the length of time of the study, the control group tended to consume less potassium than the behavioral group. The food frequency form might not have included some potassium foods consumed by the control group, resulting in a lower reported dietary potassium intake.

The behavioral group had a significantly higher estimated dietary phosphorus intake at month six compared to the control group (Table 4). The control group estimated dietary phosphorus intakes under 1000 milligrams during months four and five. This could indicate a lack phosphorus in the diet or an underestimation of dietary phosphorus intake on the FFQ. The significantly higher dietary protein intake reported by the behavioral group at month six could have contributed to this elevated dietary phosphorus dietary intake (Table 6). Phosphorus binders may have played a role in the laboratory phosphorus levels. The phosphorus binders bind to phosphorus that was consumed in the dietary protein, reducing the amount of phosphorus absorbed into the body. The behavioral group reported 100% adherence with their phosphorus binders which could have accounted for the lower plasma phosphorus at baseline and month three.

Both behavioral and control groups reported being adherent with their phosphorus binder regimen. The control group reported some non-adherent phosphorus binder behavior during months three, four, and five. During month one, both behavioral and control groups had non-adherent plasma phosphorus levels which could indicate a false reporting of phosphorus binder use.

Interdialytic Weight Gain

Average interdialytic weight gain ranged from 2.3 kgs to 2.9 kgs for the behavioral group and 3.0 kgs to 3.8 kgs for the control group (Table 7). The interdialytic weight gains in the present study were greater when compared to other studies. Hegel et al. (2) found that the average interdialytic weight gain was 1.68 kilograms per 24 hours among subjects. Caeser et al. (70) found that in-center hemodialysis patients had an average daily weight gain of 1.2 kgs per day which was non-adherent compared to the adherent weight gain guidelines of less than 0.9 kgs per day. The interdialytic weight gain was significantly lower in the behavioral group at month six and post. Behavioral contracting might have been a factor in lowering the fluid intake of subjects in the behavioral group, however, the interdialytic weight gain tended to be lower in the behavioral group throughout the entire study, although not significant. The interdialytic weight gain calculation was not calculated on a day to day basis, so the control group could have had more weekend periods of interdialytic weight gains recorded in this study than the behavioral group.

Laboratory Values

Few studies reported laboratory values obtained in ESRD patients. In the present study, plasma potassium levels ranged from 4.4 millimoles per liter (mmol/L) to 5.6 mmol/L in the behavioral group and 4.6 mmol/L to 5.0 mmol/L in the control group (Table 8). Brown and Fitzpatrick (19) defined criteria that was used to assess and score a patients' level of dietary abuse. Patients received 1 point if their plasma potassium was less than 4.5 mmol/L, 2 points if their plasma potassium was 4.5 to 5.4 mmol/L, 3 points for a plasma potassium of 5.5 to 6.0 mmol/L, and 4 points for a plasma potassium level of greater than 6.0 mmol/L (19). The more points a patient accumulated, the higher their level of dietary abuse (19). Brown and Fitzpatrick (19) reported that 58% of subjects showed some degree of dietary abuse with a plasma potassium value ranging between 5.5 to 6.0 millmoles per liter. In the present study, the percent of participants that were categorized as non-adherent based on plasma potassium, was not determined. The use of laboratory adherence score was used in the present study.

Plasma phosphorus tended to be higher in the control group throughout the study with the exception of month two when the control group tended to have a lower plasma phosphorus level (Table 9). The behavioral contracting might have been a factor in the lower plasma phosphorus levels reported in the behavioral group. Elevated plasma phosphorus in the control group could have been associated with tissue catabolism, bone disease, or hyperparathyroidism.

Illness Intrusiveness

Illness intrusiveness scores were not significantly different between the behavioral and control group during the study (Table 11). The illness intrusiveness scores ranged from 41.7 to 46.7 for the behavioral group and 35.2 to 46.8 in the control group. Subjects in the present study had higher illness intrusiveness scores when compared to other studies. This means subjects in the present study perceived the hemodialysis regimen to be more intrusive when compared to other studies. Devins (8) reported a mean illness intrusiveness score among in center staff care hemodialysis patients to be 36.4. Devins et al. (62) concluded that subjects who experienced headaches and cramps on dialysis had a higher illness intrusiveness score (46.9) than those who did not experience them (28.4). Devins et al. (56) found that ESRD individuals who had episodes of restless sleep reported significantly higher II scores (44.0) than those who did not (35.3). Devins et al. (58) reported a significant difference in II scores between in-center hemodialysis patients with a mean II score of 35.9 and post transplant patients who had a mean score of 24.4. Subjects who experienced conditions associated with hemodialysis treatments had similar levels of illness intrusiveness. None of these were measured in the present study. Subjects in the present study might have experienced cramping, low blood pressure, nausea, vomiting, headaches, a clotted kidney, or some other stressor during their dialysis treatments causing their perceptions of II to be high.

Self-Efficacy and Health Belief

Self-efficacy/health belief scores were not significantly different between the behavioral and control group in the present study. Self-efficacy/health belief scores ranged from 29.5 to 33.0 in the behavioral group and 27.5 to 31.2 in the control group and the higher the score the greater the self-efficacy/health belief to follow the renal diet. Tanner et al. (5) found that the mean self-efficacy score among the hemodialysis patients in the behavioral group was 18.43 and 18.3 in the control group, which agrees with the present study. Caesar et al. (70) found that in center hemodialysis patients' had a moderate amount of self-efficacy using the patient self-efficacy questionnaire (PSQ) which is a different self-efficacy scale than the one used in this study. Reliability for the PSQ has not been established (70).

The subjects in the present study reported a higher level of self-efficacy/health belief when compared to the subjects in Tanner et al. (5) and the same instrument was used in both studies. Some of the subjects in the present study might have experienced life events that could have altered their confidence about following the renal diet during the present study, resulting in a high level of self-efficacy/health belief. For example, an increase in social support, finances, marital status, adequate counseling and support from dialysis center staff , or decreased duration of dialysis treatment.

Behavioral Contracting, Illness intrusiveness, Self-Efficacy, Health Belief, and Adherence

The use of a behavioral contract in this study did not result in a significant difference between groups in self-efficacy/health belief, or illness intrusiveness scores. The behavioral contract did result in a significant difference in adherence scores between groups. Based on the present study and other work, results remain inconclusive when using behavioral contracts among hemodialysis patients. Other studies that had success with behavioral contracting offered a reward to their subjects for achieving their behavioral contract goal (30, 48, 49, 50, 51). The subjects in the present study did not receive a reward except verbal praise from the dietitian or dialysis staff for obtaining their monthly behavioral contract goals. Perhaps if a reward was offered, the results would have been significantly different. Tanner et al. (5) agrees with the present study in that they found no significant differences between the behavioral and control group for monthly phosphorus and fluid weight gain values despite the self-monitoring tool and behavioral contract. Tanner et al. (5) also found no significant differences in self-efficacy/health belief scores between study groups despite the use of a self-monitoring tool and behavioral contract in the behavioral group. Keane et al. (52) reported significant differences in interdialytic weight gain when behavioral contracts were initiated in hemodialysis patients.

Several factors may influence why behavioral contracts were inconclusive in the hemodialysis population. Each research study might have used a different behavioral contract with their dialysis patients instead of a standard contract. Some studies might

have offered rewards or incentives with the attainment of a behavioral contract goal where others did not. Social praise by the dialysis staff may have been included in the methods of some studies where no social praise was offered in others. However, behavioral contracting has been shown to be successful in a variety of other acute and chronic disease states (30, 48, 49, 50, 51).

Limitations

This study included only hemodialysis patients from Saint Francis Hospital in Tulsa, Oklahoma who volunteered to participate, thus results were not generalizable to other dialysis patients. Seasonal changes in dietary patterns was not taken into consideration in the present study with all subjects starting and finishing the study at the same time. Subjects who volunteered for the study, tended to be more adherent than the people who did not volunteer. The accuracy of the food frequency questionnaires was limited due to the subject's inability to estimate and record daily food intake. The accuracy of the illness intrusiveness and self-efficacy/health belief surveys were limited to the subject's ability to interpret and answer the questions. The self-efficacy/health belief scale does not have high reliablility across all sections. Positive social feedback from the staff and dietitian to the subjects was not regulated in the present study. The interdialytic weight gain was not calculated on a per day basis and makes comparisons difficult. Some of the comparisons may have resulted in no significant difference due to the limited number of subjects who participated in this study.

Recommendations for Future Research

A more comprehensive and valid renal food frequency questionnaire needs to be developed to allow for more serving sizes and food varieties. A more developed food frequency questionnaire would provide a more accurate dietary assessment of the patient's actual food and nutrient intake. Future researchers should use a larger number of subjects and control for length of time the subject had been receiving dialysis treatments, since patients who were on dialysis for a longer period of time may have different views and beliefs about dialysis. The principal investigator should calculate the interdialytic weight gain on a per day basis to account for different lengths of time between dialysis. Recruit a higher number of subjects to account for drop out rate when determining the number of subjects needed for the study. A self-efficacy/health belief scale with higher reliability on all sections is needed. The behavioral contract increased the knowledge of dietary potassium, phosphorus, and protein of the behavioral group resulting in more accurate food frequency questionnaire estimation. Future studies need to develop a survey to test the dietary knowledge between the behavioral and control groups regarding dietary sources and serving sizes of potassium, phosphorus, and protein foods.

Further research needs to be conducted with the ESRD population to learn more about the psychosocial effects that the disease and treatment regimen have on the patient. Once the psychosocial effects are understood, patient education materials could be developed to minimize these effects, possibly resulting in an increased level of treatment adherence. Also, the dietetics profession could educate dietitians on effective counseling

behaviors to practice with these patients in order to maximize their level of dietary adherence.

Implications for Practice

Based on the results and experience gained in the present study, implications for practice were developed by the author. Future researchers should have the subject focus on one behavioral change in the behavioral contract so the subject does not become confused and forget which behavior to work on. If more than one behavior is allowed on the behavioral contract, it is difficult to determine if the behavioral contract goal was met if the patient achieved one behavioral goal but did not achieve the other. The dietitian should conduct all surveys with each subject to minimize confusion regarding some of the questions and consistent answers can be achieved since the surveys are repeated throughout the study. The principle investigator should include a reward if the subject achieves the goal set on the behavioral contract from month to month.

Dietitians could use behavioral contracts in other chronic disease populations such as diabetes. Diabetic patients could define dietary behavior changes to improve blood glucose levels. Behavioral contracts would be an excellent tool for outpatient dietitians to use with their patients. The patient could define a dietary behavior change on the behavioral contract and work on that dietary behavior between appointments. The dietitian could monitor the success of the behavioral contract when the patient returned for their follow-up appointment.

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Appendix A

Recruitment Flyer

Are you having trouble with potassium, phosphorus, protein, or fluid weight gain in your diet?

Why? You are invited to participate in a research study that is designed to determine if a behavioral contract will improve your renal diet and problems with potassium, phosphorus, protein, and fluid levels. Benefits cannot be promised.

How? This study will assign half of the participants to use a behavioral contract. A behavioral contract is a signed agreement between you and the investigator dietitian (Lesley). It is designed to help you set goals to improve specific laboratory values. This study will also look at your perceptions and beliefs about hemodialysis. This study will require your time to complete surveys during your routine hemodialysis treatments at Saint Francis Hospital.

Who? All hemodialysis patients in the outpatient dialysis unit at Saint Francis Hospital will be invited to participate. Patients must be able to communicate and complete the surveys with the investigator dietitian. Patients who are currently on nutrition support (tube feeding or TNA) are ineligible to participate in the study.

When? The study will begin in April 1999 and end in February 2000. A voluntary consent form will be given to you in the next couple of weeks. This consent form will explain the purpose of the study. It will also explain the requirements of each subject if they choose to participate. Participation in this study is strictly voluntary.

Contact

If you would like more information about participating in this research study, you may contact: Investigator- **Lesley Hoyle RD/LD** at Saint Francis Hospital, 6161 S. Yale Ave., Tulsa, OK 74136, phone number- 494-7202. Lesley is a Registered Dietitian at Saint Francis Hospital and a graduate student at Oklahoma State University.

Appendix B

Consent Form

DATE [illegible]
REVISION DATE 4.21.99

IRB # [illegible]

OKLAHOMA STATE UNIVERSITY

PATIENT CONSENT DOCUMENT

The Effect of Illness Intrusiveness, Self-Efficacy, and Behavioral Contracting on Dietary Adherence in Chronic Hemodialysis Patients

IRB
APR 27 1999
APPROVED

Voluntary Participant: _____

Principle Investigator: Lesley Ramsey RD/LD

You are being asked to participate in a research study. Your decision to take part in this study is entirely voluntary. Please read carefully the information provided in this document and ask questions about anything you do not understand or any words that you do not clearly understand, before deciding whether or not to participate.

INTRODUCTION: Patients with chronic renal disease who are on hemodialysis must follow strict regimens including treatment schedules, medication, diet, and fluid restrictions. These restrictions, especially the diet, require a significant change of lifestyle for the patient. Patients who make the appropriate lifestyle changes necessary for the adjustment to hemodialysis, improve their health and quality of life while on dialysis. It has been reported that between 20-78% of hemodialysis patients do not follow their diet and fluid therapy because of the alteration in their long-standing personal habits and life style.

1. PURPOSE

You are invited to participate in this investigational research study. This study will evaluate behavioral contracting by hemodialysis patients for managing their diet to see if it effects their perception of life with chronic renal disease and their effectiveness of managing their disease. The purpose of the study is to determine if hemodialysis patients who use a behavioral contract will improve their dietary adherence. Approximately 74 patients at Saint Francis Hospital will be invited to participate in this study, with a goal of at least 40 patients willing to participate.

2. DESCRIPTION OF STUDY AND PROCEDURE(S)

It is not clear at the present time if the behavioral contracting will be effective in improving dietary compliance. For this reason, half the patients who participate in this study will be assigned to the experimental group using the behavioral contract tool and the other half will be assigned to the control group using no contract tool. Your assignment will be based on randomization . Randomization is a statistical method, like a toss of a coin, which will assign

Patient's Initials and Date: _____/____/_____

you to one of the groups. The chances of being placed in either the experimental or control group are approximately equal.

This study will not result in any treatment changes for patients assigned to either group. All patients should adhere to their usual regimen of dialysis treatment including: medications, renal diet, fluid restriction, and hemodialysis treatment schedule.

Experimental Group 1- Using Behavioral Contract Tool

If you are assigned to this group you will complete a behavioral contract with the investigator dietitian every month for six months while on the study. This contract will be a written agreement, negotiated, individualized, and private between the patient and investigator dietitian. This contract will specify expectations and plans for the behavior to be changed.

Control Group 2- Using No Tools

If you are assigned to this group you will not use the behavioral contract tool, however, data will be collected to use as comparison with group 1.

Both Group 1 and 2

You will be asked to complete a personal information record during the baseline month of the study which will ask you about: yearly income, age, race, gender, medication schedule, dialysis treatment schedule, diagnosis leading to dialysis, nephrologist, and marital status.

You will be asked to complete a food frequency form during the baseline month and months 1,2,3,4,5,6 and 8 of the study. The food frequency form will require you to estimate the types of foods that you have eaten during the previous month. You will be provided with food models and instructions to assist you in completing this form.

You will be asked to complete two surveys during the baseline month and months 1, 3, 6, and 8 of the study. These surveys will ask you questions about your views and perceptions of hemodialysis and renal disease.

Data will be obtained from your medical records starting with records for the four months prior to participation and continuing throughout the duration of the study to include diagnosis, treatment related to dialysis, medications, weights, and laboratory data which is collected routinely once a month.

Your participation in this study will last 10 months.

Patient's Initials and Date: _____/____/_____

3. RISKS

Risks to the patient are minimal in this study. There is a minimal risk with the confidentiality of patient data (please see confidentiality section of consent form). No extra laboratory tests are required for data collection. The study will involve some of the patient's time during the dialysis treatment to complete the necessary surveys and forms required in the research study. There are no extra costs related to your participation in this study.

4. BENEFITS

Benefit cannot be promised. Possible benefits are prolonged survival, relief of symptoms caused by dietary non-compliance, and more control over your disease. Some other benefits include an increase in quality of life and a decrease in the risk of morbidity and mortality. Another potential benefit is knowing more about yourself, your beliefs about dialysis, and more about the renal diet and dietary compliance.

5. CONFIDENTIALITY

All information collected from your involvement in this study will be kept confidential. By signing this document you consent to such review. This consent will be filed in an area with access restricted to the Principal Investigator and authorized representatives. Your identity will be kept confidential unless disclosure is required by law. You will not be identified in any publications resulting from this study. All data collected from this study will be kept in a locked file that will be kept in the principle investigator's office. A code number will be assigned to each subject. Only the principle investigator and the subject will be aware of their code number. By using this code number system, all data collected will be kept confidential.

6. CONTACT PERSON: For more information about this study, you may contact: *Lesley Ramsey RD/LD at Saint Francis Hospital, 494-7202, Dr. Kathryn Keim PhD RD/LD Oklahoma State University, 405-744-8293,*. You may also contact the Institutional Review Board of Saint Francis Hospital at 918-494-2495 and/or *Sharon Bacher, 203 Whitehurst, Stillwater, OK, 405-744-5700* for information about your rights as a research subject.

7. NEW INFORMATION

You will be informed of any new findings developed during the course of this research which may relate to your willingness to continue participating in this study. The investigator may

Patient's Initials and Date: _____/_____/_____

discontinue your participation in this study if in her opinion, the study or treatment offers you little or no future benefit.

8. VOLUNTARY PARTICIPATION

Your participation in this study is voluntary. You have the right to decide if you want to participate in this study. You also have the right to stop taking part in this study any time you choose without penalty or loss of benefits or treatments to which you are otherwise entitled. At no time will your medical care be at risk based on your decisions. In the event you withdraw from the study, clinical data will continue to be collected unless you specify otherwise. You have the right to refuse any further involvement.

I have read all of the above, asked questions concerning areas I did not understand, and willingly agree to participate in this study. By signing this form I understand there is go guarantee I will be able to participate in this study. There may be health or treatment conditions in my case which could make the study unsuitable for me. I will be given a copy of this signed consent form for my records.

Patient's Signature	Date
Principle Investigator's Signature	Date
Witness's Signature	Date

Patient's Initials and Date: _____/____/____

RESEARCH SUBJECTS RIGHTS

You are being considered for participation in a research study. If you decide to participate in the research you are entitled to certain rights which include but are not limited to the following:

1. The right to be informed of the nature and purpose of the research.

2. The right to be given a full explanation of the procedures to be followed including the use of any drug or device.

3. The right to be given a description of any reasonably expected or potential discomforts and risks and any alternative treatment available if complications arise.

4. The right to be given a description of any reasonable expected benefits.

5. The right to be given a description of any appropriate alternatives including alternative drugs or devices.

6. The right to be informed of any new information developed during the study which may relate to your willingness to continue participation.

7. The right to be informed how information obtained from your involvement in the study will remain confidential.

8. The right to be informed of any additional costs as a result of your participation in the study.

9. The right to an explanation of any compensation or treatment that may be available if injury occurs.

10. The right to ask any questions either prior to granting consent or thereafter concerning the research and the procedures involved.

11. The right to refuse to participate or to withdraw from the study at any time without penalty or loss of benefits to which you are otherwise entitled.

12. The right to consent or to refuse consent to participate in the research study without the influence from improper persuasion.

13. The right to a copy of your signed and dated consent form if you volunteer to participate.

The Institutional Review Board is a group of physicians and lay people who are committed to the protection of human subjects and must review all clinical research projects and the consent

Patient's Initials and Date: _____/_____/_____

documents prior to their use. For more information about your rights as a research subject you may call the Saint Francis Hospital IRB at 494-2495.

Appendix C

Institutional Review Board Approval Letters

Oklahoma State University

Saint Francis Hospital

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD

Date: April 7, 1999 IRB #: HE-99-083

Proposal Title: "THE EFFECT OF BEHAVIORAL CONTRACTING ON ILLNESS INTRUSIVENESS, SELF-EFFICACY, AND DIETARY ADHERENCE IN CHRONIC HEMODIALYSIS PATIENTS"

Principal Investigator(s): Kathryn Keim

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

Signature:

Carol Olson

Carol Olson, Director of University Research Compliance

April 7, 1999
Date

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modification to the research project approved by the IRB must be submitted for approval. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

Saint Francis Hospital
[illegible] Tulsa, OK [illegible]
(918) 494-2200
www.saintfrancis.com

Saint Francis Health System
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Institutional Review Board
A Commitment to Ethical Research and the Protection of Human Subjects
(918)494-2495 fax (918)494-2481

EXPEDITED REVIEW CERTIFICATION OF A PROPOSED STUDY

ASSURANCE #T3688

PRINCIPAL INVESTIGATOR: Lesley Hoyle, RD/LD / Kathryn Keim, Advisor

PARTICIPATING SUB-INVESTIGATORS: None

SITES: Saint Francis Hospital - Renal Dialysis Department
All research related treatment and procedures as specified in the protocol (pathology, radiation treatment, surgical procedures, drug or device treatment) and critical trial-related decisions are limited to the investigators specified and should be performed only at the sites specified.

IRB # 1410-99 The Effect of Illness Intrusiveness, Self-Efficacy, and Behavioral Contracting on Dietary Adherence in Chronic Hemodialysis Patients.
Revised Protocol 2/6/99. Revised Consent 2/22/99. Recruitment Flier 2/22/99.

The above referenced proposed research project has been reviewed by a qualified member of the IRB in accordance with this institutions policies and procedures and the federal regulations.

The IRB member has determined that:

_____ The proposed study does NOT meet criteria for expedited approval and is scheduled for full board review.

✓ The proposed study IS APPROVED for 12 months as submitted.

The IRB member determined the next review date will be on or before 2/23/2000

The attached guidelines are applicable for research approved by this IRB. Failure to follow these guidelines could result in automatic termination of your research project.

G. Kevin Donovan MD
G. Kevin Donovan, MD, General IRB Chair

2/23/99
Date

Appendix D

Behavioral Contract

CONTRACT

I will make the following monthly changes to improve my monthly progress report.

Goals(s): _____

_____

_____

_____

Signature of patient: _____ **Date:** _____

Signature of RD: _____ **Date:** _____

F/U:

Goal(s) met _____ **Goal(s) not met** _____

Comments (Reasons why goal met or not met/future goals): _____

_____

_____

_____

_____

_____

Appendix E

Personal Information Sheet

Personal Information

Name_____

Personal Information

Code number _____

Directions. Circle the number that will answer the question or fill in the blank.

1. Gender
   1 female
   2 male

2. Age_____(in years)

3. Ethnic Origin
   1 White
   2 Black
   3 Asian/Pacific Islander
   4 American Indian/Alaska Native
   5 Hispanic
   6 Other, specify_____

4. Marital Status
   1 single
   2 married

5. Primary diagnosis leading to dialysis treatment

_____

9. Year and Month started dialysis treatments

_____

10. Length of current dialysis treatments _____hours/per visit

11. Number of time per week in dialysis _____times/week

12 Current phosphorus binder_____

13 How many phosphorus binders are taken at breakfast? _____

14. How many phosphorus binders are taken at lunch? _____

15. How many phosphorus binders are taken at dinner? _____

16. How many phosphorus binders are taken with snacks? _____

17. What is your current dry weight? _____ (Circle if pounds or kilograms)

18. Household Income (dollars per year) check one:

1 less than 14,000	5 30,000-34,999
2 15,000-19,999	6 35,000,39,999
3 20,000-24,999	7 40,000-44,999
4 25,000-29,999	8 over 45,000

16. Primary Physician (Nephrologist) _____

Appendix F

Illness Intrusiveness Scale

Name _____

ILLNESS INTRUSIVENESS RATINGS SCALE Date:

The following items ask about how much your illness and/or its treatment interfere with different aspects of your life. **PLEASE CIRCLE THE ONE NUMBER THAT BEST DESCRIBES YOUR CURRENT LIFE SITUATION.** If an item is not applicable, please circle the number one (1) to indicate that this aspect of your life is not affected very much. Please do not leave any item unanswered. Thank you.

How much does your illness and/or its treatment interfere with your:

1. **HEALTH**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

2. **DIET (i.e., the things you eat and drink)**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

3. **WORK**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

4. **ACTIVE RECREATION (e.g., sports)**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

5. **PASSIVE RECREATION (e.g., reading, listening to music)**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

6. **FINANCIAL SITUATION**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

7. **RELATIONSHIP WITH YOUR SPOUSE (girlfriend or boyfriend if not married)**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

8. **SEX LIFE**

   Not Very Much 1 2 3 4 5 6 7 *Very Much*

How much does your illness and/or its treatment interfere with your:

9. FAMILY RELATIONS

Not Very Much 1 2 3 4 5 6 7 *Very Much*

10. **OTHER SOCIAL RELATIONS**

Not Very Much 1 2 3 4 5 6 7 *Very Much*

11. **SELF-EXPRESSION/SELF-IMPROVEMENT**

Not Very Much 1 2 3 4 5 6 7 *Very Much*

12. **RELIGIOUS EXPRESSION**

Not Very Much 1 2 3 4 5 6 7 *Very Much*

13. **COMMUNITY AND CIVIC INVOLVEMENT**

Not Very Much 1 2 3 4 5 6 7 *Very Much*

Appendix G

Self-Efficacy Scale

I.D = _____ DATE _____

SELF-EFFICACY AND HEALTH BELIEFS SURVEY

This information is completely confidential. I will not record your name. The answers you give will not affect the care you receive in the dialysis unit. Ask me to explain anything you do not understand. There are no right or wrong answers. Thank you for your honest answers.

Listen to each statement carefully. Please tell me how important each statement is to you.

Example:

I think it is important to wear a seat belt when I drive.

1–VERY IMPORTANT
2–SOMETIMES IMPORTANT
3–NOT IMPORTANT

KEY:
1 - 9 HB SCORES
10 - 22 SE SCORES

1. It is important to me to be healthy. 1 2 3

2. It is important to me not to itch. 1 2 3

3. It is important to me to limit foods high in phosphorus such as cheese, milk, fresh peas and beans, chocolate and dark-colored sodas, to help prevent brittle bones, bone pain, and itching.
1 2 3

4. It is important to me to limit my fluid intake of water, tea, juice, ice, sodas, and jello so that I will not have cramps when on dialysis.
1 2 3

5. It is important for me to take my calcium pills with my meals to keep my phosphorus down and my bones healthy.
1 2 3

6. It is important to me to follow my diet and take my medications as the doctor prescribes, so I will have less problems with cramping, itching, and shortness of breath.

1 2 3

7. It is important to me not to gain too much fluid weight between dialysis sessions because it is dangerous and can weaken my heart.

1 2 3

8. If I run out of my calcium pills, it is important for me to let the doctor, nurse, or social worker know right away.

1 2 3

9. I am at risk for bone disease, stroke, heart failure, and death if I do not follow my diet, limit my fluids, come for dialysis, and take my medications.

1 2 3

Listen to each statement carefully. Please tell how often you feel you can do each of the following statements.

1--ALL OF THE TIME
2--SOME OF THE TIME
3--NONE OF THE TIME

10. **I can limit the amount of fluid I drink each day.**

1 2 3

11. **I can chew gum, eat hard candy, or rinse my mouth with mouthwash when I am thirsty to prevent me from drinking too much.**

1 2 3

12. **I can take my calcium pills to keep my phosphorus down.**

1 2 3

13. **I can make changes in the foods that I eat and drink to help control my fluid intake and improve my monthly lab work and fluid gains.**

1 2 3

14 I can ask questions about my medications, fluid allowance, and diet restrictions when I am unsure

1 2 3

15 I know what foods not to eat to keep my phosphorus in good control, and I believe that I can control my phosphorus with my diet.

1 2 3

16. I can remember to take my calcium pills with each meal as prescribed.

1 2 3

17. I can still follow my diet when eating out and away from home.

1 2 3

18. I can keep up with how much fluid I gain in between dialysis, and if my calcium is too low and my phosphorus is too high.

1 2 3

19. I can set a goal to decrease my fluid intake and gradually start cutting back to reach that goal.

1 2 3

20. I can make a goal to carry my calcium pills with me everywhere I go so that I will have them when I eat a meal.

1 2 3

21. I can replace one favorite high phosphorus food (like ice cream or chocolate) with a food low in phosphorus (like sherbet or hard candy).

1 2 3

22. I can limit the amount of salty foods I eat, like hot dogs, bologna, bacon, and potato chips to help prevent thirst.

1 2 3

Appendix H

Food Frequency Questionnaire

Roberts D. Jensen J. Renal food frequency form. *Journal of Renal Nutrition.* 1997; 7 (4): 221-222.

PATIENT NAME DATE

	FOOD AMOUNTS	Select DAILY	PRO	K+	Phos	MULTIPLY DAILY PRO	K+	Phos
PROTEINS	Milk (4 oz.), Ice Cream	1 2 3 4	4	2	1			
	Hard Cheese (American, Swiss, Cheddar, etc.)	1 2 3 4	7	1	2			
	Fish _____ oz. (including tuna)	1 2 3 4	7	1	1 x oz.			
	Turkey _____ oz. Chicken	1 2 3 4	↓	↓	↓			
	Cold Cuts Hot Dogs, Sausage	1 2 3 4	↓	↓	↓			
	Meat _____ oz.	1 2 3 4	↓	↓	↓			
	Eggs	1 2 3 4	↓	↓	↓			
FRUITS AND VEGETABLES	Canned Fruit, . . 1/2 cup Apples, Grapes, Berries	1 2 3 4	-	2	-			
	Oranges, Prunes, Pears, Peaches	1 2 3 4	-	3	-			
	Banana, Melon, Dried Fruit	1 2 3 4	-	4	-			
	Lettuce, Cabbage, Celery, Eggplant, Pepper, Zucchini	1 2 3 4	-	1	-			
	Tomatoes, Carrots, Green Beans, Peas	1 2 3 4	-	2	-			
	Broccoli, Cauliflower	1 2 3 4	-	2	-			
	Dried Peas, Beans	1 2 3 4	2	4	2			
	Potatoes, Yams	1 2 3 4	2	4	1			
STARCHES	Bread, Rolls, Crackers, Tortilla	1 2 3 4	2	1	1/2			
	Cereal	1 2 3 4	↓	↓	↓			
	Noodles, Macaroni 1/2 cup	1 2 3 4	↓	↓	↓			
	Rice	1 2 3 4	↓	↓	↓			
	RANGE K+/Phos	10-100 1 px 110-200 2 px 210-300 3 px			TOTALS			
						PRO	K+	Phos

Figure 2. A blank food frequency form. As shown in the sample (Figure 1), the values for protein (PRO.), potassium (K^+), and phosphorous (Phos) are multiplied by the number of servings of different foods. Food is grouped into PROTEINS, FRUITS AND VEGETABLES, and STARCHES.

Appendix I

Approval Letters from Nephrologists

and Dialysis Unit Manager

Saint Francis Hospital

6161 South Yale Avenue
Tulsa, OK 74136
918.494.2200

www.saintfrancis.com

Saint Francis Health System
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11/10/98

Oklahoma State University Institutional Review Board:

This letter is in regard to Lesley Hoyle's research for her master's degree. Her research will be conducted in the Renal Dialysis Outpatient Unit of Saint Francis Hospital. Lesley is the renal dietitian for the outpatient dialysis unit and interacts with the patients on a regular basis. Her research will involve obtaining monthly biochemical data from each patient, bodily weights, interviewing, and surveying each patient involved. However, the dialysis unit draws monthly labs and weighs the patients as a part of the standard operating procedures. Lesley will be using these monthly labs in order to collect the biochemical data she needs for her research. Therefore, she will not be conducting any laboratory tests on the patients, just using the biochemical data that is collected by the unit every month. Her research does not require any extra procedures or risks to the patients. If you have any further questions about any of the standard operating procedures of the outpatient dialysis unit, please contact Kathy Sittler, Dialysis Unit Manager, at 918-494-5579. Thank You.

Sincerely,

Robert M. Gold M.D., F.A.C.P
Tulsa Nephrology, Inc.

Saint Francis Hospital

6161 South Yale Avenue
Tulsa, OK 74136
918.494.2200

www.saintfrancis.com

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11/10/98

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Sincerely,

James E. Bourdeau

James E. Bourdeau M.D., PhD
Tulsa Nephrology, Inc.

Saint Francis Hospital

6161 South Yale Avenue
Tulsa, OK 74136
918.494.2200

www.saintfrancis.com

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11/10/98

Oklahoma State University Institutional Review Board:

This letter is in regard to Lesley Hoyle's research for her master's degree. Her research will be conducted in the Renal Dialysis Outpatient Unit of Saint Francis Hospital. Lesley is the renal dietitian for the outpatient dialysis unit and interacts with the patients on a regular basis. Her research will involve obtaining monthly biochemical data from each patient, bodily weights, interviewing, and surveying each patient involved. However, the dialysis unit draws monthly labs and weighs the patients as a part of the standard operating procedures. Lesley will be using these monthly labs in order to collect the biochemical data she needs for her research. Therefore, she will not be conducting any laboratory tests on the patients, just using the biochemical data that is collected by the unit every month. Her research does not require any extra procedures or risks to the patients. If you have any further questions about any of the standard operating procedures of the outpatient dialysis unit, please contact Kathy Sittler, Dialysis Unit Manager, at 918-494-5579. Thank You.

Sincerely,

Kathy Sittler RN, BSN, CNN
Dialysis Clinical Director

Appendix J

Monthly Laboratory Report

Dialysis Monthly Lab Report Card

Test	Goal Range		Diet Sources	How To Correct Abnormal Levels
Potassium	3.5 - 5.5		Cooked dried beans, potatoes, bananas, orange juice, cantaloupe, tomatoes *(many fresh fruits & vegetables)*	**High:** Omit high potassium foods *High levels can cause cardiac arrest without physical symptoms* **Low:** Increase intake of high potassium foods. *Diarrhea &/or vomiting can cause potassium to decrease*
BUN *(Blood Urea Nitrogen)*	60 - 90		Low quality protein – beans, nuts, seeds High quality protein – meat, eggs, milk, poultry & fish	**High:** Avoid low quality protein. Limit high quality protein to within meal plan. *May cause nausea, vomiting, taste changes, itching, or confusion* **Low:** Increase intake of high quality protein foods.
URR	> 65 %			
Glucose *(Blood Sugar)*	65 - 130		Most foods will raise blood sugar, but desserts & sweets have the most rapid effect	**High:** Limit desserts & sweets. Eat consistent, well-balanced meals. *Include protein with each meal.* Low: Do not skip meals and follow the same recommendations as above
Albumin *(Protein)*	> 3.5		Meat, eggs, milk, poultry & fish	**Low:** Increase intake of high quality protein foods. *Albumin reflects long-term protein intake. Too low increases risk of infection, muscle loss, weakness & malnutrition*
Calcium	8.5 - 11.0		Calcium supplements	**High:** Take calcium supplements only as prescribed. **Low:** Take phosphate binders and calcium supplements. *Calcium generally goes up as phosphorus goes down.*
Phosphorus	3.5 - 6.0		Milk, cheese, yogurt, ice cream, biscuits, salmon, liver, beans, oatmeal, nuts & bran	**High:** Not taking prescribed phosphate binders with meals or too many high phosphorus foods. *Calcium is removed from the bones & teeth causing weakness, pain & itching*
Cholesterol	140 - 200		Saturated fats (animal fats), fried foods, eggs, liver	**High:** Use low fat meats and dairy products. Use canola or olive oil. Limit egg yolks to 3 per week.
Fluid Wt. Gains	1 - 3 kg		All beverages, soups, ice cream, jello, popcicles	**High:** Decrease fluid intake. Limit salt. *Excess fluid causes edema, shortness of breath, increase work on the heart, congestive heart failure*

If you have any questions about this report or your diet, please contact: Lesley Hoyle RD/LD 494-7202

VITA

Lesley Kathryn Ramsey

Candidate for the Degree of

Master of Science

Thesis: THE EFFECT OF BEHAVIORAL CONTRACTING ON ILLNESS INTRUSIVENESS, SELF-EFFICACY, AND DIETARY ADHERENCE IN CHRONIC DIALYSIS PATIENTS

Major Field: Nutritional Sciences

Biographical:

Personal Data: Born in Tulsa, Oklahoma, On May 15, 1975, the daughter of Richard and Joanne Hoyle.

Education: Graduated from Jenks High School in May 1993; received Bachelor of Science degree in Dietetics from Iowa State University, Ames, Iowa in May 1997. Completed the requirements for the Master of Science degree with a major in Nutritional Sciences at Oklahoma State University in December, 2000.

Experience: Completed a dietetic internship, 1998; employed as a clinical dietitian at Saint Francis Hospital, Tulsa, Oklahoma, 1998-present.

Professional Memberships: National Kidney Foundation, Council on Renal Nutrition