



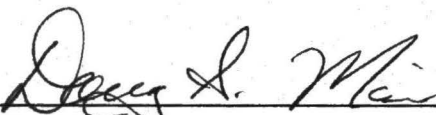
Lane, Bridget M., Enhancing the nutritional status of an older population: an educational intervention to improve the nutrition knowledge of persons over 60 living in a rural Texas community. Master of Public Health (Health Administration), May, 2002, 61 pp., 8 tables, references, 41 titles.

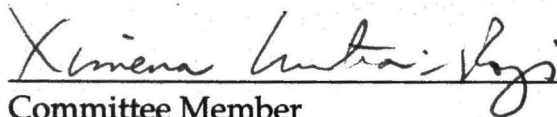
A four session nutrition education promotion program was developed and implemented for a group of seniors in a rural Texas community to enhance the nutritional status of persons over 60 through educational intervention to improve nutrition knowledge. Nutrition knowledge was measured using pre-tests and post-tests (before and after short-term nutrition education). No statistically significant differences were observed between pre/post test results, although there was a directional improvement in several aspects of test performance. Nutrition education programs that can effectively translate healthy dietary recommendations into understandable concepts can result in improvements in nutrition knowledge, and possibly have a positive influence on dietary behaviors and health markers.

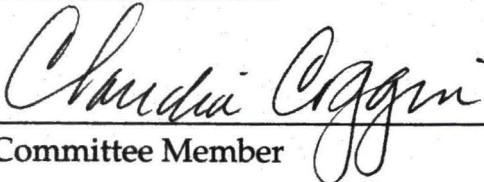
ENHANCING THE NUTRITIONAL STATUS OF AN OLDER
POPULATION: AN EDUCATIONAL INTERVENTION TO
IMPROVE THE NUTRITION KNOWLEDGE OF
PERSONS OVER 60 LIVING IN A
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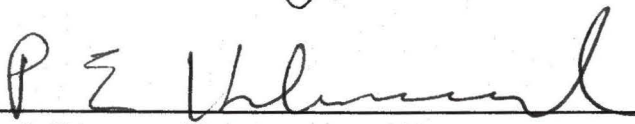
Bridget M. Lane, M.S., R.D.


APPROVED:


Major Professor


Committee Member


Committee Member


Track Director/Department Chair


Dean, School of Public Health

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THESIS

Presented to the School of Public Health
University of North Texas
Health Science Center at Fort Worth
In Partial Fulfillment of the Requirements

For the Degree of

Master of Public Health

By

Bridget Lane, M.S., R.D.

Fort Worth, Texas

May, 2002

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CHAPTER I

INTRODUCTION

As the American population grows older, providing health-promoting programs designed to help the elderly improve their quality of life becomes increasingly important. The segment of the U.S. population over sixty numbers nearly forty-five million (U.S. Census 1999). Seniors comprise the fastest growing age group in the U.S. and will increase in numbers to seventy million by 2030 (20% of the population) as the baby boomers age (Keister & Blixen, 1998). By the year 2000, those aged seventy-five and older are predicted to constitute one-half of the elderly population (Fischer, Crockett, Heller, and Skauge, 1991) and are rapidly becoming one of the largest groups utilizing medical care (U.S. Senate Committee on Aging). The World Health Organization classifies persons who are 60 to 75 years of age as elderly. Those persons aged 76 to 90 are classified as old, and those over 90 years of age are referred to as very old (Spence, A. 1995). This demographic trend presents serious economic challenges for the health care system as well as implications for community health professionals. According to Fischer et al (1991), it is extremely important to encourage activities that promote health and help seniors achieve and maintain

optimal health in order to alleviate the increased demand for health care and social services

Throughout the lifecycle, and especially during the aging process, good nutrition plays an essential role in the prevention and treatment of disease (e.g. cardiovascular disease), reducing diet-related complications, and enhancing quality of life. To assist in this preventive measure, it is essential that persons over the age of sixty are well informed about the importance and benefits associated with medical nutrition therapy and the role nutrition plays in their health. Increasing amounts of public funds are spent annually on the medical care of the hospitalized older adult. Providing medical nutrition therapy has been shown an effective and cost-saving intervention to help manage disease (Position Paper ADA, 1995). In addition, maintaining a healthy nutritional status in older adults benefits both the individual and community. According to Shellman (2000) it has been shown that health screening programs can help to reduce public health costs. When health is improved, dependence is decreased, illness recuperation time is reduced, and health care utilization is contained (Position Paper ADA, 1995; Gallagher-Allred, Voss, Finn, McCamish, 1996).

Fischer et al (1991) noted that appropriate nutrition education should be targeted to this rapidly growing segment of the population including special attention given to seniors residing in rural America. Fischer also recognized that 75-85 year old individuals have different nutrition attitudes, knowledge, and

practices than seniors aged 60-70 years old. Seniors need to be encouraged to make changes in eating habits and are receptive to making moderate dietary changes, especially in order to help control or prevent chronic diseases (Crockett, 1991). If the needs of older seniors are to be met, appropriate nutrition education programs should first identify and characterize their needs. Implementing community-based health promotion programs becomes increasingly important in enabling health professionals to improve the quality of life for the quickly growing older adult population (Shellman, 2000).

Background

Community intervention was used to screen for coronary heart disease risk among a group of seniors in a rural Texas community. A screening for coronary heart disease was completed for this elderly population during a general practice health-screening program (health fair). The Community Care Coordination Program was designed as a medical-social model to meet the needs of senior patients and their respective caregivers at the Osteopathic Health Clinic owned by the Osteopathic Health System of Texas, located in a rural community in Tarrant County. This model was designed to promote wellness and individual independence and prevent further health deterioration for elderly patients of the clinic and those seniors living in the rural community. All active clinic patients

(aged 59-91 years) visiting the clinic during the previous two years since the clinic's inception were contacted via a letter of introduction from the clinic physician. The patients were asked to complete a nutritional risk assessment questionnaire, a medication questionnaire, and a health assessment. They were asked to return the completed information within a designated time-frame of two weeks. The clinic nurse recorded blood pressure, weight, height, and laboratory measurements for forty-four of the 145 (32.9% response rate) eligible patients who returned the survey.

Significance of the Problem

The results of the screening found a 59% prevalence of hypertension, which is higher than estimates based on the 1988 through 1991 National Health and Nutrition Examination Survey (NHANES III) which indicate that approximately 50 million or about 25% of adults in the United States have hypertension (Coustasse, 1999). Sixty-one percent (61%) of the population had a total cholesterol value greater than the American Heart Association's guidelines of 200mg/dl. The BMI average was 30.7. Female prevalence of overweight, obesity, and morbidity was 15%, 48%, and 5% respectively. Coustasse (1999) notes that secondary and tertiary prevention should be strongly recommended in

this community including education programs targeting better eating habits, cholesterol, overweight, and hypertension.

The rural Texas community was targeted for a nutrition education intervention after it was found that this community was at risk for coronary heart disease (Coustasse et al, 1999). Assessing the nutrition knowledge of this older population also helped determine the need for future education intervention with a focus on health promotion and disease prevention.

Research Design and Methodology

A measurable decrease in the prevalence and incidence of cardiovascular disease mortality would be the ultimate endpoint of a nutrition education program such as this, but would require several years of follow-up. This research focused on the first step in this process; comparing the relationship between before and after short-term knowledge of nutrition.

The hypothesis of this study was "Attendance at four nutrition education classes will increase knowledge regarding nutrition for the older adult." The goal for this program was to improve the nutritional status of senior citizens from the rural Texas community by providing nutrition education classes. Specific objectives included 1) participants increasing their nutrition knowledge from pre-test to post-test by at least ten percent, and 2) at least 50 percent of

participants responding correctly to at least 50 percent of the post-test questions. Intervention objectives were to identify the nutritional knowledge of a group of older persons in a rural community before and after short-term nutrition education and increase the awareness of how dietary changes can improve risk factors attributable to cardiovascular disease and obesity.

Knowledge of nutrition was measured using the pre-test and post-test (before and after short-term nutrition education). Since this is a binomial test design (true/false) with a different n in two of the four pre/post tests, an arcsin angle conversion was necessary to more accurately convert the percent questions answered correctly into a more meaningful (and conservative) value suitable for comparative analysis. Analysis of variance (ANOVA) testing was then conducted using pre/post test results within each class to determine if there was a significant improvement, or decline, in test performance. A significance level was set at 0.05. There were six true/false questions for classes I, II, III, and seven true/false questions for Class IV.

A registered, licensed dietitian, who also is a graduate student at University of North Texas Health Science Center School of Public Health, developed the test questions. In addition, a medical doctor, along with a social worker specializing in gerontology provided assistance in question development.

Subjects were included on the basis of: 1) living in the targeted rural community, and 2) attending activities at the local senior citizen center in the

rural community. All persons attending the senior citizen center at the time the nutrition classes were presented were invited to participate. Pre-tests were excluded from data analysis for subjects less than sixty years old.

Flyers describing the classes were mailed out to persons who used the Osteopathic Health Clinic in the rural community during the past year and those who attended a health fair sponsored by the Osteopathic Health System of Texas. In addition, a flyer was displayed on the bulletin board at the Senior Citizen Center in the rural community. Participation in this study was voluntary: attending classes and completing knowledge tests was kept confidential. There were no identifiers linking subjects to the written questionnaires. At the end of the presentation, six "door prizes" were randomly distributed, including first aid kits, picture frames, t-shirts, and small bags provided by the Osteopathic Health System of Texas. After the presentation, participants were invited to enjoy a complimentary lunch at the Senior Center sponsored by the Osteopathic Health System of Texas.

During March and April of 1999, a series of four nutrition education classes was taught in lecture format at the senior citizens center in the rural community. A registered/licensed dietitian who is a M.P.H. student at the University of North Texas Health Science Center School of Public Health taught the classes. The class topics were: 1) Nutrition for the Older Adult, 2) Food-Drug

Interactions, 3) Tips for Heart Healthy Eating; Weight Management, and 4) The Benefits of Exercise.

Each class was taught in a lecture format at a rural community senior citizen center. The major goal was to help enhance the nutritional status of this older population by improving their nutrition knowledge.

Participants were given identical course pre-tests and post-tests relating to information provided in each of the respective four courses. Course content was prepared and reviewed by the principal investigators. Course information was provided verbally in English. Printed course materials were also provided for each participant in English. All participants spoke and read English as their primary language. Course participation was voluntary. Assistance was provided to any visually impaired participants by reading the question and answers aloud to the participant.

CHAPTER II

CHRONIC DISEASES AFFECTING OLDER ADULTS AND CURRENT TREATMENT AND PREVENTION

Obesity

According to the 1990 Surgeon General's Report, it is estimated that at least 26% of the United States adult population (aged 20-74) is overweight and 10% are obese (U.S. Public Health Service). The prevalence of being overweight among certain rural elderly populations in the U.S. is said to be greater than the national average (Coustasse et al, 1999). The condition of being overweight not only adversely affects the health of the overweight person in several ways, but also affects their psychological and social well being. The resolution to the problem is still not clearly understood, but several contributing factors have been identified.

For the purpose of this paper, the terms "overweight" and "obese" will be used interchangeably to describe any person described in professional literature as being overweight or obese. There are several different methods used to define overweight and obesity, but all have the same denominator: an excess of adipose

tissue. Current methods for evaluating overweight and obesity rely primarily on height/weight charts and body mass index (BMI, weight [kg]/height [m²]). A BMI of 24-27.8 indicates overweight, 27.8-40 indicates obesity, and a BMI > 40 indicates morbid obesity (Manson, Ridger, Gaziano, and Hennekens, 1996). In addition, "overfat" is another term used to describe the condition of excess adiposity. Bodyfat levels greater than 25% in men and 30% in women are considered clinical indicators of obesity and are considered a risk factor in the development of chronic diseases (ADA, 1993).

Causes

Obesity is the most common nutritional problem in the United States of public health concern, which can become a serious disability in the elderly (Roe 1992). Obesity is common in persons 65 years and older (Roe, 1992), and tends to be more common among women than men (Jensen and Rogers, 1998). According to Jensen and Rogers (1998) sedentary lifestyles may be the dominant factor and possibly contribute to obesity across all generations. Jensen and Rogers (1998) note older persons may face another challenge, "many view weight gain and sedentary living as an inevitable part of the aging process" (p. 1309). In a study by Fiatarone, et al (1994), the researchers suggest that the usual increase in adipose tissue and decline in lean body mass does not need to occur.

Other common causes of obesity are increased calorie intake, decreased calorie expenditure (diminished energy expenditure), overeating due to boredom, possible side effects of drugs which may increase appetite (Roe, 1992) and wide access to the development of the "rich modern food supply" (Stamler, 1993). According to McDowell et al (1994) the mean energy consumption of adults are 100 - 300 kilocalories higher in the NHANES III (1988-91) compared to NHANES II (1976-80). Morley (1997) notes that these NHANES observations suggest that overweight and obesity in older adults is most likely caused by 1) decrease in physical activity, 2) increase in fat storage efficiency, and/or 3) an alteration in metabolic rate.

Consequences

Obesity has been associated with a number of health-related problems. The list of accompanying consequences include elevated blood pressure (HTN) and cholesterol levels (dyslipidemia), a general increased risk of coronary heart disease (CHD), an increased risk of non-insulin dependent diabetes, gallbladder disease and increased morbidity and mortality (Coustasse, A., Schutkowski, D., Cervantes, Y. Rene, A. In press; Jensen and Rogers (1998); Denke, M., Sempos, C., Grundy, S., 1993; Roe, 1992). It is said while obesity may not have a direct cause and effect relationship to all of these conditions, obesity does tend to exacerbate

other health problems (Kaplan and Brinkman-Kaplan, 1994). Jensen and Rogers (1998) note that several studies have controlled for smoking and have found that excess adipose tissue increases the risk of death from any cause.

Obesity in older adults may also have functional and psychosocial implications (Jensen and Rogers, 1998). Many overweight and obese middle aged adults may be functional, but the same is not always true for older adults. Galanos et al (1994) found that the high BMI is associated with an increased risk of self-reported functional limitation. Jensen and Rogers (1998) note that impaired functionality in older adults may result in withdrawing from social activities and reliance on others for activities of daily living (ADL). In addition, depression is common in older and obese persons (Jensen and Rogers 1998). Treatment of obesity for the older adult needs to include interventions that focus on psychosocial issues (Jensen and Rogers, 1998).

Costs and Interventions

Just as obesity is associated with an increased risk of chronic disease (CHD, HTN, etc.), healthcare utilization to treat older obese persons is likewise increased. Jensen and Rogers (1998) note that the costs of treating the overweight population are rising. The cost of treating the overweight population of middle-aged American women over the next 25 years is estimated to be \$16

billion (Jensen and Rogers, 1998). Wolf and Golditz (1996) note that the yearly direct cost of chronic diseases such as Type II Diabetes, CHD, HTN, and gallstones in individuals with a BMI > 30 was estimated at \$22.62 billion, compared to \$5 billion healthcare dollars for a person with a BMI of 23 to 24.9. Jensen and Rogers (1998) note rural older adults with BMI>27 have increased monthly costs related to healthcare.

Nutritionists and dietitians play a very important role in the interdisciplinary effort needed for successful weight reduction in the obese older person (Jensen and Rogers, 1998; ADA Position Paper 1995). Dietitians have well-recognized roles in dietary assessment, dietary instructions, and behavior modification. In addition, other roles for dietitians include: medical assessment, exercise prescription, and assessing clients for complications.

Patients will more likely respond well to physician reinforcement for weight reduction needs (Jensen and Rogers 1998). In addition, medical intervention is usually required to manage medication dosages that tend to change as weight changes including 1) antihypertensives, 2) insulin, and 3) hypoglycemic agents (Jensen and Rogers 1998;Roe 1992). It is always prudent and recommended that a complete physical be performed by the older persons primary physician to identify medical issues before recommendations for weight reduction, exercise, and diet are completed (Jensen and Rogers 1998). Otherwise,

the older person may be causing more harm to themselves than good, especially if they had a heart condition that was left untreated.

Efforts to assist the older person to make lifestyle changes may be inhibited by unique challenges. Individuals may feel the need to change due to their disease, poor quality of life, or these older persons may feel there is no need to make any changes (Jensen and Rogers 1998). Education programs targeting lifestyle changes need to encourage family participation and identify learning limitations such as impaired hearing, eyesight, and language barriers. In addition, medical professionals need to consider the potential learning difficulties that a person with multiple medical problems and limited personal resources may encounter.

Jensen and Rogers (1998) and Dornelas, et al (1998) both note that a key component of a weight management program for older adults should have modest goals. "Small changes in lifestyle can have enormous benefit in terms of function, health, and quality of life even without large weight losses for older persons", (Jensen and Rogers 1998 p. 1310). Goals for a person with a BMI of >27 should focus on a 10-20% reduction, then focus on maintaining that weight loss (Jensen and Rogers 1998).

In addition, Dornelas et al (1998) notes the importance of primary and secondary prevention activities for older persons should be concentrated on modifying behavior patterns that encourage a better quality of life, instead of just

focusing solely on weight reduction. To this end, modest weight loss goals are consistent with the healthier weight ideals and are in contrast to ideal body weight goals. The ideal body weight goals usually require significant weight losses, which are very rarely maintained (Jensen and Roger 1998).

Cardiovascular Disease

Causes and Risk Factors

According to Denke, et al (1993), some investigators believe obesity to be an independent risk factor for CHD, but others consider that obesity increases other known risk factors for CHD, including dyslipidemia and hypertension. Atherosclerosis, which can be manifested clinically as coronary heart disease and stroke, is the leading cause of death in the United States despite a mortality rate decline of 3% per year (Luepker et al 1995; Fortmann et al 1993; Posner et al 1995, Posner et al, 1993). CHD is a disease associated with several risk factors and lifestyle behaviors including elevated total cholesterol, low-density lipoprotein cholesterol, and age (>45 years for men and >55 years for women).

Hypertension, diabetes mellitus, low high-density lipoprotein (HDL) levels, cigarette smoking, family history of premature CHD, physical inactivity, and obesity have all been identified as important CHD risk factors that should be

targeted by intervention activities according to the Adult Treatment Panel II of the National Cholesterol Education Program (NCEP) (Posner et al, 1995).

Current recommendations of the evidence is showing that population level prevention of CHD requires lowering serum lipid levels to < 200 mg/dl (Posner et al, 1993), by reducing dietary saturated fat intake (Fortmann et al, 1993).

Intervention and Treatment

Health promotion interventions targeting prevention are beneficial in high- risk groups and in those with advanced heart disease (Posner et al, 1993). The Healthy People 2000 National Health Promotion and Disease Prevention Objectives (Year 2000 Objectives), published in 1992, established the NCEP (National Cholesterol Education Program) guidelines for lowering CHD risk, including the reduction of dietary fat intakes of 30% of total energy or less and saturated fat intake of less than 10% of total intake (Posner et al 1995 and 1993). The guidelines suggested increasing the intake of complex carbohydrate and fiber containing foods and decreasing sodium intake and cholesterol intake of no more than 300 mg per day. Specifically, the Year 2000 Nutrition Objectives are 1) reducing the prevalence of overweight to no more than 20% of population with diet and exercise, 2) lowering dietary total fat and saturated fat to 30% and 10% of energy respectively, 3) increasing carbohydrate and fiber, and 4) decreasing

sodium intake in those aged 2 years and older (Posner et al 1995). All of these Year 2000 objectives have been expounded upon in Healthy People 2010 objectives, displaying a continued need for intervention and education (Healthy People 2010, 2000).

Throughout the last few decades there have been several studies posing the question "is there a diet-CHD connection and to what degree does diet impact on cardiovascular health?". A sixteen year prospective NHANES I (National Health and Nutrition Examination Survey) epidemiological follow-up study (Gartside, Wong, and Glueck, 1998) (NHEFS) assessed the important roles of modifiable dietary and behavioral factors in prevention of deaths and hospitalizations for coronary heart disease. The authors found that the following variables were positively associated with CHD: age, serum cholesterol, body mass index (BMI), cigarette use, and regions Midwest and Northeast. Factors negatively associated with CHD included gender (female), race (black), fish intake, alcohol intake, high school education, and moderate exercise. In addition, these results indicated that persons with a serum cholesterol of >249 mg/dl benefited less from fish and/or alcohol intake than those with a cholesterol of <249 mg/dl. The authors note that there were no silver bullets, meaning, that if the participant had an elevated cholesterol >249, eating more fish or drinking more alcohol would not significantly benefit the person. The associations

gleaned from this study emphasize the important role of dietary modifications in the causation and prevention of CHD.

Since the early 1960's there have been periodic health examination surveys of the U.S. populations conducted by the National Center for Health Statistics which have monitored trends in serum cholesterol (Ernst, Sempos, Briefel and Clark 1997). In the first National Health and Nutritional Examination Survey, NHANES I (1971-1979), NHANES II (1976-1980), and through the NHANES III (1988-1991) dietary intake data have been collected using a 24 hour recall. This data allows comparisons between trends in the intake of fat and cholesterol with trends in serum cholesterol concentrations for adults aged 20-74 for NHANES I and II. For NHANES III the upper age limit increased to 99 years. The study survey suggests that in the 18 years between midpoints of NHANES I and NHANES III, the age adjusted mean percentage of energy from fat declined from 36.4% to 34.19% for adults aged 20-74 years. In addition, study results show a decline in dietary fat, saturated fat, dietary cholesterol, and serum cholesterol. A significant substitution of low fat milk and skim milk for whole milk between 1970 and 1990 was also found. There was also a decrease in saturated fat consumption and increase in mono and polyunsaturated fats. The changes in diet are promising, but additional challenges exist to achieve greater reductions in intake of fat and saturated fatty acids.

Several studies throughout the years have used data from the Framingham Heart Study to detect secular trends in dietary intake patterns, extrapolating these results for interpreting national changes in CHD risks and mortality rates. The Framingham Heart Study was initiated in 1948 with 5209 participants, 2873 women and 2336 men aged 30-62 years. In 1971, 5139 Framingham Study offspring and spouses 12-60 years of age were recruited to participate in the Framingham Offspring Spouse Study which was designed to examine genetic and familial disposition toward CHD and to assess secular trends in CVD risk across family generations (Posner et al, 1995).

In the above cited study by Posner et al (1995) there is an examination of changes in dietary intake and risk factors for CVD that occurred over three decades in this U.S. population-based sample. The results found that dietary cholesterol levels declined and macronutrient and fatty acid intakes only changed slightly. The subjects who reported modifying their diets by substituting lower fat food for high fat foods between 1974-1978 and 1984-1988 were more likely to achieve the guidelines of the National Cholesterol Education Program and Healthy People 2000 Goals for 1) dietary fat, 2) dietary cholesterol, and 3) serum total cholesterol. Levels for blood pressure, total and LDL (Low-density) cholesterol and cigarette smoking were also lower in 1984-88 than earlier 1974-78, or 1957-60. Even though reports of physical activity were higher in 1984-88 compared to 1957-60, BMI, hypertension and prevalence of

overweight were also higher. Data gathered from these studies are important in developing and implementing population based strategies including nutrition education intervention.

Diabetes Mellitus

Diabetes in older persons is most commonly of the maturity onset type, or Type II Diabetes (Roe 1992). Factors contributing to the development of diabetes mellitus includes obesity and declining glucose tolerance associated with aging (Roe 1992). Most patients with Type II diabetes do not require insulin. These people tend to have a high pancreatic insulin production, which may last throughout the person's life. These older persons' diabetes is due to peripheral insulin resistance. The receptor cells in the body have been bombarded with insulin for so long, that they are numb to its effects, or resistant. Persistent hyperglycemia or poorly controlled diabetes has been associated with the development of serious complications including nephropathy, neuropathy, retinopathy, peripheral vascular disease, and coronary heart disease (Roe, 1992).

Intervention and Treatment

According to Halter (2000) The 1997 Report of the American Diabetes Associations Expert Committee recommends screening for diabetes on a regular basis for all older adults. In a study by Haffner et al (1998) it was determined that since diabetics are at high risk for cardiovascular disease (CVD), lowering their target LDL cholesterol goal to less than 100mg/dl regardless of presence of current CHD should be advocated and adopted as an official recommendation. Halter (2000) notes that while the ADA's new diagnostic criteria focuses on fasting serum glucose and downplays the use of the glucose tolerance test, the ADA's Expert Committee recognized this could lead to possible underdiagnosis. Halter (2000) notes that many older adults have marked hyperglycemia after their glucose levels/insulin responses have been challenged, which is common among older adults. Epidemiologic studies suggest that 30-50% of people who met the diagnostic criteria for diabetes do not even know they have diabetes. Despite the many advances in pharmacotherapeutics, the overall success in treating this disease has not been successful (Halter, 2000).

Shorr et al (2000) confirms the earlier studies reporting that there is lack of adequate control of hyperglycemia in many older adults. For older adults with only diabetes, they must follow a diet prescription, exercise recommendations, multiple drug regimen to control hyperglycemia, hypertension, and maybe

another drug for hyperlipidemia. Halter (2000) notes the need to develop more efficient ways of providing education to patients with the goal of increased adherence to the complex care plan.

Other Issues Affecting the Elderly

Polypharmacy

Polypharmacy, the practice of overusing medications, is a major factor that can have a great deal of influence on the nutrition of the older adult. Older persons comprise 12% of the population, yet account for 30% of total drug usage. According to Hanlon et al (1997) 50-75% of older adults take at least one prescription medication. Factors contributing to medication usage include: 1) quick fix mentality, 2) pharmaceutical companies providing incentives to physicians to prescribe their products, 3) a means for a physician to end an office visit, and 4) a way of providing patient hope (Williams 1997). In addition to these high numbers of medications taken by older persons, the effects of many of these drugs have been tested and validated on younger adults with different medical and metabolic make-ups. For example, a younger person is more likely to have more lean body mass and possibly a more vital liver than an older person; therefore having more ability to metabolize medications.

Polypharmacy is caused by several modifiable factors. The first and most common is the use of multiple prescriptions for multiple illnesses. Another factor is improper usage of medications (i.e. taking medications after the problem has been resolved). In some cases, different physicians prescribe medicine (with different names) for the same problem. In these cases, the medicine concentration in some people could possibly be increased, to toxic levels.

There are several effects of polypharmacy that can occur in the older adult, including: 1) drug-drug interaction, 2) drug nutrient interactions, and 3) adverse drug events. Drug-drug interactions (DDI) occur when drugs are altered (inhibited or accentuated) by another drug (Doncet 1996). Doncet (1996) studied drug-drug interactions in 1000 hospitals to determine if they were related to hospital admissions in older adults. The study concluded that the most common side effects from DDI included 1) neuropsychological impairment, 2) arterial hypotension, and 3) acute renal failure. The author notes that DDI are more hazardous to the older person due to decreased renal function as the person ages. The study also found that there was a positive correlation between limiting medications and limiting side effects. Finally, DDI are potentially caused by 1) taking two or more medications at the same time, 2) alcohol consumption in tandem with medication consumption and/or, 3) over-the-counter medications taken in conjunction with prescribed medications (Doncet 1997).

Another effect of polypharmacy is drug-nutrient interactions (DNI). A drug-nutrient interaction occurs when a drug causes a nutrient to be altered in some way or for a nutrient to cause a drug to be altered (Roe 1992). Risk factors associated with DNI include nutrient deficiency, drug-induced malnutrition, drug toxicities, and decreased efficacy of a drug. There are several common drug-nutrient interactions. A common type of drug used to control hypertension in older adults is a diuretic. Diuretics can pull large amounts of potassium out of the body. If this electrolyte is not replaced then hypokalemia could lead to muscle weakness, including cardiac weakness. Another common cardiovascular drug is an anticoagulant. People take anticoagulants to keep blood viscosity at certain levels of coagulation. People using these drugs should avoid foods that tend to increase the coagulation of the blood such as foods high in vitamin K, otherwise they may be at risk for a stroke or an adverse drug event.

According to Hanlon (1997), the risk of adverse drug events increases exponentially as the number of medications increase. In addition, adverse drug events are one of the top five most important quality of life problems experienced by older adults (Hanlon 1997). A threefold plan should be administered to help prevent polypharmacy: 1) educating the older person and their family, 2) consistent monitoring by peers at hospitals and governing bodies, and 3) possible penalties for physicians who fail to make changes in the care of their patients.

Herbal/Dietary Supplements

Older adults are among the top consumers using herbal and nutritional (dietary) supplements. Approximately 36% of all adults use herbal supplements (Hussey 2000). This trend could have some negative health consequences since the Food and Drug Administration does not regulate dietary supplements. According to Stupay and Sivertsen (2000) there are more than 1400 herbs on the market, and currently only about five have been approved by the FDA to be used as laxatives. Herbal and nutritional supplements have been grouped into one category known as Dietary Supplements. These dietary supplements are regulated by the Dietary Supplement Health and Education Act (DSHEA) of 1994. DSHEA defines a dietary supplement as a product intended to supplement the diet and includes: vitamins, minerals, amino acids, metabolites, herbs, and botanicals. According to the DSHEA, dietary supplements cannot claim to diagnose, prevent, mitigate, treat or cure disease (FDA 1999).

There is very little research to date regarding older adults' dietary supplements usage. The first study researching unconventional medicine was conducted in 1991. Out of 1539 people 18 and older, 28% of those 50 and older reported using unconventional therapies (Stupay and Sivertsen 2000). The people most likely to use dietary supplements are white, highly educated, and

have higher incomes (Stupay and Sivertsen 2000), and who are older (Hussey Nov. 21, 2000). Stupay and Sivertsen (2000) report dietary supplements are most often used for several chronic problems including depression, anxiety, digestive problems, high blood pressure, headaches, allergies, and back pain problems. Research has found many reasons why people use dietary supplements as either alternative therapies (used alone) or as complementary therapies (used in addition to conventional therapies.)

Since a majority of older adults take at least one prescription drug daily, including dietary supplements in their daily regimen may lead to problematic results. Dietary supplements may interact with other drugs potentially inhibiting or accentuating the effect of the prescription drug. Many older adults believe dietary supplements to be harmless, therefore they may be unaware of potentially adverse effects caused by toxicities, and/or contaminants in the herbs (Stupay and Sivertsen 2000). It is inevitable that older person will continue to use dietary supplements in order to be proactive in their healthcare. It is important that health care professionals encourage their clients to discuss their usage of herbal supplements. It is necessary that older adults receive reliable information on this ever-changing area of dietary supplements from well-informed public health professionals.

Characteristics of Adult Learners

Before health-promoting programs are targeted to the older adult, the health professionals need to understand the characteristics of adult learners. The importance of lifelong learning is well established. Yet many programs for the older adult have been poorly planned due to lack of knowledge of their audience. In addition, many misconceptions of older learners may exist among educators, which could hinder the education process and ultimately the goals of the education.

Previous studies have shown that older adults may perform more poorly on tests than younger adults, but this performance is often related to non-cognitive reasons such as a non-conducive learning environment, lack of confidence and poor motivation (Kicklighter 1991). Kicklighter (1991) also notes that certain non-cognitive factors including health status, fatigue, anxiety, and task relevance account for some of the age related decline in memory and learning among older adults. In addition, the author discusses that numerous studies have shown that healthy older adults are capable of continuing to learn and change their behavior into their 60's, 70's, and 80's. Kicklighter (1991) points out that older adults perceive themselves as capable of learning new information and research has shown that the desire to learn does not decrease with age.

The research discusses the possible learning capacity of older adults yet reveals common, physiologic, psychologic, and social issues that require modification of teaching and learning strategies. The basic framework of designing learning experiences for older adults relies on the basic framework for planning, implementing, and evaluating the education programs. This framework consists of four essential steps with the first step being the assessment of the needs of the learner.

Health Promotion and Nutrition Education

In this first step it is important that the older adult learner be involved in the needs-assessment process either through self-administered questionnaires, interviews, or focus groups (Crockett, Heller, Merkel, and Peterson 1990). The second step is the development of learning objectives and determination of content to be learned. The authors note that adult learners should, if possible, be involved in the formulation of learning objectives.

The third step is the selection and implementation of learning activities. The information-processing model of learning proposes there are three stages of learning (Kicklighter 1991). The first stage is the registration of information, the second is the encoding of information, and the third stage is the retrieval of

information. The author notes that all three stages are influenced by the sense therefore age-related physiologic changes may affect learning capacities.

The fourth step is the evaluation of the results of learning. The author notes that formative and summative evaluation should be used in nutrition education programs for older adults. The evaluation components used could include changes in older adult learner's nutrition knowledge, attitudes, food consumption patterns, or health status. Kicklighter (1991) reports that older adults, like other adults, are dependent on external feedback to reinforce feelings of worth, therefore, evaluation strategies should promote feelings of success.

The ideal learning situation for the adult learner requires specific sensory stimulation to make up for sensory deficits. "The learning environment should be warm, positive, and accepting and efforts should be made to reduce stress and anxiety" (Kicklighter p. 1421). In addition, older adult learners will benefit from being taught how to use information, instead of being taught random facts, since they tend to have a problem-oriented approach to learning (i.e. disease, death of spouse, etc.). As America continues to age, society will be shifting its focus from problems of the youth to the aging's needs and aspirations. Focus needs to be placed on appropriate and timely nutrition education programs for the older adult learners to help improve their health status through improved nutrition.

There have been several studies documenting the benefits of health promotion among non-elderly groups, but there have been fewer studies focused

on older adults. The primary goal of health promotion in the elderly is to prevent or slow the rate of disease progression and reduce the risks of comorbidities, disabilities, and death (Fox, Breuer, and Wright 1997).

"Compliance with a health promotion plan generally implies that a relatively passive role for the client that places the responsibility on him or her for following a physician prescribed regimen...adherence suggests a more equitable role for the client in cooperatively setting health promotion goals with health care professionals" Fox, Breuer, and Wright 1997 p . 257.

The two main objectives of patient education and related to primary prevention, are changing health behaviors and improving health status. The authors relay that older adults may be more motivated than younger adults to make behavior changes due to their experience in coping with chronic diseases. In addition, since older adults use healthcare services more than other groups, they tend to want to participate in health promotion programs. Success of a health promotion program is dependent upon how the information is communicated and how certain actions are targeted.

Fox, Breuer, and Wright (1997) report that older adults may be more receptive to health promotion programs that they believe are targeted to their

specific issue or if they believe are in their control. The authors conclude that to improve adherence, time should be spent with these clients to determine how to effect the proposed change. In addition, using short-term goals and targeting behaviors the older adult is willing to change, have been found to be successful in changing behavior.

Fox, Breuer, and Wright (1997) examined the effectiveness of individual assessment and counseling with the addition of a written health care plan on client adherence to the health behavior recommendation. The results of the study suggest that clients receiving individualized counseling from a public health nurse combined with a written health care plan completed significantly more preventive referrals and health behavior changes than those clients who only received counseling and no written plan. Therefore, supportive counseling by a public health nurse combined with health care plans provided to clients are significantly and positively associated with client adherence to recommendations. Individualized counseling methods and written health care plans can be delivered in community-based public health centers to enforce behavior change in low income elderly communications (Fox, Breuer, and Wright 1997).

Nutrition Education as Health Promotion

Nutrition has an important role in health promotion and disease prevention (ADA 1996). Four of the top ten causes of death in the United States are nutrition related. Heart disease, cancer, stroke, and diabetes mellitus account for more than 1.4 million deaths yearly, which in turn accounts for about two-thirds of total U.S. deaths (Hermann, Brown, and Heintz 2000). Nutrition directly impacts health conditions such as obesity, HTN, and osteoporosis, which can reduce quality of life and exacerbate or contribute to the development of other chronic disease. These chronic diseases are the most prevalent, most costly, and mostly preventable of all health problems. Nutrition related health conditions cost society approximately \$250 billion each year in rising medical costs and in the loss of productivity (Hermann, Brown, and Heintz 2000). According to the Centers for Disease Control and Prevention (1997) proper nutrition could prevent or hold off approximately 20% of annual deaths from heart disease, cancer, stroke, and diabetes mellitus. Proper nutrition is a cost-effective measure for the prevention and delay in progression towards nutrition related chronic diseases (ADA 1996).

The role of nutrition in health promotion and chronic disease prevention is important for older adults who are at an increased risk for developing chronic diseases. Nutrition education is important to improving dietary behavior,

dietary intake and other biomedical parameters in older adults. Many older adults are aware of the relationship that exists between diet and health. A large percentage find it difficult to understand and apply the array of nutrition and health information available.

"The ability of older adults to improve their personal health depends upon how successfully they can translate science-based recommendations into dietary behaviors which lead to improved nutrition and health status" (Hermann, Brown, and Heintz 2000) p.3.

Hermann, Brown, and Heintz (2000) examined a program designed to provide Oklahomans over 55 with the knowledge and skills to apply Food Guide Pyramid, Dietary Guidelines for Americans, and Nutrition Facts Label to food selection, food preparation, and food safety practices. The education sessions were taught in eight weekly segments in a plan entitled the "Healthy Living Program". The "Healthy Living" participants completed pre and post program evaluations on dietary behaviors, dietary intake, and health measures. The average age of the participants was 69 +/- 8 years.

Results from the study suggest that there were significant improvements in food and nutrition behavior scores, dietary intake and health measures among

the participants. In addition, average total body weight decreased from 163 to 159 pounds (BMI 28.0 decreased to 27.5). The average fasting cholesterol significantly decreased from 225 to 214 mg/dl. The results of this study show that by designing food and nutrition programs for older adults that translate dietary recommendations into understandable behaviors and actions, improvements in dietary intake and biomedical parameters are possible.

In a study by Fortmann, Taylor, Flora, and Winkleby (1993) the authors examined the effects of community-wide health education in diet related knowledge and behavior on plasma cholesterol levels and diet in medium sized cities in Northern California. The program planning included setting general and specific dietary change goals for each year of the campaign (reducing meat intake, using liquid oils, using low-fat recipes, etc.) This nutrition education intervention was a six year (1980-1986) integrated comprehensive community-wide, multi-factor risk reduction program.

It was found that the nutrition education messages had little effect on the selected food intake. On the other hand, nutrition knowledge increased over time in both men and women in all cities. Plasma cholesterol declined significantly in men. Nutrition knowledge among women achieved greater improvements in treatment cities than in control cities. Finally, the authors note they were not able to detect any significant lasting nutritional education effects of the Five City Project programs.

A study by Luepker et al (1996) had similar results as The Stanford Five City Project. The Minnesota Heart Health Program was a community trial of CVD prevention methods conducted from 1980-1990. This five to six year intervention program involved community wide and individual health education. A major hypothesis was that the incidence of fatal and nonfatal CHD and CVA in 30-74 aged men and women would decline in education communities after health promotion was initiated. The Minnesota Heart Health Program (MHHP) implemented a number of community wide interventions including mass media risk factor screening and direct education of the community. The program aimed to decrease population levels of cholesterol, blood pressure, smoking, and increase physical activity.

Unfortunately, the results found there was no evidence of a significant intervention effect on morbidity and mortality either for CHD or CVA. The authors conclude that this might be due to the fact that the MHHP was launched during a decade of strongly declining secular trends in CVD risk in Minnesota and nationwide. This program did not accelerate risk reduction beyond those trends. Studies like this and the former tend to have limitations due to their community-wide scale.

Nutrition Knowledge

The next step in observing nutrition education is observing if nutrition knowledge (if any) was gleaned by participants of an education program either on community-wide, nationwide, or through a small sample. Few studies have examined the nutrition knowledge of adults on a community wide basis mainly in the form of surveys. Even fewer studies have examined the change in knowledge derived from a nutrition education program targeted at the older adult.

Today there are several nutrition messages focusing on motivating Americans of all ages to reduce their fat intake, since a high fat intake has been linked to increasing the risk of developing CHD. If people do not adhere to dietary changes, many may require cholesterol -lowering medications (Kelly, Hazey, and McMahon 1992). There is not enough detailed information available regarding the older adult population's knowledge concerning cholesterol and a heart healthy diet. Additional information is needed to guide the public health community and their providers in their efforts to foster healthier eating patterns.

In a study by Read (1998), a random sample of 3198 (1333 men, 1812 women) adults were surveyed in relation to their dietary fat practices. A mail questionnaire was developed to study dietary fat knowledge, perceived risk, and dietary practices. In addition to age and gender, nutrition knowledge was

assessed as a potential factor on dietary fat behavior. The three questions used were : "1) Which products contain cholesterol? a) vegetables and vegetable oils, b) animal products like meat and dairy, c) all foods containing fat or oil, d) I don't know; 2) Do you think that the following diseases are related to the fat in one's diet? (correct responses included: heart disease and colon cancer); 3) If a fat or oil is hydrogenated it has what? (correct answer: more saturated fat)" (Read 1998,p.55).

The three questions used were to represent three major areas of dietary fat knowledge 1) sources of cholesterol, 2) relationship of fat intake to disease, and 3) identification of saturated fat in diet. The results of the nutrition questions have been combined with other areas of the study. Those respondents who correctly identified the sources of cholesterol also had lower fat behavior scores than those who answered incorrectly. For the question regarding the relationship of fat intake to disease risk, those who answered correctly also had lower fat behavior scores. As with the other questions, respondents who answered the questions on hydrogenated fat being more saturated also had lower behavior fat scores than those who answered incorrectly. The results of this study suggest that dietary fat behaviors are impacted by age, gender, and nutrition information.

Kelly, Hazey, and McMahon (1992) designed the Community Cholesterol Survey Project (CCSP) in which they assessed patients beliefs, attitudes,

knowledge and behaviors relating to cholesterol risk. There were 604 participants aged 21 - >61 years of age. The survey participants had a cholesterol measurement were interviewed by a dietitian (recent dietary intakes), and completed a self-administered questionnaire (dietary practices, beliefs, and lifestyle behaviors). The knowledge of nutrition concepts included Food Label reading, determining percent calories from fat; identifying saturated/unsaturated fat, hydrogenated fat; defining "cholesterol free", etc. The results of the study indicated that the CCSP sample population provided incorrect answers for four of the nine items. These knowledge deficits were in relation to caloric content of fats, the meaning of hydrogenation, differences between fats and cholesterol, and defining "cholesterol free". In addition, the study suggests that the participants previously given information or treatment for high cholesterol had significantly higher knowledge scores, along with participants who were currently following a cholesterol-lowering diet. The authors note that due to the knowledge deficits, it is questionable if participants can put their good intentions to work when shopping for groceries and preparing meals.

A study by Plous, Chesne, and McDowell (1995) assessed the nutrition knowledge and attitudes of cardiac patients. The 606 participants were recruited from cardiology practices from New England, Southern California, and the Midwest. The self-administered questionnaire included sex, age, attitudes about

preventing heart disease, understanding nutrition education material, and a ten item true/false nutrition quiz, and three knowledge questions. Results indicated that the majority of the patients view diet as an important factor in the treatment and prevention of heart disease. In addition, approximately one-third of one-half of the patients expressed dissatisfaction with the education materials they had received depending on location.

As for the nutrition quiz, the mean score was 3.5 out of 10 items correct. Also, fewer than 1 in 20 patients answered more than 6 items correctly, and fewer than 1 in 3 answered more than 4 items correctly. In addition, after further assessment, it was deemed that overall accuracy rates on responses to nutrition questions did not exceed chance level (50.1%). For the three supplemental questions, 50.3% of the patients did not know that hardening of the arteries can occur in women before menopause. Similarly, only 25.1% of the patients realized that the government recommends getting no more than 30% of calories from fat. Finally, patients underestimated the fat content of a Burger King Whopper by 35%. The correct answer would have the Burger King Whopper being equal to 12 pats of butter. Only 30.5% of the patients reported understanding education materials completely.

These poor outcomes maybe the result of the high number and confusing recommendations contained in literature today (i.e. dining guides, cookbooks, etc.) Finally, future research should explore reasons why dietary education

materials are not more successful and efforts should be made to design more effective education materials. Dietary counseling should receive higher priority to help prevent and decrease the progression of chronic diseases among older adults.

Results

In all, sixty-three seniors participated in at least one of the four nutrition education classes. Thirty of the seniors (48%) attended at least one class. Nine seniors (14%) attended two of the classes. Eleven seniors (17%) attended three of the classes. Thirteen seniors (21%) attended all four of the classes. All seniors were from rural areas. In addition, all participants were caucasian, which is an accurate reflection of the rural area where the classes were taught.

Table 1 - Classes and Topics Discussed

	Class Title	Topics Discussed
Class I	Nutrition needs for the older adult	Requirements for older adults: energy, protein, fiber, vitamins/ minerals. (Fats discussed in class III)
Class II	Drug-nutrient interactions: How prescription and OTC drugs can affect nutritional status.	Common OTC drugs and prescription drugs. Discussed potential drug-nutrient or food-drug interactions.
Class III	Tips for Heart Healthy Eating: Weight Management	Food Guide Pyramid, serving sizes, heart healthy cooking tips, fat requirements, triglycerides, saturated, monounsaturated, and polyunsaturated fats; cholesterol - HDL, LDL, trans-fatty acids.
Class IV	Benefits of exercise	Health problems associated with being overfat, benefits of physical activity, and weight bearing exercise.

Class I Nutrition Needs for the Older Adult

Thirty-seven seniors (8 men, 29 women) attended the first class on March 29, 1998. Thirty-four completed the pre-test, while thirty-six completed the post-test. The average age of the Class I participants was 77.15 +/- 8.31 years (mean \pm SD).

Table 2 - Class I Questions and Percent Correct for Pre and Post Tests

True or False	Pre- Test	Post-test
Q.1. A person's energy requirements increase after they turn fifty years old. <i>False</i>	70.6	72.2
Q.2. Protein has the same amount of calories per gram as fat. <i>False</i>	73.5	86.1
Q.3. A raw apple is a good source of dietary fiber. <i>True</i>	97.0.	97.2
Q.4. Vitamin D is a fat-soluble vitamin important in the absorption of calcium. <i>True</i>	94.1	83.3
Q.5. Megadosing with vitamins (taking 10 times the Recommended Daily Allowance) will always have beneficial effects. <i>False</i>	82.0	94.0
Q.6. A diet high in sodium (salt), a family history of high blood pressure, and obesity may all contribute to the development of high blood pressure. <i>True</i>	97.0	91.7

Class II Drug-nutrient interactions: How prescription drugs can affect nutritional status.

Thirty-five participants (7 men, 28 women) attended the second class on April 12, 1999. Thirty participants completed the pre-test and post-test. The average age of the class participants was 76.26 +/- 8.03 years (mean ± SD).

Table 3 - Class II Questions: Percent Correct for Pre and Post tests

True or False	Pre-test	Post-test
Q.1. When someone is taking anticoagulants (i.e. Coumadin) it is a good idea to avoid foods high in vitamin K and aspirin type products. <i>True</i>	93.1	100
Q.2. Diuretics can pull large amounts of potassium out of the body. <i>True</i>	93.1	96.7
Q.3. Antacids can help promote the absorption of iron in the body. <i>False</i>	79.3	40.0
Q.4. Extended treatment of estrogen can result in deficiencies of folic acid and B6. <i>True</i>	48.3	83.3
Q.5. Antibiotics can increase the absorption of iron and calcium in the body. <i>False</i>	69.0	33.3
Q.6. If you are taking Digoxin, it is important to avoid licorice and eat a diet high in potassium and low in sodium. <i>True</i>	72.4	90.0

Class III Weight Management and Heart Healthy Cooking Tips

Thirty-eight participants (8 men, 30 women) attended the third class on April 19, 1999. Thirty-two participants completed the pre-test and twenty-eight completed the post-test. The average age for the participants in class III was 75.85 +/- 8.05 years (mean \pm SD).

Table 4 - Class III Questions -Percent Correct for Pre and Post-tests

True or False	Pre-test	Post-test
Q.1. A 12 oz glass of orange juice equals two servings of fruit. <i>False</i>	9.3	32.1
Q.2. HDL cholesterol is the good cholesterol. <i>True</i>	65.6	96.4
Q.3. "Light" always means there's at least 1/3 less calories. <i>False</i>	43.8	57.1
Q.4. A product that says "Fat Free" on the label has virtually no fat. <i>True</i>	25.0	53.6
Q.5. Most overweight people eat too much sugar. <i>False</i>	28.1	60.7
Q.6. Olive oil is a good source of monounsaturated fat. <i>True</i>	100	89.3

Class IV Health Problems caused by being overfat and the benefits of exercise

Thirty-three seniors (7men, 26 women) attended the fourth class on April 26, 1999. Twenty-eight participants completed the pre and post tests . The average age for Class IV participants was 76.3 +/-7.64 years (mean \pm SD).

Table 5 - Class IV Questions- Percent Correct for Pre and Post-tests

True or False	Pre-test	Post-test
Q.1. Gallbladder disease is caused by being overfat. <i>True</i>	21.4	67.9
Q.2. Exercise has been shown to increase anxiety in people who exercise regularly. <i>False</i>	89.3	75.0
Q.3. Weight bearing exercise helps prevent osteoporosis. <i>True</i>	75.0	89.3
Q.4. Physical activity improves your strength, balance, and coordination all of which helps to reduce your risk of falls and bone injuries. <i>True</i>	100	92.9
Q.5. Breaking up your physical activity over the course of the day can bring the same benefits as doing the physical activity all at once. <i>True</i>	75.0	82.1
Q.6. Muscle uses more calories than fat tissue, takes up less space, but weights more. <i>True</i>	61.0	75.0
Q.7. Some individuals with high blood pressure can decrease their medication if they exercise and watch their diet. <i>True</i>	92.9	89.3

Table 6 - Results of Pre-test Scores for Classes I - IV

Class I Nutrition for the Older Adult Pre-test Participants = 34	47% scored 6/6 (100% correct), 29% scored 5/6 (83% correct), 18% scored 4/6 (66% correct), 76% scored 5/6 or greater, 94% scored 4/6 or greater, 6% scored 3/6 or less
Class II Drug- Nutrient Interactions Pre-test participants = 30	20% scored 6/6 (100%correct), 40% scored 5/6 (83% correct) 25% scored 4/6 (66% correct), 60% scored 5/6 or 6/6 86% scored 4/6 or greater, 13% scored 3/6 or less
Class III Heart Healthy Cooking Tips; weight management Pre-test participants = 30	0% scored 6/6 (0% correct), 0% scored 5/6 (0% correct), 20% scored 4/6 (66% correct), 20% scored 4/6 or greater, 37% scored 3/6, 37% scored 2/6, 6% scored 1/6
Class IV Benefits of Exercise Pre-test participants = 28	3.5% scored 7/7 (100% correct), 39% scored 6/7(85% correct), 29% scored 5/7 (71% correct), 43% scored 6/7 or 7/7, 71% scored 5/7 or greater, 96% scored 4/7 or greater 4% scored 3/7 or less.

Table 7 - Results of Post-test Scores for Classes I - IV

Class I Nutrition for the older adult Post-test participants = 36	44% scored 6/6 (100% correct) 39% scored 5/6 (83% correct) 14% scored 4/6 (66% correct) 83% scored 5/6 or 6/6 97% scored 4/6 or greater 3% scored 3/6 (50 % correct)
Class II Drug-nutrient interactions: How prescription and OTC drugs can affect nutritional status. Post-test participants = 30	17% scored 6/6 (100% correct) 23% scored 5/6 (83% correct) 50% scored 4/6 (66% correct) 40% scored 5/6 or 6/6 90% scored 4/6 or greater 10% scored 3/6 or less.
Class III Tips for Heart Healthy Eating: Weight Management Post-test participants = 29	10% scored 6/6 (100% correct) 14% scored 5/6 (83% correct) 41% scored 4/6 (66% correct) 65% scored 4/6 or greater 25 % scored 3/6 (50% correct) 10% scored 2/6 (33% correct)
Class IV Benefits of exercise Post-test participants = 28	32% scored 7/7 (100% correct) 21% scored 6/7 (85% correct) 29% scored 5/7 (71% correct) 54% scored 6/7 or 7/7 82% scored 5/7 or greater 100% scored 4/7 or greater 0% scored 3/7 or less.

Table 8 - Pre/Post test ANOVA comparison of mean test scores (arc-sin adjusted)

Class	Pre-test		Post-test		<i>Adjusted p value</i>
	<i>n</i>	Mean % correct	<i>N</i>	mean % correct	
I	34	85.8	36	87.5	0.99
II	30	75.9	30	73.9	0.87
III	32	45.3	28	64.9	0.39
IV	28	73.5	28	81.6	0.69

CHAPTER III

Discussion

To the author's knowledge, this is the first study specifically designed to assess the before and after knowledge of older adults attending nutrition education classes in a rural setting. A complete review of literature did not yield a study or class design similar to this study. For this reason, a number of assumptions had to be made. The results showed that for a majority of the questions, the participants generally improved their scores from pre-test to post-test.

Tables 2-5 display the percent of subjects in each class answering each question correctly. No patterns were noted as to specific content or style of question eliciting a substantial improvement or decline in question performance. Tables 6-7 provide a more detailed look at the percentage of participants providing correct responses.

Limitations

There are limits to our methods that should be considered in further evaluation of the results. These included potential practice and patient selection biases (senior center in rural town), the lack of formal reliability and validity testing of the survey and occasional non-standard survey administration (i.e. any actual selection biases would have the effect of limiting generalizability to other populations). Another limitation was the participants understanding or lack of understanding of the test questions. Some difficulties were more conventional such as sight and/or hearing impairments. In addition, for the first class, the tests were copied onto teal (dark) paper, which may have been somewhat difficult for the participants to read. Because of this, the other pre and posttests were photocopied onto yellow paper. Other issues affecting the study were the participants who refused to take the pre or post tests. The reasons for this included 1) refusal, 2) participants being busy helping with the congregate meal, and 3) other unknown reasons such as question sophistication.

The primary analysis of test performance (Table 8) shows that, while there was an improvement in a number of aspects of the participants' test performance, there was not a statistically significant increase in the mean percent correct for any class. The statistical methods (arcsin conversion) employed to analyze these results are more conservative than a straight mean percent

conversion, but even preliminary analyses of straight mean percent correct did not yield improvements that were statistically significant.

There were a total of eight questions (Class I-2, Class II-2, Class III-2, Class IV-2) where participants as a whole, scored worse on the post-test than on the pre-test (Tables 2-5). There are several possible reasons for this occurrence. For instance, the subject matter discussed may have been new to the participants. The questions may have been confusing or the questions may have been worded poorly. In addition, the lecture may have been difficult to understand. If these questions would have been previewed by a focus group similar to the demographic population studied, there may have been less confusion.

Fifty-two percent (33/63) of the participants attended two or more classes. There were several possible reasons for this high repeat attendance. At the end of each education session, a complementary lunch was sponsored by a local hospital. In addition to the complementary lunch, there were drawings held at the end of each education session in which participants could receive tee shirts, first-aid kits, etc.

Implications/applications

Repeat attendees exhibited a generally high level of motivation and interest in dietary/nutrition health. However, given the knowledge deficits

discovered, it is questionable whether these participants can put their good intentions and interest into practice when they shop for groceries and prepare "heart-healthy" meals for themselves or their families. It is important to this group not only as a demographic of older adults, but this rural town was targeted in a previous screening as being at risk for developing cardiovascular disease. These participants are probably not greatly helped in this task by the current food labeling and marketing practices used by food manufacturers. In the current context, it is important that consumers understand the meaning of terms such as "light", and "fat free", used in the marketing and nutritional content information, respectively. Consumers should also understand the difference between cholesterol and fat, and should be able to make judgments about how much of a food's calorie content comes from fats.

A healthier diet does not need to be a costly diet, since the major changes people need to make include decreasing foods high in fat and increasing consumption of complex carbohydrates and dietary fiber. It is a challenge to all health care educators to reach out to all citizens and encourage them to enhance their current and future health. Classroom education platforms should ensure the messages delivered or education materials provided are at the appropriate level to be understood. Some older persons may need written materials with large print that is printed on yellow or orange paper since it tends to have less glare than white paper. Older persons with impaired sight or hearing should be

identified and instructors should use personal or small group instruction to ensure equality in participation.

There are three main ideas to remember when providing education classes to older adults. The first is to emphasize the health benefits associated with good nutrition including those aged 75 and older. The next idea is to focus on the needs of the older age groups by providing food specific recommendations that promote understanding of how to incorporate better eating habits, investigating drug-nutrient interactions, and implementing appropriate physician approved physical activity. The last idea to remember is to present achievable goals that will promote a conducive learning environment.

Conclusion

The hypothesis of this study was "Attendance at four nutrition education classes will increase knowledge regarding nutrition for the older adult." The results of the study show that, overall, participants' nutrition knowledge did improve, although not significantly.

Study results revealed that a majority of the participants did better than chance levels on the post test (Table 7). For example, Class I post-test results found that 97% of the participants scored 4/6 correct. Class II post-test results found 90% of the participants scored 4/6 correct. Class III post-test results found

65% of the participants scored 4/6 correct. Class IV post-test results found 100% of the participants scored 4/7 correct.

The positive outcome of the study was that the two objectives of the nutrition education classes, 1) to increase their knowledge from pre to post test scores by 10%, and 2) fifty percent of the seniors will answer at least half of the questions correctly on the post-tests, were accomplished. Data analysis shows that the first objective was accomplished in Classes III and IV. The second objective was accomplished in all four of the classes. Additional positive outcomes of the study included 1) the participants scored very well on the pre and posttests for a majority of the questions, 2) participants usually scored higher than 50% correct for each question, and 3) high repeat attendance rates.

Future studies of this nature would be well served by first completing a focus group to study the effectiveness and understandability of the tool. Using yellow/orange paper would make the tests easier to read. In addition, using audio-visual equipment or large charts would have been more conducive to the learning environment. An interesting next step would be a follow-up study with this demographic group in a similar small town, and compare the findings to this group. Eventually it would be interesting to devise a similar tool that could be used with minority aging groups and explore the possibility of incorporating additional adult learning concepts. Focus groups using different cultures would be useful for developing culturally appropriate programs and questionnaires.

Developing nutrition education programs for older adults which focus on enhancing the knowledge associated with health promotion and chronic disease prevention is quite challenging. Nutrition education programs that can effectively decipher dietary recommendations into understandable concepts can result in improvements in nutrition knowledge, dietary behaviors, and health markers. These behavioral changes signify an improvement in nutritional status that can potentially reduce the risk of chronic diseases related to diet and possibly lower the overwhelming cost of health care.

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