

Comparing Clinical, Cognitive, and Behavioral Outcomes Among Older Adults in
the Elderly Nutrition Program Randomized to Receive Hydration-Related Information
From Either an Educational Lesson or an Informative Brochure

by

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ABSTRACT

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Comparing Clinical, Cognitive, and Behavioral Outcomes Among Older Adults in the (Title)

Elderly Nutrition Program Randomized to Receive Hydration-Related Information from Either an Educational Lesson or an Informative Brochure

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One of the fastest growing segments of the population is older adults which has led to an increased focus on the health conditions afflicting this age group. One medical condition that is considered a major health problem in older adults is dehydration. Approximately one million older adults are admitted to acute care hospitals yearly with dehydration as a component in their medical condition (Sanservo, 1997).

Several factors can contribute to the development of dehydration in older adults including decreased intake, decreased sense of thirst, age-related functional decline of the kidneys, chronic or acute diseases that lead to increased fluid loss, medication effects and diminished functional status (Sanservo, 1997). The prevalence and seriousness of dehydration points out the need to develop and implement interventions to prevent this condition.

The purpose of this study was to compare and examine the effectiveness of two methods of education on fluid and hydration issues in a sample of community dwelling older adults who were participants in the Eau Claire County and Dunn County Elderly Nutrition Programs of Wisconsin. The two methods of education were an educational lesson and an informative brochure, both of which were developed and presented by a Registered Dietitian. A two group completely randomized pre/post experimental design was used. The parameters measured were fluid intake using a food frequency questionnaire, knowledge of fluid and hydration issues, physical indicators of hydration status, cognitive status, functional status, and demographic information. During a home visit, the assessment form was completed and the randomly assigned method of education was provided. Within 14-22 days following the initial visit, a follow-up visit was conducted and the post-assessment form was completed. Prior to starting the data collection, all forms and methods of education were pilot tested.

Overall, both groups were found to be homogenous as baseline differences were not significant for age, gender, level of education, time on nutrition program, functional status, Mini Mental Status Exam (MMSE) scores, fluid intake, knowledge quiz scores, physical indicators of hydration status, and the time interval between pre/post test. Fluid intake was found to be adequate among subjects of both groups prior to the education as 90 percent were consuming the recommended minimum amount of 48 ounces. No significant change in fluid intake was found post-education. Knowledge quiz scores were at 57% or less for both groups prior to the education. Following the educational intervention, no significant change in quiz scores was found in the educational lesson (EL) group, however a significant increase ($p=.03$) in quiz scores was found in the

brochure group (BR). Despite the increase, scores remained at 59% or less for both groups. In the area of physical indicators of hydration status, 25 of 40 subjects presented with one or more signs of dehydration prior to the education. Following the education, an increase in the number of subjects with abnormal tongue dryness was found, however, improvements in all other indicators, except for no change in mucous membranes in the EL group, were observed in both groups. Baseline mean MMSE scores were within the normal range for both groups with no significant change post-education.

Results of this study reveal that the brochure was an effective education method to increase knowledge of fluid and hydration issues among older adults, however had a minimal effect on behavior change in the area of fluid intake. Pre/post differences in quiz scores, fluid intake, and physical indicators of hydration status were not significant in the EL group. Professionals looking for an effective method to increase knowledge about fluids in older adults should not dismiss the usage of brochures.

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CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	v
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xii
LIST OF ABBREVIATIONS.....	xiii
 Chapter	
1. INTRODUCTION.....	1
Objectives of the Study.....	5
2. REVIEW OF LITERATURE.....	6
Demographics of Older Adults.....	6
Dehydration.....	7
Maintaining Fluid Balance in the Body.....	8
Types of Dehydration.....	10
Indices of Dehydration.....	12
Physical Indicators.....	12
Biochemical Indicators.....	15
Limitations of Biochemical Indicators.....	19
Factors That Can Influence the Development of Dehydration.....	19
Disease Processes.....	20
Influence of Medications on Hydration Status.....	22
Age Related Changes That Can Influence the Development of Dehydration.....	23

Economic and Social Factors.....	26
Treatment of Dehydration.....	26
Assessing the Mental Status of Older Adults.....	32
Assessing the Functions Status of Older Adults.....	35
Measurement of Dietary Intake via Food Frequency Questionnaire.....	36
Nutrition Education in Older Adults.....	38
Learning Style.....	41
3. METHODOLOGY.....	47
Introduction.....	47
Research Design.....	47
Subject Inclusion.....	48
Subject Recruitment.....	48
Eau Claire County Subjects.....	48
Dunn County Subjects.....	49
Interventions.....	49
Brochure Development.....	49
Lesson Plan Development for Educational Lesson.....	51
Educational Lesson.....	52
Visual Aid Development.....	52
Instruments.....	52
Survey Assessment Instrument Development.....	52
Mini Mental Status Exam (MMSE).....	55
Training on Evaluating Physical Indicators.....	56

Data Collection Methods.....	57
Randomization.....	57
Data Collection.....	58
Pilot Study.....	60
Review of Assessment Form By Professionals.....	60
Testing of the Assessment Form and MMSE with Graduate Students...	61
Testing of the Assessment Form with Study Age Group.....	61
Brochure Pilot Testing with Study Age Group.....	62
Educational Lesson Pilot Testing.....	62
Data Analysis.....	63
Food Frequency Questionnaire.....	63
Knowledge Quiz.....	65
4. RESULTS.....	67
Pilot Study Results.....	68
Description of Subjects.....	70
Time on Elderly Nutrition Program.....	70
Functional Status.....	71
Mental Status.....	71
Description of Medical Conditions and Medication Usage.....	72
Comparison of Baseline Differences Between Groups Before Education.....	74
Medication Effects.....	74
Fluid Intake.....	77

Knowledge Quiz Scores.....	79
Individual Question Scores for Subjects By Groups.....	80
Physical Indicators of Hydration Status.....	85
Factors That Can Help to Determine or Influence Hydration Status.....	87
Change in Mental Status.....	88
5. DISCUSSION.....	89
Fluid Intake.....	92
Knowledge Quiz Scores.....	96
Physical Indicators of Hydration Status.....	102
Factors That Can Help to Determine or Influence Hydration Status.....	103
Mini Mental Status Exam.....	104
Medication Effects.....	105
Information Gathering.....	107
Limitations.....	107
Educational Intervention Notes.....	107
Conclusions.....	109
Recommendations for Future Research.....	111
BIBLIOGRAPHY.....	113
APPENDIX.....	119
List of Appendices.....	119
A. Educational Materials.....	120
Educational Brochure on Fluid and Hydration Issues.....	121
Lesson Plan on Fluid and Hydration Issues.....	123

Educational Lesson Script.....	124
Educational Lesson Visual Aids.....	128
B. Instruments.....	131
Pre/Post Assessment Form.....	132
MMSE Score Report Form.....	136
Assessment Form Pilot Testing Questionnaire.....	137
C. Consent Forms.....	138
Thesis Consent Form.....	139
Assessment Form Pilot Testing Consent Form.....	140
MMSE Pilot Testing Consent Form.....	141
Brochure Pilot Testing Consent and Questionnaire.....	142
Educational Lesson Pilot Testing Consent Form and Questionnaire.....	143
D. Data Analysis Guides.....	144
Categories for Medical Conditions.....	145
Categories for Medications.....	146
E. Case Profiles.....	148

LIST OF TABLES

Table

1. Categories for Fluid Intake for Calculation of FFQ.....	63
2. Description of Subjects.....	71
3. Frequency of Subjects and Categories of Medical Conditions.....	72
4. Medication Usage of Subjects Based on Pretest Results.....	73
5. Fluid Intake and Knowledge Quiz Scores Based on Pretest Results.....	74
6. Comparison of Laxative, Diuretic, and Medications That Can Affect Cognitive Status Usage and Physical Indicators of Hydration Status.....	76
7. Frequency of Subjects And Corresponding Categories of Fluid Intake Recommendations.....	77
8. Description of Fluid Intake From Caffeinated Beverages and Food Sources....	79
9. Frequency of Subjects and Corresponding Scores Both Pre and Posttest.....	80
10. Frequency of Subjects and Change in Scores on Knowledge Quiz Pre and Posttest.....	80
11. Frequencies for Results of Knowledge Quiz Questions Pre and Posttest.....	84
12. Frequency of Subjects and Change in Answers From Pretest to Posttest For Each Individual Knowledge Quiz Question.....	84
13. Frequency of Subjects and Presence of Physical Indicators of Hydration Status.....	85
14. Changes in Level of Physical Indicators of Hydration Status From Pre to Posttest.....	86
15. Results of Questions That May Determine or Influence Hydration Status.....	87
16. Description of Changes in Answers to Questions Pre/Post for Both Groups....	88
17. Mean MMSE Scores For Both Groups Before and After Educational Interventions.....	88

LIST OF FIGURES

Figure

1. Data Collection Process.....	59
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ABBREVIATIONS

ADA	American Dietetic Association
ADH	Antidiuretic Hormone
ADL	Activities of Daily Living
ANP	Atrial Natriuretic Hormone
BR	Brochure Group
BUN	Blood Urea Nitrogen
COPD	Chronic Obstructive Pulmonary Disease
ECF	Extracellular Fluid
EL	Educational Lesson Group
FFQ	Food Frequency Questionnaire
HCFA	Health Care Financing Administration
IADL	Instrumental Activities of Daily Living
ICF	Intracellular Fluid
IVF	Intravenous Fluids
LOA	Level of Assistance
MMSE	Mini Mental Status Examination
MOW	Meals on Wheels
RD	Registered Dietitian
RN	Registered Nurse
TBW	Total Body Water
UTI	Urinary Tract Infection

CHAPTER I

INTRODUCTION

Health and nutrition education is an important component in the prevention and management of many medical conditions. Incorporating good health and nutrition practices into a person's daily lifestyle can help to prevent many acute and chronic diseases. The prevention of the development of medical conditions leads to improved health status of the population as well as cost savings to the health care system (Leutwyler, 1995). The continued focus of today's society on prevention has lead to an increased awareness of the role education has in preventing and treating many medical conditions.

Older adults are targeted to receive health and nutrition education. As the average lifespan increases and the Baby Boom Generation ages, the population of older adults continues to grow. The older adult population is expected to increase by 17 percent from 33.5 million in 1995, to 39.4 million in 2010. The largest increase is expected in the group of older adults age 85 and older. By 2010, the number of older adults over age 85 is expected to increase by 56 percent as compared to a 13 percent increase in adults age 65 to 84 (Demographic Changes, 1996). The continued growth of this segment of the population points out the need for increased focus on the health conditions afflicting this age group and interventions to prevent these conditions and improve and maintain good health status.

One medical concern that is considered a major health problem in older adults is dehydration. Dehydration is the most common fluid and electrolyte disorder in older adults (Lavizzo-Mourey, Johnson, & Stolley, 1988). A report by the Health Care

Financing Administration (HCFA) indicated that dehydration was one of the ten most frequent diagnoses recorded for Medicare hospitalizations in 1991. Data from 1991 on Medicare beneficiaries also report that of the more than ten million hospitalizations of older adults that year, 6.7 percent, or 731,695 hospitalizations, had dehydration listed as one of the diagnoses, and 1.4 percent, or 146,960 hospitalizations, listed dehydration as the primary diagnosis (Warren, Bacon, Harris, McBean, Foley, & Phillips, 1994). Other data indicate that about one million older adults are admitted to acute care hospitals yearly with isotonic dehydration as a component in their medical condition (Sanservo, 1997). Associated with dehydration are high mortality rates. Data from 1991 Medicare files found that more than 18 percent of patients with dehydration died within 30 days of admission to the hospital. Following 30 days post admission, the mortality rate remains high at about 12 percent for women, and 18 percent for men (Warren et al., 1994).

Along with the high incidence of dehydration in older adults is increased health care costs. The hospitalization of patients with dehydration has a great effect on the financial resources of the health care system (Trotto, 1999). Medicare beneficiary data report that in 1991, more than \$446 million was reimbursed by the HCFA to hospitals for patients hospitalized with dehydration as a primary diagnosis. The cost, when broken down into amount per hospitalization with dehydration as the primary diagnosis, was found to be \$2,942 (Warren et al., 1994). As the older adult population continues to grow, failure to lower the incidence of dehydration in older adults could lead to an increase in diagnosis of dehydration and further financial burdens on the health care system (Trotto, 1999).

Several factors can contribute to the development of dehydration in older adults. These factors can range from decreased fluid intake, decreased sense of thirst, age-related functional decline of the kidneys, chronic or acute diseases that may cause increased fluid losses, medication effects, and diminished functional status (Sanservo, 1997). Increasing age is also found to be a major risk factor. Older persons age 85 to 99 years are six times more likely to be hospitalized for dehydration than persons age 65 to 69 years of age (Warren et al., 1994).

Due to the prevalence and seriousness of dehydration as a health care problem, efforts need to be directed toward the prevention and management of this condition. A primary method of prevention and management is education directed toward older adults (Warren et al., 1994). Further focus toward older adults in the community setting is important as these persons may be at further risk due to undersupervised medication use, poor food and fluid intake due to lack of spouse or caregiver, and limited air conditioning during periods of hot weather (Weinberg, Minaker, & Council on Scientific Affairs, American Medical Association, 1995). Older adults exhibit a high interest in nutrition information (Chernoff, 1991). Research based on the health education needs of older adults indicates that education interventions should focus on specific behaviors geared toward preventing disease, maintaining existing ability, and preventing declines in functional ability (Pocinki, 1991), all factors important in preventing dehydration.

Education can be delivered in a variety of methods. These methods can include personal contact with a health professional, class instruction, written materials, mass media, and information from family and friends. For older adults, communicating by written materials allows them to self pace their instruction by controlling the rate and

amount of information taken in (Lancaster, Smiciklas-Wright, Ahern, Achterberg, & Taylor-Davis, 1997). Educational methods that require active participation and involve several senses may be more preferable in older adults (Kicklighter, 1991). Education given by a health professional would involve utilizing multiple sense including hearing and eyesight. Education given in person by an educator also allows learners to gain clarification on certain points if needed (Kicklighter, 1991).

Limited information is available on effective educational methods for older adults aimed towards the prevention of various medical conditions, particularly dehydration. The prevalence and seriousness of dehydration as a health problem indicates the need for the development of specific strategies to decrease the incidence of this health problem. This research project was conducted in an attempt to determine effective methods to educate older adults about hydration and fluids. The two methods of education utilized were an educational lesson provided by a Registered Dietitian and a brochure. A pre and post assessment was completed with the subjects in their homes and the randomly assigned method of education was provided. The assessment form was designed to measure functional status, fluid intake, knowledge of hydration and fluids, mental status, and physical indicators of hydration status. Subjects were recruited to participate in this research from the Eau Claire County Meals on Wheels and Congregate Meal Programs in Eau Claire, Wisconsin, and the Dunn County Congregate Meal Program in Menomonie, Wisconsin. A total of 40 subjects participated in the research, 22 in the brochure group, and 18 in the educational lesson group.

Objectives of the Study:

1. Determine if there was a significant difference in the change in knowledge of hydration and fluids after the education and which method had the greatest effect on changing knowledge.
2. Examine the fluid intake of a sample of community dwelling older adults. Compare the effects of the two methods of education on fluid intake and determine if there was a significant difference in fluid intake following the educational interventions.
3. Examine the physical indicators of hydration status in a sample of community dwelling older adults. Compare the effects of the two methods of education on changing the level of abnormality of the physical indicators and determine if there was a significant difference in the presence of the physical indicators following the educational interventions.

CHAPTER II

REVIEW OF LITERATURE

Demographics of Older Adults

Throughout the 20th century, the population of adults over age 65 has increased at a phenomenal rate. This is evidenced by the fact that while the number of people under the age of 65 tripled in size, the number of older adults has increased by a factor of eleven. During the year 1900, 3.1 million Americans were considered elderly, whereas in 1994, the elderly population grew to 33.2 million (Yax, 2000). The growth of this segment of the population is expected to continue. Projections made by the U.S. Census Bureau predict a moderate increase in the population through the year 2010, a rapid increase to the year 2030, and then back to a moderate increase from 2030 to 2050. In 1995, the elderly population was estimated to be at 33.5 million. By 2010, the elderly population will reach 69 million, and by 2050, the elderly population is expected to reach up to 79 million (“Demographic Changes,” 1996). At these projected rates, the population of older adults will more than double in the next 50 years with as many as 1 in 5 Americans considered elderly in 2050 (Yax, 2000).

When the older adult population is broken down into segments, of particular significance is the growth of the oldest old, those ages 85 and over. This segment is expected to increase by 56 percent in comparison to a 13 percent growth for those age 65 to 84 years, meaning that a greater proportion will be over the age of 85 (“Demographic Changes,” 1996). The significance of this is that many persons in the segment considered the oldest old often suffer more from the effects of chronic disease and are often more dependent on others for assistance or care. In 1991, 50 percent of noninstitutionalized

older adults age 85 and older needed assistance with activities of daily living (ADL) as compared to only nine percent of those aged 65 to 69 years (Yax, 2000).

When comparing the number of older adult females to males, the women outnumber the men. In 1995, the older adult population was comprised of 45 percent more women than men. It's also been found that the older the age group, the lower the proportion of men as evidenced by the statistic that in 1995, there were 58 percent more women than men over the age of 85 years ("Demographic Changes", 1996). One reason for this statistic is that life expectancy for women is higher. In 1991, the average life expectancy was 79 years for women and 72 years for men (Yax, 2000). This information is important to consider when conducting research with older adults, as it may be more difficult to achieve equal representation of male to female subjects.

Factors contributing to the increases in the proportion and numbers of older adults, especially during the rapid growth period between 2010 to 2030, include declining fertility rates and mortality rates, and the maturing of the baby boom generation ("Demographic Changes", 1996), along with improvements in health care services and a heightened awareness of the different needs and concerns specific towards the older adult age group. Advances in the prevention and treatment of illnesses occurring early in life, along with decreases in infant mortality, better nutrition, and improvements in the management of chronic diseases have also contributed to the growth of this segment of the population (Chernoff, 1991).

Dehydration

Among older adults, the most common fluid and electrolyte imbalance is dehydration (Lavizzo-Mourey, Johnson, & Stolley, 1988). The following sections will

describe how fluid balance is maintained, the types of dehydration that can develop, age related changes that predispose older adults to developing dehydration, and the prevention and treatment of this condition.

Maintaining Fluid Balance in the Body

The regulation of fluid and electrolyte balance in the body relies on several hormones and mechanisms. The two hormones that regulate fluid and electrolyte balance are antidiuretic hormone (ADH), secreted by the posterior pituitary gland, and aldosterone, secreted by the adrenal gland (Zeman & Ney, 1996). Antidiuretic hormone is secreted when there is an increase in serum osmolality, caused by elevated serum sodium concentration, water deficit, or a decrease in blood volume (Sanservo, 1997). The secretion of ADH slows the excretion of water by prompting the kidney to increase tubular water resorption and stimulates the sensation of thirst prompting increased fluid intake and the retention of water by the body to restore fluid balance (Groff, Gropper, & Hunt, 2000).

Similar to ADH, aldosterone produces its effects via the kidney by promoting the resorption of sodium in the distal and convoluting tubules. The resorption of sodium causes an increase in extracellular fluid osmolarity leading to the retention of fluid in an effort to dilute the solute concentration. The release of aldosterone is influenced by many factors including an increased serum potassium concentration, an increase in adrenocorticotropic hormone, and a low serum sodium concentration (Groff, Gropper, & Hunt, 2000).

Another hormone that has a role in maintaining fluid balance in the body is atrial natriuretic hormone (ANP) which is produced in the atrial cells of the heart (Groff,

Gropper, & Hunt, 2000). This hormone is released on a continual basis with increased levels of secretion during times of atrial stretch when excess fluid is present and blood pressure is elevated. Atrial natriuretic hormone has several functions that influence fluid status. These functions include enhancing the ability of the kidney to eliminate water and sodium, improving the glomerular filtration rate which aids in the release of sodium, and inhibiting the resorption of sodium and secretion of renin (Bullock & Rosendahl, 1992). The function of this hormone is the opposite of aldosterone in that it works to inhibit sodium resorption and promote sodium excretion (Groff, Gropper, & Hunt, 2000) thereby decreasing the fluid content of the body and decreasing blood pressure.

The renin-angiotensin system's role in maintaining fluid balance involves several enzymes. A decrease in blood volume or an increased osmolality stimulate the cells of the juxtaglomerular apparatus in the kidney to secrete renin, a proteolytic enzyme. Next, the renin hydrolyzes angiotensin, a protein produced by the liver, to form the inactive peptide angiotensin I. A second enzyme, angiotensin converting enzyme, then converts angiotensin I into the active peptide angiotensin II. Angiotensin II stimulates the release of aldosterone causing the resorption of sodium and the retention of water. Angiotensin II also acts as a vasoconstrictor, which will function to lower the glomerular filtration rate and therefore the level of filtered sodium (Groff, Gropper, & Hunt, 2000). An understanding of the mechanisms involved in maintaining fluid balance in the body is important in understanding the types of dehydration and how they can develop in older adults.

Types of Dehydration

Dehydration is the excessive depletion of water from the tissues of the body that can lead to an imbalance of electrolytes, notably sodium, potassium, and chloride (Anderson & Anderson, 1994). Dehydration affects many parts of the body including the heart, kidney, and nervous system (Iggulden, 1999). Pathological fluid losses, diminished fluid intake, or both can cause dehydration. The inverse relationship between sodium and water is particularly significant. The sodium level is affected by changes in water balance as is the water balance affected by changes in sodium level. The types of dehydration that can occur are dependent upon the form of imbalance that develops between these two elements (Sanservo, 1997).

Knowledge of the types of dehydration that can develop is important in determining the prevention and treatment of dehydration. Isotonic dehydration, also described as hypovolemia or extracellular fluid (ECF) depletion, is a result of an equal loss of sodium and water from the body (Weinberg, Minaker, & Council on Scientific Affairs, 1995) in which no change in serum osmolality is observed (Sanservo, 1997). This type of dehydration develops when there is a sudden decrease in fluid intake or when the ECF content is lowered as a result of conditions such as hemorrhage, diarrhea, vomiting, burns, uncontrolled diabetes, and periods of excessive sweating (Bullock & Rosendahl, 1992). The hypovolemia leads to a reduction in the extracellular space and a decrease in the circulatory pressure. Signs and symptoms of this condition include thirst, weakness, weight loss, decreased skin turgor, elevated pulse and respiration, and little or no urine production. By the time the signs and symptoms of this type of dehydration are exhibited, the level of hypovolemia is advanced. The intracellular fluid (ICF) and

interstitial fluid transfer to the inside of the vessels to sustain blood flow (Bullock & Rosendahl, 1992).

Hypertonic dehydration occurs when the loss of water exceeds the loss of sodium resulting in conditions of hypernatremia and hyperosmolality. This type of dehydration can develop during conditions that cause decreased fluid intake, and increased excretion of water such as profuse sweating, dysphagia, decreased sense of thirst, excessive urination due to diabetes insipidus, high water loss via respiration, and watery diarrhea. Consuming too much sodium through the diet or receiving hypertonic solutions can also cause hypernatremia. The resulting hypernatremia and hyperosmolality leads to the shrinking of the cells as water moves from the ICF to the ECF in an effort to balance the level of osmolality. The clinical effects of this type of dehydration include central nervous system manifestations, tachycardia, dry, flushed skin, low blood pressure, increased body temperature, weight loss, and little or no urine production (Bullock and Rosendahl, 1992).

The third type of dehydration is hypotonic dehydration that develops when sodium loss is greater than water loss. Hyponatremia and hypoosmolality both develop as a result (Weinberg et al., 1995). As water moves from the ECF to the ICF in an effort to restore sodium balance, the cells become enlarged (Bullock & Rosendahl, 1992). This type is most often caused by excessive use of diuretics, but can also result from sodium restricted diets, overhydration, and the replacement of fluids using only water or hypotonic fluids after repeated bouts of vomiting and diarrhea, or excessive sweating (Askew & Leutkeimer, 1999). Inadequate excretion of water caused by renal disease can also lead to hypotonic dehydration. Hypotonic dehydration can cause cerebral edema,

headache, stupor, lowered body temperature, tachycardia, and nausea and vomiting (Bullock and Rosendahl, 1992).

Indices of Dehydration

An important step in the process of preventing and treating dehydration is the recognition of the indicators of dehydration. Dehydration can be exhibited through physical and biochemical indices, both of which can vary depending on the type and severity. Many of the signs and symptoms of dehydration can be vague, deceptive, or lacking in older adults due to changes associated with aging (Weinberg et al., 1995).

Physical Indicators

Identifying the physical indicators of dehydration is an important first step in the assessment of the hydration status of individuals in the clinical setting. The identification of physical indicators is also a main component in the assessment of hydration status within the community and nursing home settings where the availability of biochemical indicators is limited. Several target areas of the body are vital to the assessment of hydration status. These areas include the oral cavity, integumentary system, and the cardiovascular system.

The oral cavity has been found to be one of the most important areas to assess for hydration status in older adults (Sanservo, 1997). A study of older adults presenting to the emergency room to determine which signs and symptoms are useful in assessing the severity found tongue furrows, tongue dryness, and dry mucous membranes of the mouth and nose to be strongly correlated with dehydration (Gross et al., 1992). If a person is dehydrated, longitudinal tongue furrows will be present and the tongue will appear smaller than normal (Iggulden, 1999). The furrows should not be confused with the

benign condition of geographic tongue when a map-like appearance is observed (Sanservo, 1997). Other factors to evaluate when looking in the mouth include the presence or absence of a saliva pool and tongue coating (Gross et al., 1992). The oral cavity indicators of hydration status should not be used alone because factors such as mouth breathing and anticholinergic medications can cause dry mucous membranes (Weinberg et al., 1995). Therefore, consideration of other indicators is vital to the assessment of hydration status.

Tissue hydration status assessment can also include skin turgor evaluation. (Grimes & Burns, 1992). To evaluate skin turgor, first the skin is pinched over the sternum, inner aspect of the thigh, or forehead and then the amount of time it takes the skin to flatten is noted. In a person who is dehydrated, the skin will take from several seconds to up to thirty seconds to flatten (Grimes & Burns, 1992). In comparison, a person who is well hydrated will have skin that will fall back immediately. Skin turgor should also be used in conjunction with other indicators of hydration status because the elasticity of the skin can weaken with age (Iggulden, 1999) meaning that some skin tenting may be present in well-hydrated older adults (Rikkert et al., 1998).

Changes in the cardiovascular system are observed in states of dehydration. One change is an abnormal decrease in orthostatic blood pressure. A total decline of 20 mm Hg or more or a diastolic lowering of 10 mm Hg or more over one to three minutes from the positions of supine to sitting, sitting to standing, or supine to standing is considered significant (Trotto, 1999). However, changes in orthostatic blood pressure can be influenced by several factors, many of which are associated with aging or often found in older adults. These factors include the presence of pacemakers, cardiac conduction

disorders, and use of beta-blocker medications (Weinberg et al., 1995). Gross and his colleagues also found orthostatic blood pressure changes to be an unreliable indicator of dehydration in older adults most likely due to the loss of autonomic function that occurs with age and the use of vasoactive medications (Gross et al, 1992).

The presence of tachycardia, classified as a pulse rate greater than 100 beats per minute, has been found to be an indicator of dehydration (Sanservo, 1997). The study by Gross et al. found a weak correlation between the presence of tachycardia and dehydration in older adults. They also note that the presence of tachycardia can be helpful in distinguishing dehydrated versus nondehydrated older adults and should act as a trigger for further investigation of patient history and laboratory testing to confirm the presence of dehydration (Gross et al., 1992).

In advanced stages of dehydration, changes in facial appearance can be exhibited by the appearance of sunken eyes (Gross et al., 1992; Trotto, 1999). Other factors correlated with the presence of dehydration include upper body muscle weakness, emaciation, and lethargy (Gross et al, 1992). Rapid changes in weight status can also signify changes in hydration status. A rapid weight loss greater than 3% of body weight is considered a significant indicator of fluid loss (Weinberg et al., 1995). Manifestations such as decreased urine production and increased urine concentration also indicate low fluid status, however aging decreases the kidney's ability to concentrate urine (Iggulden, 1999). The presence of constipation can also be found in conjunction with low fluid status. The flat appearance of the veins in the neck and hands will also be present indicating low plasma volume (Iggulden, 1999).

Disturbances in the blood electrolyte level can be indicated by abrupt changes in mental status such as disorientation, confusion, hallucinations, or personality changes (Iggulden, 1999). Confusion and speech difficulty have been found to have a moderately strong association with dehydration (Gross et al, 1992).

Biochemical Indicators

Biochemical indicators are often used to diagnose and treat dehydration in both the clinical and research setting. The laboratory values used to diagnose states of dehydration include serum sodium, blood urea nitrogen (BUN), osmolality, hematocrit, and blood urea nitrogen/creatinine ratio (Sanservo, 1997; Weinberg et al., 1995). The volume of concentrated urine and urine specific gravity can also be used in identifying states of dehydration (Welch, 1998).

Sodium is the main component of the extracellular fluid and greater than 95 percent of the body's sodium is found in the extracellular fluid (Metheny, 2000). The functions of sodium include maintaining osmotic pressure and acid-base balance, and transmitting nerve impulses. Factors involved in maintaining a normal serum sodium level are renal blood flow, renin, aldosterone, and antidiuretic hormone (Fischbach, 1996).

The evaluation of serum sodium level is useful in determining changes in water and sodium balance. The normal values for an adult range from 135 to 145 mmol/L. A decreased serum sodium, also known as hyponatremia, can be found when excess body water is present. Examples of conditions where excess fluid and a low sodium level may be present include edema, congestive heart failure, and the excess administration of intravenous fluids without electrolytes added. A lowered serum sodium can also be

found when a large amount of fluid has been lost as in during times of severe diarrhea, vomiting, burns, and use of diuretics (Fischbach, 1996).

Elevated serum sodium, also known as hypernatremia, develops when the water level decreases within the blood leading to an increase in the sodium concentration. The primary cause of this imbalance is inadequate fluid intake, however factors such as fever, diarrhea, respiratory infections, diabetes mellitus, diabetes insipidus, polyuria, and profuse sweating can also contribute (Sanservo, 1997).

Urea, one of the final products of protein metabolism, is formed in the liver. The excretion of urea varies depending on dietary protein intake and increases with conditions of fever, diabetes, and increased adrenal gland activity. The blood urea nitrogen (BUN) test measures the nitrogen portion of urea and provides an indication of the glomerular filtration rate of the kidneys and the production and excretion of urea.

The normal range for the BUN is 7 to 18 mg/dl. Increased levels of BUN are often found in dehydration where salt and water have been depleted. The fluid deficit can cause reduced renal blood flow leading to a decrease in urea clearance (Metheny, 2000). Numerous other factors such as impaired renal function, congestive heart failure, shock, and excess protein intake or protein catabolism can also raise BUN levels (Fischbach, 1996).

The BUN/creatinine ratio can also be useful in diagnosing of dehydration. A ratio greater than 25 is suggestive of dehydration. An increased BUN/creatinine ratio can also be caused by renal vascular disease, obstructive uropathy, and steroid induced catabolism (Weinberg et al., 1995). Age-related decreases in renal function can also lead to an elevated BUN/creatinine ratio (Rikkert, Van't Hof, Baadehuysen, & Hoefnagels, 1998).

Osmolality is the measurement of the number of dissolved solute particles in a kilogram of solution. This laboratory measurement is useful in evaluating water and electrolyte balance (Fischbach, 1996). The test is also used to detect low molecular weight foreign substances in blood such as mannitol, ethanol, and ethylene glycol. The level of serum osmolality is based on a calculation of the measured concentration of several blood solutes including sodium, glucose, and urea (Rikkert et al., 1998). The normal serum osmolality range for adults is 275 to 295 mOsm/kg. Elevated osmolality levels are found in states of dehydration and in conditions of diabetes insipidus, diabetes mellitus hyperglycemia, hypernatremia, and alcohol ingestion. Decreased osmolality is also associated with the loss of sodium via diuretics, low sodium diets, and excessive water replacement (Fischbach, 1996).

Research has found that older adults may have a higher normal range for osmolality levels. Weinberg, Pals, McGlinchey-Berroth, and Minaker (1994) conducted a study involving a group of institutionalized male residents of a nursing home care unit. Results of the study indicate that an increased percentage of the participants had osmolality levels that were in the high normal to elevated range. These levels remained stable over a six-month time period during which the men had no evidence of ongoing dehydration including normal serum sodium and BUN/creatinine ratios. This suggests an age-related increase in serum osmolality and the notion that there may be a different osmolality reference range for older adults of long term care settings. The study also suggests that the evaluation of changes from a baseline value for the patient may be more accurate than looking at an absolute value of serum osmolality when assessing hydration status (Weinberg et al., 1994).

The laboratory measurement of hematocrit can also be used in the assessment of hydration status (Sanservo, 1997; Trotto, 1999). Hematocrit is a measure of the packed cell volume of red cells (Anderson & Anderson, 1994) and is communicated as a percentage of packed red cells in a volume of blood. Elevations in the hematocrit can be found in conditions of severe dehydration, states of shock, and polycythemia, an increase in the number of red blood cells. Changes in hematocrit levels can be used in the evaluation of fluid status only when there are no changes in red blood cell mass occurring, as in times of bleeding or hemolysis. The normal range for females is 36 to 48 percent and 42 to 52 percent for males (Fischbach, 1996).

Urine specific gravity is a measurement of the ability of the kidney to concentrate urine. A comparison between the weight of urine versus the weight of distilled water, which has a specific gravity of 1.000, is made (Fischbach, 1996). The urine specific gravity will vary depending on the state of hydration, urine volume, and solute load for excretion (Metheny, 2000). During states of dehydration in which a fluid deficit is found, the specific gravity is elevated as the kidney attempts to retain fluids. This causes solutes to be excreted in a small volume of concentrated urine (Metheny, 2000). Conditions such as diabetes mellitus or nephrosis, which can result in abnormally large amounts of glucose or protein being excreted, can also elevate the specific gravity. The normal range for urine specific gravity with normal hydration and volume is 1.003 to 1.035 (Fischbach, 1996).

Changes in urine output can also reflect changes in fluid status. A decreased excretion of concentrated urine indicates inadequate renal perfusion. This is caused by a

decrease in the extracellular fluid volume needed to transfer enough blood to the glomeruli of the kidney (Metheny, 2000).

Limitations of Biochemical Indicators

Laboratory tests can be useful in providing additional information when evaluating a person's hydration status, however several limitations must be considered when using laboratory tests. Many factors, in addition to hydration status, can influence laboratory measurements including medications and various medical conditions and disease states. Therefore, careful consideration of the patient's medical history as well as the evaluation of more than one measurement is important when evaluating lab results.

The availability of laboratory measurements in both the community and long-term care setting also limits the usability of these tests. Long-term care facilities are required to provide laboratory data on patients, however many facilities do not have in-house laboratories so the availability of results is limited (Weinberg et al., 1995). The lab tests are also most often drawn on an infrequent basis making them ineffective in daily monitoring of fluid status.

Within the community setting, laboratory measurements are often not available due to lack of facilities and equipment to conduct the tests as well as the cost of testing. The use of physical indicators, review of food and fluid intake, medications, and medical history are more effective in assessing hydration status in the community setting (Weinberg et al., 1995).

Factors That Can Influence the Development of Dehydration

In addition to being able to recognize the indices of dehydration, knowing the factors that can influence the development of dehydration is important in both preventing

and treating this condition. Many of the following factors are often found in older adults, placing them at an increased risk for developing dehydration.

Disease Processes

Various acute and chronic diseases and their effects, many of which are more prevalent in older adults than the rest of the population, can predispose a person to developing dehydration. Infections, both in chronic or acute states, such as pneumonia, chronic obstructive pulmonary disease, or urinary tract infections, can influence the development of dehydration through febrile illness, excess production of mucus, or by lowering the level of functional status thereby decreasing fluid intake (Sanservo, 1997). Infections, which present with a fever, can increase water needs by up to ten percent (Welch, 1998) as a result of an elevation in the metabolic rate (Iggulden, 1999). The elevated rate of metabolism leads to an increase in the production of metabolic wastes creating the need for additional fluid to make a solution for renal excretion. Fever can also cause an increased breathing rate resulting in additional fluid loss via water vapor from the lungs (Metheny, 2000).

Diseases such as congestive heart failure, hypertension, or renal disease, all three of which can directly affect kidney function, can also influence the development of dehydration. These diseases can vary the renal perfusion, or rate of blood flow through the capillaries, thereby altering the body's ability to maintain fluid balance (Sanservo, 1997). Congestive heart failure presents with a decreased cardiac output lowering the blood flow to the kidney. This causes the retention of sodium due to an effort by the body to increase fluid volume and thereby improve blood flow to the kidney. The decreased cardiac output stimulates the secretion of renin and eventually the formation of

angiotensin II, which acts as a vasoconstrictor and also stimulates the secretion of aldosterone. The secretion of aldosterone causes the kidneys to retain sodium and water and therefore the condition of fluid overload (Metheny, 2000).

Diabetes mellitus, in the uncontrolled state of diabetic ketoacidosis, can cause dehydration through the intravascular depletion of fluids via the process of osmotic diuresis in the kidney (Sanservo, 1997). The elevations in blood glucose that occur lead to osmotic diuresis of the kidney and result in the loss of both fluid and electrolytes. In some cases, up to four to six liters of fluid may be lost (Andreoli, Carpenter, Bennett, & Plum, 1997).

Diabetes insipidus is a condition in which insufficient antidiuretic hormone is secreted. This leads to an inability to concentrate urine and subsequently the secretion of large volumes of dilute urine. Both intracellular and extracellular fluids become depleted (Andreoli, et al., 1997). Ongoing replacement of fluids is essential as dehydration can develop rapidly (Sanservo, 1997).

Other clinical effects of diseases can also contribute to the development of dehydration. Hyperventilation will increase insensible water loss via the lungs. Conditions presenting with diarrhea can result in large amounts of sodium and water lost (Iggulden, 1999). Fractures can affect the body's fluid balance through related blood loss or invisible fluid shifts from the area of the fracture to the extracellular space. When fluid shifts to the extracellular space in what is known as a third space shift, the fluids become useless as a body fluid.

The identification of persons with these types of diseases is important in both the prevention and treatment of dehydration. Further education to persons with these

conditions regarding their increased risk of dehydration is an important component in the treatment plan.

Influence of Medications on Hydration Status

For many older adults, taking medications is a daily routine. However, many prescription and over the counter drugs can put older adults at an increased risk of developing dehydration. The most common type of medication to influence hydration status is the diuretic (Sanservo, 1997). Diuretics, substances that promote the production and elimination of urine, are prescribed most often for the treatment of hypertension and congestive heart failure in older adults (Metheny, 2000).

Other drugs that may have an influence on hydration status include sedatives, antipsychotics, or major tranquilizers such as diazepam, lorazepam, or haloperidol. These types of drugs are effective in treating conditions involving pain, anxiety, or paranoia, but also have an influence on a person's desire to consume fluids (Sanservo, 1997).

During the aging process, many older adults will experience a decrease in the motility of the gastrointestinal tract and a diminished sense of the need for elimination which can lead to constipation. Certain types of drugs such as anticholinergics and calcium carbonate or aluminum hydroxide containing antacids can also contribute to the development of constipation (Metheny, 2000). All of these factors can lead to a dependence on laxatives for the relief of constipation in older adults. However, excessive usage of laxatives can cause severe diarrhea and in turn dehydration and electrolyte abnormalities (Sanservo, 1997).

Within the community setting, the influence these types of medications can have on hydration status in older adults can be further confounded with undersupervised medication usage (Weinberg, et al., 1995). Missed doses or overdoses of medication can occur due to confusion or poor understanding of medication usage which can lead to fluid and electrolyte disturbances. Many older adults live alone or do not have people who help them to set up the proper dosages of their medications. Both older adults and caregivers need education on the home medication regimens and the over the counter drugs to prevent the improper usage of the medication that could lead to alterations in the fluid and electrolyte balance. Health professionals and caregivers need to consider and evaluate a patient's ability to be responsible to assure compliance and proper usage of medications (O'Donnell, 1995). Therefore, education regarding safe medication usage in addition to the importance of adequate fluid intake must be established.

Age-Related Changes That Can Influence the Development of Dehydration

There are several age-related changes that can influence the development of dehydration in older adults. These changes include a decrease in total body water content, a decreased sensation of thirst, and a reduction in kidney function.

In adults, water makes up 50 to 60 percent of total body weight. However, the elderly have four percent less total body water (TBW) than younger individuals with the percent decrease slightly greater in women (Welch, 1998). For example, an older adult with a weight of 150 pounds has seven liters less TBW than a younger adult of the same weight (Practical Solutions to Preventing Dehydration, 1997). This decrease in TBW occurs within the intracellular compartments causing cells to be at an increased risk for dehydration (Sanservo, 1997). The lower level of TBW is due to a reduction in muscle

mass and an increase in the amount of body fat. The change in TBW content is significant because when the body lacks adequate fluids to remove waste products, it will turn to the process of removing fluid from the tissues (Welch, 1998).

The two main mechanisms used to protect the body from dehydration are sensation of thirst and the concentration of urine via the kidneys. Both of these mechanisms work to maintain the proper osmolality of the blood (Welch, 1998). However, these two mechanisms are altered during the process of aging. The sensation of thirst normally occurs when an individual's water loss is equal to two percent of body weight or when an elevation in serum osmolality occurs (Sanservo, 1997).

Studies have found that older adults have a diminished sensation of thirst. A study conducted by Phillips et al. compared the fluid intake following a 24-hour period of restricted fluid intake between young males and elderly males. The study found that the young males corrected their fluid deficit within a two-hour period following the restriction while the elderly males did not. The study reports that the elderly males experienced a decreased sensation of thirst and therefore consumed less fluid than the young males (Phillips et al., 1984). The study finding is significant as thirst is a primary mechanism in alerting persons to replenish depleted water stores (Rolls & Phillips, 1990). Other factors that can influence the sensation of thirst include any condition that causes a large fluid and electrolyte loss producing a state of isotonic dehydration. With this type of dehydration, no change in osmolality is observed and therefore the sensation of thirst is not activated (Welch, 1998).

The second mechanism to decline with age is kidney function. Through the aging process, the kidney experiences a decrease in nephrons and a reduction in renal blood

flow. The actual weight of the kidney is decreased by 50 grams between the ages of 40 to 80 years. By the age of 70, 30 to 50 percent of the glomeruli have been lost and between the ages of 20 to 90 years, the glomerular filtration rate of the kidney is decreased by 46 percent. Both the glomerular and tubular basement membranes also experience a thickening. All of these changes result in increased difficulty in removing wastes of heavy solute load such as drugs, glucose, protein, and electrolytes (Metheny, 2000). The body also has a diminished ability to conserve or retain fluids by concentrating urine in response to changes in pH, fluid and electrolyte balance, and osmolarity (O'Donnell, 1995). The kidney's capacity to retain sodium and its ability to excrete large volumes of water also decreases. This lessens the body's ability to preserve sodium and water during periods of increased loss, which increases the risk of developing dehydration and hypovolemia. Older adults are also at an increased risk of developing fluid overload and hyponatremia during the administration of excess fluids (Rolls & Phillips, 1990). This is due to the age-related decline in the glomerular filtration rate as the body is unable to efficiently excrete the excess fluid (Chernoff, 1994).

Changes in the hormonal response of older adults can also influence the development of dehydration. Antidiuretic hormone (ADH) functions to increase the absorption of water in the tubules of the kidney by slowing the process of producing urine. The secretion of ADH remains unchanged throughout the aging process, however the responsiveness of the renal collecting tubule of the kidney is diminished. This resistance to ADH leads to a decreased ability to concentrate urine and thereby conserve water to correct states of dehydration or hyperosmolality (Welch, 1998).

Many older adults also experience problems with incontinence as they age. In an effort to control incontinence, or involuntary urination, older adults may consciously or voluntarily restrict their fluid intake. This practice not only predisposes them to developing dehydration, but also increases the concentration of urine, which can irritate the bladder wall and stimulate voiding contractions (Metheny, 2000).

Economic and Social Factors

As the older adult population continues to grow, the unemployment rate rises, and health care costs continue its dramatic increase, the ability of the nation to maintain government assistance programs is jeopardized. Many older adults depend on these government supported programs for assistance with health care costs and financial support. Increases in health care costs and unemployment also contribute to the rise in poverty in the older adult population.

For many older adults, financial difficulty hinders their ability to obtain adequate amounts of fluids to maintain hydration status. Lack of financial resources can also contribute to the development of dehydration during periods of extreme weather fluctuations such as summer heat waves as some older adults are unable to afford air conditioning or don't open windows for fear of burglary (Sanservo, 1997).

Treatment of Dehydration

Once dehydration is diagnosed, several treatments can be used. The easiest and most cost effective treatment for dehydration is simply oral replacement of fluids (Iggulden, 1999). This method is most effective in situations of mild to moderate dehydration when the patient is able to consume oral fluids and is hemodynamically stable. An intake of 2000 ml per day is recommended. Other guidelines for replacement

of fluids in older adults include replacing 50 percent of estimated current losses within the initial 12 to 24 hours. Additional fluids for daily needs and ongoing fluid losses must be included in the amount. The remaining fluid deficit can be given in the following 24 hours (Trotto, 1999). However, in patients who present with conditions involving fluid overload such as congestive heart failure, nephrotic syndrome, and cirrhosis, a more closely monitored rehydration approach is needed. In addition, persons presenting with medical problems involving excessive sputum formation, such as chronic obstructive pulmonary disease (COPD), and thereby increased fluid loss, may require a more aggressive approach to hydration (Sanservo, 1997).

During the replacement period with oral fluids, all patient should be monitored for signs of volume overload. Examples of signs of fluid overload include orthopnea, shortness of breath, alterations in sleep pattern, and increased confusion (Weinberg, Minaker, & Council on Scientific Affairs, 1995). Other signs of fluid overload include elevations in blood pressure, increases in weight, edema, and distended neck veins (Winkler & Lysen, 1993). If these conditions develop, treatment with a diuretic medication is often needed to remove excess fluids (Weinberg et al., 1995).

Beverages such as water, juices, broth, and carbonated beverages can be used in the treatment of mild dehydration (Welch, Campbell, & Crowley, 1996). Beverages such as sports drinks can also be used as oral replacement therapy. These beverages are absorbed easily into the stomach and can quickly remedy states of hypertonic dehydration (Weinberg et al, 1995). When choosing oral fluids for persons with conditions involving electrolyte abnormalities or diabetes, the glucose and electrolyte content of the fluids

should be taken into consideration to prevent complications that can occur with these conditions (Sanservo, 1997).

In cases of moderate dehydration, an oral rehydration solution composed of the appropriate ratio of electrolytes, salts, glucose, and water is used (Iggulden, 1999). Oral rehydration solutions can be indicated to treat fluid losses caused by many factors including diarrhea, vomiting, heat, and exercise, however, patients with severe dehydration should be rehydrated with an alternative method (Trotto, 1999). Oral rehydration solutions have been found to be an effective treatment in older adults. A study of nursing home residents determined to be at risk for developing dehydration found that the addition of oral rehydration solutions to their daily fluid intake increased extracellular fluid volume and thereby reduced their risk of dehydration (Welch et al., 1996).

Another method of treatment for dehydration is hypodermoclysis in which isotonic or hypotonic mixtures are provided via needles inserted into the subcutaneous tissue sites of the abdomen or anterior or lateral thighs. The rate of administration is 1 ml/minute so a total of 1500 ml of fluid can be administered via one site and up to 3000 ml of fluid using two sites over a 24-hour time span. This method of rehydration is used in persons who require a significant amount of fluid replacement (Weinberg et al., 1995). However, this method is not appropriate when a large administration of fluid is needed in a short period of time due to the slow infusion rate used (Iggulden, 1999). There are several complications associated with hypodermoclysis that need to be considered including induced electrolyte abnormalities and tissue shedding caused by excessive infusion or utilization of inappropriate types of fluids. The possibility of large vessel

puncture, formation of an abscess at the site of infusion, or pain due to an incorrect insertion of the needle are also risks associated with the procedure (Weinberg et al., 1995).

The last method of treatment for dehydration is the usage of intravenous fluids (IVF). This method is utilized for rapid replacement of fluids in the acute care setting or as a long-term treatment for persons suffering from chronic fluid losses (Iggulden, 1999). The use of IVF is also required when conditions such as tachycardia, hypotension, oliguria, and altered mentation present as the patient is unstable and requires immediate care and monitoring (Sanservo, 1997). During the administration of IVF, blood electrolytes, blood counts, and other basic lab values must be evaluated on a regular basis. The type of fluids used for replacement varies depending on the type of dehydration present. In older adults who are low in free water, but are hemodynamically in stable condition, the use of water or a five percent dextrose solution can be used. In persons who present with severe diarrhea or vomiting, an isotonic saline solution is used for replacement (Weinberg et al., 1995).

All of these methods are effective in treating dehydration. Careful consideration of the type of dehydration present, the extent of fluid depletion, the cause of depletion, and the patient's medical condition is required when determining the most appropriate method for the treatment of the fluid and electrolyte imbalance.

To avoid having to treat this medical condition and to improve the health of older adults, interventions to prevent the occurrence of dehydration are important. The best way to prevent the incidence of dehydration is to ensure adequate fluid intake on a daily basis. A general recommendation is an intake of 1500 to 2500 ml of fluid per day to

meet fluid needs, replace urinary and fecal losses, and insensible water loss caused by lung vapor and sweat (Weinberg et al., 1995). Other methods of estimating fluid needs for older adults are as follows:

- 1 ml water per calorie consumed
- 30 ml of water per kilogram body weight
- 100 ml water per kilogram body weight for first 10 kilogram, 50 ml water for next 10 kilograms, and 15 ml water for remaining kilograms body weight.

The guidelines also include a minimum intake of 1500 ml per day regardless of caloric intake or body weight (Chidester & Spanger, 1997).

Other ways to prevent the development of dehydration include identification of older adults at an increased risk. Risk factors include medical conditions or medications that can affect hydration status and decreased function status. Another method is to provide cues or regular encouragement for consumption of fluids to older adults, as a decreased sense of thirst is an effect of aging. During periods of hot weather, usage of fans or air conditioning in addition to consuming additional fluids can prevent the development of dehydration. The assessment of factors that may have contributed to the occurrence of dehydration such as medications, medical conditions, living or social situation, and mental status following an acute event can be beneficial to identify changes or interventions that can be made to prevent it from developing again (Weinberg et al., 1995). Initiation of a program designed to monitor people at an increased risk of developing dehydration or have a problems with dehydration can also be helpful (Iggulden, 1999). The assessment of an individual's ability to obtain and meet fluids needs and the instigation of a remedial intervention when appropriate are also important

steps in the prevention process. For older adults living alone in the community, the provision of health professionals such as home health nurses or aides to provide continuous monitoring and evaluation regarding fluid and health status can also be an important component in preventing dehydration (Weinberg et al., 1995).

Another important step in preventing dehydration is education. An education program on fluid awareness involving emotionally disturbed adolescents at a mental health treatment facility was conducted to assess the adequacy of current fluid intake, provide information on hydration, and determined the effectiveness of a fluid awareness program (Daniello, 2001). The intervention consisted of posting pictures of water and banners with messages to drink more fluids, increasing availability of fluids and serving more palatable beverages and foods with a high water content, sending bottled water on field trips, and displaying posters with education about fluid. At the start of the program, the survey of individual fluid intake found that 55 percent of the students had adequate fluid intake. Following the first week of intervention, a second survey of fluid intake found that 76 percent of the students had adequate fluid intake, a significant increase (Daniello, 2001). The program found that providing education on fluids and hydration can be effective in increasing fluid intake in individuals, an important step in preventing dehydration. Educating older adults as well as caregivers and support staff on aspects of dehydration is a vital component in the prevention process (Behrens, 1999). Older adults and their caregivers need to be aware of who is at risk for dehydration, how to prevent dehydration, signs and symptoms of dehydration, and what to do if a person is low on fluids (Trotto, 1999). Older adults also need to be informed on the amount of fluids needed and the types of fluid sources appropriate. It's also important to educate older

adults on how to maintain adequate fluid intake during times of illness when increased fluid losses may be occurring (Midanik & Clark, 1994). Dehydration is a serious but preventable condition.

Assessing the Mental Status of Older Adults

Assessing the mental status of older adults is an important component in evaluating the health status of older adults (Gallo, Reichel, & Anderson, 1995). Changes in mental status can be a sign of an acute illness, including dehydration (Mental Status Examination, 2000). The mental status of older adults can also reflect the accuracy of any medical and social history provided by the person (Gallo, Reichel, & Anderson, 1995). Changes in mental status can also have a direct effect on a person's ability to perform the necessary tasks of daily living (Mental Status Examination, 2000).

Performing a quantified version of a mental status exam on older adults is useful in identifying cognitive and emotional disorders in the community and clinic setting. A quantified exam ensures a systematic, standardized approach and assessment and enables patient progress to be monitored over a period of time (Mental Status Examination, 2000). A mental status exam provides an assessment of a patient's mental status at the time of evaluation, however, it's important to remember that a mental status exam can't provide a diagnosis because a diagnosis requires integration of all information including history, physical, mental, and laboratory aspects (Mental Status Examination, 2000).

The mental status exam is designed to evaluate behavior and mental capability over a variety of intellectual components. These components include level of consciousness, attention, language skills, memory, proverb interpretation, ability to

identify similarities, calculating and writing skills, and constructional ability or ability to copy complex figures (Gallo, Reichel, & Anderson, 1995).

The testing of orientation to surroundings is a basic component to evaluating mental status and addresses a person's ability to identify time, place, person, and situation. Most people continually orient themselves by way of daily routine, clocks and watches, calendars, news, and social contacts. However, for older adults, especially those living alone or in a nursing home, they may not experience these events, which in turn influences their orientation (Gallo, Reichel, & Anderson, 1995).

Attention describes a person's ability to maintain focus on a specific issue, object, or activity. An example of testing attention is by asking a person to count backwards by seven from 100 and spell the word "world" backwards as done with the Folstein Mini Mental Status Exam (MMSE). A person who is easily distracted and not able to pay attention to the surveyor will perform poorly on the tests due to a lack of observation (Gallo, Reichel, & Anderson, 1995). The level of attention can be affected in persons with delirium, depression, subcortical disorders, and Alzheimer's disease (Mental Status Examination, 2000).

Memory can be broken down into three areas, which are immediate recall, short-term memory, and long-term memory. One example of assessing immediate recall and short-term memory is by using the process of repeating three words immediately after they are spoken and then recalling the words approximately five minutes later. Out of all the components of the mental status exam, the testing of memory often causes the most anxiety for participants (Gallo, Reichel, & Anderson, 1995).

Language function is assessed by asking participants to name objects, repeat a phrase, follow an oral command, and to read and write a sentence. The ability to perform these tasks can be affected by focal disease of the left hemisphere of the brain (Mental Status Examination, 2000).

Constructional ability, or the ability to carry out learned motor functions, is tested by asking the person to copy a drawing of intersecting pentagons (Mental Status Examination, 2000). A decreased constructional ability is a premature abnormality in dementia; however, it is not specific to dementia and may also indicate changes in ability to perform body functions that involve movement and apraxia, an impairment in the capacity to carry out purposeful acts or manipulate objects (Gallo, Reichel, & Anderson, 1995).

When conducting mental status exams, it's important to take into consideration factors that can influence test scores. Age and or level of education can have an influence on the scores for the Folstein Mini Mental Status Exam (Crum, Anthony, Bassett, & Folstein, 1993). Crum et al. examined MMSE score distribution by both age and educational level and found that MMSE scores were lower for the oldest age groups and also for persons with fewer years of education. Scores on the exam were also found to have a direct relationship when considering both the level of education and age. The study found a median score of 29 for individuals age 18 to 24 years and a median score of 25 for individuals age 80 years and older. When considering level of education, the median score was 29 for individuals with at least nine years of schooling, 26 for those with five to eight years of school, and 22 for those with four years or less of school. The study also found when considering both age and education, older adults age 85 and older

with zero to four years of education had a median score of 20 while those with a college education had a median score of 28 (Crum et al., 1993). These results indicate the need to evaluate both age and level of education when evaluating the scores for the MMSE.

Assessing the Functional Status of Older Adults

The assessment of functional status in older adults is important in understanding the impact of medical illnesses and age on the older adults (Gallo, Reichel, & Anderson, 1995). Functional status assessment is a major component in the complete assessment of older adults and has an important role in determining a person's ability to take care of oneself or to maintain health. Assessing functional status is also important in determining areas where additional assistance may be needed for an individual to remain as independent as possible to preserve quality of life.

Functional status can be assessed on several levels. These levels range from social and occupational performance, everyday tasks such as driving or public transportation usage, ability to use a telephone, and personal care activities such as bathing, toileting, or dressing (Gallo, Reichel, & Anderson, 1995). When assessing functional status, activities determined to be most important have been divided into two categories: activities of daily living (ADL) and instrumental activities of daily living (IADL). The ADL constitute activities essential to living independently such as toileting, bathing, and dressing. The IADL consist of more complex activities such as housekeeping and managing money. Several scales have been developed for use by practitioners to assess a person's level of functional status (Gallo, Reichel, & Anderson, 1995).

During the assessment of functional status, it is important to take into consideration the source of information regarding the level of function. A person may feel her or his functional status is at a higher level than what may be reported by a nurse or family member who has a high amount of contact with the person. Functional status should also be evaluated separately of medical and laboratory abnormalities (Gallo, Reichel, & Anderson, 1995).

Measurement of Dietary Intake via a Food Frequency Questionnaire

There are many methods that can be used to measure dietary intake. The food frequency questionnaire (FFQ) is a dietary method used to measure the usual frequency of consumption of a list of foods that are significant sources of nutrients or of a specific food group or food component. Information on frequency, usually by per day, week, month, and per year, is collected. Some FFQ offer no information on portion size, and therefore a standard portion size, or amounts determined to be the usual size consumed by various groups based on age and sex of a large population, are used. These types of FFQ are known as non-quantitative or simple FFQ (Lee & Neiman, 1996).

Other FFQ seeking to determine relative or absolute nutrient intakes incorporate standard portion sizes into the questions or ask respondents to describe usual serving sizes as small, medium, or large relative to the serving. These types of FFQ are known as semi-quantitative and quantitative FFQ respectively (Thompson & Byers, 1994; Lee, & Nieman, 1996). The actual nutrient intake is then determined by multiplying the reported frequency of each food by the nutrient content in the specified serving of that food (Thompson & Byers, 1994).

As with all dietary assessment methods, the FFQ has both strengths and weaknesses. One strength of this method is its design to estimate usual intake, which may be more accurate than just a few days of a diet record. The time and energy required of respondents as well as cost of data collection and processing are often lower than for other dietary assessment methods. Food frequency questionnaires have also been determined to be suitable for estimating average intakes of energy and nutrients for groups of people. In addition, the ranking of individual's consumption of energy or nutrient intakes as high, average, or low can be accomplished with a FFQ (Lee & Nieman, 1996). When examining the relationship between diet and the risk of disease, the FFQ has also been found to be the most suitable choice (Feskanich et al., 1993).

Weaknesses of the FFQ include the failure to measure other aspects of dietary intake such as method of preparation, the dependence on the respondent's ability to describe intake, and the food list may not comprise foods typically consumed or portions sizes most commonly used by respondents (Lee & Nieman, 1996). The actual measure of intake is also not as accurate when compared with food recalls or diet records. The length of the FFQ also influences the accuracy of the method as the longer questionnaires have a tendency to overestimate and the shorter versions tend to underestimate (Thompson & Byers, 1994).

Food frequency accuracy may improve with portion size information, but that idea has not been verified. Studies have shown that the accuracy of the FFQ increases with the usage of portion sizes, while others have shown very little improvement. One advantage of not using portion sizes is that the data collection time is decreased. A study comparing the usage of portion size information versus not using portions size

information in elderly women found only small differences in dietary intake (Cohen, Laus, Smiciklas, Wright, AbuSabha, & Mitchell, 1999). However, another article notes that this information does not prevent the possibility that the use of portion sizes might be useful for some foods or nutrients and points out that continued efforts must be directed towards developing FFQ that encompass the age spans, populations, settings, and dietary intake components that need to be researched (Willett, 1994).

There are several factors to consider when assessing dietary intake in older adults. Due to fading memory, patience and frequent probing are often needed. Enlisting the help of family members can also be useful. It's also important to remember that interviews with older adults often take more time (van Staveren, deGroot, Blauw, & van der Wielen, 1994). Other aspects to consider with the FFQ include the specificity of the food list and method of administering the questionnaire. Specific names of food items are more likely to elicit an accurate recall than just a food group or category name. The study also reports that probing by an interviewer will increase the accuracy of the questionnaire as compared to a self-administered questionnaire (Krall & Dwyer, 1987).

Nutrition Education in Older Adults

The aging of the population and the resulting increase in the number of older adults is turning the focus of nutrition education towards this segment of the population. An increased awareness of the benefits good nutrition can have on preventing disease and maintaining health has also lead to an increased interest in nutrition related topics. The number of older adults participating in educational activities is also increasing due in part to the growth in population (Shafer, Gillespie, Wilkins, & Borra, 1996) and the rise in the level of education in this age group (Truluck & Courtenay, 1999).

The American Dietetic Association's (ADA) position on nutrition education states "nutrition education is essential for the public to achieve and maintain optimal nutritional health." The ADA also contends that nutrition education should be an important part of all health promotion, disease prevention, and health maintenance programs (Shafer et al, 1996). Nutrition education can be described as any group of learning activities aimed toward the adaptation of eating and other behaviors associated with nutrition that contribute to health and well being (Shafer et al, 1996). Nutrition education takes on the responsibility of teaching individuals what to do to improve nutrition and health, but also how to change current behaviors and adopt new dietary behaviors. The role of the dietitian in nutrition education is to function as a facilitator of behavior changes throughout the continuing educational process (Holli & Calabrese, 1991).

When planning and conducting nutrition education for older adults, several factors must be taken into consideration including the physiological, psychological, and social changes that occur with aging. Despite the many effects of aging, studies have shown that healthy older adults have the capacity to continue to learn and make behavior modifications throughout their sixties to eighties. When planning for successful nutrition education programs, it's important to understand the needs and desires of the intended audience. The practitioner must also have a good understanding of the desired outcome of the nutrition education (Shafer et al, 1996). . The modification of nutrition education to meet the needs of older adults as they experience the changes with aging is necessary (Kicklighter, 1991).

Physiological changes with aging that can affect the education provided include changes in sight, hearing, and reaction time. With aging, structural changes in the eye

lead to a decrease in visual acuity, peripheral vision, tolerance to glare, and adaptation to dark light (Kicklighter, 1991). It's been found that 10 to 15 percent of noninstitutionalized adults have some type of vision impairment (Wright K.J., Smiciklas-Wright, Blood, & Wright C., 1997). For this reason, visual material should utilize large and bold print with appropriately spaced letters, primary colors, and uncluttered organization. Information should also be presented in the client's direct line of vision (Kicklighter, 1991). A font in the 12 to 16 point range is preferred by older adults (Lancaster, Smiciklas-Wright, Ahern, Achterberg, & Taylor-Davis, 1997). A survey of Registered Dietitians revealed that the techniques of using large print materials and reading to clients from printed materials are utilized when working with visually impaired older adults (Wright et al, 1997).

With aging, a loss of hearing can also occur. Throughout the aging process, the inner ear degenerates leading to a decrease in the ability to hear high pitched sounds and understand talking. This can cause inaccurate interpretation of words and sentences (Kicklighter, 1991). Approximately 30 percent of all older adults have some type of hearing disorder (Wright et al, 1997). Practitioners working with older adults should speak in a slow, concise manner and use an audible low-pitched voice in a normal volume. The use of short, simple sentences is also recommended. Many older adults with hearing impairments utilize skills in reading lips or recognizing nonverbal actions such as gestures and facial expressions, making it important for the practitioner to use direct eye contact and avoid covering the mouth when talking (Kicklighter, 1991).

A decrease in reaction time and response can develop with aging and slow the process of learning new information. When working with older adults, it may be

necessary for the educator to slow the instruction pace and provide ample time for clients to grasp the education and complete assignments. During the education, the instructor should also pay attention for any nonverbal cues or feedback indicating the need to alter the instructional pace (Kicklighter, 1991).

Psychological and social changes are also important considerations in providing nutrition education to older adults. Many life-changing events such as retirement, illness, financial problems, and death of loved ones can result in loneliness, depression, and feelings of lack of purpose in life. These types of feelings can affect the ability of the learner to acquire new information. Group learning activities can be effective in providing companionship and socialization. Some older adults also experience anxiety in new learning situations so providing a safe and friendly environment with provision of information in a calm manner is essential. Adults experiencing depression seem to have more difficulty gaining and recalling new information. They also may have a poor self-concept of themselves and feel they are dependent on others. In this type of situation, it's important for the educator to treat them with respect and dignity and provide encouragement to become more independent. A learning environment of respect and acceptance is an important component of education in older adults (Kicklighter, 1991).

Learning Style

There are many methods and techniques of providing education to assist learners in attaining learning objectives. These methods function to form a relationship between the educator and the learner as well as the learner and the material being learned. Examples of methods include lecture, discussion, projects, simulation, and demonstration (Holli & Calabrese, 1991).

All methods have varying degrees of effectiveness, advantages, disadvantages, uses, and limitations. Several factors come into play when deciding which method to use including learner style or preference, time, facilities available, cost, and the educator's success or familiarity with the methods. In consideration of all factors as equal, the learning style with the most active participation should be chosen (Holli & Calabrese, 1991).

Techniques that may be useful in a one-on-one situation include lecture, discussion, demonstration, and audiovisual aids. The lecture technique is considered easy and efficient and simply provides information to the participant. With this type of method, the learner is passive and there is no feedback to indicate the information was learned. The learning is dependent on listening and it can be difficult to maintain the attention of the learner (Holli & Calabrese, 1991).

With the discussion technique, learning involves active participation by the learner. The discussion can center around open-ended questions and primary topics, debates, or past experiences. Disadvantages to this method include the learner feeling unprepared or too shy to discuss. The discussion method is often more time consuming than other methods (Holli & Calabrese, 1991).

Demonstration involves the observation of the learner as to how something is done as the instructor makes a presentation. This technique can be effective if the attention of the learner is captured. Weaknesses of this method include the equipment needed, the time involved, and the passive method of learning unless active participation is implemented (Holli & Calabrese, 1991).

The last method described is audiovisual aids. This technique can be effective by providing variety and enhancing memory via visual stimulation. Examples of audiovisual aids include videos, slides, flip charts, posters, overhead transparencies, food models and audiotapes. The appropriateness of methods of visual aids must be taken into consideration with each type of learning situation. For example, the usage of a flipchart would be appropriate only in small groups or one on one situation whereas an overhead projection with transparencies would be more appropriate for a large group (Holli & Calabrese, 1991).

Literature on learning style preferences of older adults also promotes methods that involve active participation by the learner and include the use of several senses (Holli & Calabrese, 1991). When educating older adults, the use of increased amounts of sensory stimulation is important to compensate for sensory loss. The older adult's readiness to learn is often based on life changing events such as retirement or the death of a spouse. Approaches to learning in older adults also tend to be problem-oriented (Kicklighter, 1991).

Many older adults recognize the importance of good nutrition in maintaining and achieving good health and are interested and receptive to information on nutrition. Access to this type of information may be limited (Lancaster et al., 1997). A survey of rural older adults designed to examine aspects of nutrition attitudes, knowledge and practice found that the younger elderly age 60 to 70 years had more positive attitudes towards outcomes based on eating habits. The older elderly age 75 to 85 years believed less strongly that healthier eating habits could lead to improved health. Results of this study signify the importance of nutrition education in older adults, despite the age, on the

positive health benefits of healthy eating habits (Fischer, Crockett, Heller, & Skauge, 1991).

When providing nutrition education, it's important to have an understanding of the educational needs and interests of the audience and the desired outcome of the education. As an educator, the primary goal is to promote a behavior change towards good nutritional practices (Shafer et al., 1996). One study on media usage was comprised of focus groups of adults ranging in age from 58 to 75 years found that older adults make changes based on health information available to them and that the information that most affected their behavior change involved specific recommendations such as lowering intake of salt. The research suggests that educational efforts need to focus on identified behaviors or skills that promote disease prevention, maintenance of existing functional status, and prevention of events that could result in disability (Aging and Health Promotion: Marketing Research for Public Education, 1984, cited in Pocinki, 1991). Health information geared towards older adults needs to be provided in simple, clear, straightforward messages with the use of few technical or scientific words (Pocinki, 1991). The information provided should also be interesting, relevant and practical (Kicklighter, 1991).

The process of bringing about a change in behavior through education by simply providing information often doesn't occur because of an inability to motivate the audience. Research has found that successful education programs often utilize contemporary models of individual, social, and environmental change (Kicklighter, 1991). The use of two types of educational brochures on calcium was studied among 216 women age 19 to 49 years. One brochure was based on the theoretical Motivation

Generating Model involving interactive behavior while the other brochure was a traditional information based brochure. Results of the study found that a significantly greater number of subjects with the interactive behavior brochure conducted self-assessments of calcium intake and were also more accurate in their assessments than those with a traditional brochure. These results further support the notion that using a theoretical model for behavior change can result in a change in specific behaviors to improve nutritional intake (Ulmi, McGowan, Gray, & Savoy, 1999).

In today's society, there are a wide variety of sources for nutrition information for older adults. Consideration of the most common sources of information for the target audience along with the effectiveness of the sources is important in determining which form of communication to use. A wide variety of methods is useful for communicating nutrition information. These include personal contact with a health professional, class instruction, friends and family, mass media, or written information. A study of rural and urban dwelling older adults cited written materials as the most common source of nutrition information for both groups (Briley, Owens, Gillham, Sharplin, 1990). Communication via written information allows older adults to self pace their learning by having control over the rate and amount of information presented (Lancaster et al, 1997). Self-paced learning can be beneficial by decreasing levels of anxiety and allowing participants to choose desired learning speed (Kicklighter, 1991).

Another study by Stewart, Brochetti, Cox, & Clarke, which was comprised of low-income older adults in focus groups, found that the subjects listed family members, health professionals, television, and printed media as sources of information. The most frequently mentioned sources of information were group discussions, media, and health

professionals, with the majority citing group discussions. Many were also interested in written information (Steward, Brochetti, Cox, & Clarke, 1998). Education via health professionals provides an opportunity for older adults to receive nutrition education using a one-on-one format with the opportunity for instant feedback on questions. This form of nutrition education also involves several senses including vision and hearing. The health professional also has the ability to assess the client's physical and psychological status during the session and to tailor the session towards the clients needs at that time. The credibility of the health professional also assures that the information provided will be current and accurate.

The prominent role of nutrition in preventing chronic disease and maintaining health further strengthens the importance of nutrition education in older adults. Many health conditions, including dehydration, can be prevented by implementing good nutritional practices. Older adults need to be aware of the benefits of good nutrition and the role it can have in preventing chronic diseases and dehydration. The development of educational programs designed to meet the needs of older adults can help to improve quality of life, maintain independence, improve health status, and decrease health care costs. For this research project, the prevalence of dehydration in older adults signaled the need to determine effective methods of education on fluids and hydration to help decrease the incidence of this health problem.

CHAPTER III

METHODOLOGY

Introduction

A prevalent health problem among older adults is dehydration. The Health Care Financing Administration (HCFA) reported dehydration to be one of the ten most frequent diagnoses recorded for Medicare hospitalizations. Dehydration is the most common fluid and electrolyte disorder in long term care and community living seniors (Weinberg, Minaker, & Council on Scientific Affairs, American Medical Association, 1995). Older adults are at an increased risk for dehydration due to several factors. These factors include decreased intake, increased fluid loss, reduced sense of thirst, medication effects and changes in functional status. Limited knowledge of the effects these factors can have on hydration status, the amount of fluid needed each day, and the signs and symptoms of dehydration can also influence the development of dehydration.

Due to the prevalence of dehydration as a health problem among older adults, educational efforts need to be directed towards the prevention and management of this condition. The purpose of this study was to determine the most effective method of education: an educational lesson by a Registered Dietitian (R.D.) or provision of a brochure on nutrition and hydration. The results of this study will aid health care providers and community educators in providing an effective method of education towards the prevention of dehydration in older adults.

Research Design

A two-group, pre-test, post-test completely randomized experimental design was used in this study (Campbell & Stanley, 1963). The two groups were compared on the

method of nutrition education about hydration and fluids. One group received an educational lesson with an R.D. and the other group was given a brochure with identical content. The research project was approved by the Institutional Review Board for the Protection of Human Subjects prior to starting the data collection.

Subject Inclusion

Subjects for this study were adults over age 60 who were participants in the Elderly Nutrition Program. Subjects were from the Dunn County Congregate Meal Program and the Eau Claire County Meals on Wheels (MOW) and Congregate Meal Programs. Persons under the age of 60 or any who had active congestive heart failure, kidney disease, or any conditions with the recommendation for a fluid restriction were excluded from the study. This information was ascertained from questions at the start of the visit.

Subject Recruitment

Eau Claire County Subjects

The subjects from Eau Claire County were recruited by several methods. The first method occurred during home visits conducted for the Nutrition Intervention Program, a program in which MOW participants determined to be at high nutritional risk were visited in their home by a Registered Dietitian. The R.D. who conducted the visits was also the researcher. The next method of recruitment was through a phone call made by the researcher in which participants in the MOW program were asked if they would be willing to participate in the study. The names of the MOW participants were obtained from the Eau Claire County Department on Aging nutrition program secretary. The last method of recruitment in Eau Claire County consisted of visiting several congregate meal

sites in the city of Eau Claire. Prior to the serving of the meal at the congregate meal site, the researcher explained the study and asked for volunteers to participate in the study. The congregate meal sites visited were Grace Barstow Apartments, Luther Lakeside Apartments, and L.E. Phillips Senior Center. Permission to recruit subjects from the congregate meal sites and the MOW program was obtained from the Eau Claire County Department on Aging Nutrition Program Director.

Dunn County Subjects

The subjects from Dunn County were recruited from two congregate meal sites using the process described earlier for the Eau Claire County congregate meal sites. The two congregate meal sites visited were the Menomonie Senior Center and the Hosford Rich Apartments. Permission to recruit subjects at the congregate meal sites was obtained from the Nutrition Program Director for Dunn County.

Interventions

Brochure Development

The development of the brochure began with a compilation of information about hydration and older adults from the “American Dietetic Association’s Complete Food and Nutrition Guide” (Duyuff, 1998), the researcher’s education and experience working with older adults, and a resource on food and medication interactions (Pronsky, 2000). Following a review of the information, learning objectives regarding hydration and older adults were developed. The learning objectives developed were:

- Subjects will be able to list three functions of water in the body.
- Participants will be able to recall that thirst is not a good early indicator of the need to increase fluid intake.

- Participants will be able to recall the number of 8oz. glasses of fluids older adults need to consume on a daily basis.
- Participants will apply knowledge of beverages and foods that can contribute to daily fluid intake to increase their own total daily fluid intake.
- Participants will be able to identify two non-beverage foods that can be counted in their total daily fluid intake.
- Participants will demonstrate an understanding of the effect of caffeine containing beverages by recognizing that caffeine can't be counted towards total daily fluid intake (Sanservo, 1997).

The information was then organized into eight sections that corresponded to the learning objectives. The sections addressed the following areas:

- | | |
|-------------------------------------|---|
| • functions of water | • fluid needs of older adults |
| • signs and symptoms of dehydration | • tips to increase fluid intake |
| • beverage suggestions | • times when additional fluid is needed |
| • caffeine | • age-related changes that increase the risk
for dehydration |

. Next, the computer program Microsoft Publisher 2000 (Microsoft Corporation, 2000) was used to format and insert graphics for the brochure. The format used for the brochure was dual sided and tri-folded on 8 ½ x 14” paper. Bright colors and graphics pertaining to fluids were used to draw attention to the brochure. Fonts in size 13 to 16 points were utilized to make the brochure easy to read by older adults. The brochure was printed in color. Refer to Appendix A for an example of brochure.

The readability of the brochure was tested using the SMOG Readability Formula described in an article by McLaughlin (1969) (cited in the U.S.D.A, Food and Nutrition Service, 1988). The approximate grade level of the brochure was found to be at the tenth grade.

The brochure was reviewed and evaluated by several professionals during the development process. Practitioners at a state dietetic conference informally reviewed the brochure for content, accuracy, readability, clarity and overall appearance. Face and content validity were assessed by experts. The experts included the Wisconsin Area Agency Regional Dietitian and the Eau Claire County Department on Aging Nutrition Director. Areas evaluated by the professionals included content, readability, age-appropriateness, design, and appearance.

Lesson Plan Development for Educational Lesson

The lesson plan for the educational lesson was developed based upon the same objectives and content of the brochure, thereby ensuring that both the brochure and the educational lesson contained the same information.

The purpose of the lesson plan was to guide the content and process of hydration information delivery. The lesson plan included the following information:

- | | |
|--------------------|---|
| • pre-assessment | • objectives |
| • content outline | • activities and information given to meet objectives |
| • materials needed | • method of evaluation |

A three-column format was used when developing the lesson plan to described the objectives, plan, and evaluation. A description of how the objectives were going to be

met and the process of evaluating to determine if the objectives were met comprised the lesson plan. A copy of the lesson plan is found in Appendix A.

Educational Lesson

A script was prepared for lesson delivery to ensure information and style continuity among the educational lessons. Materials needed for the educational lesson included the script, visual aid chart and the survey instrument. See Appendix A for a copy of the educational lesson script.

Visual Aid Development

A visual aid to be used during the educational lesson was developed. The purpose of the visual aid was to simulate a normal educational lesson and to help reinforce topics. The visual aid paralleled brochure graphics to effect equal treatments. The tables used were enlarged to a 13 or 14-point font, printed in color on 8 ½ x 11” paper, and put into a flip chart that could be held or set on a table. A copy of the visual aid can be found in Appendix A.

Instruments

Survey Assessment Instrument Development

Demographic data, information on factors that can influence hydration status, functional status, fluid intake, physical indicators of hydration status, knowledge of fluids, and the mental status of the subjects were gathered using a pre/post assessment form (found in Appendix B). An existing assessment form was not available to use to gather this type of information on older adults. Therefore, after a review of the literature and consultation with several professionals in the areas of healthcare, geriatrics, and nutrition, the instrument used in the study was developed. The professionals consulted

included a two registered dietitians, a registered nurse, an elderly nutrition program director, and thesis committee members.

Demographic information, factors that can influence hydration status, and clinical information that aids in describing hydration status was addressed in the first section of the assessment instrument. The following information was gathered:

- age
- gender
- level of education
- length of time on nutrition program
- medical conditions
- medications
- feeling of dry mouth
- color and odor of urine
- limitations on intake of fluid and reason for limiting intake
- problems with constipation or urinary tract infections

The level of functional status was assessed using a modified version of the Incapacity Scale developed by J.F. Kurtzke (Kurtzke, 1983). Functional status was delineated according to areas that can have a direct effect on hydration status. The areas addressed by the functional status scale were toileting, preparing food, grocery shopping, and walking. The use of this scale provided a quantifiable way to measure functional status in a subjective manner. Modifications made to the original Incapacity Scale (Kurtzke, 1983) were to include the areas of preparing food and grocery shopping and the corresponding levels of assistance needed for each activity.

Scale scores ranged from zero to four with increasing impairment levels. The score for each function could then be added together for a total score ranging from zero to fourteen. The higher the score, the greater the level of assistance needed in these

functional areas. A description for each level of scoring for the functions was given to increase the researcher's subjective accuracy of the scale.

Part B of the assessment form was a food frequency questionnaire. The purpose of this section was to obtain a measurement of the subject's usual fluid intake. Literature was reviewed to determine available food frequency questionnaires. The format of a semi-quantitative food frequency questionnaire was chosen because the use of portion sizes may provide a better measurement of fluid intake (Thompson & Byers, 1994). The food frequency questionnaire was developed based on the format used on the Block food frequency questionnaire. The types of fluids and portion sizes listed on the Block food frequency questionnaire were used (Block et al., 1986). Additional fluids not found on the Block food frequency questionnaire and foods that can also contribute to fluid intake, such as jell-o, ice cream, and Popsicles, were also included on the questionnaire. The portion sizes for these items were based on the "Bowes & Church Food Values of Portions Commonly Used" (Pennington, 1994) and the "Exchange Lists for Meal Planning" resources (American Diabetes Association, Inc. & The American Dietetic Association, 1995).

Food models used in the administration of the food frequency questionnaire were also obtained prior to data collection. A 4oz. glass and an 8oz. food model glass of milk in addition to a half cup serving of ice cream were collected. Food models were loaned by the Nutrition Assessment Laboratory for Education and Research in the Department of Food and Nutrition at the University of Wisconsin-Stout.

The next section of the assessment, part C., focused on the evaluation of physical indicators of hydration status. Several physical indicators of hydration status have been

identified, however some are more reliable in older adults than others. Five indicators were on the assessment form: skin turgor on forehead, tongue dryness, longitudinal furrows on tongue, mucous membranes of the mouth, and pulse rate. These were chosen based on study findings that identified them as most useful in determining the level of dehydration severity (Gross et al., 1992). The rating categories for each indicator were adapted from the scale used in the same study by Gross et al. (1992). Specific ranges for the pulse rate were determined through a review of a nursing assessment resource (Grimes & Burns, 1992).

The knowledge quiz comprised the next section of the assessment form. Knowledge of five factors related to hydration status was assessed. The questions were based on information presented in both the brochure and the educational lesson. Question formats used were true/false, multiple choice, and fill in the blank.

Mini Mental Status Exam (MMSE)

The Folstein Mini Mental Status Exam (Folstein, Folstein, & McHugh, 1975) formed the last section of the assessment. Several types of mental status exams are available, however one of the most commonly used mental status exams is the Folstein Mini Mental Status Exam (Gallo, Reichel, & Anderson, 1995). It has become a widely used tool to assess mental status in both the clinical and research areas (Crum, Anthony, Bassett, & Folstein, 1993). The purpose of this test is to determine if the level of mental status of the subjects had any effect on the retention and effectiveness of the method of education. Changes in mental status, such as confusion, can also present with dehydration. Confusion has been found to correlate moderately with dehydration severity in older adults (Gross et al., 1992). It's also important to note that a person with

dementia may have difficulty in remembering to drink fluids. The MMSE exam is composed of two sections. The areas of orientation, memory, and attention were addressed in the first section and required only verbal responses to questions. Language function and the ability to perform learned motor functions or constructional ability are addressed in the second section (Gallo et al., 1995). The five sections of the MMSE, which add up to 30 points, target the areas of orientation, immediate recall, attention and calculation, recall, and language. The MMSE scoring guidelines denote the following conditions with the scores: 27 to 30 normal, 26 need for an assessment of clinical signs present, 20 to 25 mild dementia, 10 to 19 moderate dementia, 0 to 9 severe dementia. Other materials needed for this section of the assessment included a blank, white piece of paper, and a sheet with the phrase “Close Your Eyes” typed on one side and two intersecting pentagons printed on the opposite side.

Two forms were also developed to inform the subject of the score he or she received on the exam. If the score was 27 or greater, a form stating the score on the exam was normal was given to the subject. If the score was 26 or less, a form with the score, the name of the test, and the recommendation that the subject discuss the score with his or her physician was given. See Appendix B for a copy of the MMSE score report form.

For the follow-up visit, three additional questions were added to the assessment form to determine if any changes in the subject’s health, daily activities, or family and social situation occurred since the initial visit to the subject in their home.

Training on Evaluating Physical Indicators

Although the researcher is a Registered Dietitian and had education and experience in evaluating physical indicators of health status, it was felt that to further

validate the study, training by a Registered Nurse on the evaluation of physical indicators of hydration status would be beneficial. To obtain this training, the researcher traveled to Elmwood, Wisconsin to spend time at Elmwood Nursing Home. The researcher worked with a Registered Nurse (R.N.) who reviewed the physical indicators of hydration status and provided training on evaluating the specific indicators used in this study. The R.N. instructed the researcher on the technique and evaluation of the indicators with several residents of the nursing home. The R.N. then observed the researcher evaluate the indicators on several different residents. The scale used to evaluate the different levels of each indicator on the assessment form was used with the residents. The R.N. also provided information on the ways elderly may differ from young adults on these indicators.

Data Collection Methods

Randomization

One group received education by a Registered Dietitian and the other group received a brochure. All subjects of the study were randomly assigned to receive one of two forms of nutrition education. The topic of the education was nutrition and hydration.

The subjects recruited from the Eau Claire County Nutrition Intervention Program were randomly assigned to a group in the order the referral from the MOW coordinator was received by the Registered Dietitian/researcher. Prior to starting data collection, a coin was flipped and witnessed by an outside party. It was determined that the first person referred to the Nutrition Intervention program was to receive education by the brochure. Subsequent referrals were alternately assigned to a group in the order received.

All names of Nutrition Intervention Program referrals received prior to the start of data collection were put into a hat. A coin was flipped and it was determined that the first person drawn from the hat was to receive counseling. Subsequent names were alternately assigned to a group following the order drawn from the hat. The coin toss and name draw from the hat was conducted by the Eau Claire County Nutrition Program director.

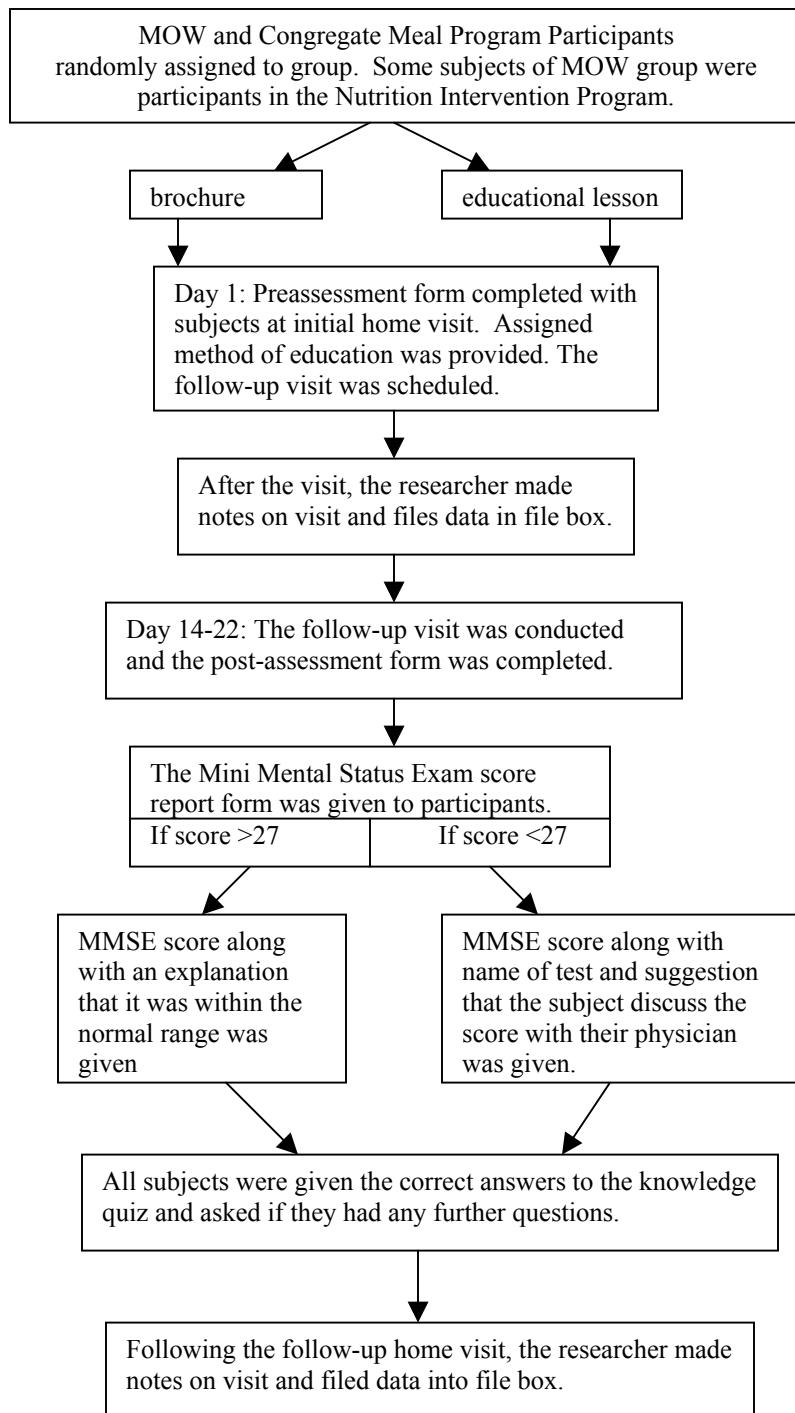
Subjects recruited from the congregate meal sites and MOW program had their names on a list in the order they signed up to participate. A coin was flipped for each list and participants were alternatively assigned to a group in the order names appeared on list.

Data Collection

Prior to beginning data collection, the research was approved by the Committee for the Protection of Human Subjects in Graduate Student Research at the University of Wisconsin-Stout. Data were collected using the survey assessment instrument and the Mini Mental Status exam as described in the Instrument Development section. After being assigned to a group, the researcher called the subjects and an afternoon home visit was scheduled. Figure 1 is a flow chart of the data collection process from the initial home visit to the completion of the follow-up visit. Refer to Appendixes B and C for a sample of the forms used during this process. All subjects signed a consent form for participation in the study (as shown in Appendix C) at the start of the visit. Meals on Wheels subject data collection was the same except that some of the initial subjects preassessment data were collected following the completion of the Nutrition Intervention program assessment. Following these initial visits with subjects who participated in the

Nutrition Intervention program, it was determined that the preassessment and educational intervention would be completed at a separate visit in an effort to keep the time of the visit similar to those who did not participate in the Nutrition Intervention program

Figure 1. Data Collection Process



Pilot Study

The purpose of the pilot study was to test the procedure, feasibility, time, and the subject's level of understanding of the data collection process, the pre- and post-assessment forms, the pre- and post intervention processes, and the two methods of education. The pilot study consisted of the following phases:

- Review of Assessment Form by Professionals
- Testing of Assessment Form and MMSE with Graduate Students
- Testing of Assessment Form with Study Age Group
- Testing of Brochure with Study Age Group
- Testing of Educational Lesson with Study Age Group
- Testing of Educational Lesson with Skilled Employee

Review of Assessment Form by Professionals

For face and content validity, two professionals associated with the Eau Claire County Department on Aging reviewed the assessment form. A pilot testing consent form was read and understood by both professionals at the start of the pilot testing (see Appendix C). Initially, the assessment was verbally administered to and reviewed by the Nutrition Program Director for Eau Claire County to test the understanding and process of administration. Next, the researcher asked the professional a series of questions (found in Appendix B) pertaining to the assessment that addressed the issues of quality of content, phrasing of questions, level of understanding, and any comments or concerns regarding the assessment form or process. The second professional to evaluate the assessment form was the Registered Dietitian for the Area Agency on Aging. She

reviewed the form and answered the same questions given to the Nutrition Program Director.

Testing of the Assessment Form & MMSE with Graduate Students

Prior to starting data collection, the researcher practiced administering the Mini Mental Status Exam and the assessment form with several University of Wisconsin-Stout students. The Mini Mental Status Exam was administered to two undergraduate students and to two graduate students in the Food and Nutritional Sciences program. The assessment form was administered to three graduate students in the Food and Nutritional Sciences program. The purpose of this process was to practice the administration of the assessment and mental status exam and to also obtain feedback regarding the forms and the administration process from students in the field of nutritional sciences. The consent form used for this phase of pilot testing is shown in Appendix C.

Testing of the Assessment Form with Study Age Group

Two males and one female participant of the Eau Claire County Congregate Meal program completed the assessment form to test the understanding, process of administration, and length of time to complete the assessment form with older adults. The assessment form used was complete except for the Mini Mental Status Exam, which was not included since it is considered a standardized test. Questions in the assessment along with any words or sections that were difficult to understand were noted. The subjects were asked if they had any comments or suggestions regarding the assessment process.

Brochure Pilot Testing with Study Age Group

To pilot test the brochure, five participants of the Eau Claire County Congregate Meal Program at a meal site in an apartment complex were recruited. Participants were given a copy of the brochure along with a consent form and questionnaire regarding the brochure.

The purpose of the pilot study was to determine if the brochure was understandable and readable by older adults. The questionnaire (found in Appendix C) addressed the following areas:

- words or sections difficult to understand
- readability of brochure
- positive points or concerns about the brochure
- length of time to read brochure

Participants were also asked to make written marks or comments on the brochure indicating words or sections that were difficult to understand or read. After completing the questionnaire, the participants were verbally asked by the researcher if there were any parts or words in the brochure that were difficult to understand or read. At the end of the testing, participants were given a clean copy of the brochure to keep.

Educational Lesson Pilot Testing

The purpose of pilot testing the educational lesson was to test the phrasing, format, understanding, and duration of the session. The pilot testing process consisted of administering the educational lesson to participants and then verbally asking questions regarding the session. A copy of the educational lesson pilot testing consent form and questionnaire is found in Appendix C.

The first participant was a skilled employee for the Food and Nutrition Department at the University of Wisconsin-Stout. The next two participants were older

adults age 82 and 87 years old. The length of time to complete the session, and comments or suggestions regarding the session and visual aid were recorded.

The last participant of this phase of pilot testing was the Outreach Worker for the Eau Claire County Department on Aging. Comments or suggestions regarding the content, order of information and delivery of information were collected and the length of time of the session was noted.

Data Analysis

Data were categorized into a useful and presentable format. To begin, all medical conditions reported by subjects were organized into categories based on the systems of the body or type of disease. A copy of the form listing the categories and corresponding medical conditions is found in Appendix D. Next, all medication were organized based on the type of medication. The categories and corresponding medications are found in Appendix D. The purpose of organizing the medical conditions and medications into this format was to aid in describing the subjects and types of medications and medical conditions found in older adults. The format also allows the information to be presented in a clear and understandable format.

Food Frequency Questionnaire

Fluid intake was calculated from the information provided by the food frequency questionnaire. Fluids were categorized as follows and the number of small, medium, and large servings were tallied for each category. Table 1 describes the categories.

Table 1 Categories for Fluid Intake For Calculation of FFQ

Fluid Category	Description of Category
Total fluid	total fluid consumed-includes all beverages listed
Water	water intake per day of glasses of water & carbonated or bottled water
Caffeine	intake of caffeinated beverages: coffee, tea, iced tea, caffeine containing soda

Table 1 continued

Fluid Category	Description of Category
Food	fluid intake from foods: ice cream, Popsicles, jell-o, sherbet, sorbet

The fluid intake in ounces per day was also calculated based on portion size listed for the medium size servings recorded for each category of fluids.

The last step in calculating the FFQ was to determine the actual fluid intake per day in ounces by assuming that a small serving was one half the size and the large serving was one and one half the size of the medium serving listed. By using these portion sizes fluid intake in ounces per day for the categories listed in Table 1 was determined.

Several rules were used during the calculation of the FFQ to assure uniform results among all subjects. The rules were as follows:

- All frequencies were calculated as per day.
- If no serving size was recorded, the medium portion size was assigned.
- If two numbers were listed for the frequency of consumption, the larger number was used in the calculation. For example, if 3 to 4 was listed, the number 4 was used.
- For frequencies reported as per month, thirty days was used to calculate the number into servings per day.
- Caffeinated beverages included caffeine containing diet and regular soft drinks, coffee, hot tea, and iced tea.
- The serving size for a medium cup of coffee or tea was counted as 6 oz.
- Foods counted as fluids were ice cream, Popsicles, jell-o, sherbet, and sorbet or flavored ice.

Knowledge Quiz

Scores for the knowledge quiz were tallied. A list of acceptable answers for question number two regarding the functions of water in the body was developed to assure reliable scoring among all subjects. The total possible score for the quiz was seven points. All questions were valued at one point each except for question number two which was assigned three points, one for each correct function of water listed.

The last step prior to entering the data was the calculation of the MMSE scores. All subjects were identified as having a complete or incomplete MMSE because there were some subjects who could not complete the entire exam due to poor eyesight. A total score out of a possible thirty points was given.

Data were entered into the SPSS Graduate Pack 10.0 for Windows software program (SPSS Inc., 2000). Data from the assessment forms were assigned variable names. Incomplete or missing variable responses and questions that subjects did not understand at the time of data collection were not included.

Baseline differences between the two groups were compared using an independent t-test for age, the LOA scores, MMSE scores, length of time between visits, fluid intake, and knowledge quiz scores. The Pearson Chi-Square was used to compare baseline differences on the variables of categorical data such as level of education, living situation, types of medications used, and time on the nutrition program. Comparisons following the education were made using an independent t-test for the mean change in fluid intake, knowledge quiz scores, and MMSE scores.

The Mann-Whitney U test was used to compare pre/post changes in the physical indicators of hydration status. For questions addressing factors that may determine or

influence hydration status such as constipation or the feeling of a dry mouth on a daily basis and the individual knowledge quiz questions, frequencies were used to compare differences between the two groups pre and post. Incomplete or missing variable responses were not included in the data analysis.

CHAPTER IV

RESULTS

The purpose of this study was to determine which method of education on nutrition and hydration was most effective in a sample of older adults living in the community setting. The two forms of education were an educational lesson given by a registered dietitian and a brochure. Changes in fluid intake, knowledge of hydration, mental status, and physical indicators of hydration status were examined. The specific objectives of the study were to:

1. Determine if there was a significant difference in change in knowledge of hydration and fluids after the education and which method had the greatest effect on changing knowledge.
2. Examine the fluid intake of a sample of community dwelling older adults. Compare the effects of the two methods of education on fluid intake and determine if there was a significant difference in fluid intake following the educational interventions.
3. Examine the physical indicators of hydration status in a sample of community dwelling older adults. Compare the effects of the two methods of education on changing the level of abnormality of the physical indicators and determine if there was a significant difference in the presence of the physical indicators following the educational interventions.

The instruments used to gather this information to measure these objectives included a level of assistance scale, food frequency questionnaire, knowledge quiz, physical indicators of hydration status scale, and the Folstein Mini Mental Status

Exam. The results of this study will be presented in the following order: pilot study results, description of subjects, and changes in fluid intake, knowledge of fluids and hydration issues and physical indicators of hydration status following the educational intervention.

Pilot Study Results

The initial phase of pilot testing with a professional of the Eau Claire County Department on Aging Nutrition Program Director and the Wisconsin Area Agency on Aging Registered Dietitian resulted in recommendations regarding increased font size and changing the color of the wording in the brochure, increasing the font size of the consent form, and changing the wording and sequence of questions on the assessment form. Suggested additions to the forms included different types of fluids to the FFQ and a question to determine if subjects made any changes since the initial visit to the post-assessment form.

Pilot testing with the undergraduate and graduate students at the University of Wisconsin-Stout was completed to practice the administration of the assessment form and the MMSE and to obtain feedback regarding the forms and process. Suggestions by the students included adding items to the FFQ and using food models and portion sizes when administering the FFQ. Recommendations regarding the wording and phrasing of questions were also provided.

The assessment form pilot testing was completed with two males and one female ranging in age from 72 to 84 years. Results of the pilot testing with the study age group participants revealed the time needed to complete the assessment form ranged from 20 to

30 minutes. Subjects also provided suggestions on items to add to the FFQ and indicated questions or phrases they found to be confusing.

The brochure pilot testing with study age group participants was completed with females ranging in age from 71 to 88 years. Three had at least a high school diploma and one had not. Three lived alone and one with a spouse. The average length of time to read the brochure was eight minutes. None of the brochures were marked by participants to identify words or phrases difficult to understand. Several participants reiterated the importance of drinking fluid, especially water on the positive points of the questionnaire given to participants. Pilot testing verified that the brochure was understandable and could be used.

The pilot testing of the second method of education, the educational lesson, was completed in several phases. The pilot testing with the skilled employee from UW-Stout found the length of time of the educational lesson to be approximately seven minutes. The participant found all the information presented in the educational lesson to be understandable and the visual aid used with the lesson to be easy to read. Suggestions provided were to change the order of information presented to improve the flow of the lesson and to make it easier to follow and understand. The next participant of this phase of pilot testing was the Outreach Worker for the Eau Claire County Department on Aging. This participant found the content to be easy to understand and the order of information presented to be appropriate. The participant also found the visual aid to be easy to read. One suggestion provided to the researcher was to talk slower during the educational lesson. The length of time to complete the educational lesson was approximately 10 minutes.

The study age group testing involved one male and one female ages 87 and 82 years. Results indicated no words or information that were difficult to understand. The participants found the order of information presented to be appropriate and the visual aid to be readable. The approximate time to complete the educational lesson was 10 to 15 minutes, which was similar to the time of eight minutes found to read the brochure. Overall, the educational lesson was well received.

Description of Subjects

Forty subjects took part in the research; 22 participated in the brochure method of education and 18 participated in the educational lesson. Table 2 shows a description of the subjects per group and then as a combined group. For the level of education, 32 of 40 subjects (80%) were found to have at minimum a high school diploma or GED and 15 of 40 (38%) subjects had some or had completed post-secondary education.

Time on the Elderly Nutrition Program

The length of time for participation in the Elderly Nutrition Program is shown in Table 2 based on the categories recorded on the assessment form. Elderly Nutrition Programs are required to offer nutrition education to participants and many programs also offer nutrition screening and nutrition counseling (Administration on Aging, 1996). Subjects who have participated in the nutrition program for a longer period of time may have received more education and for that reason the data was collapsed into the two categories of participation of less than one year and greater than one year on the nutrition program. By groups, 53 % of the brochure group (BR) and 31% of the educational lesson group (EL) had participated for less than one year and 47% of the BR and 69% of the EL had participated for greater than one year in the nutrition program (n=35; five subjects

did not report time on the nutrition program). These results indicate that a greater number of subjects in the EL had participated for greater than one year as compared to the brochure group.

Functional Status

Out of a possible maximum score of 14, the minimum level of assistance (LOA) score recorded was zero and the maximum score was eight. Twenty-six subjects, 65%, had a score of four or less indicating none to minimal assistance needed with the activities measured. Eighteen of the subjects, 35%, had a score greater than four indicating human or mechanical aid needed to complete each activity. Table 2 describes the LOA scores.

Mental Status

All 40 subjects participated in the mini mental status exam (MMSE); however, two subjects were unable to complete the entire exam. Out of a possible 30 points, the scores for both groups ranged from 19 to 30, with a mean MMSE score of both groups of 27.3. Table 2 describes the MMSE scores.

Table 2
Description of Subjects

		Brochure	Educational Lesson	Both Groups	Comparison of Baseline Differences Statistic
Number of Subjects		22	18	40	
Gender	Male ^a	2	3	5	Pearson Chi-Square
	Female ^a	20	15	35	0.519, df = 1, p = .471
Age					
	<u>n</u>	21	18	39	t = -0.170, df = 38,
	<u>M</u>	81.5	79.4	80.5	p = .471
	<u>SD</u>	8.01	8.80	8.33	
Living Situation ^a					
	Alone	19	14	33	Pearson Chi-Square
	With someone	3	4	7	= 0.505, df = 1, p = .477

^aNote^a. Numbers indicate frequency of subjects.

Table 2 Continued

	Brochure	Educational Lesson	Both Groups Combined	Comparison of Baseline Differences Statistic
Level of Education^a				
<12 th Grade/High School Diploma/GED	14	11	25	Pearson Chi-Square = .027, df = 1, p = .870
Some College & Completed College	8	7	15	
Time on Nutrition Program^a				
<6 Month – 1 Year	10	5	15	Pearson Chi-Square = 1.621, df = 1, p = .203
1->5 Years	9	11	20	
Length of Time Between Pre & Posttests				
<u>n</u>	22	18	40	t = 0.418, df = 38,
<u>M</u>	16.05	15.67	15.87	p = .678
<u>SD</u>	3.08	2.54	2.82	
MMSE Scores				
≥ 27	14	14	28	t = -0.624, df = 38,
= 26	2	3	5	p = 0.536
20-25	4	0	4	
10-19	0	1	1	

Note^b. MMSE Score ≥ 27 are normal. MMSE = 26 indicates need for assessment as clinical signs of dementia present. MMSE Score 20-25 indicates mild dementia and 10-19 indicates moderate dementia.

Description of Medical Conditions and Medication Usage

The minimum number of medical conditions listed by subjects was zero, the maximum number was five, with a mean number of 2.4 (SD 1.18) for the BR , and a mean of 2.4 (SD 1.15) for the educational lesson group. When describing the medical conditions listed by the subjects, 60% of the subjects listed a type of medical condition affecting the cardiovascular system. Medical conditions involving the skeletal, metabolic, and nervous systems were the next three most commonly listed types. Table 3 describes the medical conditions of subjects.

Table 3
Frequency of Subjects and Categories of Medical Conditions

	Brochure	Educational Lesson	Both Groups	% of Subjects
Cardiovascular	15	9	24	60
Skeletal	9	8	17	43
Metabolic	6	5	11	28

Table 3 Continued

	Brochure	Educational Lesson	Both Groups	% of Subjects
GI (gastrointestinal)	4	0	4	10
Cancer	0	4	4	10
Respiratory	2	2	4	10
Urinary	1	2	3	8
Muscular	2	0	2	5

The number of persons taking medications did not differ significantly between groups as only one person was found to take no medications. The maximum number of medications used by a subject was 21 and the mean number of medications taken by subjects of both groups was 4.9. No significant difference in the number of medications taken between the two groups was found as shown in Table 4. Fifty-three percent of subjects were taking either a laxative or diuretic medication while 30% were using a medication that could affect cognitive status.

Table 4
Medication Usage of Subjects Based on Pretest Results

	Brochure <u>n=22</u>	Educational Lesson <u>n=18</u>	Both Groups <u>n=40</u>	% of Subjects of Both Group	Statistic to Compare Groups
Taking Medications ^c	21	18	39	98%	t=-1.514, df= 37, p =.138
Number of Medications	<u>M</u> 4.1	<u>SD</u> 2.57	5.9 4.87	4.9 3.87	Pearson Chi-Square .242, df= 1, p=.622
Taking a Diuretic ^c	Yes 9	No 13	6 12	15 25	Pearson Chi-Square 1.339, df=1, p=.247
Taking a Laxative ^c	Yes 2	No 20	4 14	6 34	Pearson Chi Square= 0.943,df=1, p=.332
Taking a Cognitive Status Affecting Medication ^c	Yes 8	No 14	4 14	12 28	30%

Note^c.Number indicates frequency of subjects.

Comparison of Baseline Differences Between Groups Before Education

To further describe the subjects of the study and assure that the groups were of similarity, baseline differences between the two groups were examined based on the information gathered during the preassessment. As shown in Table 2, group baseline differences were not significant for age, gender, level of education, time on nutrition program, LOA scores, and time between the pre and posttest. No significant differences between the two groups were also found for the physical indicators of hydration status as shown in Table 14 and fluid intake and knowledge quiz scores as shown in Table 5.

Table 5
Fluid Intake & Knowledge Quiz Scores Based on Pretest Results

	Brochure	Educational Lesson	Statistics to Compare Baseline Differences Between Groups
Fluid Intake Pretest (ounces/day)			
<u>M</u>	71.5	83.5	$t = -1.006$, $df = 38$, $p = .321$
<u>SD</u>	26.8	47.5	
Knowledge Quiz Scores Pretest (out of possible 7 points)			
<u>M</u>	3.41	4.00	$t = -1.541$, $df = 38$, $p = .132$
<u>SD</u>	1.18	1.24	

Medication Effects

No statistically significant associations were found when examining usage of laxative medications and quiz scores, MMSE scores, and fluid intake. Mean fluid intake was higher in subjects using a laxative medication as compared to those not using a laxative medication with a mean difference in fluid intake of 33 ounces per day. Laxative usage was not associated with the presence of abnormal mucous membranes of the mouth as only one subject using a laxative medication and zero of those not using a laxative exhibited an abnormal mucous membrane of the mouth. Of the six subjects using laxatives, three had one or more signs of dehydration based on the presence of physical indicators and 20 of 34 subjects not using laxatives had physical indicators of

dehydration present. Some subjects were identified with an abnormal pulse rate of below normal; however, these subjects were not counted as it is not an indicator of dehydration.

Table 6 describes presence of physical indicators of hydration status and usage of laxative medications.

When examining usage of a diuretic medication, no statistically significant association was found with total fluid intake, MMSE scores, and knowledge quiz scores. Subjects using diuretics were found to have higher mean fluid intakes as compared to those not using a diuretic, a mean difference of 14.2 ounces per day. Only 1 of 15 subjects using a diuretic exhibited some longitudinal tongue furrows. Of the 25 not using a diuretic medication, there was an almost equal amount of subjects presenting with some longitudinal tongue furrows ($n=13$) as those presenting with no longitudinal tongue furrows ($n=12$). Seven of the 15 subjects (47%) using a diuretic medication exhibited signs of dehydration with only 1 of 7 presenting with two signs. Of the 25 subjects not using a diuretic medication, 72% ($n=18$) presented with a physical indicator of hydration status. None of the subjects using a diuretic medication were also using a laxative medication. Table 6 describes usage of diuretic medications and the presence of physical indicators of hydration status.

Medications that can affect cognitive status can influence a person's desire to consume fluids and therefore have an effect on hydration status (Sanservo, 1997). No statistically significant association was found with the usage of medications that can affect cognitive status and total fluid intake, knowledge quiz scores, and MMSE scores. Eight (67%) of the 12 subjects using a medication that can affect cognitive status exhibited signs of dehydration with 2 of the 12 presenting with two signs of dehydration.

Of the 28 subjects not using a medication that can affect cognitive status, 16 (57%) presented with a physical indicator of dehydration. Table 6 describes the usage of a medication that can affect cognitive status and the presence of the physical indicators of hydration status.

Table 6

Comparison of Laxative, Diuretic, and Medications That Can Affect Cognitive Status
Usage and Physical Indicators of Hydration Status

	If Taking a Laxative Medication		If Taking a Diuretic Medication		If Taking a Medication That Can Affect Cognitive Status	
	Yes	No	Yes	No	Yes	No
Skin Turgor						
Falls Back Immediately	4	29	13	20	11	22
Slow	2	5	2	5	1	6
Remains	0	0	0	0	0	0
Tongue Dryness						
Moist	4	22	10	16	8	18
Wet	0	0	0	0	0	0
Dry	2	12	5	9	4	10
Longitudinal Tongue Furrows						
None	4	22	14	12	7	19
Some	2	12	1	13	5	9
Many	0	0	0	0	0	0
Mucous Membranes of Mouth						
Moist	5	34	15	24	12	27
Somewhat Dry	1	0	0	1	0	1
Very Dry	0	0	0	0	0	0
Categories of Pulse Rate						
Normal	5	24	9	20	9	20
Elevated	0	0	0	0	0	0
Below Normal	1	9	5	5	2	8
Total Fluid Intake Per Day in Ounces						
<u>M</u>	105.0	71.9	85.8	71.6	93.0	70.0
<u>SD</u>	79.0	23.5	26.9	42.3	60.5	19.5
	$t=1.018, df= 5.158, p=.354$		$t= 1.167, df= 38, p=.250$		$t= 1.291, df= 12.0, p=.221$	
Total Quiz Score Out of Possible 7 Points						
<u>M</u>	3.7	3.8	3.5	3.8	3.8	3.6
<u>SD</u>	1.2	1.3	1.4	1.1	1.1	1.3
	$t= -.018, df= 38, p=.986$		$t= -.560, df= 38, p=.579$		$t= .250, df= 38, p=.804$	

Table 6 Continued

	If Taking a Laxative Medication		If Taking a Diuretic Medication		If Taking a Medication That Can Affect Cognitive Status	
	Yes	No	Yes	No	Yes	No
MMSE Score Out of Possible 30 Points						
<u>M</u>	26.8	27.4	27.7	27.1	27.3	27.4
<u>SD</u>	1.8	2.2	1.8	2.3	2.8	1.9
	t= -.592, df= 36, p=.588		t= .867, df= 38, p=.392		t= -.126, df= 36, p=.900	

Fluid Intake

Fluid intake for this study was measured using a semi-quantitative food frequency questionnaire. Overall, the subjects of the study were found to have adequate intake of fluids. Thirty-six of 40 subjects (90%) were consuming at least the recommended minimum intake of 48 ounces, or six cups, of fluid per day prior to the educational intervention. The baseline fluid intake between groups did not differ significantly ($t = -1.006$, $df = 38$, $p = .321$) with the mean total fluid intake for the BR as 71.5 ounces (SD 26.8) and 83.5 ounces (SD 47.5) for the EL. Despite no significant difference found between the groups in baseline fluid intake, it is important to note that the EL did have a greater fluid intake than the BR. Table 7 describes the frequencies of subjects for baseline fluid intake prior to the education as grouped into categories of less than the recommended fluid intake, within the recommended fluid intake, and greater than the recommended fluid intake. Only two subjects from each group had fluid intakes below the recommended amount of 48 to 64 ounces.

Table 7

Frequency of Subjects And Corresponding Categories of Fluid Intake Recommendations

	BR	EL	Both Groups
Below recommended fluid intake at < 48 oz. per day	2	2	4
Meets fluid intake recommendations of 48oz. to 64 oz. per day	8	3	11
Exceeds fluid intake recommendations at > 64 oz. per day	12	13	25

Following the education, no significant difference in fluid intake was observed for both the BR and EL groups ($t = -0.008$, $df = 23.122$, $p = 0.993$). The mean total fluid intake decreased slightly to 71.0 ounces (SD 27.7) for the BR, a difference of 0.5 ounces, and to 83.1 ounces (SD 32.8) for the EL, a difference of 0.4 ounces. Overall, fluid intake remained unchanged following the education intervention for both groups.

When examining intake of caffeinated beverages, the overall intake was found to be low with a mean intake of 10.5 ounces for both groups, 8.1 ounces for the BR and 13.5 ounces for the EL. The difference in intake of caffeinated beverages of 5.4 ounces found between the groups was not significant at baseline ($t = -1.650$, $df = 38$, $p = 0.107$), and following education, no significant change in the intake of caffeinated beverages between groups occurred ($t = 1.328$, $df = 38$, $p = 0.192$). Table 8 describes fluid intake from caffeinated beverages for both groups.

Fluid intake from food sources was also found to be quite low with a mean intake for both groups of 2.8 ounces per day. The baseline difference between groups in fluid intake from foods prior to the education was found to be significant ($t = 2.221$, $df = 35.9$, $p = .033$) with a mean intake of 3.6 ounces per day for the BR and 1.8 ounces per day for the EL, a difference of 1.8 ounces. Following the education, changes in fluid intake from foods pre and post were not found to be significant ($t = -0.879$, $df = 27.6$, $p = 0.387$) with a mean intake for both groups of 2.3 ounces per day. Table 8 describes the mean fluid intake for both groups based on pre and posttest results. Overall, only a minimal change in intake of fluid from food sources occurred in both the brochure and educational lesson group following the education.

Table 8

Description of Fluid Intake From Caffeinated Beverages & Food Sources

		Fluid Intake of Caffeinated Beverages In Ounces/Day			Fluid Intake From Food Sources In Ounces/Day				
		<u>M</u>	<u>SD</u>	Mean Change Pre/Post	<u>M</u>	<u>SD</u>	Mean Change Pre/Post	<u>M</u>	<u>SD</u>
Brochure	Pre	8.1	11.2		3.6	3.1			
	Post	9.9	11.7	+1.8	3.1	2.5	-.45	2.8	
Educational Lesson	Pre	13.5	17.7		2.8	2.8			
	Post	11.3	10.0	-2.3	2.6	2.3	+.11	1.0	

Knowledge Quiz Scores

No significant difference in total quiz score was found between groups before the education was provided ($t = -1.541$, $df = 38$, $p = 0.132$). The mean quiz scores out of a possible seven points were 3.41 (SD 1.18) for the BR, 4.00 (SD 1.24) for the EL, and 3.67 (SD 1.23) for both groups combined.

Pre/post differences in knowledge quiz scores were not significant in the EL with a mean of 3.89 (SD 1.18); however, scores did significantly increase in the BR ($t = 2.324$, $df = 3.48$, $p = 0.03$) with a mean of 4.14 (SD 1.46). Despite the increase in scores for the brochure group, both groups mean scores remained less than 59%. For the pretest scores, 12 of 22 of the BR and 7 of 18 of the EL scored 50% (3 of 7 points) or less on the knowledge quiz. After the education, only 8 of the BR and 6 of the EL scored 50% or less on the knowledge quiz. Evaluation of changes in quiz scores following the education revealed that six of the BR and two of the EL increased their score by one point, five of the BR and one of the EL increased their score by 2 points, and two of the BR and zero of the EL increased their score by three points. Table 9 describes the knowledge quiz scores for both groups before and after the education intervention and Table 10 describes the changes in scores pre and post for the two groups.

Table 9
Frequency of Subjects & Corresponding Scores Both Pre and Posttest

Total Score Out of a Possible 7 Points	Brochure		Educational Lesson Group	
	Pre	Post	Pre	Post
1/7	2	1	0	0
2/7	1	2	2	3
3/7	9	5	5	3
4/7	7	3	4	6
5/7	2	7	5	5
6/7	1	4	2	1
7/7	0	0	0	0

Table 10
Frequency of Subjects and Change in Scores on Knowledge Quiz Pre & Post

Change In Score	↓ score by 2 points	↓ score by 1 point	no change in score	↑ score by 1 point	↑ score by 2 points	↑ score by 3 points
Brochure	2	2	5	6	5	2
Educational Lesson	0	6	9	2	1	0

A correlation of pre/post total fluid intake with pre/post knowledge quiz scores revealed a significant correlation with post total fluid intake and post knowledge quiz scores (Pearson Correlation 0.322, p=.036). A partial correlation between the two methods of education revealed a significant correlation with post total fluid intake and knowledge quiz scores for the EL (Pearson Correlation 0.620, p=.006) and not for the BR (Pearson Correlation 0.168, p= .454).

Individual Question Scores For Subjects By Groups

1. True or False: Beverages containing caffeine can be counted towards your total daily fluid intake.

Prior to the education, no baseline differences in the answer to this question were found between groups (Pearson Chi-Square 0.209, df = 1, p = 0.648). Only 36% (n=8 of 22) of the BR and 29% (n=5 of 17; 1 subject did not answer) of the EL correctly answered the question on the pretest. Following the education, 27% (n=6 of 22) of the BR and 41% (n=7 of 17; 1 subject did not answer) of the EL correctly answered the

question and no significant difference was found between the two groups (Pearson Chi Square = 0.834, df = 1, p= .361). Table 11 describes the results for this question and Table 12 describes the change in score between the pre and posttest for both groups following the education. Based on these results, it appears that the educational lesson was more effective in educating older adults about caffeine.

2. Name three functions of water in the body. (1 point for each correct function listed).

a. 1st function of water:

No significant differences in answers to this question were found between groups prior to the education (Pearson Chi-Square .388, df = 1, p = 0.533). Eighty-two percent of the BR (n=18 of 22) and 89% (n=16 of 18) of the EL answered correctly on the pretests. Following the education, 95% (n=21) of the BR and 89% (n=16) of the EL group answered correctly on the posttest and no significant difference in scores was found between the two groups (Pearson Chi-Square 0.615, df= 1, p= .433) . Table 11 describes the results for the naming of the first function of water and Table 12 describes the changes in score between the pre and posttest for both groups following the education.

b. 2nd function of water:

Prior to the education, no significant differences in answers to this question were found between the two groups (Pearson Chi-Square 2.349, df = 1, p = 0.125). On the pretest, 55% (n=12 of 22) of the BR and 78% (n=14 of 18) of the EL correctly named a second function of water. On the posttest, 64% (n=14) of the BR and 67% (n=12) of the EL correctly answered the question with no significant difference found between the two groups (Pearson Chi-Square 0.040, df= 1, p= .842). Table 11 describes the results and

Table 12 describes the change in scores between the pre and posttest following the education for the naming of the second function of water.

c. 3rd function of water:

No significant differences were found between the two groups prior to the education (Pearson Chi-Square 0.218, df = 1, p = 0.641). Pretest results indicated the 32% (n=7) of the BR and 39% (n=7) of the EL were able to correctly name a third function of water in the body. Following the education, 50% (n=11) of the BR and 22% (n=4) of the EL subjects were able to correctly answer this question with no significant difference found in scores between two groups (Pearson Chi-Square 3.259, df= 1, p=.071). Table 11 describes the results for the naming of the 3rd function of water in the body and Table 12describes the change in score pre and post for this question.

Overall, subjects in the BR exhibited increased scores in all three parts of the question following the education. Subjects in the EL showed no increase in scores for all three parts of this question. Based on the results, it appears the brochure intervention was more effective in educating on the functions of water in the body.

3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?

- a. 3-5 glasses b. 6-8 glasses c. 9-11 glasses d. 12 or more**

Prior to the education, no significant difference in scores for this question was found between the two groups (Pearson Chi-Square 0.001, df = 1, p = 0.970). Pretest scores indicated that 77% (n=17 of 22) of the BR and 78% (n=14 of 18) of the EL correctly answered this question on the pretest. Following the education, the number of persons who correctly answered this question increased slightly for the BR with 82% (n=18) and stayed the same for the EL at 78% (n=14) with no significant differences

between the two groups found (Pearson Chi-Square 0.101, df= 1, p= 0.751). Table 11 describes the results for this question for both groups and Table 12 describes the change in scores pre and posttest for both groups following the education. Overall, the scores for this question were high in both groups of subjects prior to the education with no significant change following the education intervention indicating both groups had knowledge of the recommended daily fluid intake amount.

4. True or False In addition to fluids, foods such as jello and ice cream can be counted towards your total daily fluid intake.

No significant difference in response to this question was found between the two groups prior to the education (Pearson Chi-Square 0.175, df = 1, p = 0.676). Pretest results indicated that 55% (n=12 of 22) of the BR and 61% (n=11 of 18) of the EL correctly answered this question. Following the education, the number of subjects who correctly answered the questions increased to 82% (n=18) in the BR and to 83% (n=15) in EL with no significant differences in scores found between the two groups (Pearson Chi-Square 0.016, df= 1, p= .900). Table 11 describes the results of this question for both groups and Table 12 describes the change in scores pre and posttest for both groups following the education. Both groups exhibited increased scores for this question, however a greater increase was found among brochure subjects.

5. True or False A good early indicator that I need to increase my fluid intake is feeling thirsty.

A significant difference in pretest scores was found between the two groups prior to the education (Pearson Chi-Square 4.555, df = 1, p = 0.033). Pretest results reveal that only 5% (n=1) of BR and 29% (n=5 of 17; 1 subject did not answer the

question) answered correctly. Following the education, the number of subjects who correctly answered the question increased in the BR to 14% (n=3) and decreased in the EL to 12% (n=2) with no significant differences in scores between the two groups found (Pearson Chi-Square 0.030, df= 1, p= .862). Results for this question are described in Table 11 and the change in score for the pre and posttest following the education is described in Table 12. Overall, the scores for this question remained low in both groups indicating that both methods of education were not effective in increasing knowledge that thirst is not a good early indicator of need to increase fluid intake due to age-related changes in the body that occur with aging.

Table 11
Frequencies for Results of Knowledge Quiz Questions Pre and Posttest

	BR				EL			
	Pre		Post		Pre		Post	
	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect
Question 1.	8	14	6	16	5	12	7	10
Question 2.								
a. 1 st function	18	4	21	1	16	2	16	2
b. 2 nd function	12	10	14	8	14	4	12	6
c. 3 rd function	7	15	11	11	7	11	4	14
Question 3.	17	5	18	4	14	4	14	4
Question 4.	12	10	18	4	11	7	15	3
Question 5.	1	21	3	19	5	12	2	15

Table 12
Frequency of Subjects and Change in Answer from Pretest to Posttest for Each Individual Knowledge Quiz Question

	Incorrect to Correct Answer		No Change in Answer		Correct to Incorrect Answer	
	BR	EL	BR	EL	BR	EL
1. T or F Beverages containing caffeine can be counted towards total daily fluid intake.	1	3	18	13	3	1
2. Name 3 functions of water in the body:						
a. 1 st function.	3	2	19	14	0	2
b. 2 nd function	7	2	10	12	5	4
c. 3 rd function	7	2	12	11	3	5

Table 12 continued

	Incorrect to Correct Answer		No Change in Answer		Correct to Incorrect Answer	
	BR	EL	BR	EL	BR	EL
3. How many 8oz. glasses of fluids do older adults need to consume on daily basis?	2	1	19	16	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted toward your total daily fluid intake.	7	4	14	14	1	0
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	3	1	18	12	1	4

Physical Indicators of Hydration Status

Five physical indicators of hydration status were measured using a scale indicating the normal appearance or value and then two subsequent levels of increased abnormality. Of the forty subjects, none of them presented with the highest level of abnormality. Table 13 describes the presence and levels of abnormality of the physical indicators of hydration status for subjects of both groups before and after the educational intervention.

Table 13

Frequency of Subjects and Presence of Physical Indicators of Hydration Status

	Normal				Moderate Abnormality				Severe Abnormality	
	BR		EL		BR		EL		BR & EL	
	pre	post	pre	post	pre	post	pre	post	pre & post	
skin turgor on forehead	19	20	14	17	3	2	4	1	0	
tongue dryness	15	15	11	6	7	7	7	12	0	
longitudinal tongue furrows	12	11	14	14	10	11	4	4	0	
mucous membranes of mouth	21	21	18	18	1	1	0	0	0	
pulse rate per minute	16	18	13	16	5	4	5	2	0	

Following the education, six subjects in the EL and three subjects in the BR changed from a normal to a moderately abnormal finding in tongue dryness following the education, whereas three subjects in the BR and only one subject in the EL had a decrease in abnormality for tongue dryness. Improvements in all other physical indicators of hydration status were observed in both groups following the educational intervention except for the EL and the indicator of mucous membranes of the mouth in which no change was observed. Table 14 describes the changes in abnormality of the physical indicators from pre to posttest and the statistic used to determine if there was a significant difference between the two groups for the amount of change between pre and post.

Table 14
Changes in Level of Physical Indicators of Hydration Status From Pre to Posttest

	Increase in Abnormality		No Change		Decrease in Abnormality (Moved Closer to Normal or to Normal)		Statistic to Compare Both Groups ^c
	BR	EL	BR	EL	BR	EL	
Skin Turgor ^a	2 ^b	0	17	15	3	3	Mann-Whitney U 177.0, z=-1.565, p=.412
falls back immediately slow remains							
Tongue Dryness moist wet dry	3	6	16	11	3	1	Mann-Whitney U 150.5, z=-1.656, p=.117
Longitudinal Furrows on Tongue none some many	2	4	19	10	1	4	Mann-Whitney U 191.0, z=-0.243, p=.808
Mucous Membranes of Mouth moist somewhat dry very	1	0	20	18	1	0	Mann-Whitney U 198.0, z=.000, p=1.000
Change in Pulse Category normal elevated below normal	0	0	20	15	1	3	Mann-Whitney U 166.5, z=-1.206, p=.228

Note. ^aThe terms listed below each physical indicator describes the indicator from normal to increasing abnormality. ^bNumbers denote frequency of subjects. ^cThe Mann Whitney U statistic was used to determine if the change in the presence and level of abnormality of the physical indicators of hydration status from pre to posttest was significant.

Factors That Can Help to Determine or Influence Hydration Status

For the questions addressing factors that can determine or influence hydration status, pretest results indicate that 25% had problems with constipation, 15% had problems with urinary tract infections (UTI), 30% of subjects experienced the feeling of a dry mouth on a daily basis, and 23% indicated their urine had a dark color or strong odor to it on a daily basis. Only one person reported to limit his or her intake of fluids. Posttest results for the EL indicate one person did not answer these questions. See Table 15 for the results of these questions.

Table 15
Results of Questions That May Determine or Influence Hydration Status

		Brochure		Educational Lesson	
		Pre	Post	Pre	Post
Problems with constipation	yes:	3	3	7	5
	no:	19	19	11	12
Problems with urinary tract infections	yes:	2	2	4	2
	no:	20	20	14	15
Experience Dry Mouth Daily	yes:	7	5	5	7
	no:	15	17	13	10
Dark color or strong odor to urine	yes:	4	3	3	1
	no:	18	19	15	16
Limit Intake of Fluids	yes:	0	1	1	1
	no:	22	21	17	16

Note. Numbers denote frequency of subjects.

Posttest results indicate a decrease in the number of persons who reported problems with constipation, urinary tract infections, and a dark color or strong odor to urine on a daily basis. An increase in the number of subjects with no abnormalities or problems was found in the BR with the factors of constipation, UTI, dark color or strong odor to urine, and limiting of intake of fluids and in the EL with the factors of dry mouth and UTI. Subjects who indicated no on the pretest and yes on the posttest to problems

were found in both groups for all questions except the question regarding limiting intake of fluids in both groups and dry mouth in the EL. See Table 16 for the description of the pre/post changes in answers.

Table 16
Description of Changes in Answers to Questions Pre/Post For Both Groups

	Indicated Yes on Pretest to No on Posttest		No Change in Response to Question Pre/Post		Indicated No on Pretest To Yes on Posttest	
	BR	EL	BR	EL	BR	EL
1. a. Problems with constipation?	1	0	20	16	1	1
b. Problems with Urinary Tract Infections?	1	1	20	14	1	2
2. Experience the feeling of dry mouth on daily basis?	0	3	20	14	2	0
3. Does urine have dark color or strong odor to it?	1	0	19	15	2	2
4. Do you limit intake of fluids?	1	0	21	17	0	0

Note. Numbers denote frequency of subjects.

Change in Mental Status

No significant difference in MMSE scores was found between the two groups prior to the education ($t=-0.624$, $df = 38$, $p = 0.536$). Following the education, no significant difference in the change in MMSE scores was found between the two groups ($t=.274$, $df = 37$, $p = .785$). Table 17 describes the mean MMSE score before and after the education for both groups.

Table 17
Mean MMSE Scores for Both Groups Before and After Educational Intervention

MMSE Score	Pre		Post		Change Between Pre & Post Scores	
	BR	EL	BR	EL	BR	EL
N	20	18	21	18	.7	.3
Mean	27.3	27.4	28.0	27.7		
SD	1.89	2.48	2.31	2.93		

CHAPTER V

DISCUSSION

An increased awareness of the health problems affecting the older adult population has prompted further interest in prevention. One method of prevention is education. Currently, the field of nutrition education is in need of further research into effective methods of providing nutrition education (Shafer, Gillespie, Wilkins, & Borra, 1996). To determine effective methods of education, the change in knowledge, fluid intake, and physical indicators of hydration status were measured in 40 older adults following the administration of one of two methods of education: an educational lesson developed and presented by a Registered Dietitian (R.D.) or a brochure developed and delivered by an R.D. A 14 to 22 day time period between pre and postassessment was used to measure the retention and impact of the educational interventions. The use of this time period was supported by the two-week time period used in a study designed to investigate the effectiveness of nutrition education brochures on calcium using a theoretical model versus traditional information based model (Ulmi, McGowan, Gray & Savoy, 1999). Information gathered for this study was for the purpose of describing the subjects, determining homogeneity of groups to aid in describing the results of the study, and measuring the effectiveness of the educational methods.

The 40 subjects of this study were randomly assigned to one of two groups: 22 in the brochure group (BR) and 18 in the educational lesson group (EL). The unequal number of subjects in each group was due to failure of some subjects to complete the entire study. Overall, both groups were found to be homogenous for age, gender, level of education, length of time on the nutrition program, MMSE scores, and functional status

as measured by the level of assistance score. The similarity of the two groups at baseline supports the possibility that differences in the fluid intake, knowledge quiz scores, and physical indicators of hydration status were due to the method of education provided.

The mean age was 80.5 years with a range of 63 to 100 years. This was found to be slightly higher than the mean age of 78 years for average Meals on Wheels participants and 76 years for average Congregate Meal Program participants as reported in a national evaluation of the Elderly Nutrition Program (ENP) (Administration on Aging, 1996). The mean age was also older than participants in other elderly nutrition education studies (Colson & Green, 1991; Sharpe, Vaca, Sargent, White, Gu, & Corwin, 1996) and the average age of 72 years for the U.S. population over age 60 (Administration on Aging, 1996).

Eighty percent of subjects (32 of 40) had at minimum a high school diploma or GED while 38% of subjects (15 of 40) had some or completed post-secondary education. The level of education found is similar to the study by Kupka-Schutt and Mitchell (1992) of adults age 65 and older in which the majority of subjects had at least a high school education, but differs from the study by Colson and Green (1991) involving older adults who found the mean level of education was 13.5 years with a range of 3 to 17 years. The average educational attainment of older adults is between the 11th and 12th grades (Hochhauser, 2001). Overall, subjects of this study were found to be educated, as the majority had completed high school.

The majority of subjects, 65% (n= 26 of 40) had a score indicating none to minimal assistance needed with activities measured, however, 35% (n= 18 of 40) had a

score indicating mechanical or human assistance was needed with the activities. This indicates that while most subjects had minimal functional limitations, there were some subjects with functional impairments that could influence hydration status. The findings support the results of the national evaluation of the ENP indicating that functional status impairment is found in this segment of the population as one quarter of Congregate Meal Program participants and three-quarter of Meals on Wheels participants have difficulty carrying out one or more daily tasks (Administration on Aging, 1996).

The number of chronic diseases present in an older adult can be a risk factor for dehydration. A study designed to identify risk factors of dehydration among nursing home residents found that having greater than four chronic diseases is associated with an increased risk of dehydration (Lavizzo-Mourey, Johnson, & Stolley, 1988). This study found that the average number of medical conditions reported by subjects was 2.4 with a range of zero to eight. These findings concur with the national evaluation of the ENP indicating a mean number of chronic health conditions of 2.4 for congregate meal program participants and three for meals on wheels participants (Administration on Aging, 1996). When comparing the results of this study to the Lavizzo-Mourey, Johnson, & Stolley (1988) study, the mean number of chronic medical conditions in nursing home residents was 6.1, a much higher number than found with this research. The difference in the number of medical conditions between the two studies is likely due to the fact that residents of the nursing home tend to have poorer health status than those still living in their homes. The most common reported medical conditions for subjects of this study were conditions involving the cardiovascular, skeletal, metabolic, and nervous systems. The ENP national evaluation had similar findings as many participants reported

health conditions such as heart disease, diabetes, anemia, and osteoporosis (Administration on Aging, 1996).

Medication usage can also have an impact on the development of dehydration in older adults as many medications can directly affect fluid status. These medications include laxatives, diuretics, and medications that can affect cognitive status (Sanservo, 1997). Only 1 of 40 subjects reported no medication usage. Of the 39 remaining subjects, the mean number of medications used by subjects was 4.9, indicating polypharmacy among subjects. Lavizzo-Mourey et al. (1988) reported a mean number of 5.1 medications in their study of nursing home residents and the results indicated usage of more than four medications to be a risk factor for dehydration among the residents. This suggests that subjects of this study may be at risk for dehydration due to the mean number of medications reported; however, subjects were found to have adequate intake of fluids. Interestingly, despite study findings indicating a greater number of chronic diseases among samples of nursing home residents versus the lower number found with this study, medication usage was found to be quite similar. Overall, subjects of this study were found to be representative of ENP participants. Although the mean age of subjects was slightly greater, subjects were similar to ENP participants in the areas of functional status impairment, and the number and type of medical conditions present.

Fluid Intake

Fluid intake was measured using a semiquantitative food frequency questionnaire (FFQ). Using six to eight cups (1500 to 2000ml) a day as a standard, fluid intake was adjudged to be adequate for both intervention groups. Although intake differences

between groups were not significant, the EL intake was higher at 83.5 ounces (2505 ml) compared to 71.5 ounces (2145 ml). Following the education, fluid intake decreased slightly for both groups, however no significant change was found. Overall, both forms of education were found to have no effect on the fluid intake of subjects. Despite no statistically significant differences between the two groups, it is unclear as to why subjects of the EL had higher fluid intakes than the BR on both the pre and posttests as subjects were randomly assigned to one of the two groups. Nutrition program participation was longer for EL subjects, although not statistically significant; thus attention to fluid and overall intake may be greater for this group. The sufficient fluid intake found makes a positive statement towards the ENP and promotion of good nutritional practices to promote healthy older adults. Results of this study indicate that participants of the ENP are adequately hydrated.

The adequate fluid intake found in this study may also be related to the fact that the subjects were in fairly good health and able to live on their own and control their fluid and food intake. A study of adults age 20 to 80 years in which seven day diaries of food and fluid intake were collected and analyzed found that the elderly group, ages 65 to 80 years ingested about 2100 ml, or 70 ounces, of total fluid per day. The study also found that the elderly took in similar quantities of fluids as the younger age groups and suggested that under ad libitum conditions, healthy older adults do not take in abnormal amounts of fluids (de Castro, 1992).

The provision of meals and fluids by the ENP may have provided the needed fluids and encouraged fluid intake by stimulating consumption of a beverage with meals. A study on fluid intake in the institutionalized elderly found that 79% of residents total

fluid intake was obtained from meals and indicated that residents consuming less than 50% of meals could be at risk for inadequate total fluid intake (Chidester & Spanger, 1997). One reason why no significant changes in fluid intake occurred following the educational interventions may be that subjects came to the realization that fluid intake was sufficient and no further change was needed, as they were not suffering from dehydration. This reasoning is supported by the study involving education in both hypertensive and normotensive subjects that resulted in the most dietary changes made in subjects with the diagnosis of hypertension and suggested that the hypertensives made changes because they felt it may improve their health (Colson & Green, 1991)

Dehydration was one of the ten most frequent diagnoses recorded for Medicare hospitalizations in 1991 (Warren, Bacon, Harris, McBean, Foley, & Phillips, 1994). The high incidence of dehydration in older adults and the adequate fluid intake found in subjects of this study leads to the question of whether the FFQ was sensitive enough to measure daily fluid intake in older adults. Several factors can influence the accuracy of a FFQ including length, completeness of food list, and the ability of respondents to describe intake (Lee & Nieman, 1996). As no standardized FFQ was available to measure fluid intake, the researcher developed the FFQ used in this study. The FFQ was pilot tested with older adults to measure length of time to administer, and test the completeness of food list, and understandability. Thompson and Byers (1994) reported that when compared with food recalls or diet records, the actual measure of intake is not as accurate. However, FFQ have been determined to be suitable for estimating average intake of energy and nutrients for groups of people (Lee & Nieman, 1996). A mean MMSE score of 27.1, which is within normal, was found; therefore mental status was

likely not a factor related to the accuracy of the FFQ in this study. However this is just a mean score and there were some subjects who exhibited memory problems.

The FFQ consisted of 35 items and subjects were questioned verbally on each item. The length of the FFQ may have influenced the accuracy of the questionnaire as subjects may have become tired from answering each individual item with information on both portion size and frequency of usage. The researcher did note that some subjects seemed to get frustrated over lengthiness of FFQ and others did struggle with answering all items as they had some memory problems. Portions sizes and food models were also used in an effort to increase the accuracy of the FFQ, however this idea has not yet been verified. A study of elderly women reported only small differences in dietary intake with the use of portion sizes (Cohen, Laus, Smiciklas-Wright, AbuSabha, Mitchell, 1999) while Willett (1994) reports that the use of portion sizes may be useful for some foods or nutrients. When carrying out this research, it appeared to be beneficial to use the portion sizes and food models as it gave subjects a visual aid and also provided guidance to the researcher when analyzing data for improved accuracy as some subjects used very large glasses and others used small glasses

Caffeine can act as a diuretic resulting in an increased fluid loss. Baseline caffeine intake, 8.1 ounces (243 ml) for BR and 13.5 ounces (405 ml) for the EL group, was not significantly different ($t = -1.650$, $df = 38$, $p = 0.107$). Post-intervention caffeine intake increased slightly for the BR (up to 9.9 ounces, 297 ml,) and decreased (to 11.3 ounces, 339 ml,) for EL. Overall, caffeinated beverage intake was found to be low. A moderate intake of 200 to 300 mg of caffeine per day has been found to be acceptable for most healthy adults, which is equivalent to about two cups of brewed coffee (Pronsky,

2000). Combined with the adequate fluid intake, the caffeine intake appears to have little impact on hydration status despite the diuretic effect of caffeine.

Knowledge Quiz Scores

Prior to the educational intervention, scores on the quiz were low at 57% or less indicating subjects had limited knowledge on fluid and hydration issues prior to the education. Following the education, despite an increase in scores, mean scores for both groups were 59% or less indicating knowledge deficits on fluid and hydration were still present among both groups following the education.

When looking at the change in mean scores for the BR, despite being statistically significant it appears to be a minimal increase. However, when looking at changes in scores among subjects, a decrease from 12 subjects to 8 subjects scoring less than 50 percent on the quiz was observed in BR, whereas a decrease from seven subjects to six subjects was observed in the EL. One reason for the increased scores in the BR may be that the subjects were able to self pace their learning and refer back to the brochure as needed. In the EL, learning occurred only during the session and the pace or rate of information provided depended on the researcher. A study of rural and urban dwelling elderly found that written materials were the most common source of nutrition information and suggested that the elderly may prefer written information versus electronic sources of media such as television or radio because they can control the pace of information presented (Briley, 1990). The decrease in reaction time and response that can occur with aging and in turn slow the process of learning information (Kicklighter, 1991) is another possible explanation for the minimal change in scores for the EL. The

information provided during the session may have been presented too quickly and the EL subjects had no information to refer back to following the education.

The significant increase in scores for the BR as compared to the EL may also be due to the fact that the length of time of the initial session with the researcher was greater for the EL. The EL participated in the educational intervention immediately following the preassessment whereas the BR could read the brochure at a later time if desired. It may be that participants in the EL became fatigued or tired at the end of the session and therefore had less concentration or attention on the material being presented. Another possible explanation for the increased scores in the BR group is perhaps subjects in the EL were not ready to learn at the time the education was presented. Readiness to learn was not assessed in subjects of either group prior to the provision of the education. The subjects in the BR had the opportunity to choose the time they wanted to learn whereas the EL had no choice in the time they participated in the education. .

The results of this study contradict other literature on learning style preferences promoting methods that include the use of several senses (Holli & Callabrese, 1991). While the brochure method involved the sense of sight, the educational lesson involved both sight and sound and was still less effective in increasing knowledge than the brochure.

Reasons for the overall low scores on the quiz by both groups may be related to the fact that this group of subjects was relatively healthy and may not have experienced or were suffering from dehydration. A study of hypertensive and normotensive older adults found that education presented via an informal discussion group with visual aids,

handouts and food samples was more effective in the hypertensive group as compared to the normotensive group suggesting that older adults with medical conditions requiring dietary modification respond more positively to education. Both the hypertensive and normotensive groups had statistically significant increases in knowledge scores; however, the increases were greater in the hypertensive group (Colson & Green, 1991). The increase in knowledge scores for both groups in the Colson and Green study also indicates that education involving group discussion and written material is effective further suggesting that incorporation of both verbal and written information can be conducive to learning. Perhaps scores for this study would have increased with the usage of the educational lesson and the brochure together. This is further supported by a study of older adults at a congregate meal site involving educational sessions with demonstrations and both written and verbal information that found increased knowledge regarding fruits, vegetables, and least nourishing foods and a change in behavior of increased fruit consumption (Sharpe, et al., 1996).

Five questions based on the main points of the educational intervention, using the multiple choice, true/false, and fill in the blank format, were used in this study. This is similar to the study by Sharpe et al. on a nutrition education program at congregate meal sites in which six multiple choice questions based on the key points of the educational sessions were used that successfully measured an increase in knowledge by participants (Sharpe et al., 1996).

When examining the results by individual knowledge quiz questions, increased scores were observed in the BR for four of the five questions. These questions addressed the areas of the functions of water, recommended fluid intake amounts, foods that can

count towards increased fluid intake, and reliability of thirst as an early indicator to increase fluid intake. In comparison, an increase in scores for the EL was observed in only two questions addressing the areas of caffeinated beverages counting towards total daily fluid intake and foods that can count towards total daily fluid intake. A closer look reveals only a greater increase over the BR for the questions regarding caffeinated beverages suggesting that the educational lesson may be more effective on that topic. A significant difference in pretest scores was found only on the last question regarding thirst as an indicator to increase fluid intake in which only one brochure subject and five educational lesson subjects answered correctly indicating that overall scores were low for this question. Following the education, no significant difference was found and a slight increase up to three correct answers in the BR and a decrease down to two correct answers in the EL was observed. These results indicate that both methods were relatively ineffective in increasing knowledge on this topic. Perhaps older adults are hesitant to believe that their sense of thirst is a poor indicator of the need to increase fluid intake. It may also be that older adults had never been informed that their sense of thirst is not a reliable indicator prior to this education and may need further reinforcement or emphasis on the topic to stimulate retention.

The brochure was more effective than the educational lesson in increasing knowledge in the areas of the functions of water in the body, the recommended total fluid intake per day, foods that can count towards fluid intake, and thirst as a poor indicator of need to increase fluid intake. Reasons for the increased scores in the BR may be related to the color and graphics of the brochure which may have stimulated interest in reading the brochure. A study involving the evaluation of a nutrition newsletter designed

specifically for older adults revealed that the appearance received the most positive response based on the opinions of older adults (Lancaster et al., 1997). In addition, the information contained in the brochure was broken down into small sections that are easy to read and further reinforced with appropriate graphics, both techniques recommended to help enhance learning in older adults (Pocinki, 1991). Scores also reveal that despite the changes in scores following the education, overall knowledge in the area of thirst as a poor early indicator of need for increased fluid intake, caffeinated beverages not counting towards daily fluid intake, and more than two functions of water remained low following the education indicating the need for more effective methods of education on these topics.

The significant correlation of the post total fluid intake and post knowledge quiz scores in the EL is likely due to the slight decrease in quiz scores that paralleled the slight decrease in total fluid intake post intervention. No significant association in post fluid intake and quiz scores in the BR was found likely because the increase in quiz scores was not associated an increase in fluid intake.

The significant increase in the knowledge quiz scores and minimal change in fluid intake in the BR group indicate that the brochure was effective in increasing knowledge, but had little effect on changing behavior. Perhaps subjects realized they had adequate fluid intake and had no need to make changes or the increased knowledge simply didn't translate into action. The EL also had minimal change in behavior with a slight decrease in fluid intake further suggesting that the method of education was not effective in changing behavior.

One of the primary goals of nutrition education is behavior change, yet studies have shown that many educational interventions fail to result in behavior change (Contento et al., 1995). The established relationship between lifestyle behavior and health outcomes has been reported; however, information by itself has not been adequate to result in lasting behavior change (Muehrer, 2000). Education programs that provide information and teach skills often don't result in behavior change due to failure to motivate the audience's attitude and behavior (Shafer et al., 1996; Contento et al., 1995). Nutrition education programs that provide both motivational and how to knowledge are needed to result in behavior change (Contento et al., 1995). The identification of the needs, behaviors, motivations, and desires of the target audience is an important component in effecting behavior change. The incorporation of theoretical frameworks may also be useful in facilitating a change in behavior (Shafer et al., 1996). Two reasons why no behavior change was found in this study may be that the two methods of education used were not based on a theoretical framework and the readiness to learn or level of motivation of subjects was not assessed prior to the educational intervention.

Two studies reviewed that found both a change in knowledge and behavior used both written and verbal forms of nutrition education. A nutrition education project consisting of a variety of nutrition topics at a congregate meal site that incorporated both demonstration, written and verbal methods of education found a change in knowledge and behavior among subjects post intervention (Sharpe et al., 1996). The study by Colson and Green (1991) on a nutrition education program on sodium status and health also included both written and verbal methods of education and resulted in changes in dietary habits and an increase in knowledge. These studies suggest that the incorporation

of both written and verbal methods of education can be effective in increasing knowledge and changing behavior.

Physical Indicators of Hydration Status

This study was unique in that it included the evaluation of physical indicators of hydration status, namely towards the application of identifying alterations in the hydration status of subjects. No statistically significant differences were found between the two groups prior to the education. Eight of 40 subjects presented with two or more abnormal values as signs of dehydration prior to the education. Of the remaining 31 subjects, 17 presented with one physical indicator of dehydration. The abnormal pulse value found in subjects was not counted as all irregular values were found to be in the abnormally low category, which is not a sign of dehydration. Overall, a total of 25 subjects (63%) presented with one or more signs of dehydration prior to the education indicating that there could be some early stages of dehydration present in subjects of this study. These clinical indicators of dehydration must be contextually reviewed because other factors may contribute to the presence of the clinical symptoms of dehydration. An important context is that fluid intake was adequate. The presence of diminished skin turgor can also occur with aging due to a decrease in skin elasticity (Iggulden, 1999). Mouth breathing and anticholinergic medications can also cause dry mucous membranes (Weinberg et al., 1995). Findings on physical examination must also be considered in relative to other measures of dehydration. Following the education, the only indicator to show a statistically significant change was tongue dryness. A change in tongue dryness from normal to abnormal was noted for six BR and three EL subjects; improvement was noted for three BR and one EL subject following the educational intervention. The

change in abnormality of tongue dryness may be related to factors such as mouth breathing and anticholinergic medications, which can cause dry mouth (Weinberg et al., 1995), as no significant change in fluid intake was found for both groups following the education. Both groups exhibited improvements in all other physical indicators of hydration status except for no change in the EL and the indicator mucous membranes of the mouth. Perhaps the FFQ was not sensitive enough to measure an increase in fluid intake, which led to improvements in the physical indicators of hydration status.

The validity of these indicators as clinical signs of dehydration in older adults must also be considered. Despite no change in fluid intake, tongue dryness changed from normal to abnormal in nine subjects post-intervention. Although not statistically significant, two subjects in the BR and four in the EL also had a change from normal to abnormal in longitudinal tongue furrows post-intervention. Perhaps tongue dryness and longitudinal tongue furrows are not reliable or valid indicators of dehydration in older adults.

Factors That Can Help to Determine or Influence Hydration Status

Questions addressing problems with constipation, urinary tract infections (UTI), feeling of a dry mouth, a dark color or strong odor to urine, and the limiting of intake of fluids were asked on both the pre and posttest. No statistically significant differences were found between the two groups before and after the education. For both groups, 30% or less of subjects indicated problems with the factors addressed by the questions. Following the education, an increase in the number of subjects from the BR indicating no problems was found for the factors of constipation, UTI, dark color or strong odor to

urine, and limiting intake of fluids. For the EL, problems with dry mouth and UTI decreased from baseline. One possible explanation for the improvement is perhaps some subjects increased their fluid intake following the education; however, the increase was not reflected on the FFQ. Other factors such as changes in medications could have contributed to the decrease in the problems with constipation or feelings of dry mouth. Subjects in the EL may have also learned that dry mouth was a symptom of dehydration through the education and therefore increased fluid intake to prevent the feeling of dry mouth.

Mini Mental Status Exam

Overall, subjects of both groups were found to have scores within the normal range for the MMSE. No significant difference in the MMSE status exam scores was found between the two groups both before and after the educational intervention. Both age and level of education can have an influence on MMSE scores (Crum, Anthony, Bassett, & Folstein, 1993). The study by Crum et al. found that the median score for community dwelling older adults age 80 years and older is 25. The study also found that when considering both age and level of education, adults age 85 and older with 9 to 12 years of education or a high school diploma had a mean score of 26 and those with college experience or a higher degree had a mean score of 27 (Crum et al., 1993). These results are similar to the results of this study of subjects with a mean age of 80.5 years and 80% of subjects having at minimum a high school diploma that found a slightly higher mean score of 27.3. The slightly higher score is not surprising given that 38% of subjects had some college experience or had completed college. Overall, mean MMSE scores were within the normal range and were similar to another study of community

dwelling older adults. Confusion and dementia can lead to a decrease in fluid intake (Weinberg et al., 1995); however, that does not appear to be a factor in this study sample.

Medication Effects

Medications such as diuretics and laxatives can have a direct influence on hydration status. Diuretics can lead to dehydration via excessive production of urine (Watson, 1996) and overuse of laxatives can lead to diarrhea and in turn dehydration or electrolyte abnormalities (Sanservo, 1997). One half (n=3) of the subjects using laxatives presented with physical signs of dehydration and 59% of those not using a laxative also presented with physical indicators of dehydration. Therefore, it appears that laxative usage did not have an effect on the presence of the physical indicators. Fluid intake was not significantly different when compared with laxative usage, however fluid intake was higher in subjects using a laxative medication. The increased fluid intake may explain why, despite using a medication that can directly influence hydration status, no significant association was found between laxative usage and the physical indicators.

When looking at the relationship of the physical indicators of hydration status and the usage of diuretic medication, a statistical significance was found with longitudinal tongue furrows; however, only one subject using a diuretic medication presented with them. Forty-seven percent of those using a diuretic and 72% of those not using a diuretic exhibited signs of dehydration indicating both groups had signs of dehydration with a slightly higher percentage in those not using a diuretic. It appears that the use of diuretics did not influence the presence of physical indicators of dehydration. The lower incidence in the subjects using diuretics may be related to the fact that they had higher total fluid intake, however the difference was not statistically significant. Perhaps subjects using

laxatives or diuretics were aware of the increased risk of fluid imbalances associated with these medications and the need for adequate fluid intake and therefore had higher fluid intakes. Another possible explanation for the increased fluid intake may be the use of fluids to take the medications. Perhaps the education they received on fluid intake in conjunction with the need to use fluids when taking the medications was sufficient to increase fluid intake.

The results of this study are similar to the study of nursing home residents and risk factors for dehydration by Lavizzo-Mourey et al. (1988), which found that the use of diuretics is not associated with an increased risk of dehydration, as subjects using diuretics in this study had increased fluid intake and a lower incidence of physical indicators of dehydration. However, Lavizzo-Mourey et al. did find that the usage of a laxative medication is associated with an increased risk of dehydration, which contradicts results of this study where subjects using laxatives had fewer physical indicators of dehydration and increased fluid intake as compared to those not using laxatives.

Subjects using medications that can affect cognitive status were also found to have higher mean fluid intakes than those not using a cognitive medication. Sixty-seven percent of the subjects using and 61% of those not using a medication that can affect cognitive status presented with physical indicators of dehydration indicating a slight increase in those using this type of medication. It does not appear that the use of medications affecting cognitive status has a large effect on the presence of physical indicators of dehydration.

Information Gathering

Factors involved in the gathering of information can have an impact on study findings. This study relied on information gained directly from subjects. When compared to a study of nursing home residents (Lavizzo-Mourey et al., 1988), a lower incidence of chronic disease was found in subjects of this study. The lower incidence may be due to the dependence on self-reported information versus healthcare provider documentation. People often have difficulty remembering names of medical conditions or simply may be hesitant to report all information despite assurance of confidentiality.

The reliance on self-reported information may also have influenced the accuracy of the FFQ. Older adults often experience memory problems that could affect the accuracy of the FFQ (van Staveren, deGroot, Blauw, & van der Wielen, 1994). Subjects may have had difficulty in remembering the frequency of beverage usage.

Limitations

Limitations of this study included small sample size ($n= 40$), unequal numbers of subjects between the two groups, and the majority of the sample represented only elderly subjects who participated in the ENP and not the older adult population in general. Participation in the ENP may also have confounded the results of this study as the program could enhance adequate fluid intake despite any education on fluid and hydration issues provided. ENP participants are provided fluids with meals which promotes fluid intake. The ENP also provides education at congregate meal sites so subjects may have been aware of important fluid and hydration issues prior to this study's educational intervention.

The preferred learning style of subjects also was not measured. The preferred learning style of persons can influence the place people choose to learn, what they want to learn, and the manner in which they participate (Truluck & Courtenay, 1999). Some subjects may not have preferred the learning styles used in this study and therefore may have had decreased retention of the information presented.

Nutrition education that provides information and instruction often fails to facilitate a change in behavior because it doesn't motivate the audience attitudinally or behaviorally. The use of strategies based on theoretical frameworks, such as the Health-Belief model or Knowledge Attitude Behavior model, may be used to produce a change in behavior (Shafer et al., 1996). The nutrition education methods used in this study were not based on a theoretical model which may be one reason why no change in behavior was found. The change in attitude also was not measured, which is important to note as changes in attitude can lead to modifications in behavior (Shafer et al., 1996). Since subjects were randomly assigned to groups, learning style and adult learning principles were not taken into consideration regarding group assignment for the educational intervention.

Educational Intervention Notes

When completing this research, there were several factors regarding the assessment process and education delivery that are important to note, especially for people planning to conduct research with older adults. Despite being found acceptable to use based on pilot tests results, the assessment form seemed to be too lengthy for many subjects. Some subjects seemed to become fatigued or tired of answering questions during the assessment process. This fatigue was further confounded in the EL as the

education was provided immediately following the assessment process. In the BR, subjects were able to choose when they wanted to participate in the education by reading the brochure. Perhaps by conducting more pilot testing, the lengthiness of the assessment form when used with older adults would have been noticed.

During the data collection process, the researcher felt the educational lesson would be more effective than the brochure as it was assured the EL received the education. It seemed at times that subjects receiving the brochure would simply put it aside without looking at it. Surprisingly to the researcher, the brochure was more effective in increasing knowledge as compared to the educational lesson. Readiness to learn was not assessed in subjects; therefore those receiving the education lesson may not have been ready to learn at the time of the education whereas brochure subjects had the opportunity to decide when they wanted to learn. Perhaps, delivering the educational lesson at a different time rather than immediately after the assessment process would be more effective as subjects would not be fatigued from the length of the assessment process.

Conclusions

Subjects of both groups were found to have adequate fluid intake both pre and post intervention. Ninety percent of subjects were consuming the recommended minimum fluid intake of 48 ounces (six cups) per day prior to the education with only a slight increase following the education. The two methods of education had a minimal effect on the total fluid intake. The finding of adequate fluid intake among this sample is a positive point for the ENP supporting the notion that participation in the program promotes adequate fluid intake among older adults.

A statistically significant increase in knowledge quiz scores was found in the BR following the educational intervention indicating that the brochure is an effective educational method to increase knowledge of fluid and hydration issues. Mean knowledge quiz scores for the EL decreased slightly following the education. Despite the changes in scores, mean scores for both groups remained less than 59% indicating that subjects still had knowledge deficits following the educational intervention. The educational lesson was more effective in educating about caffeinated beverages, while the brochure showed increased efficacy in increasing knowledge on the functions of water in the body, foods that can counts towards fluid intake, and thirst as a poor early indicator to increase fluid intake. Overall, knowledge of the recommended daily fluid intake amount, foods that can count towards fluid intake, and one function of water in the body were high among both groups following the educational intervention. Knowledge of thirst as a poor early indicator to increase fluid intake remained low in both groups post intervention.

Twenty-five of 40 subjects presented with one or more physical indicators of dehydration prior to the educational intervention. Post intervention, both methods of education were effective in decreasing the level of abnormality of the physical indicators except for the increased abnormality in tongue dryness for both groups and no change in mucous membranes of the mouth in the EL. Overall, neither method was found to be more effective than the other in decreasing the level of abnormality.

The results of this study indicate that the use of a brochure to increase knowledge of fluid and hydration issues is an effective method of education in older adults. The use of a brochure to educate community dwelling older adults who are not participants in the

ENP is likely to be effective in increasing knowledge of fluid and hydration issues. The results also suggest that the brochure is more effective in increasing knowledge than an educational lesson provided by an R.D. among ENP participants.

The high incidence of dehydration among older adults indicates the need for the identification of groups of older adults at risk for developing dehydration and the usage of methods of education effective in improving the hydration status of older adults. The brochure method showed improvements in knowledge which is helpful in increasing the awareness of the effects of dehydration and methods of prevention, but had minimal effect on fluid intake and physical indicators of hydration status.

Recommendations for Future Research

The completion of this research project has helped to identify areas where future research is recommended.

1. Limited information on the usage and appropriateness of various dietary methods to assess intake in the older adults population is available, specifically towards measuring fluid intake. Further research to determine effective dietary assessment methods in older adults will aid in assessing adequacy of food and fluid intake of older adults. This would lend further insight to areas where further education is needed and also aid in measuring the effectiveness of educational interventions.
2. Conduct this study with older adults who were not participants in the ENP as participation in the ENP may enhance hydration status whether subjects want to learn more about fluid and hydration issues or not.

3. Conduct a study using both the brochure and educational lesson together as the educational intervention. Usage of the two methods together may result in greater improvements in knowledge, fluid intake, and physical indicators of hydration status.
4. Complete a 24-hour food and fluid recall on the same day that the physical indicators of hydration status are measured. This would provide a measurement of fluid intake that day to correlate with the presence of the physical indicators of hydration status.
5. A study to compare the prevalence of dehydration among persons who participate in the ENP and those who do not participate in the program.
6. A study involving older adults to compare and evaluate the effects of educational methods based on a theoretical framework in the area fluid and hydration issues.

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APPENDIX**A. EDUCATIONAL MATERIALS**

Educational Brochure on Fluid and Hydration Issues

Lesson Plan on Fluid and Hydration Issues

Educational Lesson Script

Educational Lesson Visual Aids

B. INSTRUMENTS

Pre/Post Assessment Form

MMSE Score Report Form

Assessment Form Pilot Testing Questionnaire

C. CONSENT FORMS

Thesis Consent Form

Assessment Form Pilot Testing Consent Form

MMSE Pilot Testing Consent Form

Brochure Pilot Testing Consent and Questionnaire

Educational Lesson Pilot Testing Consent Form and Questionnaire

D. DATA ANALYSIS GUIDES

Categories for Medical Conditions

Categories for Medications

APPENDIX A

EDUCATION MATERIALS

- Educational Brochure on Fluid and Hydration Issues
- Lesson Plan on Fluid and Hydration Issues
- Educational Lesson Script
- Educational Lesson Visual Aids

Appendix A Educational Brochure on Fluid and Hydration Issues

Beverage Suggestions	
• Water	Juice
• Milkshakes	Milk
• Carbonated water	Lemonade
• Decaffeinated coffee or tea	Hot Cider
• Decaffeinated sodas such as Sprite or 7-Up	
• Juice drinks such as Crystal Light or Kool-Aid	
• Nutritious supplement drinks (e.g. Ensure, nuBasics)	



** For more flavor, try adding a slice of lemon or a sprig of mint to your water.

Foods that can also be counted toward daily fluid intake:

- * ice cream * Jell-O * broth-based soups
- * popsicles * Italian ice



Foods with a high water content can also contribute to total daily fluid intake.

Examples of these foods include:

- fruits such as watermelon, orange, grapefruit & apples
- lettuce and broccoli
- cottage cheese and yogurt

Source: The National Institutes of Health and National Institute of Allergy and Infectious Diseases, NIH/NIAID, Bethesda, MD.

- Additional fluid may also be needed during:
- * very hot or cold weather - your body needs more water to maintain normal body temperature
 - * during times of illness when you're sick with fever, diarrhea, nausea and/or vomiting which cause increased fluid loss

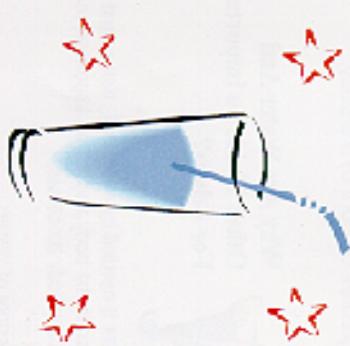
Caffeine Content of Selected Beverages**

Item	Caffeine Range
coffee:	
brewed:	
cup	110-150 mg
percolated	40-70 mg
decaffeinated	2-5 mg
Instant:	
freeze dried	40-100 mg
decaffeinated	2-3 mg
Tea (bags or loose):	
1 minute brew	0.38 mg
3 minute brew	20-46 mg
5 minute brew	20-50 mg
Soda:	
Mountain Dew, Pepsi, YET, Coca Cola, Dr. Pepper	52-55 mg
Pepsi	37-38 mg
Diet Coke	40-46 mg

Source: From: Porter, PV. *Postgraduate Medicine*, 115, 74, 1999.

- **For most healthy adults, a moderate caffeine intake of 200-300 mg per day causes no physical problems. If you have any medical problems, you should talk with your physician for guidelines on caffeine consumption.

To stay healthy, it's important to take in enough fluids.



Please take a moment to learn more about how you can make sure you are getting enough fluids.

FLUIDS

Note. Brochure has been reduced to fit this page. Original version was formatted to fit on 8 ½ x 14" paper.

Deborah E. Troy-Pakian, RD, CD
Graduate Student Food and Nutrition Sciences
University of Wisconsin-Madison
Madison, WI 53706

Appendix A Educational Brochure on Fluid and Hydration Issues continued

One of the most important and often overlooked nutrients needed by the body's water. Like the oxygen required to breathe, you need water to survive.

- Water is the nutrient needed in greatest amount by the body.

Why Are Water And Other Fluids So Important For Adults?



Water is needed by every cell, tissue, and organ in the body and has an important role in many body processes.

Functions of Water:

- Deliver nutrients to body's cells
- Carry away waste products
- Keep skin hydrated and moisten the mucus membranes of the eyes, mouth, and nose
- Maintain adequate blood volume
- Regulate body temperature by helping to cool the body in the summer and acting as insulation in the cold weather
- Help deliver medications to the proper places in the body

Signs and symptoms of dehydration:

<ul style="list-style-type: none"> • dry mouth** • flushed skin • impaired physical performance • increased body temperature, • breathing rate, and pulse rate 	<ul style="list-style-type: none"> - fatigue - headache - dizziness - increased weakness - labored breathing with exercise
---	---

**By the time you feel thirsty, you've already lost up to 2% of your body weight as water.

Source: The National Research Institute's Consumer Food and Nutrition Information Center (FCN)

HOW MUCH FLUID DO YOU NEED EACH DAY?



Older adults need to consume at least 6 to 8 cups of fluids per day.

Caffeine-free and non-alcoholic beverages are your best choice to meet fluid needs and prevent dehydration.

- Older adults need to consume at least 6 to 8 cups of fluids per day.
- Caffeine and alcohol can act as diuretics, causing you to lose fluid through increased urination.
- Beverages containing caffeine include coffee, tea, sodas such as Coke, Pepsi, or Mountain Dew

Tips to Increase Fluid Intake

- Take breaks throughout the day to drink a beverage.
- Have a glass of fluid with each meal and with snacks.
- Have a glass of fluid next to your favorite chair or where you sit most often.
- Take a sip of water when you pass a drinking fountain.



Note. Brochure has been reduced to fit this page. The original version of the brochure was formatted to fit on 8 ½ x 14" paper.

Appendix A Lesson Plan on Fluids and Hydration

<u>Objectives</u>	<u>Plan</u>	<u>Evaluation</u>
<p>1. Participants will list three functions of water in the body.</p> <p>2. Participants will be able to recall changes that occur with aging by recognizing that thirst is not a good early indicator of need to increase fluid intake</p> <p>3. Participants will be able to recall the number of 8 oz. glasses of fluids older adults need to consume on a daily basis.</p> <p>4. Participants will apply knowledge of beverages and foods that can contribute to total daily fluid intake towards increasing their own daily fluid intake.</p> <p>5. Participants will be able to identify two foods that can be counted towards total daily fluid intake.</p> <p>6. Participants will demonstrate understanding of the effect of caffeine containing beverages by recognizing that caffeine can't be counted towards total daily fluid intake.</p>	<p>Explain functions of water in the body.</p> <p>Discuss the importance of adequate fluid intake to prevent dehydration and the changes that occur with aging that put older adults at greater risk for developing dehydration.</p> <p>Inform participants of the number of 8 oz. glasses of fluid needed by older adults each day.</p> <p>List types of beverages and foods that can be counted towards total daily fluid intake. Also show visual aid chart with list.</p> <p>Inform participants of foods that can be counted towards total daily fluid intake. A visual aid chart with a list of foods will be used.</p> <p>Discuss the effect caffeine has on the body by acting as a diuretic and how caffeine containing beverages can't be counted towards daily fluid intake. Visual aid chart showing caffeine content of selected beverages will be shown.</p>	<p>Participants will verbally list three functions of water in the body.</p> <p>Participants will correctly answer be asked a true/false question showing that they recall that thirst changes with age.</p> <p>When asked and given four choices, participants will be able to correctly identify the amount of fluid needed each day.</p> <p>Food frequency questionnaire will be administered before and after education to assess and detect changes in fluid intake.</p> <p>Participants will correctly answer a true/false question that shows they can correctly identify two foods that can be counted towards daily fluid intake.</p> <p>Participants will correctly answer a true/false question asking whether caffeine containing beverages can be counted towards total daily fluid intake.</p>

Materials Needed:

- Written script of lesson
- Visual aid chart
- Methods of evaluation: initial assessment form containing food frequency questionnaire, knowledge quiz, physical indicators of hydration status, and demographic/health questions.

Appendix A Lesson Plan Script

Title: Fluids

Audience: Older adults age 60 and older who participate in the Dunn County Congregate Meal program or the Eau Claire County Nutrition Intervention program.

Purpose: To educate older adults about fluids and the importance of adequate fluid intake to prevent dehydration.

Objectives:

- 1.) Participants will be able to list three functions of water in the body
- 2.) Participants will be able to recall changes that occur with aging by recognizing that thirst is not a good early indicator of need to increase fluid intake.
- 3.) Participants will be able to recall the number of 8 oz. glasses of fluids older adults need to consume on a daily basis.
- 4.) Participants will apply knowledge of beverages and foods that can contribute to total daily fluid intake towards increasing their own daily fluid intake.
- 5.) Participants will be able to identify two foods that can be counted towards total daily fluid intake.
- 6.) Participants demonstrate understanding of the effect of caffeine containing beverages by recognizing that caffeine can't be counted towards total daily fluid intake.

Preassessment:

A knowledge quiz will be given during the initial assessment prior to the education that contains questions about fluids. A food frequency questionnaire to determine fluid intake will also be administered prior to the education.

Outline of Presentation:

I. Introduction

- To stay healthy, it's important to take in enough fluids. Today, I'm going to talk about fluids and how you can make sure you are getting enough fluids.

II. Water

- One of the most important and often overlooked nutrients needed by the body is water. Like the oxygen required to breathe, you need water to survive.
- Water is the nutrient needed in the greatest amount by the body.

You may be thinking: why is water so important for adults?

- Water is needed by every cell, tissue, and organ in the body and has an important role in many body processes.
- Some of the functions of water include:
 - Deliver nutrients to body's cells
 - Carry away waste products
 - Keep skin hydrated and moisten the mucous membranes of the eyes, mouth, and nose
 - Maintain adequate blood volume

Appendix A Lesson Plan Script continued

- Regulate body temperature by helping to cool the body in the summer and acting as insulation in the cold weather
- Help deliver medications to the proper places in the body

III. Adequate fluid intake to prevent dehydration.

- Consuming enough fluids is also important in preventing dehydration.
- Older adults are at a greater risk for developing dehydration because of some changes in the body that can occur with aging.
- Some of these changes include:
 - the body's kidney function is reduced
 - the body's sense of thirst is decreased
 - and the body's water stores are lowered because muscle tissue, which holds a lot of water, decreases with age.
- There are several signs and symptoms of dehydration. As shown on this chart, they include: **(see chart)**

◆ dry mouth**	◆ fatigue
◆ flushed skin	◆ headache
◆ impaired physical performance	◆ dizziness
◆ increased body temperature, breathing rate, & pulse rate	◆ labored breathing with exercise

** One thing to remember about dry mouth is that by the time you feel thirsty, you've already lost up to 2% of your body weight as water.

IV. As for the amount of fluid needed each day:

- Older adults need to consume at least 6 to 8 cups of fluids per day.
- Caffeine-free and non-alcoholic beverages are your best choice to meet fluid needs and prevent dehydration
- The reason to choose caffeine-free and non-alcoholic beverages is because:
 - caffeine and alcohol can act as a diuretic, causing you to lose fluid through increased urination
 - examples of beverages that contain caffeine include coffee, tea, and sodas such as Coke, Pepsi, or Mountain Dew

V. Caffeine

- For most healthy adults, a moderate caffeine intake of 200-300 mg per day poses no physical problems. However, if you have any medical problems, you should talk with your physician for guidelines on caffeine consumption.
- The amount of caffeine found in beverages varies. **(see chart)**
- Coffee brewed by the drip method contains about 110-150 mg of caffeine, while percolated cup of coffee contains 40-70 mg of caffeine and a cup of decaf coffee has between 2-5 mg of caffeine.
 - Instant coffee contains 40-108 mg of caffeine while decaf instant coffee has 2-3 mg.

Appendix A Lesson Plan Script continued

- The caffeine content of tea varies depending on the length of time it is brewed. Tea brewed for 1 minute can contain 9-33 mg of caffeine, and tea brewed for 3-5 minutes can contain 20-46 mg of caffeine.
- The caffeine content of soda also varies and can range from 52-55 mg for Mountain Dew and Mello Yello, 40-48 mg for coca cola and Dr. Pepper, 37-38 mg for Pepsi, and 40-46 mg for Diet Coke.

VI. Beverage suggestions and foods with high fluid content.

- There are many different types of beverages that can be used to contribute to your total daily fluid intake. Examples of these beverages as listed on chart include:
(see chart)
 - * water *milk *juice *lemonade *carbonated water
 - *decaf coffee or tea *decaf sodas such as sprite or 7-Up
 - *juice drinks such as Crystal Light or Kool-Aid
 - * and also nutritional supplement drinks such as Ensure or Nubasics
- If you're looking for a way to add more flavor to your water, try adding a slice of lemon or a sprig of mint.
- There are also certain foods can be counted towards your total daily fluid intake. These foods include: * ice cream *jell-o * popsicles * Italian ice
*broth-based soups
- Foods with a high water content can also contribute to total daily fluid intake. Examples of these foods include:
 - fruits such as watermelon, oranges, grapefruit, & apples
 - lettuce and broccoli
 - and cottage cheese and yogurt

VII. Some tips to help you increase fluid intake include:

It can seem overwhelming at times to think about consuming 6 to 8 glasses of fluids per day. Some tips to help you increase your fluid intake include:

- Take breaks throughout the day to drink a beverage
- Have a glass of fluid with each meal and with snacks
- Have a glass of fluid next to your favorite chair or where you sit most often
- Take a sip of water when you pass a drinking fountain

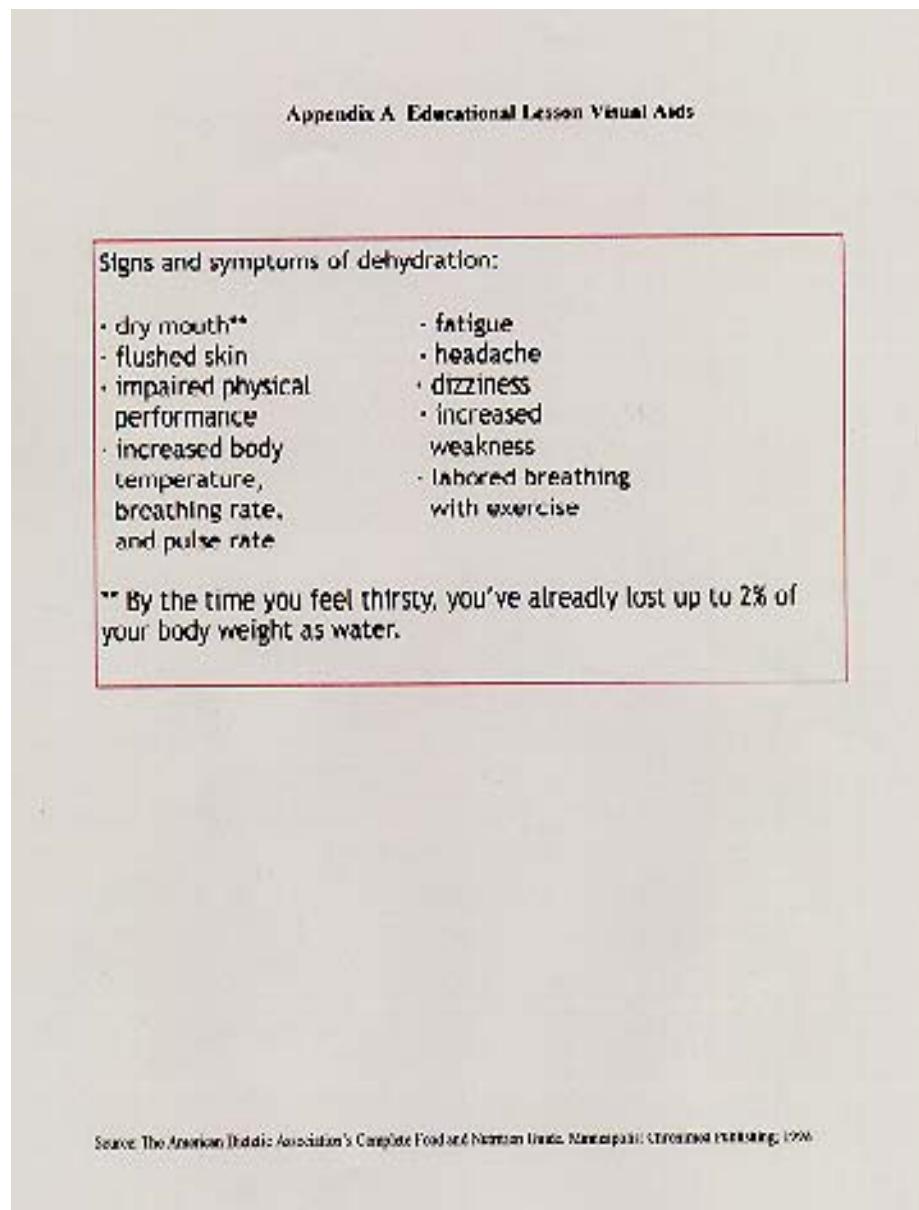
VIII. Times when additional fluid is needed by the body.

- There are times when additional fluid is needed by the body. These times include:
 - very hot or cold weather-your body needs more water to maintain normal body temperature
 - during times of illness when you're sick with fever, diarrhea, nausea, and/or vomiting which cause increased fluid loss

Do you have any questions?

Appendix A Lesson Plan Script continued

Evaluation: The knowledge quiz and food frequency questionnaire will be administered two-weeks following the education to determine changes in knowledge of fluids and intake of fluid.



Note. This picture has been reduced. Original version was on 8 1/2 x 11" paper.

Appendix A Educational Lesson Visual Aids

Beverage Suggestions		
• Water		• Juice
• Milkshakes		• Milk
• Carbonated water		• Lemonade
• Decaffeinated coffee or tea		• Hot cider
• Decaffeinated sodas such as Sprite or 7-Up		
• Juice drinks such as Crystal Light or Kool-Aid		
• Nutritional supplement drinks (e.g. Ensure, NuBasics)		
** For more flavor, try adding a slice of lemon or a sprig of mint to your water.		
Foods that can also be counted toward daily fluid intake:		
♦ ice cream	♦ jell-o	♦ broth based soup
♦ popsicles	♦ Italian ice	

Foods with a high water content can also contribute to total daily fluid intake. Some examples are:

- fruits such as watermelon, oranges, grapefruit, & apples
- lettuce and broccoli
- cottage cheese and yogurt

Note. This picture has been reduced. Original version was on 8 1/2 x 11" paper.

Appendix A Educational Lesson Visual Aids

Caffeine Content of Selected Beverages**	
<u>Item</u>	<u>Caffeine Range</u>
Coffee	
• Brewed:	
drip	110-150 mg
percolated	40-70 mg
decaffeinated	2-5 mg
• Instant:	
freeze dried	40-108 mg
decaffeinated	2-3 mg
Tea (bags or loose)	
• 1 minute brew	9-33 mg
• 3 minute brew	20-46 mg
• 5 minute brew	20-50 mg
Soda	
• Mountain Dew, Mello Yello	52-55 mg
• Coca-Cola, Dr. Pepper	40-48 mg
• Pepsi	37-38 mg
• Diet Coke	40-46 mg

Adapted from: Pronsky SM. Food Medication Interactions 11th Ed., Birchrunville, PA: Food-Medication Interactions.

**For most healthy adults, a moderate caffeine intake of 200-300 mg per day poses no physical problems. If you have any medical problems, you should talk with your physician for guidelines on caffeine consumption.

Note. This picture has been reduced. Original version was on 8 1/2 x 11" paper.

APPENDIX B

INSTRUMENTS

- Pre/Post assessment Form
- MMSE Score Report Form
- Assessment Form Pilot Testing Questionnaire

Appendix B Pre/Post Assessment Form continued**B. Food Frequency Questionnaire**

Beverages	Medium Serving	How Often?					Your Serving Size	
		Day	Week	Month	Year	Rarely /never		S
orange juice or grapefruit juice	4 oz. glass							
cranberry juice or apple juice	4 oz. glass							
tomato juice	4 oz. glass							
other fruit juices/fortified drinks	4 oz. glass							
Tang, Start breakfast drinks	6 oz. glass							
V-8 juice or tomato juice	8 oz.							
lemonade/Kool Aid	8 oz.							
whole milk & beverages made with whole milk	8 oz.							
2% milk & beverages made with 2% milk	8 oz.							
skim milk, 1% milk, or buttermilk	8 oz.							
milk in coffee or tea	1 T.							
cream or half & half in coffee or tea	1 T.							
milkshake	8 oz.							
caffeine containing regular soft drinks	12 oz. can							
Rarely /never								
L								
coffee, not decaffeinated	1 medium cup							
decaffeinated coffee	1 medium cup							
hot tea	1 medium cup							
iced tea	8 oz. glass							
herbal tea	1 medium cup							
hot cider	1 medium cup							
hot chocolate	1 medium cup							
liquid nutritional supplement drinks (Ensure, NuBasics)	8 oz. can							
beer	12 oz.							
wine	5 oz.							
liquor/spirits	1.5 oz.							

Appendix B Pre/Post Assessment Form Continued

Foods	Medium Serving	How Often?				Rarely /never	Your Serving Size
		Day	Week	Month	Year		
M L							
ice cream	1/2 c.						
popsicles	2 fl. oz. bar (single pop)						
jell-o	1/2 c.						
sherbet	1/2 c.						
sorbet/flavored ice	1/2 c.						

*Adapted from the G. Block Food Frequency Questionnaire. Portions sizes based on the Exchange Lists for Meal Planning by the American Diabetes Association and The American Dietetic Association, 1995; and Bowes & Church's Food Values of Portions Commonly Used, 1994.

Assessment of Physical Indicators

Indicators	Categories		
skin turgor on forehead	falls back immediately	slow	remains
tongue dryness	moist	wet	dry
longitudinal furrows on tongue	none	some	many
mucous membranes of mouth	moist	somewhat dry	very dry
pulse rate/minute: _____	normal (60-100 bpm)	Elevated (>100)	below normal (<60)

* Adapted from: Gross CR, Lindquist RD, Woolley AC, Granieri R, Allard K, & Webster B. Clinical Indicators of Dehydration Severity in Elderly Patients. *Journal of Emergency Medicine*. 1992; 10:267-274.

D. Knowledge Quiz

- True or False Beverages containing caffeine can be counted towards your total daily fluid intake.
- Name three functions of water in the body. (List up to three things water does in your body.)
 - _____
 - _____
 - _____
- How many 8 oz. glasses of fluids do older adults need to consume on a daily basis?
 - 3-5 glasses
 - 6-8 glasses
 - 9-11 glasses
 - 12 or more glasses
- True or False In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.
- True or False A good early indicator that I need to increase my fluid intake is feeling thirsty.

Appendix B Pre/Post Assessment Form continued**Additional questions for the post-test assessment**

What changes have you noted in your health since I last visited you?

What changes have occurred in your daily activities since I last visited you?

What changes have occurred in your family and social situation since I last visited you?

Comments:

Appendix B MMSE Score Report Form

Name: _____

Date: _____

Your score on the mental test that I gave you was _____ which is within normal range.

Name: _____

Date: _____

Your score on the mental test I gave you was _____ out of 30. You may want to discuss this score with your physician. Please tell your physician the name of the memory test was the Folstein Mini Mental Status Exam.

Appendix B Assessment Form Pilot Testing Questionnaire for Review By Professionals

1. Were there any questions in the assessment that you feel are not pertinent to the study? yes or no

If yes, please list the questions _____

2. Was the phrasing of the questions easy to understand? yes or no

If no, please list the questions that were difficult to understand _____

3. Were there any words that were difficult to understand? yes or no

If yes, please list the words _____

4. Do you feel the order of events of the assessment form was appropriate? yes or no

If no, please list suggestions _____

5. Please list any concerns you have regarding the assessment form and the process of administering the assessment. _____

6. Please list any comments or suggestions you have for the assessment form and the process of administering assessment _____

Brochure Questionnaire

1. Were there any parts of the brochure that were difficult to understand? yes or no

If yes, please list the parts _____

2. Were there any parts of the brochure that were difficult to read? yes or no

If yes, please list the parts _____

3. Please list any suggestions or comments you have regarding the content of the brochure. _____

4. Is the brochure clearly legible? yes or no

If no, please list suggestions _____

5. Do you feel the graphics, spacing, and coloring of the brochure are appropriate? yes or no

Please list any comments or suggestions _____

6. Please list any additional comments or suggestions you have on the brochure.

Thank you for taking the time to evaluate the assessment process and the brochure for my study.

APPENDIX C

CONSENT FORMS

- Thesis Consent Form
- Assessment Form Pilot Testing Consent Form
- Assessment Form Pilot Testing Questionnaire
- MMSE Pilot Testing Consent Form
- Brochure Pilot Testing Consent and Questionnaire
- Educational Lesson Pilot Testing Consent Form & Questionnaire

Appendix C Thesis Consent Form

My name is Lesley Paskvan and I am a graduate student in the Food and Nutritional Sciences program at University of Wisconsin-Stout. I am conducting a research project to determine the best approach to use to educate adults over age 60 about hydration and fluids. I would appreciate your participation in this study. It is not anticipated that this study will present any medical or social risk to you. The information gathered will be kept strictly confidential and any reports or findings will not contain your name or any other identifying information.

Your participation in this project is completely voluntary. If at any time you wish to stop participating in this research, you may do so without coercion or prejudice.

Questions or concerns about participation in the research or subsequent complaints should be addressed first to Lesley Paskvan at (715) 831-0069 and second to Dr. Ted Knous, Chair, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI, 54751, phone (715) 232-1126.

By signing below, I hereby give my informed consent to be a participant in this research study.

Signature _____ Date _____

Appendix C Assessment Form Pilot Testing Consent Form

My name is Lesley Paskvan and I am a graduate student in the Food and Nutritional Sciences program at University of Wisconsin-Stout. I am working on a research project to determine the best approach to use to educate adults over age 60 about hydration status and fluids. I have developed an assessment form to be used in the study. I am asking for volunteers to let me practice the administration of the assessment and to test the usability of the form. Your specific responses to each item will not be reported anywhere, only the findings related to the administration of the assessment (e.g. length of time, phrasing, format of form, etc.) will be reported. By completing this assessment form, you will be giving your informed consent to be a participant in the pilot study. This study will not present any medical or social risk to you. The information gathered will be kept confidential and any reports or findings will not contain your name or any other identifying information.

Your participation in this study is completely voluntary. If at anytime you wish to stop participating in this research, you may do so without coercion or prejudice.

Questions or concerns about participation in the research or subsequent complaints should be addressed first to Lesley Paskvan at (715) 235-1766 and second to Dr. Ted Knous, Chair, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI 54751, phone (715) 232-1126.

Thank you for your participation in this research.

Appendix C MMSE Pilot Testing Consent Form

My name is Lesley Paskvan and I am a graduate student in the Food and Nutritional Sciences program at the University of Wisconsin-Stout. I am conducting a research project to determine the best approach to use to educate elderly about hydration status. One part of my study involves conducting a mini mental status examination. To practice administering this examination, I am asking for volunteers to let me administer the exam to them. Your specific responses to each item will not be reported anywhere, only the findings related to administering the test (e.g. length of time, phrasing, etc.) will be reported. By completing the mini mental status examination, you will be giving your informed consent to participate in this pilot study. This study will not present any medical or social risk to you. The information gathered will be kept confidential and any reports or findings will not contain your name or any other identifying information.

Your participation in this project is completely voluntary. If at any time you wish to stop participating in this research, you may do so without coercion or prejudice.

Questions or concerns about participation in the pilot study or subsequent complaints should be addressed first to Lesley Paskvan at (715) 235-1766 and second to Dr. Ted Knous, Chair, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI 54751, phone (715) 232-1126.

Thank you for your participation in this pilot study.

Appendix C Brochure Pilot Testing Consent Form & Questionnaire

My name is Lesley Paskvan and I am a graduate student in the Food and Nutritional Sciences program at the University of Wisconsin-Stout. I am conducting a research project to determine the best approach to use to educate adults over age 60 about hydration status. I've developed a brochure about hydration and fluids and would like comments regarding the brochure. I am asking for volunteers to read the brochure and complete a questionnaire about the brochure. By returning this questionnaire, you will be giving your informed consent to participate in this pilot study. This study will not present any medical or social risk to you. The information gathered will be kept confidential and any reports or findings will not contain your name or any other identifying information.

Your participation in this project is completely voluntary. If at any time you wish to stop participating in this research, you may do so without coercion or prejudice. You may keep a copy of the brochure after filling out the questionnaire and making comments on a brochure.

Questions or concerns about participation in the pilot study or subsequent complaints should be addressed first to Lesley Paskvan at (715)235-1766 and second to Dr. Ted Knous, Chair, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI, 54751, phone (715) 232-1126. Thank you for your participation in this pilot study.

Please fill out the following questionnaire and feel free to make comments and write on the brochure.

- | |
|---|
| 1. Age: _____ |
| 2. Gender: Male Female |
| 3. Level of education: _____ less than 12 th grade
_____ high school diploma/GED
_____ some college
_____ completed college |
| 4. Do you live alone _____ or with someone _____? If you live with someone, what is your relationship to that person? _____ |
| 5. Please circle any words in the brochure you did not understand. |
| 6. How long did it take you to read the brochure? _____ minutes |
| 7. Were there any parts of the brochure that were difficult to understand? Yes No
If yes, please list here or mark in the brochure. |
| 8. Were there any parts of the brochure that were difficult to read? Yes No
If yes, please list here or mark in the brochure |
| 9. Please list any positive points of this brochure. |
| 10. Please list any concerns you have about this brochure. |

Appendix C Educational Lesson Pilot Testing Consent Form & Questionnaire

My name is Lesley Paskvan and I am a graduate student in the Food and Nutritional Sciences program at University of Wisconsin-Stout. I am working on a research project to determine the best approach to use to educate elderly about hydration status. I have developed a counseling session to be used in the study. I am asking for volunteers to let me practice the administration of the counseling. Only the findings related to the administration of the counseling (e.g. length of time, phrasing, format, understandability, etc.) will be reported. By participating in this counseling session, you will be giving your informed consent to be a participant in the pilot study. This study will not present any medical or social risk to you. The information gathered will be kept confidential and any reports or findings will not contain your name or any other identifying information.

Your participation in this study is completely voluntary. If at anytime you wish to stop participating in this research, you may do so without coercion or prejudice.

Questions or concerns about participation in the research or subsequent complaints should be addressed first to Lesley Paskvan at (715) 235-1766 and second to Dr. Ted Knous, Chair, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI 54751, phone (715) 232-1126.

Thank you for your participation in this research.

1. Age: _____

2. Level of Education: less than 12th grade
 high school diploma, GED
 some college
 completed college

3. Do you live alone or with someone ? If you live with someone, what is your relationship to that person? _____

APPENDIX D**DATA ANALYSIS GUIDES**

- Categories for Medical Conditions
- Categories for Medications

Appendix D Categories For Medical Conditions

Cardiovascular = 1

- heart condition
- HTN
- High cholesterol

Respiratory = 2

- sleep apnea - breathing problems
- SOB - bronchitis
- lung disease.

Skeletal = 3

- back problems
- TKR
- arthritis
- degenerative bone disease
- lame leg

Nervous = 4

- stroke
- tremor
- headache
- toe numbness
- head tumor

Metabolic = 5

- diabetes
- thyroid

Vision/Sensory = 6

- glaucoma - cataracts
- eye problems
- macular degeneration
- allergies

Gastrointestinal = 7

- ulcer
- Zenker's diverticulum
- diverticulosis
- stomach problems

Cancer = 8

- skin cancer
- lymphoma
- breast cancer
- history of prostate cancer

Muscular = 9

- PMR
- fibromyalgia

Urinary = 10

- kidney stone
- incontinence
- benign prostate

Appendix D Categories of Medications

Antidepressant = 1

- Paxil
- Doxepin
- Wellbutrin
- Prozac
- Nortriptyline
- Zoloft
- Amitryptiline
- Remeron

Antihypertensive = 2

- Diovan - Diltiazem
- Sular - Verapamil
- Propanolol - Covera hs
- Plendil
- Cardura
- Toprol
- Prinivil
- Procardia
- Vasotec
- Zestril
- Enalapril
- Metoprolol
- Cozaar
- Mavik
- Atenolol

NSAID/Analgesic = 3

- Lodine
- Ecotrin
- Ibuprofen
- Aspirin
- Celebrex
- Hydrocodone
- Tylenol
- Darvocet
- Duragesic

Anticonvulsant/Antipanic/Antianxiety = 4

- Clonazepam
- Alprazolam
- Neurontin
- Carbamazepam
- Depakote
- Lorazepam

Antihyperlipidemic = 5

- Lescol
- Lipitor
- Gemfibrozil

Antiulcer = 6

- Prilosec
- Prevacid
- Ranitidine

Bronchodilator/Antiasthma = 7

- Slobid - Flovent
- Albuterol - Serevent
- Combivent - Pulmicort

Thyroid Hormone = 8

- Levothyroid
- Synthroid
- Thyroid
- Levotab

Antiosteoporosis = 9

- Fosamax
- Calcitonin

Antiparkinson = 10

- Sinemet
- Amantidine
- Carbidopa

Bladder Control = 11

- Oxybutynin
- Detrol

Oral Hypoglycemia/Antidiabetic = 12 Cardiotonic/Antiarrhythmic/Antianginal = 13

- Glucotrol
- Glyburide
- Micronase
- Insulin
- Lanoxin
- Digitek
- Adalat

Anticoagulant/Platelet Aggregate Inhibitor = 14

- Warfarin
- Plavix

Antialzheimer's = 15

- Aricept

Antihistamine = 16

- Claritin

Antianemic = 17

- Ferrous sulfate
- Allegra

Appendix D continuedCorticosteroid = 18

- Prednisone
- Triamcin
- Rhinocort

Antineoplastic/Antiarthritic = 19

- Methotrexate

Antimalarial = 20

- Quinine

Smoking Deterrent = 21

- Nicotrol

Vitamin/Mineral/Herbal Supplements = 22

- Vitamin D
- Tums/Calcium
- Multivitamin
- Vitamin E
- Vitamin C
- Saw Palmetto
- Hawthorne Berry

Hormonal = 23

- Premarin

Antihypotensive = 24

- Proamatine

Diuretic = 25

- Bumetamide
- HCTZ
- Furosemide
- Triamterene

Laxatives = 26

- MOM
- Docusate Sodium
- Colace
- Metamucil

>than 1 category of med. used = 27

APPENDIX E

CASE PROFILES

CASE PROFILES**Subject # 1****Method:** Brochure

Variable	Variable
Age	90
Level of Education	<12 th grade
Number of Medical Conditions	1
Uses Laxatives	yes
Gender	female
Length of Time on Nutrition Program	<6 months
Number of Medications	9
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	yes	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	5	5
Total Fluid Intake (oz./day)	79.7	51.6	Caffeinated Beverage Intake (oz./day)	3.4	0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	88	88	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	28	29			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	2
2. Name three functions of water in the body.		
a.	1	1
b.	2	1
c.	2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	4	5

Subject # 2		Method: Brochure			
Variable		Variable			
Age	88	Gender		female	
Level of Education	some college	Length of Time on Nutrition Program		<6 months	
Number of Medical Conditions	3	Number of Medications		3	
Uses Laxatives	no	Uses Diuretics		no	

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	4	6
Total Fluid Intake (oz./day)	54.0	61.0	Caffeinated Beverage Intake (oz./day)	0	0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	2	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	80	68	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	26	26			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	1	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	1
• Total Score (out of possible 7 points)	5	6

Subject # 3		Method: Brochure			
Variable		Variable			
Age	94	Gender		female	
Level of Education	completed college	Length of Time on Nutrition Program		<6 months	
Number of Medical Conditions	2	Number of Medications		4	
Uses Laxatives	yes	Uses Diuretics		no	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	yes	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	6	6
Total Fluid Intake (oz./day)	31.3	44.3	Caffeinated Beverage Intake (oz./day)	3.9	9.2
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	2	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	2	1
Pulse Rate/Minute	68	64	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	24	25			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				2	2
b.				2	2
c.				2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?				1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more					
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				1	2
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				2	1

Subject # 4		Method: Brochure			
Variable		Variable			
Age	83	Gender		female	
Level of Education	high school diploma/GED	Length of Time on Nutrition Program		<6 months	
Number of Medical Conditions	0	Number of Medications		0	
Uses Laxatives	no	Uses Diuretics		no	

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	2	2
Total Fluid Intake (oz./day)	72.5	77.4	Caffeinated Beverage Intake (oz./day)	.8	1.2
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	64	72	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	24	26			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	2
c.	1	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	2	2
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	4	2

Subject # 5		Method: Educational Lesson			
Variable		Variable			
Age	82	Gender		female	
Level of Education	high school diploma/GED	Length of Time on Nutrition Program		<6 months	
Number of Medical Conditions	2	Number of Medications		4	
Uses Laxatives	no	Uses Diuretics		yes	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	yes	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	2	4
Total Fluid Intake (oz./day)	77.2	61.8	Caffeinated Beverage Intake (oz./day)	0	0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	62	70	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	26			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				1	1
b.				1	1
c.				2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?					
a. 3-5 b. 6-8 c. 9-11 d. 12 or more				2	2
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				3	3

Subject # 6		Method: Brochure			
Variable		Variable			
Age		Gender		female	
Level of Education	some college	Length of Time on Nutrition Program		<6 months	
Number of Medical Conditions	3	Number of Medications		6	
Uses Laxatives	no	Uses Diuretics		yes	
Question		Pre	Post	Question	
Problems with constipation?		yes	no	Problems with urinary tract infections?	no
Dark color or strong odor to urine on a daily basis?		no	no	Experience the feeling of a dry mouth on a daily basis?	no
Do you limit your intake of fluids?		no	no	Level of Assistance Score (out of possible 7 points)	7
Total Fluid Intake (oz./day)	45.5	56.6		Caffeinated Beverage Intake (oz./day)	6.4
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1		Tongue Dryness (1= moist, 2= wet, 3= dry)	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1		Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1
Pulse Rate/Minute		80		Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1
Mini Mental Status Exam (out of possible 30 points)	28	30			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.				1	1
a.				1	1
b.				2	1
c.					
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?				1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more					
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				3	5

Subject # 7		Method: Brochure			
Variable		Variable			
Age	90	Gender		female	
Level of Education	high school diploma/GED	Length of Time on Nutrition Program		1-3 years	
Number of Medical Conditions	5	Number of Medications		8	
Uses Laxatives	no	Uses Diuretics		yes	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	8	8
Total Fluid Intake (oz./day)	78.1	77.4	Caffeinated Beverage Intake (oz./day)	6	6.4
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	60	90	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	24	28			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				2	1
b.				2	2
c.				2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?				1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more					
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				2	2
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	1
• Total Score (out of possible 7 points)				1	3

Subject # 8**Method: Brochure**

Variable		Variable	
Age	77	Gender	female
Level of Education	completed college	Length of Time on Nutrition Program	
Number of Medical Conditions	2	Number of Medications	7
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	5	4
Total Fluid Intake (oz./day)	69.4	58.0	Caffeinated Beverage Intake (oz./day)	2.0	2.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	80	70	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	29			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	2
2. Name three functions of water in the body.		
a.	1	1
b.	2	1
c.	2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	2
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	4	4

Subject # 9**Method:** Educational Lesson

Variable	Variable
Age	83
Level of Education	high school diploma/GED
Number of Medical Conditions	1
Uses Laxatives	yes
Gender	female
Length of Time on Nutrition Program	<6 months
Number of Medications	4
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	5	4
Total Fluid Intake (oz./day)	65.1	110.9	Caffeinated Beverage Intake (oz./day)	12	16.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	76	84	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	26	27			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	1	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	5	4

Subject # 10		Method: Brochure			
Variable		Variable			
Age	87	Gender		female	
Level of Education	less than 12 th grade	Length of Time on Nutrition Program		3-5 years	
Number of Medical Conditions	4	Number of Medications		6	
Uses Laxatives	no	Uses Diuretics		yes	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	yes	Level of Assistance Score (out of possible 7 points)	1	1
Total Fluid Intake (oz./day)	66.7	48.1	Caffeinated Beverage Intake (oz./day)	18	18
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	2	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	2
Pulse Rate/Minute	90	80	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	29	29			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	1
2. Name three functions of water in the body.					
a.				1	1
b.				2	1
c.				2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?					
a. 3-5 b. 6-8 c. 9-11 d. 12 or more				1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				3	5

Subject # 11		Method: Brochure			
Variable		Variable			
Age	88	Gender		female	
Level of Education	less than 12 th grade	Length of Time on Nutrition Program		6 months- 1 year	
Number of Medical Conditions	3	Number of Medications		1	
Uses Laxatives	no	Uses Diuretics		no	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	yes	Problems with urinary tract infections?	yes	yes
Dark color or strong odor to urine on a daily basis?	yes	yes	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	1	1
Total Fluid Intake (oz./day)	49.5	55.5	Caffeinated Beverage Intake (oz./day)	7.7	10.3
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	70	80	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	29			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				2	1
b.				1	2
c.				1	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?					
a. 3-5 b. 6-8 c. 9-11 d. 12 or more				2	2
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				3	2

Subject # 12**Method: Brochure**

Variable	Variable
Age	77
Level of Education	less than 12 th grade
Number of Medical Conditions	3
Uses Laxatives	no
Gender	female
Length of Time on Nutrition Program	1-3 years
Number of Medications	4
Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	0	0
Total Fluid Intake (oz./day)	107.4	110	Caffeinated Beverage Intake (oz./day)	1.7	18
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	54	52	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	3
Mini Mental Status Exam (out of possible 30 points)	28	29			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	1	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	5	5

Subject # 13		Method: Educational Lesson			
Variable		Variable		Variable	
Age	78	Gender		female	
Level of Education	high school diploma/GED	Length of Time on Nutrition Program			
Number of Medical Conditions	2	Number of Medications		6	
Uses Laxatives	no	Uses Diuretics		no	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	5	5
Total Fluid Intake (oz./day)	40.3	34.8	Caffeinated Beverage Intake (oz./day)	0	6.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	64	60	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	19	18			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				1	1
b.				1	2
c.				2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?				2	2
a. 3-5 b. 6-8 c. 9-11 d. 12 or more					
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				3	2

Subject # 14**Method: Brochure**

Variable	Variable
Age	71
Level of Education	some college
Number of Medical Conditions	2
Uses Laxatives	no
Gender	male
Length of Time on Nutrition Program	<6 months
Number of Medications	4
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	4	4
Total Fluid Intake (oz./day)	71.8	42.1	Caffeinated Beverage Intake (oz./day)	0	8.6
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	74	86	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	30			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	2	1
c.	1	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	2	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	1
• Total Score (out of possible 7 points)	3	6

Subject # 15**Method:** Educational Lesson

Variable	Variable
Age	78
Level of Education	less than 12 th grade
Number of Medical Conditions	2
Uses Laxatives	no
Gender	female
Length of Time on Nutrition Program	3-5 years
Number of Medications	2
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	1	1
Total Fluid Intake (oz./day)	82.5	70.0	Caffeinated Beverage Intake (oz./day)	6.0	3.4
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	62	68	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	29	27			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.		
a.	1	1
b.	1	2
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	4	4

Subject # 16**Method:** Educational Lesson

Variable	Variable
Age	72
Level of Education	high school diploma/GED
Number of Medical Conditions	2
Uses Laxatives	no
Gender	male
Length of Time on Nutrition Program	5 years or more
Number of Medications	3
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	yes
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	0	0
Total Fluid Intake (oz./day)	70.3	100.8	Caffeinated Beverage Intake (oz./day)	6.8	6.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	82	72	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	28	30			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	1	2
• Total Score (out of possible 7 points)	6	6

Subject # 17**Method: Brochure**

Variable	Variable
Age	80
Level of Education	high school diploma/GED
Number of Medical Conditions	1
Uses Laxatives	no
Gender	female
Length of Time on Nutrition Program	6 months-1 year
Number of Medications	1
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	yes
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	4	6
Total Fluid Intake (oz./day)	78.8	65.4	Caffeinated Beverage Intake (oz./day)	36.0	24.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	58	56	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	3
Mini Mental Status Exam (out of possible 30 points)	20 ¹	20			

Note.¹ Incomplete MMSE exam.

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.		
a.	2	1
b.	1	2
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	2
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	3	3

Subject # 18		Method: Brochure			
Variable		Variable			
Age	80	Gender		female	
Level of Education	high school diploma/GED	Length of Time on Nutrition Program		5 years or more	
Number of Medical Conditions	4	Number of Medications		3	
Uses Laxatives	no	Uses Diuretics		yes	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	5	4
Total Fluid Intake (oz./day)	62.8	68.8	Caffeinated Beverage Intake (oz./day)	24.4	30.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	64	64	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	28	29			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				1	1
b.				1	1
c.				2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?					
a. 3-5 b. 6-8 c. 9-11 d. 12 or more				1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				1	2
• Total Score (out of possible 7 points)				4	5

Subject # 19**Method:** Educational Lesson

Variable		Variable	
Age	100	Gender	female
Level of Education	some college	Length of Time on Nutrition Program	5 years or more
Number of Medical Conditions	3	Number of Medications	2
Uses Laxatives	no	Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	yes	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	4	4
Total Fluid Intake (oz./day)	54.0	53.1	Caffeinated Beverage Intake (oz./day)	6.0	.4
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	2	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	70	68	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	26	25			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	1
2. Name three functions of water in the body.		
a.	2	1
b.	2	2
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	2
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	1	2
• Total Score (out of possible 7 points)	2	3

Subject # 20**Method:** Educational Lesson

Variable	Variable
Age	63
Level of Education	high school diploma/GED
Number of Medical Conditions	1
Uses Laxatives	yes
Gender	female
Length of Time on Nutrition Program	6 months-1 year
Number of Medications	21
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	yes	Problems with urinary tract infections?	yes	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	8	9
Total Fluid Intake (oz./day)	256.9	161.8	Caffeinated Beverage Intake (oz./day)	75.0	25.6
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	60	64	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	29	30			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	1	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	5	5

Subject # 21**Method:** Educational Lesson

Variable	Variable		
Age	73	Gender	female
Level of Education	high school diploma/GED	Length of Time on Nutrition Program	5 years or more
Number of Medical Conditions	2	Number of Medications	11
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?		yes	Problems with urinary tract infections?		yes
Dark color or strong odor to urine on a daily basis?		no	Experience the feeling of a dry mouth on a daily basis?		yes
Do you limit your intake of fluids?		no	Level of Assistance Score (out of possible 7 points)	5	6
Total Fluid Intake (oz./day)	99.9	107.8	Caffeinated Beverage Intake (oz./day)	0	.4
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	70	84	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	28			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.		
a.	1	1
b.	2	1
c.	1	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	2
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	1	1
• Total Score (out of possible 7 points)	6	5

Subject # 22		Method: Educational Lesson			
Variable		Variable			
Age	81	Gender		female	
Level of Education	high school diploma/GED	Length of Time on Nutrition Program		5 years or more	
Number of Medical Conditions	1	Number of Medications		2	
Uses Laxatives	no	Uses Diuretics		no	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	0	0
Total Fluid Intake (oz./day)	68.9	52.5	Caffeinated Beverage Intake (oz./day)	12	12
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	74	84	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	29			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				1	2
2. Name three functions of water in the body.					
a.				2	1
b.				2	1
c.				1	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?				1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more					
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				2	2
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				1	2
• Total Score (out of possible 7 points)				4	4

Subject # 23

Variable			Method: Brochure		
Age	83		Gender	male	
Level of Education	high school diploma/GED		Length of Time on Nutrition Program	5 years or more	
Number of Medical Conditions	3		Number of Medications	3	
Uses Laxatives	no		Uses Diuretics	no	

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	1	1
Total Fluid Intake (oz./day)	49.0	61.9	Caffeinated Beverage Intake (oz./day)	0	.40
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	70	78	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	28	28			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.	1	1
a.	1	2
b.	1	2
c.		
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	6	4

Subject # 24**Method: Brochure**

Variable		Variable	
Age	86	Gender	female
Level of Education	some college	Length of Time on Nutrition Program	5 years or more
Number of Medical Conditions	2	Number of Medications	1
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	7	7
Total Fluid Intake (oz./day)	87.5	97.2	Caffeinated Beverage Intake (oz./day)	6.2	12.2
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	68	68	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27 ¹	27 ¹			

Note¹. Incomplete MMSE exams.

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	4	5

Subject # 25**Method: Educational Lesson**

Variable		Variable	
Age	77	Gender	male
Level of Education	completed college	Length of Time on Nutrition Program	5 years or more
Number of Medical Conditions	3	Number of Medications	3
Uses Laxatives	no	Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	yes	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	ye
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	1	1
Total Fluid Intake (oz./day)	61.1	82.1	Caffeinated Beverage Intake (oz./day)	24.4	25.7
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	2	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	54	70	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	1
Mini Mental Status Exam (out of possible 30 points)	29	30			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?		
a. 3-5 b. 6-8 c. 9-11 d. 12 or more	1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	4	4

Subject # 26		Method: Brochure			
Variable		Variable			
Age	76	Gender		female	
Level of Education	less than 12 th grade	Length of Time on Nutrition Program		<6 months	
Number of Medical Conditions	1	Number of Medications		2	
Uses Laxatives	2	Uses Diuretics		2	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	0	0
Total Fluid Intake (oz./day)	73.4	88.9	Caffeinated Beverage Intake (oz./day)	38.6	46.3
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	52	78	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	1
Mini Mental Status Exam (out of possible 30 points)	30	30			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				1	1
2. Name three functions of water in the body.					
a.				1	1
b.				2	1
c.				2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?					
a. 3-5 b. 6-8 c. 9-11 d. 12 or more				1	1
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				4	6

Subject # 27**Method:** Educational Lesson

Variable		Variable	
Age	86	Gender	female
Level of Education	high school diploma/GED	Length of Time on Nutrition Program	3-5 years
Number of Medical Conditions	5	Number of Medications	4
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	yes	Problems with urinary tract infections?	yes	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	2	5
Total Fluid Intake (oz./day)	96.1	85.7	Caffeinated Beverage Intake (oz./day)	7.7	7.7
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	56	58	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	3
Mini Mental Status Exam (out of possible 30 points)	30	30			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	3	5

Subject # 28**Method: Brochure**

Variable		Variable	
Age	81	Gender	female
Level of Education	high school diploma/GED	Length of Time on Nutrition Program	6 months-1 year
Number of Medical Conditions	3	Number of Medications	3
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	yes	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	0	0
Total Fluid Intake (oz./day)	63.7	66.9	Caffeinated Beverage Intake (oz./day)	9.0	13.5
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	64	72	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	29	29			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	1	2
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	3	3

Subject # 29**Method: Brochure**

Variable		Variable	
Age	89	Gender	female
Level of Education	high school diploma/GED	Length of Time on Nutrition Program	1-3 years
Number of Medical Conditions	3	Number of Medications	5
Uses Laxatives	no	Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	yes	no
Dark color or strong odor to urine on a daily basis?	yes	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	6	6
Total Fluid Intake (oz./day)	51.6	43.9	Caffeinated Beverage Intake (oz./day)	0	0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	56	56	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	3
Mini Mental Status Exam (out of possible 30 points)	28	27			

Knowledge Quiz Questions 1= correct 2= incorrect**Pre Post**

1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.

2 2

2. Name three functions of water in the body.

- a. 1 1
- b. 2 1
- c. 2 2

3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?

1 1

a. 3-5 b. 6-8 c. 9-11 d. 12 or more

4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.

1 1

5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.

2 2

- Total Score (out of possible 7 points)

3 4

Subject # 30		Method: Brochure			
Variable		Variable			
Age	70	Gender		female	
Level of Education	some college	Length of Time on Nutrition Program			
Number of Medical Conditions	1	Number of Medications		2	
Uses Laxatives	no	Uses Diuretics		no	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	0	0
Total Fluid Intake (oz./day)	49.6	64.9	Caffeinated Beverage Intake (oz./day)	1.7	.9
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	70	60	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	30	30			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				1	1
b.				1	1
c.				1	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?				1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more					
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	2
• Total Score (out of possible 7 points)				4	5

Subject # 31**Method: Educational Lesson**

Variable		Variable	
Age	87	Gender	female
Level of Education	some college	Length of Time on Nutrition Program	<6 months
Number of Medical Conditions	3	Number of Medications	8
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	yes	yes	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	1	1
Total Fluid Intake (oz./day)	94.2	43.9	Caffeinated Beverage Intake (oz./day)	12	18.2
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	50	54	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	3
Mini Mental Status Exam (out of possible 30 points)	29	29			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	1	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	2
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	5	4

Subject # 32

Variable			Method: Brochure
Age	87		Gender female
Level of Education	high school diploma/GED		Length of Time on Nutrition Program 1-3 years
Number of Medical Conditions	3		Number of Medications 3
Uses Laxatives	no		Uses Diuretics yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	1	3
Total Fluid Intake (oz./day)	79.0	33.0	Caffeinated Beverage Intake (oz./day)	6.0	2.6
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	2	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	58	58	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	3
Mini Mental Status Exam (out of possible 30 points)	25	28			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	1
b.	2	1
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	2	2
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	1	3

Subject # 33**Method: Brochure**

Variable		Variable	
Age	64	Gender	female
Level of Education	some college	Length of Time on Nutrition Program	
Number of Medical Conditions	5	Number of Medications	9
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	yes	yes	Experience the feeling of a dry mouth on a daily basis?	yes	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	2	2
Total Fluid Intake (oz./day)	126.8	122.4	Caffeinated Beverage Intake (oz./day)	0	0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute		72	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)		1
Mini Mental Status Exam (out of possible 30 points)	29	29			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	2	1
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	2	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	3	6

Subject # 34**Method:** Educational Lesson

Variable	Variable
Age	79
Level of Education	less than 12 th grade
Number of Medical Conditions	2
Uses Laxatives	no
Gender	female
Length of Time on Nutrition Program	5 years or more
Number of Medications	1
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	1	2
Total Fluid Intake (oz./day)	67.8	119.2	Caffeinated Beverage Intake (oz./day)	18.4	12.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	2	2	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	66	80	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	26			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	1
2. Name three functions of water in the body.		
a.	1	1
b.	1	1
c.	1	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	5	5

Subject # 35**Method: Educational Lesson**

Variable		Variable	
Age	85	Gender	female
Level of Education	some college	Length of Time on Nutrition Program	
Number of Medical Conditions	3	Number of Medications	5
Uses Laxatives	no	Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	2	1
Total Fluid Intake (oz./day)	60.9	69.4	Caffeinated Beverage Intake (oz./day)	0	0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute		70	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	29	30			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	1
2. Name three functions of water in the body.		
a.	1	1
b.	1	2
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	1	2
• Total Score (out of possible 7 points)	5	4

Subject # 36

Variable			Method: Educational Lesson		
Age	87		Gender	male	
Level of Education	high school diploma/GED		Length of Time on Nutrition Program	3-5 years	
Number of Medical Conditions	2		Number of Medications	4	
Uses Laxatives	no		Uses Diuretics	no	

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	4	5
Total Fluid Intake (oz./day)	37.4	45.4	Caffeinated Beverage Intake (oz./day)	0	0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	66	72	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	27	27			

Knowledge Quiz Questions 1= correct 2= incorrect**Pre Post**

1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.

2. Name three functions of water in the body.

- a. 1
- b. 2
- c. 2

3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?

- a. 3-5 b. 6-8 c. 9-11 d. 12 or more

4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.

1 1

5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.

- Total Score (out of possible 7 points) 2 2

Subject # 37**Method:** Educational Lesson

Variable	Variable
Age	63
Level of Education	completed college
Number of Medical Conditions	3
Uses Laxatives	yes
Gender	female
Length of Time on Nutrition Program	<6 months
Number of Medications	8
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	yes	yes
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	no	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	7	7
Total Fluid Intake (oz./day)	85.1	86.6	Caffeinated Beverage Intake (oz./day)	24.0	18.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	2	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	76	88	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	28	29			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	2
b.	1	1
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	2	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	1	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	3	3

Subject # 38**Method:** Educational Lesson

Variable	Variable
Age	74
Level of Education	some college
Number of Medical Conditions	2
Uses Laxatives	yes
Gender	female
Length of Time on Nutrition Program	5 years or more
Number of Medications	12
Uses Diuretics	no

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	yes	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	yes	yes	Level of Assistance Score (out of possible 7 points)	7	7
Total Fluid Intake (oz./day)	112.1	93.4	Caffeinated Beverage Intake (oz./day)	27.0	24.2
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	2	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	3	3
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	2	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	56	60	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	1
Mini Mental Status Exam (out of possible 30 points)	26	27			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	2	2
2. Name three functions of water in the body.		
a.	1	2
b.	1	2
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	3	2

Subject # 39**Method: Brochure**

Variable	Variable
Age	70
Level of Education	less than 12 th grade
Number of Medical Conditions	2
Uses Laxatives	no
Gender	female
Length of Time on Nutrition Program	5 years or more
Number of Medications	3
Uses Diuretics	yes

Question	Pre	Post	Question	Pre	Post
Problems with constipation?	no	no	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	yes	no	Experience the feeling of a dry mouth on a daily basis?	no	no
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	0	0
Total Fluid Intake (oz./day)	143.7	147.4	Caffeinated Beverage Intake (oz./day)	6.9	3.4
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	2	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	60	64	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	1	1
Mini Mental Status Exam (out of possible 30 points)	26	27			

Knowledge Quiz Questions 1= correct 2= incorrect	Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.	1	1
2. Name three functions of water in the body.		
a.	1	1
b.	2	2
c.	2	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?	1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more		
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.	2	2
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.	2	2
• Total Score (out of possible 7 points)	3	3

Subject # 40		Method: Educational Lesson			
Variable		Variable			
Age	82	Gender		female	
Level of Education	completed college	Length of Time on Nutrition Program		5 years or more	
Number of Medical Conditions	5	Number of Medications		7	
Uses Laxatives	no	Uses Diuretics		yes	
Question	Pre	Post	Question	Pre	Post
Problems with constipation?	yes	yes	Problems with urinary tract infections?	no	no
Dark color or strong odor to urine on a daily basis?	no	no	Experience the feeling of a dry mouth on a daily basis?	yes	yes
Do you limit your intake of fluids?	no	no	Level of Assistance Score (out of possible 7 points)	4	3
Total Fluid Intake (oz./day)	73.5	116.0	Caffeinated Beverage Intake (oz./day)	12.0	27.0
Skin Turgor (1= falls back immediately, 2= slow, 3= remains)	1	1	Tongue Dryness (1= moist, 2= wet, 3= dry)	1	1
Longitudinal Tongue Furrows (1= none, 2= some, 3= many)	1	1	Mucous Membranes of the Mouth (1= moist, 2= somewhat dry, 3= very dry)	1	1
Pulse Rate/Minute	56	62	Category of Pulse Rate (1= normal, 2= elevated, 3= below normal)	3	1
Mini Mental Status Exam (out of possible 30 points)	30	30			
Knowledge Quiz Questions 1= correct 2= incorrect				Pre	Post
1. T or F Beverages containing caffeine can be counted towards your total daily fluid intake.				2	2
2. Name three functions of water in the body.					
a.				1	1
b.				1	1
c.				1	2
3. How many 8oz. glasses of fluids do older adults need to consume on a daily basis?				1	1
a. 3-5 b. 6-8 c. 9-11 d. 12 or more					
4. T or F In addition to fluids, foods such as jell-o and ice cream can be counted towards your total daily fluid intake.				2	1
5. T or F A good early indicator that I need to increase my fluid intake is feeling thirsty.				2	1
• Total Score (out of possible 7 points)				4	5