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Enhancing Weight Gain in Long-Term Care Residents at Risk for Weight Loss through Protein and Calorie Fortification.

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ABSTRACT

Enhancing Weight Gain in Long-Term Care Residents at Risk for
Weight Loss through Protein and Calorie Fortification

By

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Purpose of this study was to compare two methods of supplementing diets in order to provide additional protein and calories to increase body weight. The study consisted of two groups from the James H. Quillen Veterans Affair Medical Center Nursing Home Care Unit. Experimental group received foods fortified with increased calories and protein at mealtimes. Control group received nutrition supplements between meals. Fifteen subjects began the study. Analysis of weight change revealed that those in the experimental group had no weight change over the four months. Subjects in the control group gained an average of 4.8 lbs of body weight in the same period. The Mann-Whitney Test was used to determine if the weight changes were significantly different between groups. Analysis indicated that (p-value = 0.2550) there was no significant difference in body weight gain between the groups. A larger sample size would have improved the outcome of the study.

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CHAPTER 1

INTRODUCTION

The number of Americans over age 65 is increasing dramatically and comprises nearly 13 % of the population. Current life expectancy is 79 years of age for women and 72 years of age for men. In fewer than 25 years those over 65 will make up 20% of the population in the United States. This is due to the aging baby boomers and longer life expectancies. The 85 years and older population is the most rapidly growing age group in this country.[1]

Many of these elderly persons reside in long-term care facilities. Entering a long-term care facility may increase the personal, social, economic, and medical needs of the elderly. The long-term care resident must become familiar with a new environment, and the adjustment is often more difficult due to separation from mate and/or family. The resident may be facing loss of life-long independence. Poor health resulting from disease frequently complicates the change and the total care of the resident. Poor health is often accompanied by decreased ability to consume food, which in turn threatens nutritional status. These changes from the individual's daily routine require special considerations.[2]

Nutritional needs and concerns in older adults tend to be multifactorial in nature and are not always easy to identify or meet.[1] While it is apparent that physiologic systems weaken at different rates, it remains unclear as to how much is related to the aging process and how much is due to a change in attitude and behaviors. Many pleasures of life are associated with food. Celebrations, such as birthdays, weddings, and family reunions often revolve around food. However, for the long-term care resident there may be no association of pleasure with food due to health-related problems. A resident's food

intake has been found to decrease with disease states, drug therapy, depression, dental problems, dementia, and dysphagia.[3]

In many cases, residents who suffer from dental problems, dysphagia, or certain diseases require mechanically altered foods to facilitate eating. Mechanically altered foods include ground, chopped, blended, and/or pureed. Mechanical changes in consistency make it possible for the resident to swallow. However, mechanical alterations of food usually mean decreased eye-appeal, color, and taste, leading to decreased intake which results in weight loss. Severe decreases in body weight often indicate poor nutritional status.[4]

Statement of the Problem

Many long-term care residents are at risk for weight loss. Poor intake and decreased appetite may lead to weight loss and diminished nutritional status. Residents may need increased calories to maintain or increase weight to within target range. The purpose of this study was to compare two methods of supplementing diets in order to provide additional protein and calories. Increased body weight is the desired outcome of nutritional supplementation and/or fortification.

Decreased appetite associated with poor health, mental status, socioeconomic problems, polypharmacy, and prescription of a mechanically altered diet decreases food intake. Many times it is not possible to increase appetite. Often the resident is tired or full before completing a meal, and the resident's appetite may be decreased due to depression. Continuation of decreased intake results in severe weight loss, which threatens nutritional status. Because appetite often cannot be stimulated, supplementation of the diet with added nutrients presents a viable option.[5]

By increasing the nutrient and caloric density of food, normal or smaller than normal amounts of food may be consumed yet provide the nutrients necessary to maintain or increase weight. Traditionally, supplementation of the diet has meant providing additional food and beverages between meals for the resident. These between meal supplements often resulted in decreased appetite and intake at mealtimes. Another technique that could be used is fortification of foods given at mealtime in order to increase nutrient concentration without increasing the amount of food offered.

Significance of the Problem

The goal of the registered dietitian in long-term care is to assist residents in maintaining or improving nutritional status. Many long-term care residents are at risk due to poor nutritional intake. Because poor acceptance and decreased appetite may lead to weight loss, increased calories may be needed to maintain or increase weight within normal limits. Severe weight loss can be accompanied by decreases in laboratory values such as hemoglobin, hematocrit, albumin, prealbumin, and total protein. Poor nutritional status also contributes to skin breakdown resulting in decubitis ulcers. As a result of poor nutritional intake, weight loss occurs, threatening the health status of the elderly and resulting in malnutrition.[1]

It is estimated that 25% to 80% of institutionalized elderly are malnourished or undernourished.[6] The functional changes that accompany malnutrition may lead to inability to perform basic self-care activities, which can lead to depression, apathy, and further decreases in intake.[6] The outcome of malnutrition is often seen as infection, poor wound healing, decubitus ulcer, impaired mental status, and poor rehabilitation. For the elderly long-term care resident, annual death rate was less in those residents with (a)

percentage of ideal body weight greater than 90%, (b) serum albumin greater than 4 g/dl, (c) hematocrit greater than 41%, and (d) cholesterol levels greater than 156 mg/dl. Body weight below 90% of ideal body weight is most often the result of poor nutritional intake.[6]

High nutritional risk has been identified by James H. Quillen Veterans Affair Medical Center (VAMC), as those residents who have experienced: (a) a 5% weight loss in one month, (b) 10% weight loss within six months, or (c) any resident at least 20% below ideal body weight. Residents may be within normal weight range and still be at high nutritional risk if they: (a) have decubitus ulcers, (b) consume less than 50% of meals for a three-day period and/or (c) have low values of hemoglobin, hematocrit, albumin, or total protein.

Hypothesis

The long-term care resident given a fortified diet with additional protein and calories at meal time will have a greater weight gain as opposed to the long-term care resident who receives a nutritional supplement between meals.

Null Hypothesis

The long-term care resident given a fortified diet with additional protein and calories at meal time will demonstrate no weight gain.

Assumptions

The following assumptions are critical to the study:

(1) The length of the study was adequate to obtain the data for analysis and measure significant weight change of the subjects.

(2) Procedure for weighing the subjects was accurate and consistent with nursing staff each month.

(3) Foods were prepared according to standardized recipes by VAMC nutrition and food service staff.

(4) Trays were prepared accurately according to VAMC nutrition and food service policies.

Limitations

Limitations of the study as follows:

1. Subjects were restricted to those residing at the James H. Quillen Veterans Affair Medical Center Nursing Home Care Unit (VAMC-NHCU).

2. The subject population consisted of those residents who were on a regular diet, mechanically altered diets, or those with documented chewing or swallowing difficulties who are at risk for weight loss.

3. The study excluded those residents on therapeutically modified diets as well as those with organ disease, heart/liver/kidney failure, or cancer.

4. Supplemented food items were labeled for identification.

5. Data collected, i.e. body weight, were used to assess change in nutritional status for participants of the study.

6. Supplementation and fortification was coordinated with Nutrition and Food Service Department at the VAMC-NHCU where they were responsible for the accurate preparation of foods and the appropriate delivery of meals. Nursing Services were accountable for weighing and recording of monthly body weights.

7. Calorie and protein content of foods and supplements consumed were calculated by the Nutritional Analysis Tool 2.0 (http://www.nat.uiuc.edu/nat.pdl).

The study continued for four months.

Definition of Terms[7]

Elderly: a person 65 years of age or older

Long-term care facility: a facility such as a nursing home that houses and provides nursing care for the elderly

Resident: a person who resides at a long-term facility

Weight gain: an increase in current weight

High protein-high calorie supplemented diet: a diet that provides approximately 1800-2000 calories and approximately 101 grams of protein per day (specific to this study)

Mechanically altered foods/diet: foods that are blended or chopped to facilitate eating

Nutritional status: an adequate nutritional intake to maintain weight, hematocrit, hemoglobin, total protein, and albumin within normal limits, without regard to disease state

Bolus: a soft ball of food formed in the mouth suitable for swallowing

Achalasia: failure to relax muscles involved in swallowing

Polypharmia: taking excessive medications

CHAPTER 2

REVIEW OF LITERATURE

Weight loss commonly occurs in elderly individuals and it is associated with functional decline and mortality. Ryan et al. demonstrated that subjects who lost at least 5% body weight in one month were 4.6 times more likely to die within one year compared to those who maintained weight within normal range.[8] Unexplained weight loss in the elderly is a multifaceted problem related to disease states and normal aging processes. Few studies have explained or determined reasons for weight loss in the elderly.

Weight loss occurs when inadequate amounts of food are consumed, and this contributes to decreased nutritional status. When prolonged inadequate intake continues, malnutrition occurs. The elderly must be able to obtain optimal nutrition from limited intake. If foods are prepared at the proper consistency and fortified with calories and nutrients, weight loss may be decreased with minimum intake and nutritional status can be maintained.[5] The review of literature will explore reasons for weight loss and malnutrition in the elderly. These problems include dysphagia, depression, dementia, drugs, dental, and nutritional deficiencies.

Dysphagia

Dysphagia refers to the sensation of impaired passage of food from the mouth to the stomach. The true prevalence of dysphagia is unknown, but epidemiologic studies estimate the prevalence in individuals over age 50 to be in the range of 16% to 22% .[10] A survey study in a Midwestern population estimated the prevalence of dysphagia to be 6% to 9% in those residing in long-term care facilities. Importantly, up to 60% of nursing

home occupants have feeding difficulties.[10] Changes can occur in the normal physiology of swallowing caused by aging, neurologic decline, cognition changes, medication side effects, radiation therapy, or surgical alterations of mouth or neck structures.[11] The consequences of dysphagia range from minor discomfort at mealtimes to serious complications such as malnutrition, dehydration, aspiration pneumonia, and death. Dysphagia is a serious problem in the elderly population that may greatly influence quality of life, weight loss, and mortality.

In order to understand how dsyphagia alters adequate intake of food, a physiologic description of swallowing is necessary. Swallowing is a complex activity involving the action of the esophagus to transport food from the mouth to the stomach.[11] Swallowing dysfunction in the elderly is generally mild, without evidence of clinical symptoms. However, many disorders change the swallowing function of the elderly.

Normal swallowing involves several components of the body to coordinate and maintain integrity, such as the cranial nerves – V, VII, IX, X, and XII. The changes in swallowing function also involve the nerves of the parasympathetic nervous system and skeletal and smooth muscle.[11]

Table 1.[11] Brief Review of Cranial Nerve Function on Food Intake	
Trigeminal V	Controls muscles associated with chewing and sensation of oral mucosa.
Facial VII	Controls muscles of facial expression, controls taste in the tongue, controls oral secretions, controls swallowing.
Glossopharyl IX	Controls taste on tongue, controls swallowing.
Vagus X	Controls gastrointestinal mobility and secretion.
Hypoglossal XII	Controls nerves in the tongue.

Swallowing Review

Swallowing occurs about 100 times per day and in three phases: the oral, the pharyngeal, and the esophageal phases.[12] The oral phase includes chewing and lubrication of a bolus of food with saliva. This process prepares the food for swallowing. The tongue holds the bolus until it is ready to transfer to the back of the throat. This sets the stage for the pharyngeal phase. When the swallowing reflex occurs, the pharyngeal phase begins.[12]

This stage causes the food bolus to be forced to the back of the throat, and respiration stops momentarily. The soft palate is lifted to prevent food from going into the nasal passages. The epiglottis (larynx) rises and the vocal cords are shut off. This step prevents aspiration of food into the lungs. The upper sphincter of the esophagus is relaxed. The bolus of food goes around the epiglottis and into the esophagus. Food or liquid goes into the esophagus and moves down. The lower esophagus sphincter relaxes, and food goes into the stomach.[12]

This transfer of the food bolus to the esophagus and to the stomach is the esophageal phase of swallowing. After the food enters the stomach, the soft palate and epiglottis return to their usual position, and breathing is restored. The swallowing process is a reflex started by voluntary action and is regulated by the swallowing center which is located in the medulla of the brain.[12]

The skeletal muscle effectiveness in swallowing is dependent on cognitive status. Residents with dementia and other causes of decreased sensorium are likely to have dysphagia. In addition, many elderly people experience changes in neuromuscular control that result in dysphagia.[12]

When Swallow Is Altered

Oral dysphagia can be related to neurological disorders, oral lesions, or decreased saliva production. Neurological disorders, in addition to Alzheimer's disease, include cerebrovascular accident, amyotropic lateral sclerosis, multiple sclerosis, and Sjogren syndrome. This form of dysphagia is usually classified as oropharyngeal dysphagia. Signs of this form of dysphagia are:

- drooling of liquids
- weak lips
- pocketing of foods in cheeks or under the tongue
- spitting out food
- poor tongue control
- excessive tongue movements
- inability to move tongue in all directions
- poor lip closure
- slowed oral transit time
- facial weakness
- decreased oral sensation
- slurred speech [13]

Most cases of oropharyngeal dysphagia occur in the elderly secondary to central nervous system disorders, usually strokes. According to Finestone[13], aspiration pneumonia after strokes causes over 50,000 deaths a year. The severity of the swallowing deficit is related to the amount of brain damage as a result of the stroke. About 75-80% of this form of dysphagia is related to neuromuscular disorders.

Advanced disease is demonstrated by drooling, pocketing of food in the cheek, and silent or gross aspiration.[13]

Difficulties in the oropharyngeal phase of swallowing are altered by a number of conditions including:

- *Inflammatory lesions of the upper gastrointestinal or respiratory tract.* Damage in this area of the GI tract can be caused by infection, radiation therapy, and chemotherapy. Painful swallowing occurs in most cases in this form of dysphasia.
- *Cancerous lesions of the upper gastrointestinal tract.*
- *Anatomic and functional abnormalities in the upper esophageal sphincter*. The usual cause of this condition is Zenker's diverticulum that causes regurgitation, cough and cachexia.
- *Neurological disease*. This form of dysphagia is caused by cerebrovascualar disease, Parkinson's disease, multiple sclerosis, brain tumor, and diabetes.
- *Myopathy*. (muscle disorders).
- *Alzheimer's disease.* The resident may forget how to eat, and therefore swallowing sequence is not initiated. There is also reduced lateral tongue movement and further delay in triggering the pharyngeal phase of the swallow.
- *Medication.* Can alter swallowing function in this stage of the swallow. These drugs include; drugs that suppress the central nervous system, penicillamine, amiodarone, and high doses of aminoglycosides. The treatment of this form of dysphagia is usually based on the cause of the disease process. Other interventions are to modify the temperature and texture of the diet, tongue exercise, head, neck, chin tuck positions, special feeding devices, and supraglottic swallow.[13]

Esophageal Dysphagia

Esophageal dysphagia alters the successful transfers of food to the esophagus.[10] When food enters the esophagus, the striated muscles of the upper esophagus and the smooth muscles at the bottom of the esophagus are stimulated by the nerves of the parasympathetic nervous system. The result is wave-like peristaltic movements that move food through the esophagus to the stomach. Food travels down the esophagus. As it reaches the stomach, a wave of relaxation occurs just as it is about to enter the stomach. This wave causes the lower esophageal sphincter to open and allows the passage of food into the stomach.[10]

In some elderly residents, the peristaltic wave is absent or has a lower amplitude. This causes food to be caught in the esophagus. The esophagus is dilated with accumulated food and causes pain. The passage of food and fluid through the esophagus is delayed. The control of fluids with this condition is more difficult than the control of solid food.[10]

Recurrent impaction of the esophagus with a food bolus, or aspiration and nasal regurgitation, are commonly found in this form of dysphagia. This phase of swallowing pathology is noted on clinical observation and is often confirmed by a modified barium swallow with the use of video equipment. Indications of this form of dysphagia include:

- coughing before, during, or after food or fluid intake
- wet “gurgly” voice after swallowing
- hoarse or breathy voice
- absent swallow reflex
- delay or absence of laryngeal elevation

- choking
- nasal regurgitation
- numerous swallows needed to clear the throat.[10]

Difficulty swallowing solid foods is usually related to a narrowing of the esophagus. Eventually, this may also cause difficulty with swallowing liquids. This means the bolus of food has difficulty moving through the esophagus. Motility disorders or obstructive disorders with swallowing are usually found with the esophageal phase of swallowing. The conditions causing narrowing of the esophagus include cancers and thickening of the esophagus due to repeated reflux of gastric contents. Some drugs common to long-term care residents can cause dysphagia by irritating the esophagus. These drugs include potassium chloride, vitamin C, ferrous sulfate, tetracycline, nonsteroidal anti-inflammatory agents (NSAIDS), and alendronate. Adequate fluids should always be given with these drugs to minimize irritation of the esophagus.[14]

Other times, the cause is achalasia which is a failure to relax muscle, spastic disorders affecting the esophagus, connective tissue disorders, or mechanical obstruction of the aorta. With achalasia the lower esophageal sphincter fails to open, and food cannot pass into the stomach from the pharynx, resulting in aspiration. The results are difficult or incomplete passage of food through the esophagus causing dysphagia, chest pain, or both. This form of pathology is usually identified by a barium swallow or an upper endoscopic examination. At times, dilation of the stricture is attempted to ease swallowing.[15]

Guidelines for Dysphagia

Some guidelines for feeding the dysphagic patient are listed below.

- Good oral hygiene before meals.
- Temperature of foods for these residents should be very cold, as the resident may lose the ability to sense the temperature of the food in his mouth.
- Use pineapple, cranberry, or carbonated beverage to clear mucus prior to eating.
- Highly seasoned food with a distinct aroma helps to identify the food placed in the mouth.
- Foods must be moist to hold together when swallowed as a bolus.
- Gravies and sauces make swallowing easier.
- No foods with skins, seeds, hulls, or rice.
- No ground beef, as it is difficult to swallow.
- Avoid food with two or more consistencies such as: cereal in milk, or vegetable soup. [16]

Depression

Cognitive and mental disorders are a frequent cause of weight loss. There is a link between psychiatric well-being and food intake[17], thus decreased appetite is quite common in the depressed elderly. Depression is the most common mental illness in the elderly, but treatment of depression is often very successful.

As people grow older, their ability to function independently decreases. By age 85, 33% of the elderly are dependent on others to perform normal activities of daily living; even the most basic such as toileting and feeding.[17] The loss of the ability to function independently significantly limits personal choices such as when to eat, what to eat, when to go to bed, when to go out, and when to use the bathroom. These losses can be troublesome to a previously independently functioning adult. The idea of being a

bother and not having any value are frequent concerns of the dependent elderly. The loss of vision, hearing, and speech further complicate choice in everyday living. Loss of the ability to walk significantly decreases the opportunity to change the environment and limits outdoor activities. Functional losses all lead to a decline in environmental stimulation.[17]

The diagnosis of depression is made after other physical and medical disorders have been excluded. Diseases such as heart disease, cancer, hypothyroidism, respiratory diseases, infections, and flu can cause symptoms of depression. Drugs such as steroids, beta blockers, and levodopa may cause depression, while nutrition can also play a role. Vitamin B12 and folate levels are often determined after assigning a diagnosis of depression.[18]

As a person grows older they often experience loss of health, family, and independence. These losses often lead to feelings of fear, anxiety, and depression. Recognition of depression is important to maintain nutritional status and life itself.[18]

Dementia

The prevalence of dementia in long-term care facilities is high and does increase as individuals age. It is estimated that 65% of residents in long-term care have dementia. Behavioral problems are the most critical factor causing admission to long-term care.[19] There are estimated 4,000,000 persons with Alzheimer's disease in the United States, and 1,000,000 of them are in long-term care. Alzheimer's disease accounts for 50-60% of all dementias and is the most frequently identified cause of dementia.[19] The National Institute of Health estimates that dementia costs over $40 billion each year for those over

age 65. One out of three families in America will be affected by this devastating disease.[19]

Damage to the brain usually occurs first in the frontal lobe and results in memory loss, apathy, and behavioral disturbances. There is a loss of the executive function of the brain, which means the part of the brain that plans and directs complex behavior is affected.[20] Behavior is confused; there is no rhyme or reason as the ability of the brain to create order, plan, and direct behavior shuts down. Additionally, normal behavioral inhibitions are lost, and the resident losses the ability to function logically. Reasoning with a person who does not understand is often frustrating to both the caregiver and the resident who has dementia.

Loss of memory, especially recent memory, is another frequent problem and results in confusion about time and place. Cognitive losses result in difficulty to think, loss of things, mood swings, loss of judgment, and personality changes. The disease affects the resident on all levels of functioning including physical, psychosocial, cognitive, and environmental. The changes caused by the disease and the complexity of eating create many food and nutrition implications. Not giving attention to the nutritional and dietary concerns of these residents can result in weight loss, malnutrition, constipation, dehydration, and pressure sores. [20]

Meals and snacks need to provide adequate calories to maintain weight and nutritional status. Often concentrated calories are recommended for these patients. By increasing the nutrient and caloric density of food, normal or smaller than normal amounts of food may be consumed to provide the nutrients necessary to maintain or increase weight.

Drugs

The 1994 Joint Commission Accreditation Hospital Organization (JCAHO) has a provision stating that, "Before discharge, patients should be given instructions and counseled about possible food-drug interactions."[21] Long-term care facilities are joining the spectrum of health care services as part of managed care, and they are JCAHO accredited to participate with hospitals in the continuum of care.[21]

Federal regulations put into effect on July 1, 1995, specified that risk factors for malnutrition, such as drug therapy, were specified to be part of the nutrition assessment. The drugs of concern are listed here:

- Cardiac glycosides
- Diuretics
- Anti inflammatory drugs
- Antacids – overuse
- Laxatives – overuse
- Psychotropic drug – overuse
- Anticonvulsant
- Antineoplastic drugs
- Phenothiazines
- Oral hypoglycemics[22]

The elderly are the largest consumers of both prescription and nonprescription drugs. The increased drug use occurs if the elderly are at home or in a health care facility. This population group represents twelve percent of the population, while taking

30% of the drugs prescribed or purchased over-the-counter. The percent of the drug bill of this population is expected to increase to 40% of the total drug expenditure by the year 2030.[23]

The potential for adverse effects of drugs rises with increased drug use, and the elderly have a three to seven times greater likelihood of experiencing an adverse drug reaction than middle-aged adults. Health care costs increase due to hospitalizations alone. Data from North America and England show that 10 to 25% of admissions of elderly patients to acute care hospitals are due to adverse drug reactions.[23]

Drugs are the basis of therapy for several chronic diseases that afflict the elderly population. Over 80% of those over age 65 have at least one chronic disease. [24] Diseases commonly found in the elderly population include cardiovascular diseases, diabetes, hypertension, and osteoporosis. All these diagnoses require medications that can often result in an increased likelihood of inappropriate or excessive use of drugs and an increased exposure to drug-related toxicities. Nursing home residents consume an average of eight drugs daily.[24]

A major consequence of polypharmacy in elderly patients is the risk of nutritional deficiencies induced by drugs. Mechanism of drug-nutrient interactions include reduced food intake caused by side effects such as, nausea, vomiting, and altered taste perception; interference with nutrient absorption; alteration in nutrient metabolism; and increased nutrient excretion.[25] All these effects of drugs can have a negative impact on nutritional status, as well as decrease the effectiveness of nutrients and/or drugs. A major difference between pharmacy and nutrition is that nutrients and energy are essential to life in both health and disease, and medications are only needed in the absence of health.[26]

Dental

According to The Report of the Nutrition Screening Initiative in 1991, oral health problems include tooth loss, decayed teeth, poor fitting dentures, periodontal disease, and other oral pathology.[27] According to Dwyer, by age 50 years, 11% of the population has lost their teeth, 42% have root caries that are untreated, 40% have gingivitis, 17% have periodontal disease, and 5% have crown caries left untreated.[27] After age 85 years, tooth loss increases to 55%. Frequent signs of oral problems include problems with chewing, persistent halitosis, infection in the gums, oral lesions, bleeding gums, and dental caries. The oral health condition can limit food intake and the form in which food can be consumed. This in turn may require mechanically altered and pureed diets to facilitate eating.[27]

As people age, the jaw shrinks, and with weight loss the dentures often will no longer fit properly, making the chewing of food difficult. The result may be that residents in long-term care give up foods that require more chewing, such as meat. Individuals using dentures have only one-sixth of the biting force of people with their natural teeth. Many long-term care residents, especially those who are alert, are reluctant to accept ground or other texture alterations. At times inadequately cleaned dentures may cause a bad taste in the mouth and decrease the appetite. Good oral hygiene is important for food intake.[28]

Oral motor dysfunction is not uncommon in the elderly. A slower closing of the jaws decreases the biting force with chewing. This situation is not improved by the use of dentures. Dentures are a major contributor to choking in the elderly. Both decreased

jaw movement and the decreased force of jaw movement cause food not to be chewed as finely as in younger adults. [29]

The decreased biting force causes elders to make different food choices. One study showed elderly men consumed in their diet 30% less carotene and Vitamin E, 27% less iron, 24% less fiber, and 20% less folate and thiamine compared to younger men.[30] Some hard to chew foods are often eliminated from the diet; one of these foods is typically meat.

The majority of elders also show evidence of periodontal disease and bleeding of gums.[27] Periodontal disease and other oral infections may increase calorie needs. The disease process makes eating difficult due to sore gums or teeth and increased sensitivity to spicy, acidic, and very hot or cold foods. [28]

Oral problems are often correctable problems for preventing further weight loss. If a resident is reluctant to be fed or to put very hot or cold foods into his/her mouth, dental problems may be the cause. [28]

Dry Mouth

Xerostomia, or dry mouth, is caused by drugs and disease in the elderly. Over 400 medications are noted to contribute to dry mouth; most common are antipsychotic, antidepressant, and antihypertensive medications. Dry mouth decreases denture retention, causes periodontal disease, and presents difficulty with chewing and swallowing; thus nutritional intake and total calorie intake is reduced. Lubrication from saliva prepares the food as a bolus for swallowing. Saliva maintains a pH of 7.4, which neutralizes bacteria and prevents dental caries. Secretory IgA is also present to prevent infection from bacteria entering the mouth. Those with greater impairment in oral dental

status are more likely to have impaired nutritional status. Saliva is also important for digestion of carbohydrate foods, taste sensation, and lubricating food for swallowing. Dry mouth leads to deterioration of the teeth and disease in the oral cavity, specifically erosion of enamel on teeth. [29]

Common complaints of those with dry mouth include difficulty speaking, food sticking to teeth, and difficulty in tasting and swallowing food. In addition, the lack of saliva increases the potential for the growth of pathogens in the mouth and results in disease. Saliva and salivary glands are part of the immune process to protect pathogens from gaining entry to the body. Without adequate saliva, dry foods stick to the mucosa and are difficult to dislodge by swallowing or spitting out. According to Ejvind [30] "among a population of frail older people, xerostomia has been shown to be among the best predictors of significant involuntary weight loss in the previous year."

Prevalence of Undernutrition

A study by Abbasi and Rudman in 1993 [31], "Observations on the Prevalence of Protein-Calorie Undernutrition in Veterans Administration Nursing Homes," reviewed 26 nursing homes in the central United States for prevalence of underweight and malnutrition and extent of documentation of malnutrition by care providers. The study determined indicators of malnutrition to be an albumin level of less than 3.5 g/dl, and calorie deficiency indicated by the resident being less than 80% of the standard weight. Charts were reviewed for input by physicians, registered nurses, and registered dietitians. The low body weight in these facilities ranged from two to 20%, with the median being 12%. Low albumin levels were found in five to 58% of the residents, with the median

low albumin (less than 3.5 g/dl) at 28% for residents. For each of the two indicators, a 10-fold difference was found between the lowest and the highest prevalence.

According to Abbasi, "This high prevalence is of concern because the affected residents are likely to experience a several-fold higher death rate than their well nourished counterparts."[31] Malnutrition, according to the author, causes a host of mental and physical changes, such as decreased activities of daily living skills, impaired ventilation, decreased resistance to infection, poor wound healing, and delayed treatment and healing of pressure sores.[31]

The Elderly Nutrition Screening Initiative [27] was a project of the American Academy of Family Practice, The American Dietetic Association, the National Council on Aging, and 30 invited members of a Blue Ribbon Panel with expertise in nutrition, medicine, and aging. The report issued by the National Screening Initiative in 1991 showed that 85% of older Americans were at nutrition risk: 24% at high nutrition risk and 38% at moderate nutrition risk. This report focused on a five-year study of Americans over the age of 65 years. The elderly found to be at high nutritional risk on hospital admission had up to three times more complications, two times longer stay, three times higher risk of death, and increased medical costs by thousands of dollars based on information from the five year study. [27]

Nutrition Recommendations of the Elderly

The elderly population represents an extremely heterogeneous group as compared to younger population groups. This heterogeneity has important consequences for medical therapy and especially for recommendations regarding vitamin needs. The elderly also share several factors for putting them at an increased risk of malnutrition. An

adequate intake of different nutrients is of importance for the prevention of nutritional deficiency and malnutrition.

In recent years, new information has accumulated indicating that nutrient needs for persons 51 years and older are not necessarily the same as those for persons older than 70 years. This new knowledge has led to more defined nutrient recommendations for older adults. In contrast to the 1989 Recommended Dietary Allowances (RDAs), which grouped all older adults 51 years and older into one category, separate Dietary Reference Intakes (DRIs) are being published for adults aged 51 through 70 years and those older than 70 years. [32]

Calories, vitamin $B_{12,}$ calcium, magnesium, and zinc intakes are most frequently below the recommendations for the elderly**.** For example, caloric intakes averaged only 80% of the RDA for elderly men and 73% for elderly women, according to data from the Continuing Survey of Food Intakes by Individuals.[32] Vitamin B_{12} is interesting because a deficiency of this vitamin may be more prevalent among older adults than previously believed and because a vitamin B_{12} deficiency may lead to problems with dementia in older adults. [32] In the 1989 RDAs [32], the recommendation for vitamin B_{12} was lowered from the previous (1980) edition. It is now recognized that the requirement for vitamin B_{12} does not change with age. However, many older adults malabsorb protein-bound Vitamin B_{12} as a result of atrophic gastritis or loss of stomach acid with aging. This condition affects about 25% of adults aged 50 to 69 years and up to 40% of adults older than 80 years. To ensure that older adults with atrophic gastritis receive the required amount of vitamin B_{12}, the DRIs for vitamin B_{12} are 2.4 micrograms/day. Relatively little information is available regarding the bioavailability of vitamin B_{12} from various foods,

including dairy foods; however, a recent investigation, involving more than 500 older adults, found that vitamin B_{12} was absorbed more efficiently from dairy products than it was from meat**,** poultry, or fish.[33]

New dietary intake recommendations for calcium call for increased intakes of calcium for the age group. The DRI for calcium for all adults aged 51 years and older is 1,200 mg/day, 400 mg/day higher than previously recommended for older adults. Adequate calcium intake throughout life helps to protect bones from osteoporosis, a disease affecting 28 million people, mostly women and older adults.[33]

The amount of zinc in the diet affects the total zinc levels in the body. The RDAs for men and women 51 years of age and older have been set at 15 mg and 12 mg, and there are no more specific recommendations for intakes for older individuals. Reviews of 10 studies of elderly people revealed that mean intakes were between 7 mg and 10 mg/d. Pennigton[34] reported that zinc intakes were only 72% of the RDA for women 60 to 65 years of age and 85% of the RDA for men and that dietary adequacy of zinc is of concern for a number of age and gender groups. These lower levels of dietary intakes are, in part, a reflection of the density of zinc in the diet and the diminished energy intake associated with aging. It is recognized that recommended energy intakes for those older than 74 years should be less and the density of zinc; i.e. meats, in the diet should increase at older ages. It is evident that unless people are particularly careful to choose foods rich in zinc, it is unlikely that the RDA will be met. If elderly people consume proportionately less of the foods that are rich in zinc, the density of zinc in their diets will decline further, exacerbating problems of obtaining sufficient zinc from dietary sources.[34]

Summary

The elderly are susceptible to protein calorie malnutrition. Protein calorie malnutrition in the elderly has been positively identified in 50% of those entering a long-term care facility and stems from inadequate caloric intake. [31] Protein calorie malnutrition is more prevalent in the institutionalized elderly than in the community living elderly. Protein calorie malnutrition may be associated with dementia, poor dentition, depression, physical or neurological anorexia, drug induced anorexia, and change in living environment. [3]

The challenge lies in providing a diet which enhances mastication and swallowing and provides adequate nutrition. Nutrient content of such a diet may need to be magnified in order to provide needed nutrients, especially if intake is only 50% of the food provided. Due to the widespread problem of dysphagia among the elderly, the challenge is strengthened. Foods must be served in a soft consistency and as attractively as possible, thus, careful preparation to enhance eye appeal and nutritional supplements for increased nutrition are essential. Nutritional fortification by adding increased amounts of calories, protein, carbohydrate, fats, vitamins, and minerals are needed to improve nutritional status of the elderly.

CHAPTER 3

DESIGN AND METHODOLOGY

The Sample

The James H. Quillen VAMC NHCU houses 120 long-term care residents. VAMC-NHCU chose to participate in the study because of its concern for good nutritional care. The health care residents of VAMC-NHCU were also chosen due to availability and willingness of the administration to support the study.

Recruitment of subjects included residents on mechanically altered diets or those on a regular diet with documented chewing or swallowing difficulties who were at risk for weight loss. Criteria for weight loss was as followed: (1) residents must have recent (within one month) weight loss of five pounds; (2) residents must be at least 20% below ideal body weight; and/or (3) 10% weight loss within six months. Residents may also be within normal weight range and still be at high nutritional risk if they: (1) have decubitus ulcers; (2) consume less than 50% of meal for a three day period and/or; (3) have low values of hemoglobin, hematocrit, albumin, or total protein. The study excluded those residents on therapeutically modified diets as well as those with organ disease, heart/liver/kidney failure, and cancer.

The subjects were randomly assigned to either the control or the experimental group. The experimental group received foods fortified with increased protein and calories at mealtimes, including commercially available food fortifiers such as Promod, non-fat dry milk, Forta Vanilla Shake Mix, and were provided a Resource Shake one time daily with the lunch meal**.** The control group received supplementation with a commercial nutritional supplement e.g. Resource shakes between meals two or three

times per day at 10:00 a.m., 2:00 p.m., and/or 8:00 p.m. Data collected, i.e. body weight, were the variables used to assess change in nutritional status for subjects.

Twenty-five residents were identified as meeting the study requirements. After information was presented to the subjects and/or subject's legal representatives and consent forms signed 15 residents were enrolled in this study. All subjects were veterans of the armed forces, were male, and were between the ages of 60 to 95.

Subjects for the experimental group received added nutrients to their meal plan through fortified foods served at mealtime. The residents for the control group received the regular planned menu and two to three between meal supplements. Between meal supplements are the traditional way of adding nutrients for VAMC nutritional risk residents. Therefore, the control group received no additional treatment during this study.

Protocol

Charts of all residents on a mechanically altered diet or those on a regular diet with documented chewing or swallowing difficulties were reviewed to obtain information about body weight, diet orders, and eating habits. After reviewing the charts, subjects for the study were chosen if they met any of the nutritional risk criteria.

The experimental group received treatment through fortification of certain food items and one commercial supplement daily e.g. Resource. Meals for the experimental group were planned with assistance from VAMC nutrition and food service staff. Foods that were planned to add nutrients to the treatment group's meal plan included the following:

- Fortified oatmeal

- Fortified cream of wheat
- Fortified grits
- Fortified cream soup
- Fortified meat soufflé
- Resource Shakes one time daily as a supplement

Fortified foods provided approximately 1600-1700 calories per day with approximately 84 grams of protein per day (Appendix A). Fortified foods plus the remaining food items provided approximately 2700 calories per day with approximately 109 grams of protein per day. The fortified oatmeal was adopted from a Menu Magic Foods (Indianapolis, Indiana) recipe and supplemented by adding Forta Vanilla Shake Mix from Ross Laboratories® (Columbus, Ohio). This recipe added additional calories and protein along with other nutrients to the breakfast meal as seen in Appendix B. The fortified soup was planned for the noon and evening meals. The soup was a cream soup fortified with non-fat dry milk (Appendix B). The fortified meat soufflé was developed by using Promod and following the supplied recipe from Menu Magic Foods. Ingredients for the Promod are as follows: [illegible]-D Whey protein concentrate and soy lecithin. Recipes for the meat soufflé included one for tuna or salmon, beef or pork, turkey or chicken as seen in Appendix B. Meat soufflés were served at lunch and supper. Promod ® is a concentrated product which fortifies food with protein. The soufflés were soft in texture to accommodate diet orders of mechanically altered diets or those with chewing and swallowing difficulties. The high-calorie, high protein nutritional supplement for the control group was Resource® from Novartis Nutrition Corporation (Appendix B).

Both groups were provided the regularly planned menu for their prescribed diet each day. The experimental group's food items were fortified at mealtime to provide

approximately 2700 calories per day. The control group received the regularly planned menu for their prescribed diet, plus between meal supplements, at 10:00 a.m., 2:00 p.m., and/or 8:00 p.m. Calories provided to the control group by the regular menu averaged 2,000 calories per day. Between meal supplements provided an additional 500-750 calories per day (Appendix B). Nutritional analysis was completed using the Nutritional Analysis Tool 2.0 (http://www.nat.uiuc.edu/nat.pdl).

Development of Instrumentation

Implementation of the study began by consulting the Chief of Nutrition and Food Services at the VA Medical Center for participation in the study at the VAMC-NHCU. Approval of the project was granted by the ETSU Institutional Review Board and the VA Medical Center Research and Development Board. Meetings were held with the VAMC-NHCU (a) director of nursing, (b) physicians and physician's assistant, and (c) nutrition and food service staff to introduce the plans for the study. Recipe testing of the fortified cereals, cream soup, and meat soufflés was initiated with the nutrition and food service staff to provide an appropriate textured, eye-appealing product. The experimental group recipes and menus were planned by the principal investigator and approved by the registered dietitians. The menu included fortified foods and appropriate textured foods for a three-week cycle period and the diet was named pureed extra or mechanical extra diet depending on the recommended diet texture. After approval of the study, the subjects were identified and randomly assigned to an experimental or control group. The physicians were notified of those subjects who were assigned to the experimental group and the diets were changed to pureed extra or mechanical extra. Physicians and physician assistants are the only medical staff who have authority to change the diets at

the VA Medical Center. The food and nutrition service staff were introduced to the type of foods to be served and were trained to identify those residents receiving the experimental fortified diet.

An instructional meeting was given by the Chief of Nutrition and Food Service and registered dietitians for nutrition and food service aides and cooks on how to prepare and serve the special fortified foods. Recipes for the fortified foods were presented to the cooks for preparing the meat entrees, fortified cereals, and soup (Appendix B). The nutritional services staff was instructed on adding gravy and sauces to each soufflé and providing appropriate portion sizes.

Subjects were weighed monthly by nursing staff and weights were documented on appropriate forms and on the computer system. Protocol for weight measurement was the VAMC-NHCU policy for weighing the resident. This policy states that: (1) the resident be weighed the same time each month within seven days and at the same time of the day, (2) that the resident be weighed without shoes, in bed clothing, and (3) the weight chair be calibrated before each weighing. Questionable recorded weights were checked by reweighing the resident.

Statistical Design and Evaluation

Weight gain or loss was defined as the weight after subtracting the beginning weight from the ending weight. Mean weight change for all subjects was determined after subjects were weighed monthly over a period of four months. Mean body weight change of the experimental subjects was compared to mean body weight gain of the control subjects.

CHAPTER 4

RESULTS

This study was conducted to determine a suitable method of nutritionally supplementing diets to produce a desirable increase in body weight in long-term care residents. Two methods of supplementation were studied. The control group received a diet that was supplemented between meals two to three times per day at 10:00 am, 2:00 pm, and 8:00 pm. This was a typical supplementation procedure. The experimental group received a diet with foods fortified with added protein and calories at each meal and a nutritional supplement one time daily.

The null hypothesis was that the long-term care resident given a fortified diet with additional protein and calories at meal time will demonstrate no weight gain.

Fifteen subjects began the study with seven in the experimental group and eight in the control group. The two groups were from the VAMC Nursing Home Care Unit in Johnson City, Tennessee. At the end of the study the experimental group contained only five subjects, due to death of one member and a change to a therapeutic diet in one subject diagnosed with renal disease. In the control group the ending total was maintained at eight subjects.

Data for each group were collected by obtaining monthly body weights for all subjects. Weight change was compared between the groups. Weights were collected on a monthly basis for each subject for a period of four months. The goal was to produce body weight gains by providing supplemented foods. Body weight changes were compared for both groups (Table 2). During the study, the experimental group had three

subjects who lost weight and two subjects who gained weight. The control group had three subjects who lost weight and five subjects who gained weight (Table 3).

Mean weight change was calculated by subtracting the beginning weight from the ending weight for each subject. Analysis of weight change revealed that that those in the experimental group had no weight change over the four months. Subjects in the control group gained an average of 4.8 lbs of body weight during the study.

To determine if the weight changes were significantly different between groups, the Mann-Whitney Test was used from Minitab, a statistical computer program. This statistical test is calculated in terms of the sum of the ranks of weight gain of the people in the control group and the sum of ranks of people in the experimental group, taking both groups into consideration. Review of analysis indicated that p-value = 0.2550, meaning that the null hypothesis could not be rejected at $p > 0.05$. The results indicate there is no significant difference in body weight gain between the control and experimental group (Table 4). There was a slight increase in body weight gain in the control group; however, this difference was not statistically significant because of the small sample size.

Table 2. Subjects Weight in Pounds Over Time						
Subject	**Group**	**Time1**	**Time2**	**Time3**	**Time4**	**Time5**
1	E	148.0	149.0	149.5	149.2	144.7
2	E	105.6	106.4	108.6	109.9	110.0
3	E	160.0	160.0	163.0	154.0	155.0
4	E	120.0	121.6	123.0	130.0	132.7
5	E	152.4	152.3	154.3	153.9	143.6
6	C	85.6	85.9	98.3	97.0	97.6
7	C	105.0	106.7	110.9	112.0	129.0
8	C	154.5	152.3	153.4	159.4	164.3
9	C	188.0	188.0	189.5	187.4	180.7
10	C	171.6	173.0	170.4	168.5	171.2
11	C	156.5	156.5	155.6	158.1	158.0
12	C	120.1	122.0	124.2	123.0	123.4
13	C	186.4	186.4	186.7	187.5	182.0

E = Experimental Group
C = Control Group

Table 3. Subjects Weight Change Over Time		
Subject	**Group**	**Wt Change (lbs)**
1	E	-3.3
2	E	4.4
3	E	-5.0
4	E	12.7
5	E	-8.8
6	C	12.0
7	C	24.0
8	C	9.8
9	C	-7.3
10	C	-0.4
11	C	1.5
12	C	3.3
13	C	-4.4

E = Experimental Group
C = Control Group
Wt = Weight

Table 4. Mann-Whitney Test: Weight Changes Between Groups
Change_Control N = 8 Median = 2.40
Change_Experimental N = 5 Median = -3.30
Point estimate for ETA1-ETA2 is 4.70
95.2 % CI for ETA1-ETA2 is (-8.80,17.00)
W = 61.0
Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.2550
Cannot reject at alpha = 0.05
This value is larger than 0.05; the null hypothesis could not be rejected

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The results of this study showed no significant difference in body weight gain between the experimental and control groups. It may be concluded in this study that fortification of foods at mealtime did not provide a significant weight gain as determined by the Mann-Whitney test. It would have been beneficial to determine if variables such as age, compliance, and consumption of foods may have affected weight change in these subjects. It was outside the scope of this study to evaluate these additional variables.

This study could have been improved by having a larger subject sample. It would have increased the internal validity of the study to use many nursing homes with larger assignment of subjects to the two groups. The lack of participation from the residents and the residents' legal representatives at the VAMC-NHCU made recruitment for the study very difficult for a large sample size.

Twenty-five percent to 80% of elderly entering long-term care facilities are malnourished or undernourished .[3] Due to this high percentage, it is essential that ways be designed and implemented to improve nutritional status. Extended research is needed to incorporate ways of increasing body weight for those who are underweight.

Experimentation would be beneficial to find more foods that can be fortified without altering palatability. A problem with fortification of food may have been the dislike of some of the fortified food items that were prepared. Residents likes and dislikes were evaluated; however, some residents could not identify their needs due to their mental confusion. Foods offered in this study included soufflés, fortified cereal, and cream soup. Due to individual preferences if a variety of foods could have been offered

with added nutrients there may have been more weight gain in those Residents. For example, fortified meats instead of soufflés, fruits, or dry cereals could have been used as part of a fortified meal plan.

Detailed clinical assessment should be incorporated to best meet the nutritional needs of each resident. This assessment should include previous food intake records, weight and height, chewing and swallowing ability, and blood chemistry which should include prealbumin, albumin, total protein, transferrin, hemoglobin, and hematocrit. It would have been interesting to follow clinical assessment parameters such as prealbumin or albumin in the present study, if there was more time, resources, and financing been available. Changes in albumin or prealbumin may have shown an improvement in nutritional status even when weight gain was not evident.

Future research should include studies that incorporate a variety of fortified foods from each of the four food groups with comparison with between meal supplements with a larger sample size to determine if there are weight changes between groups. The study should included pre- and post- blood chemistry values for comparison of improved nutritional status along with food intake records and body weights.

Forty percent of long-term care residents have a need for some type of food modification due to chewing and swallowing difficulty.[15] Thus, maintaining nutritional status becomes a challenge. The clinician should plan menus which best suit the individual and his/her eating ability. Foods of different consistency and texture should be offered to each resident until the appropriate food consistency is met. During this process, precautionary measures should be taken to prevent choking.

Malnutrition is manifested by low blood chemistry values such as hemoglobin, hematocrit, albumin, and total protein. Severely decreased body weight results from inadequate intake and often results in malnutrition. Malnutrition in the elderly is a severe and widespread problem and is often associated with dysphagia.[17] Health care professionals must work to improve nutritional intakes by providing the most suitable consistency for the elderly and by providing the most appropriate way to add nutrients to their diet either through supplements between meals or fortified foods at meal time.

REFERENCES

1. Jarvis JK. Healthy Eating in Later Years. (Statistical Data Included). *Nutrition Today*; 2001.

2. Van Staveren W. Regulation of appetite in frail persons. *Clinics in Geriatric Medicine;* 2002. 18(4): 675-84

3. Lewis MM. Long-Term Care in Geriatrics. Nutrition in Long-term Care. *Clinics in Family Practice.* 2001; 3:3.

4. Hogstel M. Feeding the frail elderly. *Journal of Gerontological Nursing*. 1989; 15(3): 16-20.

5. Gibert SK. *Enhancing Weight Gain in Long-Term Care Residents Through a Protein-Calorie Supplemented Mechanically Altered Diet*. [honor's thesis]. Johnson City, TN: East Tennessee State University, 1991.

6. Meyyazhagan S. Nutritional requirements with aging. Prevention of disease. *Clinics in Geriatric Medicine;* 2002; 18(3): 557-76.

7. Thomas CL. Taber's Cyclopedic Medical Dictionary. 18th ed. Philadelphia, PA: F.A Davis Company; 1997.

8. Ryan C, Bryant E, Eleazer P, Rhodes A, Guest K. Unintentional weight loss in long-term care: predictor of mortality in the elderly. *South Med J.* 1995; 88:721-4.

9. Jensen GL. Nutrition in the elderly. *Gastroenterology Clinics of North America.* 2001; 30(2): 313-34.

10. Lind CD. Dysphagia: Evaluation and treatment. *Gastroenterology Clinics.* 2003;32:2.

11. *Marx: Rosen's Emergency Medicine: Concepts and Clinical Practice 5th ed*. Dysphagia. Mosby Inc; 2002.

12. Bowman JB. Dysphagia: An Overview. *MedSurg Nursing*; 2001.

13. Finestone HM. Rehabilitation medicine: 2. Diagnosis of dysphagia and its nutritional management for stroke patients. *Canadian Medical Association Journal (CMAJ)*. 2003; 169(10): 1041-4.

14. Althaus CB. Types and solutions: dealing with dysphagia (Nutrition Update). *Food Service Director*; March 15, 2002.

15. Kaplan D. Aspiration pneumonia and dysphagia in the elderly. *Chest*; 2003.

16. Penman J.P. Thomson, M. A review of textured diets developed for the management dysphagia. *Journal of Human Nutrition and Dietetics.* 1998; 11, 65-51.

17. Reynolds CF. III. Recognition and differentiation of elderly depression in the clinical setting. *Geriatrics*; 1995.

18. Guigoz Y. Identifying the elderly at risk for malnutrition. The Mini Nutritional Assessment. *Clinics in Geriatric Medicine*. 2002; 18(4): 737-57.

19. Johnson MA. Low body weight and weight loss in the aged. *Journal of the American Dietetic Association*. 12/1/1990.

20. Grossberg GT. Geriatric mental health. *Clinics in Geriatric Medicine.* 2003; 19:4.

21. *1994 Accreditation Manual for Hospitals*. Oakbrook Terrace, Ill: Joint Commission on Accreditation of Healthcare Organizations, 1994.

22. Cooper JW. Community and Nursing Home Practice Drug Therapy OBRA Monitoring and Patient Education Guidelines. Cooper Consultant Press, J. W.; 1993.

23. Chernoff R. Geriatric Nutrition. The Health Professional's Handbook. Second Edition. 2003. 24.

24. Niedert KC. Nutrition Care of the Older Adult. The American Dietetic Association. 1998.

25. Raj VN. Risk for drug-induced malnutrition is unchecked in elderly patients in nursing homes. Journal of the American Dietetic Association. 1994; 94:192.

26. Sally H. Drug-diet interactions in elderly people. *Nutrition and Food Science.* 1993; 4:14.

27. Dwyer J; White J; et al. Consensus of the Nutrition Screening Initiative: risk factors and indicators of poor nutritional status in older Americans. *Journal of the American Dietetic Association.* 1991; 91:783.

28. Marshall T, Warren J, Hand J, et al. Oral health, nutrient intake and dietary quality in the very old. *Journal of the American Dental Association.* 2002; 133:1369.

29. Lamy M., Mojon Ph., Kalykaksi G., et al. Oral status and nutrition in the institutionalized elderly. *Journal of Dentistry.* 1999; 27:443-448.

30. Ejvind B., Chung J., Rapin C. Nutrition and oral health. *Best Practice and Research Clinical Gastroenterology*. 2001; 15:885-896.

31. Abbasi and Rudman. Observations on the Prevalence of Protein-Calorie Undernutrition in Veterans Administration Nursing Homes. 1993.

32. Chernoff R. Geriatric Nutrition. The Health Professional's Handbook Second Edition. Aspen Publisher. 1999

33. Johnson K, Bernard M, Funderburg K. Vitamin nutrition in older adults. *Clinics in Geriatric Medicine*. 2002; 12:2002.

34. Pennigton CR. The incidence and recognition of malnutrition in hospital. *Bristish Medical Journal*. 308:945-48.

APPENDICES

APPENDIX A

Foods Used for Calorie and Protein Fortification

Foods Used For Fortification		
Fortified Food	**Calories**	**Protein**
Breakfast Fortified Hot Cereal	 469.5	 11.3
Lunch 2” x 3” Pureed Meat Soufflé Resource Milkshake Fortified Cream Soup	 251.92 (Average) 250 201	 23.2 (Average) 9 8.41
Lunch 2” x 3” Pureed Meat Soufflé Fortified Cream Soup	 251.92 (Average) 201	 23.2 (Average) 8.41
Total	**1625**	**84**

APPENDIX B

Recipes and Nutritional Analysis of Food and Supplements

Fortified Hot Cereal

RECIPE: **Fortified Oatmeal, Cream of Wheat, Grits** PORTION SIZE: **1 Cup**

COOKING TEMP: **Range Top** (Convection)

COOKING TIME: **1 min**

Kcal	**392**	Fat	**15.5**	Vit A	**2340 IU**
Protein	**11.3 gm**	Sodium	**262 mg**	Vit C	**23 mg**
Carbohydrate	**53 gm**	Potassium	**523 mg**	Iron	**8.4 mg**
Cholesterol	**Trace**	Fiber	**3.6 gm**	Zinc	**5.5 mg**

Portions	5	10	25	40
Ingredients	Measure	Measure	Measure	Measure
Oatmeal, Grits, Cream of Wheat, dry	1 2/3 c.	3 1/3 c.	8 1/3 c	3 qt + 1 1/3 c.
Water	3 1/3 c.	6 2/3 c.	1 gal.	1 gal. + 2 ½ qt
Forta Vanilla Shake + Milk (appendix B)	1 ¼ c.	2 ½ c.	6 ¼ c.	10 c.
Brown Sugar	1/3 c.	2/3 c.	1 2/3 c.	6 c.
Margarine	1/3 c.	2/3 c.	1 2/3 c.	2 2/3 c.

Directions:

1. Bring water to boil. Add cereal.
2. Cook, stirring constantly, for 1 minute or longer if needed.
3. Add remaining ingredients and blend.
4. Serve hot.

(Reprinted with permission from Menu Magic Foods, 1988)

Forta Shake Fortified Nutritional Supplement

Nutritional Information Per Serving

Serving Size……. 1.4 oz Mix
Servings per Container …… 12
Calories…… 137
Protein……. 9 g
Sodium……. 24 g
Potassium …… 440 mg

Percent of Reference Daily Intake
Vitamin A ……. 30
Vitamin C ……. 25
Thiamin …… 30
Riboflavin ……. 50
Niacin …… 25
Calcium ……. 30
Iron …… 25
Vitamin D ……. 30
Vitamin E ……. 25
Vitamin B_6 …… 25
Folic Acid …… 25
Vitamin B_{12} …….. 40

Fortified Cream Soup

Ingredients: 1 32oz can of cream soup.

Directions: Add 2 cups non-fat dry milk

Add 1 qt. water

Add 2 tablespoons fat (butter)

Provides: 10 ¼ (one cup servings 8 oz)

201 calories per serving

8.41 grams protein per serving.

Fish (Tuna or Salmon) Soufflé

RECIPE: **Pureed Fish (Tuna or Salmon)** PORTION SIZE: **# 8 Scoop**

COOKING TEMP: **325** (Convection)
350 (Convectional)

COOKING TIME: **30-40 min**

Kcal	**230**	Fat	**12.5**	Vit A	**106 IU**
Protein	**22 gm**	Sodium	**386 mg**	Vit C	**.37 mg**
Carbohydrate	**10.3 gm**	Potassium	**323 mg**	Iron	**1.27 mg**
Cholesterol	**45 mg**	Fiber	**1 gm**	Zinc	**2.2 mg**

Portions	5	10	25	40
Ingredients	Measure	Measure	Measure	Measure
Salmon or Tuna	10 oz	1 lb 4 oz	3 lb + 2 oz	5 lbs
Bread	2 ½ slices	5 slices	13 slices	20 slices
Milk	¾ c.	1 ½ c	3 ¾ c	1 qt
Tarter Sauce	1/3 c.	2/3 c	1 2/3 c	2 2/3 c
Promod	1.5 Tsp	2 Tsp	1 Tbs	2 Tbs

Directions:

1. Place ingredients in blender. Blend until smooth, stopping and stirring as needed.
2. Pour into steam table pan and refrigerate if necessary
3. Bake at 325° (convection) for 30-40 minutes.
4. Reheat at appropriate time to proper serving temperature.
5. Can use tuna or salmon.

(Reprinted with permission from Menu Magic Foods, 1988)

Beef or Pork Soufflé

RECIPE: **Pureed Beef or Pork** PORTION SIZE: **Approximate 3x 4 square**

COOKING TEMP: **300** (Convection)
325 (Convectional)

COOKING TIME: **30 min**

Kcal	**278**	Fat	**16.4**	Vit A	**106 IU**
Protein	**21 gm**	Sodium	**267 mg**	Vit C	**.38 mg**
Carbohydrate	**7.5 gm**	Potassium	**224 mg**	Iron	**3.4 mg**
Cholesterol	**122 mg**	Fiber	**1 gm**	Zinc	**3.8 mg**

Portions	5	10	25	40
Ingredients	Measure	Measure	Measure	Measure
Canned Beef or Ground Beef, Raw	½ lb	1 lb	2 lb	3 1/3 lbs
Eggs	2	4	8	13
Milk	¾ c.	1 ½ c	3 c	5 c
Margarine	2 T	1/4 c	½ c	¾ c
Bread, slice	2 sl	4 sl	8 sl	13 sl
Promod	1.5 Tsp	2 Tsp	1 Tbs	2 Tbs
Pan size	8 x 8 (1 pan) 2 x 3	8 x 8 (2 pans) 2 x 3	8 x 8 (3 pans) 2 x 3	18 x 26 5 x 8

Directions:

1. Brown ground beef and drain if raw.
2. Combine beef and remaining ingredients in processor or blender.
3. Blend until smooth at least 2 minutes.
4. Pour into greased pan(s) – cover with foil.
5. Use cooked chopped pork instead of beef for pork squares.
6. Bake at 325° (convection) for 30 minutes.

(Reprinted with permission from Menu Magic Foods, 1988)

Chicken and Turkey Soufflé

RECIPE: **Pureed Chicken/Poultry** PORTION SIZE: **# 8 Scoop**

COOKING TEMP: **325** (Convection)
350 (Convectional)

COOKING TIME: **30-40 min**

Kcal	**227**	Fat	**7**	Vit A	**63 IU**
Protein	**30 gm**	Sodium	**744 mg**	Vit C	**.37 mg**
Carbohydrate	**6.9 gm**	Potassium	**295 mg**	Iron	**3.4 mg**
Cholesterol	**58 mg**	Fiber	**1 gm**	Zinc	**2 mg**

Portions	5	10	25	40
Ingredients	Measure	Measure	Measure	Measure
Chicken or Turkey cooked	12 oz	1 ½ lb	3 ¾ lb	6 lbs
Bread	2 ½ slices	5 slices	13 slices	20 slices
Chicken broth or hot water	2 c.	1 qt	2 ½ qt	1 gal
Promod	1.5 Tsp	2 Tsp	1 Tbs	2 Tbs

Directions:

1. Cook meat if needed and cut into small pieces.
2. Place meat, bread, broth (liquid) and Promod in blender.
3. Bake at 325° (convection) for 30-40 minutes
4. Place in steam table pan and refrigerate if necessary.
5. Reheat at appropriate time to proper serving temperature.

(Reprinted with permission from Menu Magic Foods, 1988)

High-Calorie, High Protein Nutritional Supplement
Resource ® Standard

Primary Indications - Protein-calorie malnutrition

Available in - Chocolate, French Vanilla, and Strawberry

Ingredients:

Water, corn syrup, sugar, sodium and calcium caseinates, high oleic sunflower oil, corn oil, soy protein isolate, hydrolyzed cornstarch, calcium phosphate tribasic, potassium citrate, natural and artificial flavor, magnesium chloride, sodium citrate, soy lecithin, cellulose gel, choline chloride, ascorbic acid, potassium chloride, carrageenan, potassium hydroxide, cellulose gum, ferrous sulfate, zinc sulfate, alpha tocopheryl acetate, niacinamide, calcium pantothenate, copper gluconate, manganese sulfate, pyridoxine hydrochloride, vitamin A palmitate, thiamine hydrochloride, riboflavin, chromic acetate, folic acid, biotin, potassium iodide, sodium molybdate, sodium selenite, phytonadione (vitamin K_1), cholecalciferol (vitamin D_3), cyanocobalamin (vitamin B_{12}).

Kcal	**250**	Fat	**6 gm**	Vit C	**36 mg**
Protein	**9 gm**	Sodium	**220 mg**	Iron	**4.5 mg**
Carbohydrate	**40 gm**	Potassium	**350 mg**	Zinc	**3.75 mg**
Cholesterol	**0 mg**	Vit A	**1000 IU**	Thiamine	**0.38 mg**
Vitamin D	**80 IU**	Vitamin E	**7.5 IU**	Vitamin B6	**0.5 mg**
Folic Acid	**100 mcg**	Vitamin B_{12}	**1.5 mcg**	Calcium	**350 mg**

VITA

SHANNON M. TOLBERT

Personal Data:	Date of Birth: October 17, 1979 Place of Birth: Bristol, Tennessee Marital Status: Single
Education:	Public Schools, Bristol, Tennessee Radford University, Radford, Virginia; Foods and Nutrition, B.S., 2001 East Tennessee State University, Johnson City, Tennessee; Clinical Nutrition, M.S., 2004
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