DEVELOPMENT OF A SELF - INSTRUCTIONAL UNIT ON THE MANAGEMENT OF END STAGE RENAL DISEASE

> Thesis for the Degree of M. S. MICHIGAN STATE UNIVERSITY DIANE GAY GROVES 1977





This is to certify that the

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ABSTRACT

DEVELOPMENT OF A SELF-INSTRUCTIONAL UNIT ON THE MANAGEMENT OF END STAGE RENAL DISEASE

By

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A survey of nephrology dietitians and physicians conducted in the summer of 1976, indicated that the majority of respondents did not use self-instructional materials when counseling clients with End Stage Renal Disease (ESRD). A current self-instructional unit on ESRD was not available for dietitians and/or dietetic students. Therefore, a current unit on present methods of treatment of ESRD needed to be developed for dietitians and/or dietetic students. The unit was also seen as being applicable to allied health professionals on the renal treatment team, who might be supporting and reinforcing dietary counseling.

The unit was developed according to a recognized method that included 1) development of six content areas (normal structure and function of the kidney, clinical chemistry, ESRD, dialysis, dietary treatment, and diabetes and ESRD), 2) testing with thirty dietetic students (seniors and juniors enrolled in Michigan State University's Coordinated Study Plan) and dietetic trainees, and 3) collection of data by use of Revision Data Sheets for recording of errors, comments and time to complete the unit. The unit goal of achievement of eighty percent accuracy on the unit post-test was not met by the students. The range of scores improved for each group from pre to post-test, as did the mean score. A two tailed T-Test indicated significance between the pre and post-test scores at p < .001, but the difference between group achievement was not significant (p > .05). All students took longer to complete the post-test than the pretest. The seniors took the longest amount of time (7.8 hours) to complete the unit and also had the highest mean post-test score (46.5). Less than half of the questions (twenty-seven out of fifty-nine) were correctly answered by at least eighty percent of the students, but there was student improvement on all questions from pre to post-test.

The students did not meet the unit goal, indicating need for revision of the unit.

Other conclusions were that there appears to be a relationship between time spent on the unit and achievement level and a relationship between level of professional qualification and achievement level.

DEVELOPMENT OF A SELF-INSTRUCTIONAL

UNIT ON THE MANAGEMENT OF

END STAGE RENAL DISEASE

By

Diane Gay Groves

A THESIS

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CHAPTER 1

INTRODUCTION

Prior to the mid-twentieth century, persons with renal disease received limited treatment and were given little hope of living more than a few years. There are two classifications of renal disease, 1) End Stage Renal Disease (ESRD) is defined as less than ten percent remaining renal function and 2) Chronic Renal Failure (CRF) is defined as ten to twenty-five percent remaining renal function. The symptoms characteristic of either of these is commonly termed uremia, which is ultimately fatal.

Previously, nutritional therapy for CRF was planned to severely restrict some nutrients. Recently, hemodialysis has been introduced as an additional means of treatment of CRF. Dialysis, peritoneal or hemodialysis, is a method of removing toxic products from the body when renal function has deteriorated due to destruction of nephrons. This is accomplished by filtration of blood through a semi-permeable membrane. With the advent of hemodialysis, dietary therapy has been liberalized. Currently in the United States about 32,000 patients are on maintenance hemodialysis (1). It is predicted that within five to six years, the number of patients on hemodialysis will increase to 55,000 (1). These patients will be kept alive on hemodialysis or will eventually receive a renal allograft (kidney transplant). According to Burton (1), "much of their clinical success depends on rational dietetic indoctrination and

monitoring of the patients by dietitians with expertise in this field." It should be emphasized that treatment exclusively by nutritional means is not the answer, but helps to improve the state of the patient with renal failure.

To gather current information on counseling of clients with ESRD, a survey I of 125 dietitians and physicians in the eastern and midwestern states who were members of the Council on Renal Nutrition (CRN) was undertaken in the summer of 1976. One purpose of this survey was to determine what information patients with CRF were given by dietitians. and the amount of time dietitians spent counseling these patients. According to the sixty-three percent return, nutritional counseling and management of clients with ESRD involved many hours on the part of the dietitian. ESRD with the added complication of diabetes is considered a subspeciality of nephrology. When the client with ESRD also had diabetes, the numbers of dietary restrictions increased. Patients having diabetes and ESRD require additional counseling time in order that they comprehend both diseases and the dietary restrictions. Dietitians also reported that few self-instructional or audiovisual materials were used in counseling. Concurrently with the survey, the status of self-instructional and audio-visual materials available for clients with CRF was assessed. A large variety of these materials were available for clients. Due to the need of dietitians for a comprehensive listing of such materials, the CRN was compiling such a listing for distribution to CRN members. Dietitians reported their reasons

¹Diane Groves, "Survey of Selected Clinicians Regarding Instructional Materials for Patients with Chronic Renal Failure." Independent Study, Michigan State University, 1976.

for not using these materials as not knowing they existed, not liking the format or content or not finding them easily accessible, usually meaning costly. It was concluded that the listing by CRN would alert dietitians to the existence of these materials.

Programmed, or self, instruction has been used successfully as an instructional strategy. It is applicable to patient and professional education. The results of the above survey led to the conclusion that adequate self-instructional materials exist for clients with ESRD. There are no current materials available for dietitians and/or dietetic students. The manual previously developed for the American Dietetic Association is out of date because of changes in dietary treatment methods and is not currently available. It was perceived that such a self-instructional unit needed to be developed for dietitians and/or dietetic students based on current methods of treatment of ESRD. Such a project appeared feasible becuase of the successful use of selfinstruction in professional education (2).

CHAPTER 2

RELATED LITERATURE

Schein (2) has delinated several mechanisms of instruction that are applicable to professional education. These include self-paced study, independent study, tutorial methods, problem centered study, practicum and internships.

Teaching strategies are the teacher's approach to using information, choosing resources and providing an activity role for students. There are basically two kinds of strategies: expository, in which the teacher presents information to the students, and inquiry, in which the teacher acts as facilitator and arranges learning conditions so that questions are raised (3).

In contrast to the types of teaching strategies, people have different learning styles, such as, some need concrete experience, while others learn best from abstract conceptualization. Others are active experimenters versus reflective observers (4).

Systematic Approach to Learning

A systematic approach to learning (5) has been identified that includes first defining the purpose and content of the educational activity, then gathering data on student characteristics and writing the behavioral objectives. Students are then pretested for present knowledge (entering behavior) and are grouped based on their characteristics. Students may be grouped based on interest or achievement

level, but they should be allowed to proceed to more advanced work if they do well on pretests. The learning strategy is then defined, which is how one wants to teach the material. Existing resources are determined along with those that need to be developed. After construction of the learning strategy, evaluation of the teacher and of learner performance occurs. Revision of the learning strategy is based on evaluation.

Objectives

The term objective has been defined as describing a desired outcome of the educational activity and tells the teacher and the student what the student should be able to accomplish when he or she finishes the course or unit (3, 5). An objective should include the type of behavior expected, the conditions under which the student must demonstrate the behavior and how well he or she should perform the objective (3, 5, 6).

Bloom (7) has devised a Taxonomy of Educational Objectives in a hierarchy which is:

Knowledge - to recall and recognize
Comprehension - to translate from one form to another
Application - to apply or use information in a new situation
Analysis - to examine a complex and break it down into its parts
Synthesis - to put together information in a unique or novel
way to solve a problem
Evaluation - to make a judgment about something in light of
some criteria

According to Johnson and Johnson (8) most teachers only teach to the level of knowledge, which is the simplest level of mental activity.

Media

According to Gerlach and Ely (3), "a fundamental component of the systematic approach to learning is the selection of instructional media."

Media is defined as the graphic, photographic, electronic or mechanical means for attracting attention, processing and reconstituting visual or verbal information (3, 5). Media should be selected for use based on its potential to accomplish the objective and whether the media will be used for group or independent study.

The different types of media (9) that can be used are real things (people, objects), verbal representation, graphic representation, still pictures, motion pictures, audio recordings and programs (programmed instruction, computer assisted instruction and simulations).

Programmed Instruction

Johnson and Johnson (8) claim that "self-instructional materials are essential if teachers are to have time to help diagnose learning difficulties, interact with students on a one to one basis, inspire, motivate, identify and encourage creativity and self-direction."

Programmed instruction (PI) is defined as sequences of information (verbal, visual or audio) designed to elicit pre-determined responses (3,5). PI involves active participation, that is, the reader must make responses, and he has immediate knowledge of his results.

There are two types of PI. In linear PI, each student follows the same path. In branched PI, each answer of a multiple choice or

true-false question leads to a different part of the text. The student is eventually led back to the main thought after he has completed remedial work (5).

PI has several advantages, such as, the student receives immediate reinforcement of correct answers and it allows the student to set his own pace and to repeat work (5). The disadvantages of PI include the fact that linear programs can be boring because they are written in such small steps or students may look up answers before doing the quesions. Another disadvantage is that students may not see the continuity of the material since it is presented in small steps (5).

According to Schein (2), self-paced instruction can be easily linked to the rest of the educational system. Wittich and Schuller (9) have generalized that PI leads to significant and accelerated learning outcomes.

Three important considerations of the developer for PI include time, space and money. Time is needed for the developer and the student. Developer time can be decreased by using commercially prepared objectives or tests, packaged media or audio-visual units that are already developed. It is easier to use a team of people to help with instructional format and content when developing a unit. Self-paced units require a place where a student can work on the module by himself. Money is a consideration both for costs of development and duplication (5).

Construction Principles

There are several principles to follow when designing selfinstructional units. First, provide for small steps. The smallness

of the step depends on the complexity of the task and the difficulty of the content. Boredom occurs from steps that are too small. The next principle is to provide for a graduated sequence of objectives until the criterion performance is reached. The use of the practice cycle is the third principle. This cycle provides for the following:

input - information provided to the student to guide him
practice - opportunity to try the desired behavior

feedback - information on how well the student performed The developer should provide for a perceived purpose which is why the student should learn the material and also provide an overview of the material that gives the student an expectation of the kinds of learning he will acquire (8).

Another principle relates to the steps in developing a selfinstructional unit which have been elaborated by Johnson and Johnson (8). These steps are to state the objectives, write the post-test, prepare the unit providing small steps, frequent practice and feedback. The next step is to test the material for errors, comments and other data needed for revision. Finally, the material is revised holding the objectives and post-test constant until all objectives are met.

In order to have the student feel that you are talking with him on a one to one basis, self-instructional units should be written in the first person and sketches, diagrams, pictures, etc., should be added for illustration and clarity (8).

Construction Techniques

Several different methods can be used to construct selfinstructional materials. One method is to use different types of

frames, such as, discrimination, constructed response, set, practice and terminal (10).

Discrimination Frame Technique

The discrimination frame technique (10) teaches the students to distinguish between two or more items. The items that must be presented in this frame type are the item and that which is not the item, that is, the discriminative stimulus (S^D) and the nondiscriminative stimulus (S^{Δ}). This technique usually involves a three frame sequence, with the first frame providing a stimulus prompt, which is removed in the second frame. The third frame may ask for a definition and example. An example of the discrimination frame technique might be:

Frame 1: stimulus prompt included

Meat is the edible portion of mammals. IN THE LIST BELOW, PLACE A CHECK MARK (\checkmark) BEFORE EACH ITEM THAT IS MEAT. \checkmark A. beef \checkmark D. lamb _____ B. chicken _____ E. fish \checkmark C. beef liver \checkmark F. pork

Frame 2: stimulus prompt removed

 PLACE A CHECK MARK (√) BEFORE THOSE ITEMS THAT ARE MEAT.

 ✓
 A. pork liver
 D. cod

 ✓
 B. hamburger
 E. chicken thigh

 ✓
 C. ham
 F. salmon

Frame 3: no stimulus prompt; definition and examples asked for

Define meat and give two examples. ANSWER: Meat is the edible portion of mammals. Two examples are beef and pork.

Constructed Response Frame Technique

The constructed response frame technique (10) is used most often. No choices are presented to the student, but he must construct his own response. These have a tendency to be boring and the scope of the material that can be presented is limited. Students sometimes have difficulty in obtaining transference to tasks in the real world. An example of a constructed response frame is:

The prefix 'milli' means 1000th. Since this is the case a milligram is <u>1000</u>th of a gram.

Set Frame Technique

A set frame (10) has the response asked for in the data portion of the frame.

The second exchange list I mentioned is the vegetable list. This list contains all foods that are <u>vegetables</u>.

Practice Frame Technique

A practice frame (10) follows the set frame and gives the student a chance to practice what he has learned in the set frame. An example of a practice frame is:

Whenever you are looking for a food that is a vegetable you would look in the <u>vegetable</u> exchange list.

Terminal Frame Technique

The terminal frame (10) is the most complex and contains no or few prompts.

Name the three exchange lists with which we have been working and describe the types of foods found in each. ANSWER: milk exchange list - milk and milk products vegetable exchange list - vegetables fruit exchange list - fruits

Practice Question Technique

Another method of constructing self-instructional units involves development of sequences of information followed by practice questions designed in the format of multiple choice, true-false or short answer. Gronlund (11) has enumerated rules for construction of these types of test questions. Multiple choice questions should be stated clearly and simply in a positive form or with negative wording emphasized. Answers should be grammatically correct, verbal clues should be avoided, length and position of the correct answer should be varied and each item should be independent of others. True-false test items should have only one central item, should be unequivocally true or false, should be short and extraneous clues to the answer should be avoided. Short answer items should be stated so that only a single, brief answer is possible, the blank should be at the end of the statement, should be stated in the form of a question and should be stated as an incomplete statement only when this provides greater conciseness, should state the degree and unit desired for numerical answers.

Test quesions should be relevant and directly related to the unit objectives. Mager (12) states that "the rule is to match the performance and the conditions of the test items with those of the objective."

The post-test or achievement test measures how well the students meet the objectives. This test should be written after the objectives have been written. The level of accuracy should be determined. Gronlunds' (11) rules for achievement tests include measuring desired learning outcomes that harmonize with the objectives, measuring an adequate sample of the outcomes and material provided, using types of test items most appropriate for measurement, reliability. Achievement tests are used for improvement of student learning.

Testing

Testing of the unit can involve three types of testing:

- 1. one to one
- 2. small group
- 3. field

One to one testing uses a representative of the intended group and attempts to discover inadequacies and what caused the mistakes. Small group (five to eight students) testing helps to determine how much of the material is learned. The developer presents the introductory remarks and administers the pretest. Students are given the unit to work through and then write the post-test. Field testing is done with an entire class. The teacher or trainer presents the unit to the students as a normal part of the class routine. This allows the developer to test the instructions to the user of the unit. Students are pre and post-tested and the developer is interested in how well the unit achieves its purpose (10).

Evaluation

Evaluation is done after the developer has tested the unit. One wants to determine if the students met the objectives, if they did poorly on one part or objective, if they liked the unit and the way it was taught and if they were interested (5).

Evaluation is a process to discover whether the particular method of instruction is adequate and it makes some kind of judgment as to the ability of the student (5).

Feedback is what the student has to say about the unit. From this one can find out if one is expecting too much prior knowledge, if the pace was adequate, if the examination tested the objectives and what needs to be revised (5).

The common methods for gathering evaluation data are (8):

 error rate approach - collect responses, which can be analyzed, for each practice and post test item. Those

items that produce error or do not yield the desired learning are then modified

- interview technique seeks reactions and comments during or following a lesson
- delayed response approach indicated when the student is experiencing difficulty and wants to delay in answering a question
- 4. blackout procedure eliminates what may be unnecessary parts of the material in order to see how much material can be eliminated without producing error.

If the objectives are not achieved it is because the material has failed, not the student.

Revision

Revision is based on evaluation, feedback and changes in content.

Johnson and Johnson (8) have suggested the use of Revision Data Sheets for collecting error rate and interview data. This allows the learner to record his errors and explain why he missed the item. The revision data sheet can ask for errors on test questions, errors on practice questions, suggestions for improving the package and comments on the material.

Critical test data include the mean for the post test, an analysis of each test item to determine what percentage of students answered it correctly, the class range and the amount of time to complete the unit (10).

Summary

In summary, the development of a self-instructional unit follows the systematic approach to learning. The purpose and content of the unit must be defined and objectives written. The learning strategy, that is, the self-instructional unit, is developed, tested and revised based on evaluation.

CHAPTER 3

PURPOSE AND GOALS

Background Information

According to the 1976 survey¹ nephrology dietitians reported that the areas on which they counseled clients with ESRD were reasons for diet restrictions, foods allowed, special recipes, information on food preparation and disease information (see Table 1).

Table l.	Items discussed by	dietitians	during	consultation	of
	clients with ESRD				

Item	Number of respondents*	Percent
Diet information		
Reasons for diet restrictions	65	94
Foods allowed	64	93
Special recipes and food		
preparation information	59	86
Other	19	28
Disease information	47	68

* Total N = 69

Under diet information, "Other" included such things as eating out, special dietary products and behavior modification. The remainder of the diet information was given to the client as part of the

1_{Ibid}

explanation of the diet. Disease information included the purpose of laboratory tests and their correlation to the disease and dietary compliance, the use of hemodialysis, the disease processes and the differences from normal renal function.

The perception was made that in order to provide effective counseling and management of clients with ESRD, the dietitian must understand concepts related to the disease, as well as to the diet. The assessment of the responses to the survey confirmed that a selfinstructional unit for dietitians and/or dietetic students was not currently available covering this material. A unit was published by the American Dietetic Association in the 1960s and was considered out of date in view of current dietary practice.

Purpose

Because of the non-availability of a self-instructional unit on ESRD for dietitians and/or dietetic students, and the apparent need for dietitians to be knowledable regarding management of clients with ESRD, the purpose of this project was to develop a self-instructional unit on ESRD for dietitians and/or dietetic students. The unit would be designed to provide a concise method to learn about and/or review basic information on normal structure and function of the kidney, the purpose of laboratory tests for diagnosis and monitoring of renal disease, ESRD, dialysis, dietary treatment and the complications and treatment of the diabetic with ESRD.

The material was written specifically for dietitians and/or dietetic students, but since the dietitian in only one member of the renal treatment team, it was perceived that an allied health

professional, defined as a nurse, dialysis technician or renal social worker, could be the person supporting and reinforcing dietary counseling. The allied health professional must therefore understand the same material that a dietitian should understand. Thus, it was seen that an additional use of the self-instructional unit would be by allied health professionals, except for the part of the dietary treatment section focusing on meal planning and menus. The material on meal planning and menus was specifically oriented towards the dietitian since he is the person who must know the basis of the diet prescription and how to interpret it into a meal pattern. The dietitian should know how menus are developed that meet the specifications of the diet prescription, as well as what parameters are used to determine if the client is complying with his diet. The first four areas of the unit would be:

- 1. normal structure and function of the kidney
- 2. clinical chemistry
- 3. End Stage Renal Disease (ESRD)
- 4. dialysis

These areas were considered preliminary to understanding the dietary treatment section. The area on diabetes and ESRD, which is a subspeciality of nephrology, was to be an exposure to the added complication of diabetes, since the numbers of clients with diabetes and ESRD are increasing (13).

Goals of the Self-Instructional Unit

It was assumed that an achievement level of eighty percent accuracy on the unit post-test would indicate that the dietitian and/or dietetic student had the basic knowledge on ESRD and its' management.

The level of eighty percent accuracy was chosen because the reader should have retained eighty percent of the material presented in the unit. Therefore, the following goal for the self-instructional unit was developed on the precept that fulfillment of this goal would enable the dietitian and/or dietetic student to have the basic concepts essential for effective management of clients with ESRD.

After completing the unit on End Stage Renal Disease, the dietetic students should be able to achieve an eight percent level of accuracy on a unit post-test covering the following areas:

- Normal Structure and Function of the Kidney nephron, filtration, secretion and reabsorption
- 2. Clinical Chemistry

BUN, creatinine, GFR, Blood and Urine tests

3. Dialysis

methods, machines, shunts

- End Stage Renal Disease symptons, alkalosis, acidosis, bone disease, effect on laboratory values
- 5. Dietary Treatment

protein, sodium, potassium, phosphorus, calories, diet calculation

6. Diabetes and Chronic Renal Failure management and prognosis

CHAPTER 4

PROCEDURE

Essential criteria which must be established prior to the development of a self-instructional unit are 1) who is the intended audience, 2) what is the rationale for development of the unit and 3) what are the goals for the unit. The self-instructional unit on ESRD for dietitians and/or dietetic students, including dietary treatment, was perceived according to the following criteria:

rationale - preliminary resource on ESRD for students and/or a review resource on ESRD for dietitians who are not nephrology dietitians

goals - to enable the learner to work more effectively with the renal treatment team upon achievement of the learning outcomes

Development

Step 1: Unit Goals

The first step in the procedure was to write the overall unit goals along with the level of accuracy that students were to obtain

upon completion of the unit. These unit goals were then subdivided into six content areas, which were the following:

- 1. normal structure and function of the kidney
- 2. clinical chemistry
- 3. end stage renal disease (ESRD)
- 4. dialysis
- 5. dietary treatment of ESRD
- 6. diabetes and ESRD

It was perceived that each of these areas would be developed into a section capable of being used alone. Thus, for each of these sections, it would be necessary to have a pretest, post-test, objectives and instructions. The flow chart of the unit is shown in Figure 1.

Step 2: Pre/Post Tests

A pre/post test was developed for each section based upon the objectives and a unit pre/post test was developed using questions from the section tests. The same test was used pre and post in order that student achievement from pre to post-test could be directly compared. These tests were developed using Gronlund's (11) criteria for achievement tests and multiple choice, true-false and short answer questions. A copy of the unit pre/post test is presented in Appendix A.

Step 3: Content

After the pre/post tests were developed, the content that would need to be provided to answer the questions was decided. Each of these areas of information was developed into a subdivision of the section. Practice questions and answers were developed for each subdivision, in order that the reader could test his comprehension of the



Figure 1. Flow chart of the unit



Figure 2. Flow chart of each section

material at once. Practice question development was based on Gronlund's (11) criteria for multiple choice, true-false and short answer questions.

Step 4: Review

As each section was developed it was critically reviewed by a nephrology dietitian for accuracy and format. Revisions in the context of the unit were made based on this review. The revisions were also reviewed.

Step 5: Information Section

The unit had an information section designed to provide information on the following:

- 1. intended audience
- 2. rationale
- 3. goals
- 4. format of the unit (see Figure 1)

5. format of sections (see Figure 2) - a different symbol was used throughout the unit in order to highlight the specific areas of the section, which included instruction, introduction, objectives, pretest, explanation, practice questions and answers, and post-test.

6. Revision Data Sheets - explanation of when the student was to complete these and that they were intended to give the developer feedback

7. appendix

a. glossary - terms unique to the unit were developed into a glossary that could be contained within the unit as a reference b. reference bibliography - this was based on the resources used for development of each section with the purpose of providing the reader with a list of current references should he desire further information.

Step 6: Diet Exchange List Analysis

In order to obtain current diet exchange lists that would be used with meal planning and menu preparation, the foods currently listed in the Diet Instruction Manual by the Association of Michigan Nephrology Dietitians (AMND) were reanalyzed, with AMND permission, using Michigan State University's computerized nutrient data base. Based upon reanalysis, phosphorus and calorie values were added to the lists and discrepancies in nutrient values were modified. These changes were indicated by * in the exchange lists and are to be presented to AMND in June, 1977, for their subsequent approval. Permission for use of the exchange lists with appropriately noted suggested revisions was received from the Michigan Kidney Foundation.

Step 7: Revision Data Sheets

It was perceived that error rate and interview data would be most valuable for evaluation of the unit and revision. In order to collect this data, Revision Data Sheets were developed based on those of Johnson and Johnson (8). The student was to check off incorrect answers for pre and post-test questions and practice questions, note time to complete the section or unit tests and make comments if he desired. A sample of the unit Revision Data Sheet is found in Appendix A. Step 8: Review; One to One Testing

The total unit was reviewed by the Assistant Director of Learning and Evaluation Service at Michigan State University for format, and revisions were made based on this critique.

Concurrently, one to one testing was done with one senior dietetic student in order to find major problems and to have an estimate of the amount of time it might take to complete the unit.

Step 9: Recruitment of Testers

The two instructors of HNF 480, Clinical Experience at Michigan State University were contacted for permission to have their senior students test the unit. Ten of these students were enrolled in the clinical foodservice management experience, nine of whom had had the clinical nutrition experience, and five were enrolled in the clinical nutrition experience. Fourteen of the fifteen students were enrolled in the Coordinated Study Plan. All of these students had previously taken HNF 470, Clinical Nutrition at Michigan State University and thus had previously been exposed to diet and renal disease in this course.

The coordinator of the Flint, Michigan, Dietetic Traineeship was contacted and permission was granted to test the unit with the six dietetic trainees. These trainees had already received a Bachelor of Science in Dietetics and would be entering the third month of the one year dietetic traineeship when the unit was tested. All of the dietetic trainees spend one month of the traineeship on a renal unit with a nephrology dietitian, but at the time of testing, only one trainee had been on the renal unit.
The instructor of the junior Coordinated Study Plan students was contacted for permission to have nine of her students test the unit. The students were currently enrolled in HNF 303, Dynamics in Dietetics (Clinical Nutrition Field Experience) and in HNF 470, Clinical Nutrition, but had not yet been exposed to renal diets in the latter course.

Testing

A testing plan and set of instructions for the test monitors was developed. The test monitors were the developer (two groups), the traineeship coordinator (one group) and the instructor of the HNF 480 students enrolled in the clinical nutrition experience (one group). The units, Revision Data Sheets and unit pre and post-tests were duplicated. Testing of the unit began with administration of the unit pretest to a group of students at one time with a monitor present. The monitor issued the instructions, unit pretest, units and Revision Data Sheets and collected the tests. Units were given to the students because they contained the diet exchange lists used in calculation of two diet questions. Pretests were administered to seniors in the foodservice experience on April 22, 1977, to seniors in the clinical nutrition experience on April 28th and to the dietetic trainees on May 2nd. The students were given an estimate of the time it might take to complete the unit and were told they could do it in small pieces or at one sitting. As the student worked through the unit, she was to complete the Revision Data Sheet, including time to complete the sections and unit tests. The students reassembled as a group and the monitor administered the post-test (seniors in foodservice on April 29th, seniors in clinical nutrition on May 12th and

dietetic trainees on May 16th). Units, Revision Data Sheets and posttests were collected and all materials were returned to the developer.

Evaluation

Information from the revision data sheets was coded, keypunched and analyzed for the following:

- frequency of each pretest and post-test question correct and incorrect (all sections and unit)
- frequency of each practice question correct and incorrect (sections only)
- mean scores for the unit pre and post-tests for each of the groups (seniors, dietetic trainees, juniors) plus the total group
- range of pre and post-test scores for the unit for each of the groups plus total group
- comparison of unit post-test scores between each group plus the total group
- 6. comparison of average amount of time to complete the unit pre and post-tests and the total unit between each group

Based upon the frequency analysis of questions it was determined which questions of the unit post-test were incorrect most often, and therefore, which content areas were met at the eighty percent level of accuracy. Comments on the Revision Data Sheets were noted for use in revising the unit.

From the comparison of pre and post-test scores for the unit it was determined if the dietetic students and dietetic trainees met the

unit goal with eighty percent accuracy. Which parts of the unit goal were not met was determined from the frequency analysis.

A two tailed T-Test was used for determination of significant difference in the pre and post-test mean scores for the unit for the total group. Analysis of variance was used to determine if there was any significant difference in the achievement level between juniors, seniors and dietetic trainees.

The average amount of time to complete each section and the unit pre and post-tests was used to determine the average amount of time to complete the entire unit.

CHAPTER 5

RESULTS/DISCUSSION

The assumption had been made that an achievement level of eighty percent accuracy on the unit post-test would indicate that the dietitian and/or dietetic student had the basic knowledge on ESRD and its management. The intended goal of the unit was that respondents as a group would achieve a level of eighty percent accuracy on the unit post-test, leading to the ability to effectively manage clients with ESRD.

The unit post-test had a total of fifty-nine questions based upon the content of each of the six sections. Responses were tabulated from Revision Data Sheets which served as the evaluation tool for the study. Students were asked to check a question incorrect even if they only got one part of the question wrong. It is therefore conceivable that on many questions, students may have gotten parts of the question correct, but not the total question. It was assumed that any student that did not check a question as incorrect answered it correctly. All respondents completed a Unit Revision Data Sheet. All students did not complete a Revision Data Sheet for each section.

Frequency Data

The approach to identification of achievement of the unit goals began with analysis of frequency data on the unit pre and post-test questions. The frequency data looked at what percentage of students

answered a question on the unit post-test with 100 percent accuracy.

Table 2 indicates those questions, by section content, on which at least eighty percent of the respondents achieved 100 percent accuracy on questions of the unit post-test. Table 3 shows those questions for which less than eighty percent of the respondents achieved 100 percent accuracy on questions of the unit post-test. On the unit post-test fifteen questions related to normal structure and function of the kidney, eight to clinical chemistry, twelve to ESRD, six to dialysis, thirteen to dietary treatment and five to diabetes and CRF. At least eighty percent of the students correctly answered over half of the questions relating to the sections on normal structure and function of the kidney, nine out of fifteen questions, and ESRD, seven out of twelve questions, according to Tables 2 and 3. It appears that the content areas were not mastered for any section, since eighty percent of the total number of questions pertaining to any section were not correctly answered by at least eighty percent of the students. Half or less of the students answered the two diet calculation questions correctly (questions fifty-eight and fifty-nine). There was student improvement on each question from pre to post-test as indicated on Tables 2 and 3. Four questions (questions 2, 7, 14 and 50) were answered correctly by all respondents. The only question on dialysis (question 14) answered correctly, as shown in Table 2, was answered with 100 percent accuracy by all respondents. Table 2 indicates that four questions (questions 2, 4, 7 and 14) were correctly answered by at least eighty percent of respondents on the pretest. The percentage responding accurately increased on three of these questions (questions 2, 7 and 14) on the post-test, as shown on Table 2.

Section and		Correc	t responses	; responses		
question	Pret	test	Pos	t-test		
	N*	Percent	N*	Percent		
I. Normal structure and function of the kidney						
1 2 3 4 5	15 28 5 29 13	50 93 17 97 43	29 30 26 29 25	97 100 87 97 83		
29 35	10 14 20 4	33 47 67 13	24 26 26 27	80 87 87 90		
11. Clinical chemistry 7 27 30	29 2 20	97 7 67	30 24 27	100 80 90		
III. End Stage Renal Disease	17	67	26	07		
12 19 38	7 21	57 23 70	28 28 24	87 93 80		
40 46 49	19 23 1	63 77 3	28 29 28	93 97 93		
52 IV. Dialysis	9	30	24	80		
14 V. Dietary treatment 15	26 9	87 30	30 27	90		
25 32	5 1	17 3	25 24	83 80		
33 34 50	11 7 18	37 23 60	25 27 30	83 90 100		
vi. Diadetes and CRF 43	17	57	28	93		

Table 2. Unit pre and post-test responses for questions on which at least eighty percent of respondents achieved 100 percent accuracy on the post-test questions

* Total N = 30

Conting and		Correct	t responses	
question	Pre	test	Post	-test
	N*	Percent	N*	Percent
I. Normal structure and function of the kidney				
10		23	22	73
26	5	47	16	73 53
28	21	70	22	77
36	15	50	19	63
45 II Clinical chemistry	14	4/		5/
	15	50	23	77
17	10	33	20	67
18	9	30	22	73
37	10	33		73
JY III End Stage Renal	15	50	23	//
Disease				
20	3	10	21	70
21	8	27	20	67
31 AA	4	13		43
54	8	20	20	67
IV. Dialysis		_,		07
8	1	3	20	67
16		23	21	70
41	3	10	18	60 60
47	4	13	23	77
V. Dietary treatment				
23	10	33	23	77
24 12	13	43	12	40 72
48	8	27	21	73
53	2	7	10	33
58	1	3	15	50
59 VI Diskatas and CDC	1	3	12	40
VI. DIADETES AND LKF 51	9	30	12	43
55	2	7		37
56	6	20	19	63
57	6	20	21	70

Table 3. Unit pre and post-test responses for questions on which less than eighty percent of respondents achieved 100 percent accuracy on the post-test questions

Table 2 also indicates that twenty-seven questions were answered correctly by at least eighty percent of respondents, whereas, Table 3 indicates that thirty-two questions were answered correctly by less than eighty percent of the respondents. Detailed analysis of questions on Table 3 might indicate the needed areas of revision. Tables 7 to 19 in Appendix B indicate the frequency data for the unit and sections.

Analysis Data

Achievement of the unit goal was determined by analysis of data for mean score. The eighty percent level of accuracy stated in the unit goal for the unit post-test would require 47.6 questions answered correctly. The mean post-test score for all students was 43.9 as shown in Tables 4 and 5. None of the groups as a whole met the level of eighty percent accuracy (47.6 questions correct), as indicated by the mean post-test score in Tables 4 and 5.

Tables 4 and 5 present results for the unit. Table 4 presents the range of scores for the unit for the total group and the subgroups. No student received a score of 100 percent on the unit post-test, although at least one of the senior students had a score of fiftyeight out of a possible fifty-nine. The range of scores improved for each group from unit pre to post-test, that is, the low score was higher and the high score was higher on the post-test.

Tables 4 and 5 indicate the mean scores for the pre and post-test for the unit, and shows that there was improvement in total mean score for each group of students. Table 5 shows the gain in score between the mean unit pretest score and the mean unit post-test score was 23.3 for all students, and a two tailed T-test indicated significance at

			Uni	it	
Group		Pretest	<u></u>	F	Post-test
	low		high	low	high
All students (N=30)	7	$\overline{X} = 20.6$	38	22	$\overline{X} = 43.9$
Seniors (N=15)	12	X = 21.3	36	32	$\overline{X} = 46.5$
Dietetic trainees (N=6)	11	X = 23.8	38	22	53 X = 42.7
Juniors (N=9)	7	$\overline{X} = 17.3$	24	29	$\overline{X} = 40.6$

Table 4. Range of pre and post-test scores for unit for each group (seniors, dietetic trainees, juniors) plus total group, and mean score

* Total questions = 59

Table 5. Mean scores for pre and post-tests for unit for each group (seniors, dietetic trainees, juniors)plus total group, gain score and significance level for total group

Cupun		Unit	
Group	Pretest	Post-test	Gain
All students (N=30)	$\frac{20.6}{\sigma} = 7.7$	43.9 σ = 8.6	23.3 p < .001
Seniors (N=15)	21.3 $\overline{\sigma} = 6.9$	46.5 σ = 8.6	25.2
Dietetic trainees (N=6)	23.8 σ = 11.5	42.7 ज = 12.5	18.9
Juniors (N=9)	$\frac{17.3}{\overline{\sigma}} = 5.6$	40.6 $\overline{\sigma} = 5.6$	23.3

the p < .001 level. Analysis of variance between the mean scores for the groups of students indicated that the difference between groups was not significant (p > .05). Therefore, there was not any difference between mean scores of the groups, but the difference between pre and post-test scores for all students was significant.

Tables 4 and 5 indicated that the seniors had the highest overall mean unit post-test score, 46.5. The senior post test scores on the whole were higher than the other groups. The difference between the unit pre and post-test mean scores, 25.2, was also higher for the seniors than the other groups.

The possibility is raised that the seniors might have done better on the unit as a result of being previous students of the developer. Also, the seniors receive little or no exposure to renal diets during their clinical nutrition experience, so they may have thought the unit would be an excellent method to learn about ESRD and its' treatment. In contrast, the dietetic trainees, might not have done as well because they thought they would be receiving this material when they spend their month on the renal unit.

All students may not have done as well as they might have because of other class commitments and therefore, lack of time to spend on the unit.

Table 6 reflects the time spent on the total unit. The table indicates that all students spent more time on the unit post-test than on the pretest. The total amount of time to complete the unit includes time to write the unit pre and post-test and to complete each section from pre through post-test. Table 6 indicates the seniors' average amount of time to complete the total unit was longer than any

	Pretest	Post-test	Total unit
	(minutes)	(minutes)	(hours)
All students	30.8	56.8	5.9 $\overline{\sigma} = 4.5$
(N=30)	σ = 19.4	σ = 36.4	
Seniors	36.7	56.0	7.8
(N=15)	ਰ = 16.7	σ = 37.1	σ = 3.7
Dietetic trainees (N=6)	41.7 σ = 12.5	85.0 $\overline{\sigma} = 35.6$	5.0 $\overline{\sigma} = 5.0$
Juniors (N=9)	$\frac{13.9}{\overline{\sigma}} = 17.5$	$\frac{39.4}{\sigma} = 26.2$	4.9 σ = 4.9

Table 6. Comparison of average amount of time to complete unit pre and post-tests and total unit between each group (seniors, dietetic trainees, juniors) plus total group

of the other groups. It appears that amount of time spent could be an indication of how well students performed on the post-test. From Table 6 it is seen that the group, the seniors, that had the longest average amount of time had the highest score (Table 5). The dietetic trainees had a lower average amount of time than the seniors and had the lowest score.

Comments

Comments from the students on the overall unit include the fact that they thought it was too long, but it was an excellent learning experience. Practice questions were considered good because they forced the student to think about what was read. The students thought that the dietary treatment should be stressed most. Some of the questions they reported as not understanding were those most frequently checked incorrect. It was reported that answers needed to be placed directly after the questions. Students commented that the section on physiology was too detailed. One suggestion was to have a case study included, possibly as the overall post-test.

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CHAPTER 6

CONCLUSIONS/RECOMMENDATIONS

Conclusions

The major conclusion from this study is that there was an overall significant improvement in student achievement from unit pre to posttest, but 100 percent of the students did not reach the mastery level of eighty percent accuracy for the unit goal, as measured by the posttest. There appears to be a relationship between amount of time spent on the unit and achievement level, that is, the longer the time spent on the unit the higher the score. The students who thoroughly completed the unit thought it was a valuable learning experience.

There appears to be a relationship between level of professional qualification and achievement level on the unit. Of the groups, the seniors are closest to professional qualification and achieved the highest mean score.

It was concluded that since the students did not meet the unit goal, the unit needs to be revised.

Recommendations

A major recommendation would be to make the unit shorter, based on comments from the students. It is suggested that the clinical chemistry section could be incorporated into the section on ESRD. The section on diabetes and CRF needs to be developed into a specialized unit of its' own. A revised unit would thus include sections on normal

physiology, ESRD, dialysis and dietary treatment. The sections on physiology and dialysis need additional and better illustrations. According to student feedback, the dietary treatment section needs to have more programming for the part dealing with diet calculation.

From student suggestions, it is recommended that the format of the unit should be changed so that answers to practice questions immediately follow the questions.

If the concept is retained of having each section capable of being used alone, each of the revised sections needs to have a pre and post-test, section objectives and instructions. It is conceivable that a case study could be the post-test that would be the final evaluation tool for the total unit.

The physiology, ESRD and dialysis sections need to be revised with the advice of physicians who are specialists in nephrology.

Since the unit is also perceived as being used by allied health professionals, it is recommended that it would need to be tested by representatives of this group.

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APPENDIX A

SUMMARY

SURVEY: INSTRUCTIONAL MATERIALS FOR PATIENTS WITH CHRONIC RENAL FAILURE

Conducted Summer 1976 by Diane G. Groves, R.D. Graduate Student Department of Food Science and Human Nutrition Michigan State University

Of the 125 questionnaires mailed to dietitians and physicians in eastern and midwestern states who are members of the Council on Renal Nutrition, sixty-three percent were returned and of these fifty-six percent were tallied. Those questionnaires not tallied were returned without responses.

The respondents were mostly hospital dietitians counseling either over thirty patients or one to ten patients. These patients' dietary restrictions usually included sodium, potassium, protein, fluid, calories and sometimes phosphorus. The initial counseling time reported was usually thirty minutes to one hour with follow-up counseling given one to two times weekly. Approximately one-third of the respondents reported that they provided additional counseling if the patient was in the hospital or showed additional need for counseling.

These dietitians used mainly one to three instructional tools including exchange lists, cookbooks, and slides. The majority did not use self-instructional or audio-visual materials.

If self-instructional material was used, it was included in the followup counseling. The respondents indicated that it tended to decrease counseling time and reinforced the instruction. The same was true of audio-visual material.

The focus of counseling was reasons for diet restrictions, food lists, recipes and cooking tips, and disease information. The most frequent questions raised after the initial consultation were on foods allowed, recipes, and cooking tips. Fewer than one-third had self-instructional or audio-visual material covering these topics.

The range of patients with chronic renal failure and diabetes was none to fifty percent with the majority not using special instructional materials, but having further restrictions of carbohydrates and/or calories.

Most of the respondents did not consult children. Of those who did consult children, the age range was ten to eighteen years. The most common additional restriction in their diets was increased calories. Special materials for children were not usually used and only ten percent saw a great need to develop materials for children.

The majority of dietitians wanted to see individual material developed. The respondents chose adults with chronic renal failure as having the greatest need for instructional materials. Adults with chronic renal failure and diabetes, and patients who cannot read were rated as having the next greatest need.

Booklets and still pictures were the most commonly used media presently. The respondents indicated their preferences for media development as:

- adults with chronic renal failure slides, filmstrips, motion pictures
- children games, motion pictures
- diabetics with chronic renal failure slides, booklets, motion pictures

The conclusions reached based upon these data were:

- 1. there is a great need for self-instructional or audiovisual material that is easily accessible to dietitians
- 2. material should be for individual or group use
- 3. material should contain diet information on sodium, potassium, protein, fluid, calories and phosphorus in separate units so any or all units could be used
- 4. material aimed at use in the initial counseling should contain reasons for diet restrictions, reference to food lists, cooking tips, disease information
- 5. material for those with diabetes should contain all of the above plus include discussion of carbohydrate and calories
- 6. material developed for children should be aimed at the ten to eighteen year group and include discussion of the need for high calorie intake
- 7. any material should be large print
- 8. slides appear to be the most versatile since they could be used for patients of all ages, and those who cannot read. Additional slides could be added for diabetes, and slides are updated more easily.

* * * *

The results of this survey were presented to the Association of Michigan Nephiology Dietitians (AMND) on September 15, 1976. AMND recommended the following:

- 1. material be developed for patients with chronic renal failure and diabetes
- 2. media should be a booklet with accompanying slides and tape. This would be the most versatile since patients who could not read could listen to the tape and view the slides
- 3. material should be large print
- 4. information should be given on chronic renal failure, diabetes, protein, sodium, potassium, carbohydrate, fluid, phosphorus, and calories

- material developed should be based on the diet manual currently used in Michigan (Diet Instruction Manual by AMND)
- 6. the booklet should contain meal exchange lists, blank charts for sample meal plans, fresh and regular canned fruit lists, average carbohydrate values added to each food list, a miscellaneous group containing high carbohydrate food in amounts containing ten, twenty and thirty grams of carbohydrates
- 7. slides could be developed from illustrations in the booklet and a tape would be a verbal discussion of the information in the booklet

A list of currently available instructional materials is being compiled by the Council on Renal Nutrition and will be available from:

Vickie Liddle, R.D.Sachiko St. Jeor, R.D.Dialysis Clinic, Inc.Dept. of Behavioral Science1714 Hayes St.Hershey Medical CenterNashville, TN 57203Hershey, PA 17033

REVISION DATA SHEET

UNIT

Instructions: The author needs your achievement data in order to know what to revise. As you check your answers for the unit pretest, mark below any answer you wrote that did not match the "correct answer". You will do the same for the unit post-test. In this way, you will be providing me with identification of the areas in the package where I failed to provide adequate instruction. On the back of the page is an area for comments. Complete this after taking the post-test. Please note the amount of time it took to complete the pre and post-test.

Diane Groves

POST-TEST

Question

PRETEST

Question

1	18	35	52	1	18	35	52
2	19	36	53	2	19	36	53
3	20	37	54	3	20	37	54
4	21	38	55	4	21	38	55
5	22	39	56	5	22	39	56
6	23	40	57	6	23	40	57
7	24	41	58	7	24	41	58
8	25	42	59	8	25	42	59
9	26	43		9	26	43	
10	27	44		10	27	44	
11	28	45		11	28	45	
12	29	46		12	29	46	
13	30	47		13	30	47	
14	31	48		14	31	48	
15	32	49		15	32	49	
16	33	50		16	33	50	
17	34	51		17	34	51	

What suggestions do you have to imp	prove this self-instructional unit?
shorten it	make it more interesting
lengthen it	make it more fun
make it less confusing	other:
make instructions clearer	·
make it more challenging	
Amount of time to complete pretest:	
Amount of time to complete post-tes	st:

COMMENTS:



Write or choose the best answer; some questions may have more than one correct answer.

- 1. Which of the following are functions of the kidney?
 - a. removal of waste products
 - b. secretion of renin
 - c. regulation of acid base balance
 - d. regulation of ionic balance

2. The functional unit of the kidney is the _____.

- 3. List the parts of this functional unit
 - a. b. c. d. e. f. g.
- 4. A substance enters the glomerulus and is filtered by the nephron. None is present in the urine. This substance was
 - a. excreted
 - b. reabsorbed
 - c. secreted

5. The hormone that mediates sodium reabsorption is _____.

- 6. The hormone effecting calcium reabsorption is .
- 7. Large amounts of protein are normally present in the urine
 - a. true
 - b. false
- 8. Water can be removed during dialysis by what processes?
 - a. b.
- 9. A tuft of capillaries leading into Bowman's capsule is the

- 10. Concentration of urine and the countercurrent mechanism take place in the ______.
- 11. Define tubular reabsorption and secretion.
- 12. A person is in alkalosis and therefore his potassium secretion increases.
 - a. true
 - b. false
- 13. The production of creatinine is
 - a. constant
 - b. variable
- 14. The membrane used in dialysis is
 - a. non-permeable
 - b. semi-permeable
 - c. permeable
- 15. What amino acid is essential in CRF but normally is not essential for adults?
- 16. Net filtration pressure is the ______ of the opposing hydrostatic and colloid osmotic pressures across the capillary.
- 17. A normal clearance rate is
 - a. 110 125 ml/min b. 180 l/day
- 18. A person has a BUN of 100 gm/dl and a serum creatinine of 3.5 mg/dl. Is this normal?
 - a. yes b. no
- 19. ESRD means
- 20. List 2 systems that manifest symptoms in ESRD.
 - a.

Ь.

a. there is increased Na+ in the urine there is an increased water intake Ь. 22. Indicate the response to dialysis of the following manifestations a. anemia b. bone disease c. nausea 23. Dietary treatment helps to a. reduce the urea that the kidney has to excrete b. replace protein losses 24. Sodium intake is determined by measuring a. urine level b. serum level 25. 500 cc of fluid are allowed for _____. 26. The three components of renal function which alter the filtrate are: a. b. c. 27. Finish the equation: UN GFR = ---28. The ascending limb of the loop of Henle is permeable to a. sodium b. water 29. ADH level is high and aldosterone is low; therefore water is lost and Na+ is reabsorbed. a. true b. false 30. Tubular function tests measure the ability of the kidney to the urine.

21. Hyponatremia can occur when

31.	As	GFR	decr	eases.
-----	----	-----	------	--------

- a'. BUN _____
- b. serum bicarbonate _____
- c. urine volume _____
- d. serum calcium _____
- 32. The suggested caloric intake in CRF is ______ kcal/kg ideal weight.
- 33. What vitamins are supplemented and why?
- 34. Dietary treatment of CRF is important because
 - a. diet helps to maintain biochemical control
 - b. diet provides a good state of nutrition
 - c. diet therapy helps the patient return to a previous life style
- 35. The events that occur in the loop of Henle to produce a concentrated urine are called _____.

36. The hormone influencing this concentration is _____.

- 37. The ______ of a substance is the volume of plasma from which that substance is cleared by the kidneys per unit time.
- 38. A person is in acidosis and he therefore excretes an alkaline urine and acidifies his blood.
 - a. true b. false

39. GFR stands for ______.

A normal value is ______ml/min.

40. Indicate what happens to the following in renal failure

a. GFR _____

- b. urea _____
- c. serum phosphate _____

41. What are three means of access to the bloodstream for dialysis?

- a.
- b.
- c.

42. Fluid is regulated in the diet to balance fluid output and

43. A glomerular lesion may occur independently of glucose intolerance.

- a. true
- b. false
- 44. As GFR decreases, serum phosphate increases. What happens to PTH? What happens to calcium?

45. What effect does vitamin D. have in reabsorption of phosphate?

- a. decreases
- b. increases

46. A mild carbohydrate intolerance occurs in many patients with CRF.

- a. true
- b. false
- 47. The 2 types of dialysis are

a.

- b.
- 48. The protein requirement in uremia is _____ gm/kg body weight.

49. What medication is given to bind phosphorus? _____

- 50. Dietary success depends on patient .
- 51. Diabetic patients with CRF have lower predialysis BUN and creatinine and a higher predialysis potassium.
 - a. true b. false

52. Hyperkalemia can lead to _____ (list one).

53.	Phosphorus is restricted in proportion to
54.	Glucocorticoids, given post-transplant, promote Na*
	and K+
55.	The choice of treatment for patients with CRF and diabetes is
	a. related donor transplants b. cadaver transplants c. dialysis
56.	Insulin requirements before dialysis and
	after dialysis.
57.	In post-transplant diabetic patients insulin requirements
	·
Giver plan calcu 3 mea	n the following diet prescriptions, determine a meal pattern and one day's menu. Use the sample exchange lists in the Appendix and lation sheets provided. Assume patient eats everything and has als and one snack.
58.	45 gm protein (70-75% HBV), 65 mEq Na+, 45 mEq K+, 800-1000 mg PO ₄ ,

2400 calories, 1500 cc fluid.

59. 70 gm protein (70-75% HBV), 109 mEq Na+, 70 mEq K+, 1000-1200 mg PO₄, 3000 calories, 1500 cc fluid.

CHECK ANSWERS BEGINNING ON PAGE 56.

.

			10	ET WORKSHEE	I					
FOOD GROUP	No. of exchanges	Protein gm	Na+ mg or mEq	K+ mg or mEq	P04 mg	Calories	Breakfast	Lunch	Dinner	Snack
DAIRY PRODUCT										
MEAT, FISH, EGGS, POULTRY, CHEESE										
STARCHES, UNSALTED SALTED										
VEGETABLES LIST A LIST B LIST C LIST D LIST D										
FRUITS: LIST I LIST II										
FATS, SALTED										
FREE FOODS										
TOTAL										
COMMENTS										

SAMPLE MENU

FOOD

AMOUNT

BREAKFAST

LUNCH

DINNER

SNACK

			10	ET WORKSHEE						
	No. of exchanges	Protein gm	Na+ mg or mEq	K+ mg or mEq	P04 mg4	Calories	Breakfast	Lunch	Dinner	Snack
<u> </u>					1					
								1		

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.

SAMPLE MENU

•

F00D

AMOUNT

BREAKFAST

LUNCH

DINNER

SNACK

ANSWERS

- 1. A, B, C, D
- 2. Nephron
- 3. Glomerulus Bowman's capsule Proximal convoluted tubule Descending limb of the loop of Henle Ascending limb of the loop of Henle Distal convoluted tubule Collecting duct
- 4. B
- 5. Aldosterone
- 6. Parathormone
- 7. B
- 8. Osmosis, Ultrafiltration
- 9. Glomerulus
- 10. Loop of Henle
- 11. Tubular reabsorption is a transfer of materials from the tubular lumen to the peritubular plasma. Tubular secretion is an opposite movement from the plasma to the lumen.
- 12. A
- 13. A
- 14. B
- 15. Histidine
- 16. Sum
- 17. A, B
- 18. B
- 19. End Stage Renal Disease

20. Nervous Alimentary tract Respiratory Circulatory Skeletal Skin 21. A, B 22. a. hemoglobin falls first then rises b. may improve, remain static or deteriorate c. rapidly relieved 23. A, B 24. A 25. insensible losses 26. Glomerular filtration Tubular reabsorption Tubular secretion 27. UNV GFR = P_N 28. A 29. False 30. Concentrate or dilute 31. a. increases b. decreases c. increases or decreases d. decreases 32. 35-45 kcal 33. Water soluble vitamins, due to loss during dialysis 34. A, B, C 35. Countercurrent Mechanism 36. Antidiuretic Hormone (ADH) 37. Clearance 38. B

- 39. Glomerular Filtration Rate 110-125 ml/min
- 40. a. decreases b. increases c. increases
- 41. AV Shunt, AV fistula, Bovine graft
- 42. Insensible water loss
- 43. A
- 44. Increases Decreases
- 45. B
- 46. A
- 47. Hemodialysis Peritoneal Dialysis
- 48. 0.5 0.6 gm/kg
- 49. Aluminum hydroxide gels (Amphogel)
- 50. Compliance
- 51. A
- 52. Cardiac arrythmias, muscular weakness, cramps, nervous irritability or mental disorientation
- 53. GFR
- 54. Retention Excretion
- 55. B, C
- 56. Decrease Increase
- 57. Increase
- 58.} See pages 59-62.

This is the end of the unit. Hope you had fun and learned about ESRD.

											•
	Snack	۱		-					×		oral
	Dinner	1	L	1		l		2	x		000 cc c
	Lunch		l	l	l		l	2	×		ints; 10
	Breakfast	L	ſ	l			l	2	×		ie suppleme
	Calories	345	165	320	25	35	65 65	210		1230	igh calor
T	PO 4 mg	315	240	120	25	40	15 15	30		800	ies of h
ET WORKSHEE	K+ mg or mEq	510	300	140	150	250	100 150	0		1600	1200 calor
D	Na+ mg or mEq	180	90	480	10	15	2	300		1079	eeds about
	Protein gm	12	21	æ	F	2	0.5	0		45	salt; n
	No. of exchanges	3	3	4	-	-		9			ant ½ tsp.
	FOOD GROUP	DAIRY PRODUCT	MEAT, FISH, EGGS, POULTRY, CHEESE	STARCHES, UNSALTED SALTED	VEGETABLES LIST A LIST B	LIST C LIST D	FRUITS: LIST I LIST II	FATS, SALTED	FREE FOODS	TOTAL	COMMENTS Add a sci

intake (500 cc in food).

SAMPLE MENU

FOOD

AMOUNT

.

BREA	KFAST							
						Whole milk	J2	cup
						Poached egg	Ī	•
						White toast	1	slice
						Apple juice	12	cup
						Margarine	2	tsp.
Plus	free	foods	and	high	calorie	supplements		•

LUNCH

						Roast	chicken	1	oz.
						White	bread	1	slice
						Green	beans	12	cup
						Fruit	cocktail	12	cup
						Margai	rine	2	tsp.
P1us	free	foods	and	high	calorie	suppleme	ents		•

DINNER

Plus	free	foods	and	high	calorie	supplements		
						Margarine	2	tsp.
						Mashed potato	12	cup
						Yeast roll	1	
						Roast beef	1	0Z.
						Whole milk	12	cup

SNACE	<									
	-					Whole_milk	12	cup		
						Vanilla wafers	12			
Plus	free	foods	and	high	calorie	supplements				
			DIE	ET WORKSHEET						
---	---------------------	---------------	------------------	-----------------	-------------------	------------	-------------	---------	----------	-------
FOOD GROUP	No. of exchanges	Protein gm	Na+ mg or mEq	K+ mg or mEq	PO 4 mg	Calories	Breakfast	Lunch	Dinner	Snack
DAIRY PRODUCT	4	16	240	680	420	460	F	l	l	-
MEAT, FISH, EGGS, POULTRY, CHEESE	ى ع	35	150	500	400	275	-	l	2	-
STARCHES, UNSALTED SALTED	9	12	720	210	180	480	2	2	l	-
VEGETABLES LIST A	L	-	10	150	25	25			L	
		- 0	15	250 250	25 40	25 35			,	
FRUITS: LIST I LIST II	- m	0.5 1.5	97	100 450	15 45	65 195	-	-	-	-
FATS, SALTED	9	0	300	0	30	210	2	2	2	
FREE FOODS							×	×	×	
TOTAL		70	1458	2590	1180	1770				
COMMENTS Add ¹ / ₂ t:	sp. salt; 1	needs 120)0 calories	from high	calories	supplments	; 1000 cc e	oral in	take	

(500 cc in food).

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SAMPLE MENU

FOOD

AMOUNT

BREAKF	AST					
				Whole milk	12	cup
				Scrambled egg	ī	•
				Special K	12	cup
				White toast	า	slice
				Prune juice	14	cup
				Margarine	2	tsp.
Plus fi	ree foods	and high	calorie	supplements		•

LUNCH

	-					Whole milk	12	cup
						Roast turkey	1	oz.
						White toast	2	slices
						Raw tomato	2	slices
						Applesauce	12	cup
						Salad dressing	2	tsp.
Plus	free	foods	and	high	calorie	supplements		•

DINNER

						Whole milk	12	cup
						Baked cod	Ź	oz.
						Yeast roll	1	
						Lettuce	12	cup
						Mashed potato	12	cup
						Cherries	12	cup
						Mayonnaise	2	tsp.
						Margarine	1	tsp.
Plus	free	foods	and	high	calorie	supplements		-

SNACK

						Ice cream	2/3 ci	lb dr
						Low sodium peanut butter	1 T.	•
						Graham crackers	2-25"	square
						Pineapple juice	1/3 ci	q
Plus	free	foods	and	high	calorie	supplements	·	•

APPENDIX B

•

0			Pret	est				Pos	st-test	t		
tion	Corı	rect	Incor	rect	No repor	t ted	Corr	rect	Incor	rrect	No repor	t ted
	N*	%	N*	%	N*	%	N*	%	N*	%	N*	%
1	15	50	15	50			29	97	1	3		
2	28	93	2	7			30	100				
3	5	17	25	83			26	87	4	13		
4	29	97		_3			29	97	1	3		
5	13	43		5/			25	83	5	17		
6	10	33	20	6/			24	80	6	20		
/	29	9/		3			30	100				
8		3	29	9/			20	67	10	33		
9	14	47	16	53			26	87	4	13		
10		23	23	//			22	73	8	27		
	14	4/	16	53			22	73	8	27		
12	17	57	13	43			26	87	4	13		
13	15	50	15	50			23	77	7	23		
14	26	87	4	13			30	100				
15	9	30	21	70			27	90	3	10		
16		23	23	77			21	70	9	30		
17	10	33	20	67			20	67	10	33		
18	9	30	21	70			22	73	8	27		
19	7	23	23	77			28	93	2	7		
20	3	10	2/	90			21	70	9	30		
21	8	27	22	73			20	67	10	33		
22	3	10	2/	90			18	60	12	40		
23	10	33	20	67			23	77	7	23		
24	13	43		57			12	40	18	60		
25	5	1/	25	83			25	83	5	17		
26	5	17	25	83			16	53	14	47		
2/	2	/	28	93			24	80	6	20		
28	21	/0	9	30			23	77	7	23		
29	20	6/	10	33			26	87	4	13		
30	20	6/	10	33			2/	90	3	10		
31	4	13	26	87			13	43	17	57		
32		3	29	97			24	80	6	20		
33	11	37	19	63			25	83	5	17		
34	7	23	23	77			27	90	3	10		
35	4	13	26	87			27	90	3	10		
36	15	50	15	50			19	63	11	37		
37	10	33	20	67			22	73	8	27		
38	21	70	9	30			24	80	6	20		
39	15	50	15	50			23	77	7	23		
40	19	63	11	37			28	93	2	7		
					-	•						

Table 7. Unit pre and post-test questions: frequency of correct and incorrect responses

			Pret	test		Post-test							
Ques- tion	Cori	rect	Inco	rrect	Not reported	Cori	rect	Inco	rrect	N repo	ot rted		
	N*	%	N*	%	N* %	N*	%	N*	%	N*	%		
41			30	100		18	60	12	40				
42	2	7	28	93		22	73	8	27				
43	17	57	13	43		28	93	2	7				
44	6	20	24	80		21	70	9	30				
45	14	47	16	53		17	57	13	43				
46	23	77	7	23		29	97	1	3				
47	4	13	26	87		23	77	7	23				
48	8	27	22	73		21	70	9	30				
49	1	3	29	97		28	93	2	7				
50	18	60	12	40		30	100						
51	9	30	21	70		13	43	17	57				
52	9	30	21	70		24	80	6	20				
53	2	7	28	93		10	33	20	67				
54	8	27	22	73		20	67	10	33				
55	2	7	28	93		11	37	19	63				
56	6	20	24	80		19	63	11	37				
57	6	20	24	80		21	70	9	30				
58	1	3	29	97		15	50	15	50				
59	1	3	29	97		12	40	18	60				
			1										

Table 7. (cont'd)

0			Pret	test	<u></u>				Po	st-test	;	
Ques- tion	Cori	rect	Incon	rrect	No repor	ot rted	Cori	rect	Inco	rrect	N repo	lot orted
	N*	%	N*	%	N*	%	N*	%	N*	%	N*	%
1 2 3 4 5 6 7 8 9 0 11 12 13 14 15 16 7 8 9 0 11 21 22 34 25 26 27 8 9 0 31 23 34 35	20 8 13 11 23 12 13 11 22 6 15 18 21 4 5 7 6 10 7 10 8 6 6 3 8 4 15 6 14 5 6 14 5 6 14 5 7 6 10 10 10 10 10 10 10 10 10 10	67 27 43 37 7 70 40 43 37 40 40 37 40 40 73 20 50 60 70 13 720 20 10 27 13 50 20 10 27 13 50 20 70 10 27 13 50 20 70 20 10 27 20 20 10 27 20 20 20 20 20 20 20 20 20 20 20 20 20	4 17 12 14 23 13 12 14 13 13 12 14 13 13 19 10 7 4 21 20 18 19 15 8 15 17 19 19 22 7 21 0 19 11 20 19 11 20 19	13 57 40 47 77 43 40 47 43 40 47 43 40 47 43 40 47 43 40 63 50 75 63 57 63 57 63 57 63 57 63 57 63	655555555555555555555555555555555555555	20 17 17 17 17 17 17 17 17 17 17 17 17 17	24 25 22 22 22 22 24 25 22 24 25 22 24 25 22 24 25 22 22 22 22 22 22 22 22 22 22 22 22	80 83 80 73 70 83 73 80 80 83 80 67 80 77 77 83 77 67 83 80 83 80 83 80 83 80 57 63 67 80 63 77 67 77 80 70	$ \begin{array}{c}\\ 1\\ 3\\ 4\\\\ 1\\ 1\\ 5\\ 1\\ 2\\\\ 8\\ 2\\ 5\\\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 8\\ 6\\ 5\\ 1\\ 6\\ 2\\ 5\\ 2\\ 1\\ 4\\\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\ 1\\$	3 10 13 3 3 3 3 3 7 17 3 20 7 17 3 20 7 17 3 13 13 13 13 13 13 13 13 13 13 13 <	655555555555555555555555555555555555555	20 17 17 17 17 17 17 17 17 17 17 17 17 17

Table 8. Section on normal structure and function of the kidney pre and post-test questions: frequency of correct and incorrect responses

Question	Correct		Incor	rect	Cor	rect
question	N*	%	N*	%	N*	%
1-1a 1-1b 1-1c 1-1d 1-2a 1-2b 1-2c 1-3a 1-3b 1-3c 1-3d 1-3e 1-3f 1-4a 1-4b 1-4c 1-4d 1-4e 1-5a 1-5b 1-5c 1-5d 1-5c 1-5f 1-5g 1-6a 1-6b 1-6c 1-6d 1-6i 1-6j 1-7a 1-7b 1-7c	24 19 19 20 25 24 24 24 24 24 24 24 23 22 18 22 24 13 25 22 18 22 24 13 19 25 24 21 13 25 20 21 23 23 22 15 23 21 22 24 23 24 23 24 23 24 23 24 23 24 24 23 24 24 23 24 24 23 24 24 24 24 25 24 24 24 25 24 24 25 24 24 24 25 24 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 24 24 25 22 18 25 24 24 25 22 18 25 24 24 25 22 18 25 24 24 25 22 18 25 24 24 25 22 18 25 24 21 25 22 18 22 24 23 22 24 24 25 22 18 22 24 25 22 18 22 24 24 25 22 24 21 25 22 24 21 25 22 24 21 25 22 24 21 25 22 24 21 25 22 24 21 25 22 24 21 25 22 24 21 25 22 24 21 25 22 21 23 22 22 23 22 22 23 22 22 23 22 23 22 23 22 23 22 23 22 24 23 22 23 22 23 22 23 22 23 22 24 23 22 24 23 22 24 23 22 24 23 22 24 23 22 24 23 22 24 23 22 24 23 22 24 23 22 24 23 22 22 23 22 22 23 22 22 23 22 22 23 22 22	80 16 16 16 67 83 80 80 80 80 80 80 80 77 60 47 70 83 73 60 73 80 43 63 83 80 70 43 83 67 70 77 77 73 50 77 77 73 50 77 77 73 80 77 77 70 83 73 80 70 77 77 70 83 70 77 77 70 83 73 80 70 77 77 77 70 83 80 70 77 77 70 83 80 70 77 70 77 70 83 80 70 77 77 70 77 70 77 77 70 77 77	$ \begin{array}{c} \\ 6 \\ 6 \\ 5 \\ \\ 1 \\ 1 \\ 1 \\ $	20 20 20 17 3 3 27 7 23 37 13 10 23 10 23 10 3 40 20 	655555555555555555555555555555555555555	20 17 17 17 17 17 17 17 17 17 17 17 17 17
1-7d 1-7e 1-7f 1-8a	22 16 20 20	73 53 67 67	3 9 5 5	10 30 17 17	5 5 5 5 5	17 17 17 17
I-8D	21	/0	4	13	5	17

Table 9. Section on normal structure and function of the kidney practice questions: frequency of correct and incorrect responses

	Cor	rect	Incor	rect	Coi	rrect
Question	N*	%	N*	%	N*	%
1-9a 1-9b 1-9c 1-9d 1-9e 1-9f 1-9g 1-9h 1-9i 1-9j 1-9k 1-91 1-9m 1-9n 1-9n 1-9p	21 14 23 20 18 23 20 21 20 21 20 23 13 22 23 21 24 25	70 47 77 67 60 77 67 70 67 70 67 77 43 73 77 70 80 83	4 11 2 5 7 2 5 4 5 2 12 3 2 4 1 	13 37 7 17 23 7 17 13 17 7 40 10 7 13 3	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	17 17 17 17 17 17 17 17 17 17 17 17 17 1

Table 9. (cont'd)

0			Pret	test				Post-	test			
Ques- tion	Cori	rect	Inco	rrect	No	ot rted	Cori	rect	Incor	rect	N repo	lot orted
	N*	%	N*	%	N*	%	N*	%	N*	%	N*	%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	23 15 10 6 16 16 5 22 9 9 18 5 11 12 7 15 10 20 12 11 4 6 16 18 8	77 50 33 20 53 53 17 73 30 60 17 37 40 23 50 33 67 40 37 13 20 53 60 27	9 14 18 8 19 2 15 15 15 15 19 13 12 17 9 14 4 12 13 20 18 8 6 16	30 47 60 27 27 63 7 50 50 20 63 43 40 57 30 47 13 40 47 13 40 43 67 60 27 20 53	7 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	23 20 20 20 20 20 20 20 20 20 20 20 20 20	22 23 21 22 23 17 23 20 22 23 6 20 22 21 22 21 22 21 22 21 22 7 19 23 21	73 77 70 73 77 57 77 67 73 77 67 73 77 20 67 73 73 70 73 73 70 73 73 70 73 73 70 73 77 70 73	 2 2 1 6 3 1 17 3 1 1 2 1 1 2 1 1 2 1 1 6 4 2	7 7 3 20 10 3 57 10 3 7 3 7 3 53 13 7 7	8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	27 23 23 23 23 23 23 23 23 23 23 23 23 23

Table 10.	Section on clinical	chemistry pre	and post-test	questions:
	frequency of correct	t and incorrec	t responses	

	Corr	rect	Incori	rect	Not reported	
Question	N*	%	N*	%	N*	%
2-1a 2-1b 2-1c 2-1d 2-1e 2-1f 2-2a 2-2d 2-2c 2-2d 2-2c 2-2d 2-2c 2-3a 2-3b 2-3c 2-3d 2-3f 2-3f 2-3f 2-3f 2-3f 2-3f 2-3f 2-3f 2-3f 2-5c 2-7c 2-7c 2-7c 2-7c 2-7c	22 22 19 22 23 22 23 20 22 23 17 21 23 20 23 22 21 21 21 21 21 21 21 21 21 21 21 21	$\begin{array}{c} 73\\73\\73\\63\\73\\73\\73\\77\\73\\67\\73\\70\\77\\77\\73\\70\\77\\73\\70\\73\\70\\73\\70\\70\\73\\60\\57\\63\\73\\60\\57\\63\\73\\60\\57\\63\\73\\67\\63\\56\\56\\60\\63\\73\\73\\70\\67\end{array}$	$ \begin{array}{c} \\ 1 \\ 4 \\ 1 \\ 1 \\ \\ 1 \\ 3 \\ 1 \\ \\ 6 \\ 2 \\ \\ 3 \\ \\ 3 \\ \\ 3 \\ \\ 3 \\ \\ 3 \\ \\ 3 \\ \\ 3 \\ \\ 3 \\ \\ 3 \\ 1 \\ 2 \\ 2 \\ 1 \\ 1 \\ 8 \\ 1 \\ 2 \\ 2 \\ 1 \\ 5 \\ 6 \\ 4 \\ 1 \\ 3 \\ 4 \\ 6 \\ 5 \\ 4 \\ 1 \\ 1 \\ 2 \\ 3 \\ 3 \\ \\ \\ 6 \\ 2 \\ 2 \\ 1 \\ 5 \\ 6 \\ 4 \\ 1 \\ 3 \\ 4 \\ 6 \\ 5 \\ 4 \\ 1 \\ 1 \\ 2 \\ 3 \\ \\ \\ 6 \\ \\ 3 \\ \\ \\ 6 \\ \\ 3 \\ \\ \\ \\ $	$ \begin{array}{c} & 3 \\ & 13 \\ & 3 \\ & 3 \\ & 3 \\ & 10 \\ & 3 \\ & 10 \\ & 3 \\ & 10 \\ & 3 \\ & 7 \\ & 7 \\ & 10 \\ & 3 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 3 \\ & 7 \\ & 7 \\ & 3 \\ & 17 \\ & 20 \\ & 13 \\ & 3 \\ & 10 \\ & 13 \\ & 20 \\ & 20 \\ & 17 \\ & 13 \\ & 3 \\ & 7 \\ & 10 \\ & 10 \\ \end{array} $	8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	27 23 23 23 23 23 23 23 23 23 23 23 23 23

Table 11. Section on clinical chemistry practice questions: frequency of correct and incorrect responses

		Pretest							Post-test						
Ques- tion	Correct N* %		Incorrect N* %		Not reported N* %		Correct N* %		Incorrect N* %		Not reported N* %				
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	4 3 20 10 10 14 13 17 12 10 4 8 10 14 8 3 15 15	13 10 67 33 47 43 57 40 33 13 27 33 47 27 10 50 50	19 20 3 13 13 9 10 6 11 13 19 15 13 9 15 20 8 8	63 67 10 43 43 30 33 20 37 43 63 50 43 30 50 67 27 27 27	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23 2	23 19 23 21 20 21 23 16 20 23 21 15 16 22 20 13 23 22	77 63 77 70 67 70 77 53 67 77 70 50 53 73 67 43 77 73	4 2 3 2 7 3 2 8 7 1 3 10 1	13 7 10 7 23 7 7 27 23 3 10 33 3	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23 2			

Table 12. Section on end stage renal disease pre and post-test questions: frequency of correct and incorrect responses

0	Cori	rect	Incor	rect	Not reported		
Question	N*	%	N*	%	N*	%	
3-1a 3-1b 3-1c 3-1d 3-2a 3-2b 3-2c 3-3a 3-4a 3-4b 3-4c 3-5a 3-5b 3-5c 3-5d 3-5c 3-5d 3-6a 3-7b 3-7c 3-7d 3-7e 3-7f 3-7g 3-8a 3-8b 3-8c 3-9a	23 22 18 23 18 23 18 16 20 20 19 23 22 17 21 21 21 21 21 21 22 20 20 19 21 22 21 22 21	77 77 73 60 77 60 53 67 67 63 77 73 57 70 63 73 57 47 77 70 70 70 70 70 70 73 67 63 70 73 70	 1 5 7 3 4 1 6 2 4 1 6 9 2 2 2 2 1 3 3 4 2 1 2 2 1 3 3 4 2 2 2 1 3 3 4 2 2 2 1 3 3 4 2 2 2 1 3 3 4 2 2 2 2 1 3 3 4 2 2 2 2 2 2 1 3 3 4 2 2 2 2 2 2 2 2 2 2 2 2 2	3 17 17 23 10 10 10 13 20 7 13 3 20 7 13 3 20 30 7 7 7 7 3 10 10 10 13 7 3 7 7 3 7	777777777777777777777777777777777777777	23 23 23 23 23 23 23 23 23 23 23 23 23 2	

Table 13. Section on end stage renal disease practice questions: frequency of correct and incorrect responses

Ques-		Pretest						Post-test					
Ques- tion	Correct		Incorrect		Not reported		Cori	rect	Incorrect	N repo	lot orted		
	N*	%	N*	%	N*	%	N*	%	N* %	N*	%		
1 2 3 4 5 6 7 8 9 10 11 12 13	21 21 7 3 1 4 9 2 8 6 2	70 70 23 10 3 13 13 13 30 7 27 20 7	2 2 16 20 22 19 19 14 21 15 17 21	7 53 67 73 63 63 63 47 70 50 57 70	7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23	23 23 15 21 23 23 19 18 19 19 23 21 14	77 50 70 77 63 60 63 63 77 70 47	8 27 2 7 4 13 5 17 4 13 4 13 2 7 9 30	7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23 2		

Table 14. Section on dialysis pre and post-test questions: frequency of correct and incorrect responses

	Cori	rect	Incor	rect	Not reported		
Question	N*	%	N*	%	N*	%	
$\begin{array}{r} 4-1a \\ 4-1b \\ 4-1c \\ 4-1d \\ 4-1e \\ 4-1f \\ 4-2a \\ 4-3a \\ 4-3a \\ 4-3c \\ 4-3c \\ 4-4a \\ 4-4b \\ 4-4c \\ 4-4d \\ 4-5a \\ 4-5b \\ 4-5c \\ 4-6a \end{array}$	23 22 21 19 22 23 21 21 23 22 20 21 21 13 23 22 19	77 73 70 63 73 77 70 70 70 70 70 70 43 77 73 63	1 2 4 1 2 2 2 2 2 2 1 3 2 2 10 1 4	3 7 13 3 7 7 7 7 7 7 3 3 10 7 7 33 10 7 7 33	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23 2	

Table 15. Section on dialysis practice questions: frequency of correct and incorrect responses

		Pretest							Post-test					
Ques- tion	Correct		Incorrect		N repo N*	ot rted	Correct		Incorrect		repo	Not reported		
	N.	<i>1</i> 0		<i>N</i>		<i>1</i> 0		<i>1</i> 0		<i>N</i> 0		<i>10</i>		
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	10 1 9 4 15 9 2 10 9 14 8 13 5 6 17 5 11	33 30 13 50 30 7 33 30 47 27 43 17 20 57 17 37 7	13 22 14 19 8 14 21 13 14 9 15 10 18 17 6 18 12 21	43 73 47 63 27 47 70 43 47 30 50 33 60 57 20 60 40 70	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23 2	23 19 21 16 23 22 18 22 22 22 22 19 20 17 23 23 23 23 20	77 63 70 53 77 73 60 73 73 63 63 67 57 77 77 77 77	 4 2 7 1 5 1 1 1 4 3 6 3	13 7 23 3 17 3 17 3 3 13 10 20 	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23 2		
19	7	23	16	53	7	23	18	60	5	17	1 7	23		
20	. 3	10	20	67	7	23	21	70	2	7	17	23		
21	9	30	14	47	7	23	22	73	Ī	3	7	23		
22a	2	7	21	70	7	23	14	47	9	30	7	23		
22Ь	4	13	19	63	7	23	14	47	9	30	7	23		

Table 16. Section on dietary treatment pre and post-test questions: frequency of correct and incorrect responses

	Cori	rect	Incorr	rect	Not reported		
Question	N*	%	N*	%	N*	%	
5-1a 5-1b 5-1c 5-2a 5-2b 5-2c 5-2d 5-2d 5-4d 5-4d 5-4f 5-4f 5-4f 5-4f 5-4f 5-5b 5-6d 5-6c 5-6d 5-7c 5-7c 5-8a 5-8d 5-8d 5-8d 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-9a 5-10b	$\begin{array}{c} 23\\ 23\\ 23\\ 20\\ 23\\ 16\\ 20\\ 14\\ 16\\ 23\\ 23\\ 15\\ 22\\ 23\\ 19\\ 13\\ 18\\ 22\\ 23\\ 16\\ 22\\ 23\\ 20\\ 21\\ 21\\ 22\\ 20\\ 20\\ 21\\ 21\\ 19\\ 21\\ 17\\ 22\\ 21\\ 17\\ 22\\ 21\\ 17\\ 22\\ 21\\ 17\\ 22\\ 21\\ 17\\ 22\\ 21\\ 17\\ 22\\ 21\\ 17\\ 22\\ 21\\ 21\\ 21\\ 21\\ 22\\ 21\\ 21\\ 21\\ 22\\ 21\\ 21$	$\begin{array}{c} 77\\ 77\\ 77\\ 77\\ 53\\ 67\\ 47\\ 53\\ 77\\ 77\\ 50\\ 73\\ 77\\ 50\\ 73\\ 77\\ 63\\ 43\\ 60\\ 73\\ 77\\ 53\\ 73\\ 73\\ 77\\ 73\\ 77\\ 73\\ 77\\ 73\\ 77\\ 70\\ 70\\ 70\\ 70\\ 70\\ 70\\ 70\\ 70\\ 70$	$ \begin{array}{c} $	$ \begin{array}{c} & & & & \\ & & & & & \\ & & & & & \\ & & & &$	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	23 23 23 23 23 23 23 23 23 23 23 23 23 2	

Table 17. Section on dietary treatment practice questions: frequency of correct and incorrect responses

Table 17. (cont'd)

Ouestion	Cor	rect	Incor	rect	Not reported		
Question	N*	%	N*	%	N*	%	
5-10c	16	53	7	23	7	23	
5-10d	17	57	6	20	7	23	
5-11a	19	63	4	13	7	23	
5-12a	22	73	1	3	7	23	
5-12b	23	77			7	23	
5-12c	23	77			7	23	
5-12d	22	73	1	3	7	23	
5-12e	22	73	1.1	3	7	23	
5-12f	23	77			7	23	
5-13a	17	57	6	20	7	23	
5-13b	15	50	8	27	7	23	
5-13c	16	53	7	23	7	23	
	l				L		

0		Pretest							Post-test					
Ques- tion	Correct		Incorrect		N repo	Not reported		Correct		Incorrect		Not reported		
	N*	%	N*	%	N*	%	N*	%	N*	%	N*	%		
1	1	3 37	20	67 33	9	30 30	16	53 67	4	13	10	33 33		
3	4	13	17	57	9	30	16	53	4	13	1 10	33		
4	5	17	16	53	9	30	19	63	1	3	10	33		
5	5	17	16	53	9	30	20	67			10	33		
6	7	23	14	47	9	30	18	60	2	7	10	33		
7	13	43	8	27	9	30	19	63	1	3	10	33		
8	11	37	10	33	9	30	17	57	3	10	10	33		
9	15	50	6	20	9	30	20	67			10	33		
10	13	43	8	27	9	30	19	63	1	3	10	33		
11	13	43	8	27	9	30	20	67			10	33		
12	7	23	14	47	9	30	17	57	3	10	10	33		

Table 18. Section on diabetes and chronic renal failure pre and posttest questions: frequency of correct and incorrect responses

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Question	Cori	rect	Incor	rect	Not reported		
Question	N*	%	N*	%	N*	%	
6-1a 6-1b 6-1c 6-1d 6-2a 6-2b 6-3a 6-3b 6-3c 6-4a 6-4b 6-4c 6-5a 6-5b 6-6a 6-6b 6-7a 6-7b 6-7a	20 18 15 19 16 18 19 17 19 17 18 18 20 19 17 18 19 17 18	67 60 50 63 53 60 63 63 63 60 60 67 63 57 60 63 53 60	2 5 1 4 2 1 1 2 2 1 3 2 1 3 2 1 4	7 17 3 13 7 3 10 3 7 7 7 3 10 7 3 10 7 3	10 10 10 10 10 10 10 10 10 10 10 10 10 1	33 33 33 33 33 33 33 33 33 33 33 33 33	
6-7c	19	60		3	10	33	

Table 19. Section on diabetes and chronic renal failure practice questions: frequency of correct and incorrect responses

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