DOES PROVIDING SMALL FREQUENT MEALS IMPROVE THE NUTRITIONAL INTAKE AMONG ELDERLY RESIDENTS WITH DYSPHAGIA WHO LIVE IN EXTENDED CARE?

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Abstract

Dysphagia, which is common among the elderly population, is a disorder of the swallowing mechanism that interferes with a person's ability to safely swallow while eating. Malnutrition and dehydration are common consequences of dysphagia and, if left untreated, can lead to mortality or acute conditions requiring medical intervention. Improving the nutritional intake of this population is challenging because of factors such as prolonged feeding time, diminished physical tolerance for eating, and palatability of the diet that can negatively influence the amount of food consumed at a meal. Research has suggested that smaller, more frequent meals may be of benefit for individuals with dysphagia for managing fatigue while eating. The purpose of this crossover study was to determine if serving five-meals versus the usual three-meals per day would result in improved energy intake among elders with dysphagia who lived in extended care. Thirty-one residents (71 to 96 years of age), with a diagnosis of dysphagia, were randomly assigned on their units into one of two groups. For the first study period, one group received three meals while the other group received the same amount of calories spread over five meals. In the second study period, four weeks later, the same menu was served but the meal pattern was reversed for the two groups. Food and fluid items consumed by participants during each four-day study period were weighed and energy intakes determined using Food Smart Nutrition Management software (version 5.0). Paired sample t-test analysis revealed that the average calories consumed were not significantly different for the two meal patterns (average calories for three-meal pattern: 1325 +/- 207 Kcal/day; average calories for five-meal pattern: 1342 +/- 177 Kcal/day P=0.565). Based on the study's findings, offering five feedings a day does not appear to improve intakes of this population when compared to three feedings. Dietitians involved in the care of this vulnerable group may need to consider other nutrition intervention strategies.

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Acknowledgments

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Chapter 1: Introduction to the Study

Statement of the Research Problem

Background. Dysphagia is a broad term used to encompass all anatomical or physiological abnormalities that interfere with the normal process of swallowing (Task Group, 1993, p. iii). The prevalence of dysphagia is high among the geriatric population. Studies have shown that swallowing disorders may affect between 30-70% of residents living in health care facilities (Kayser-Jones & Pengilly, 1999; Layne, Losinski, Zenner, & Ament, 1989; Siebens et al., 1986; Steele, Greenwood, Ens, Robertson, & Seidman-Carlson, 1997) and general population surveys have suggested that approximately 5-16% of older people describe having symptoms of dysphagia (Bloem et al., 1990; Lindgren & Janzon, 1991). Researchers speculate that the combined effect of age-related changes in oral-pharyngeal function and underlying medical and neurological disease may account for the higher prevalence of swallowing dysfunction among the elderly as compared to young adults (Hudson, Daubert, & Mills, 2000; Patterson, 1996).

In clinical practice, dysphagia is divided into two disorders: 1) abnormalities affecting mastication, tongue manipulation, and function of the pharynx and upper esophageal sphincter and 2) medical conditions affecting the esophagus. The first category is defined in the literature as oropharyngeal dysphagia and is identified by the individual's inability to initiate the act of swallowing and transfer food from the mouth to the upper esophagus (Hudson et al., 2000). Cerebral vascular accidents, multiple sclerosis, and Parkinson's disease are a few of the common conditions associated with oropharyngeal dysphagia (Hudson et al., 2000). Esophageal dysphagia results from abnormalities that impair or disrupt the passage of food down the esophagus (Ergun & Miskovitz, 1992; Hudson et al., 2000; Patterson, 1996). The most common causes of esophageal dysphagia in the elderly are reflux esophagitis with peptic stricture and secondary dysmotility from other disorders (Patterson, 1996).

Functional changes occurring in the oral cavity and pharynx that are associated with aging have the greatest impact on swallowing in the elderly (Ergun & Miskovitz, 1992). Studies have found that elderly individuals often require more time to chew their food, have increased fatty and connective tissue in the tongue, produce less saliva, and exhibit a slower transit of food from pharynx to the esophagus (Hudson et al., 2000; Logemann, 1990; Patterson, 1996; Jaradeh, 1994). These functional changes do not necessarily lead to swallowing impairment in healthy older adults but can result in a decreased functional reserve such that problems may develop more easily when a disease such as Parkinson's is present. The elderly person also faces additional compounding factors that can challenge their ability to eat normally such as impaired cognition (Hudson et al., 2000; Logemann, 1990), lack of dentition or poorly fitting dentures (Jaradeh, 1994), and use of medications that exacerbate problems with swallowing (Logemann, 1990; Jaradeh, 1994).

Protein-calorie malnutrition. One of the consequences of dysphagia is inadequate dietary intake, and if left unmanaged, it can lead to weight loss, protein-calorie malnutrition, and dehydration. Results from several studies have provided evidence for an association between dysphagia and malnutrition (Sheppard, Liou, Hochman, Laroia, & Langlois, 1988; Sitzmann, 1990; Smithard et al., 1996). Sitzmann (1990) reported that over a 1-year period all 90 patients admitted with a primary diagnosis of dysphagia exhibited malnutrition, with over 70% having biochemical indices suggestive of visceral protein depletion. Other researchers have investigated the association between the severity of swallowing impairment and the degree of nutritional compromise. For example, Moghissi and Teasdale (1980) have reported an association between dysphagia severity, loss of weight, and nitrogen balance. The results of their study found that a greater percentage of subjects with severe dysphagia were in negative nitrogen balance (89% versus 28.5%) and had lost more than 4 to 5 kg of body weight (89% versus 0%), when compared to subjects with low grade dysphagia. Similarly, Sheppard et al. (1988) found that the body mass index (BMI =weight (kg)/ height (m^2)), an accepted measurement of body composition, was strongly associated with dysphagia severity score among 108 adults with mental disabilities.

Protein-calorie malnutrition (PCM), a common condition among institutionalized elderly (Sullivan, 2000) can lead to very serious complications if left undiagnosed. Severe malnutrition can manifest clinically as an increased susceptibility to infection, reduced respiratory sufficiency, delayed wound healing, mental confusion and even death (Hudson et al., 2000; Veldee & Peth, 1992). Furthermore, it has been suggested by Veldee and Peth (1992) that PCM may also impact the deglutive and respiratory muscles which can further compromise the integrity of the swallow in the dysphagic individual. They speculate that the muscles involved in deglutition, which likely have a moderate to high percentage of type II muscle fibers, may be among the first to atrophy during prolonged periods of nutrient deficit. The additional compromise to the swallowing mechanism caused by PCM could significantly hinder an individual's ability to consume adequate nutrition and increase their risk for aspirating food and/or fluid into their lungs.

PCM can negatively affect dysphagia mortality as it sets up a vicious cycle whereby weakened respiratory muscles impair the individual's ability to clear aspirated material from the lungs and suppressed immunity diminishes the body's ability to fight and recover from aspiration pneumonia. Sitzmann (1990) characterized dysphagia as a systemic disease associated with malnutrition and a mortality rate of 13% (p. 62). Siebens et al. (1986) found that eating-dependent, nursing home residents (of which 61% had abnormal oral stage dysphagia) had a higher six-month mortality rate than those who were independent eaters. Similarly, Smithard et al. (1996) reported that stroke patients assessed to have an unsafe swallow had poorer outcomes such as higher risk of chest infection, poor nutritional status, and an increased risk of death, as compared to stroke patients without dysphagia.

Dehydration. Dehydration is common among elders living in long-term care and unfortunately is a nutritional concern that is frequently overlooked by health care providers (Kayser-Jones, Schell, Porter, Barbaccia, & Shaw, 1999; Ramage, Ross, & Hadden, 1998). The few studies that have investigated fluid intakes among elderly individuals with dysphagia have shown that their intake of thickened fluids is inadequate. For instance, Finestone, Foley, Woodbury, and Greene-Finestone (2001) found that stroke patients (N=6) initiated on thickened-fluid dysphagia diets had a mean fluid intake of 755 ml +/- 162 ml/day, which represented 33% of their estimated requirements. This volume of fluid was significantly lower than mean fluid intake of 3159 ml +/- 523 ml/day received by patients (N=7) through enteral or intravenous means. In the study conducted by Ramage et al. (1998), only one of 29 residents with oro-pharyngeal dysphagia who were receiving thickened fluids met their fluid requirements. The mean fluid intake for the 29 residents was 1432 ml/day. Although the sample size of these two studies was small, the results suggest that individuals with dysphagia may be at risk for dehydration.

Just like malnutrition, dehydration also poses many risks for older individuals such as increased susceptibility to urinary tract infection, pneumonia, electrolyte imbalances and confusion (Kayser-Jones, Schell, & Porter et al., 1999). In addition to one's inability to safely consume fluids of normal consistency, age-related changes such as decreased thirst, impaired ability to regulate fluid balance, and decreased ability of the kidneys to concentrate urine, are other factors that could increase an older person's risk for dehydration (Kayser-Jones, Schell, Porter, et al., 1999; Ramage et al., 1998).

Factors affecting oral intake. The treatment goal for individuals with dysphagia is to maintain safe oral feeding and to prevent the onset of malnutrition and dehydration. However, improving food intake among elderly persons with dysphagia is challenging because of several factors that can interfere with the normal process of eating and acceptance of meals. Firstly, treatment often requires the exclusion of certain food from the diet because of its consistency (Curran & Groher, 1990; Martin, 1991; McCallum, 2003; Pardoe, 1993) and the provision of food and fluid modified in texture may not be well received (Anonymous, 1996; Hotaling, 1992; Ramage et al., 1998). Ensuring that individuals with dysphagia ingest enough fluids, particularly if they are receiving thickened fluids, can be difficult. Many factors such as unpalatable taste (Finestone et al., 2001), extra effort and time required to consume thickened drinks, (Finestone et al., 2001; Ramage et al., 1998) and texture that can leave individuals feeling full early, (Ramage et al., 1998) can all influence a person's intake of fluids. In addition, food preferences and dining habits of the older person, which are often based on culture and family tradition can have a significant impact on their food intake (Ott, Readman, & Backman, 1993; Ott, Readman, & Backman, 1990). Ensuring that dysphagia diets are palatable and meals are pleasurable is sometimes difficult in a long-term care setting when structured menus offer limited variety and lack of aesthetic appeal.

Secondly, the act of eating for elderly persons with dysphagia is a lengthy and laboured process that can contribute to fatigue and early cessation of meals (Ramage et al., 1998; Task Group, 1993, pp. 27-31). Individuals with dysphagia often require longer meal times because of delays in swallow initiation or disruptions such as drooling, clearing of mucous, or coughing or choking while eating. These disruptions can diminish physical tolerance during meals that not only affect a person's ability to eat for prolonged periods but can also increase their risk for aspiration. These consequences may contribute to malnutrition by reducing a person's total oral intake.

Thirdly, elderly people with dysphagia often depend on others to provide them with food and fluid, and this reliance on others for feeding assistance puts them at risk for inadequate intake and poor nutritional status (Berkhout, Cools, & Van Houwelingen, 1998; Kayser-Jones & Schell, 1997; Musson et al., 1990; Rudman, Abbasi, Isaacson, & Karpiuk, 1995). Ramage et al. (1998) found that staff required 30 to 60 minutes to feed a meal to each patient with dsyphagia. Similar time requirements for feeding patients with dysphagia were reported in a pilot study conducted over a three-month period at St. Peter's Hospital (Task Group, 1993, p. 19). However, another study which looked at the amount of nursing time spent feeding residents in long term care found that only 18 minutes per day were actually spent feeding residents with severe dementia and 14 minutes for those with moderate dementia (Hu, Huang, & Cartwright, 1986). For people with dementia, the disease can lead to the development of swallowing difficulties and self- feeding problems as the condition progresses (Freter & Rockwood, 2002). Patient observation conducted at two nursing care facilities showed that inadequate staffing and lack of sufficient time to feed residents led to unsafe practices, such as residents being fed too quickly and forcefully, as well as failure of staff to properly identify those residents having trouble swallowing (Kayser-Jones & Schell, 1997). Similarly, Ramage et al. (1998) reported that one of the major barriers to obtaining adequate caloric intake for persons with dysphagia was pressure on staff to finish feeding in order to complete other care related duties.

Role of nutritional care. Dietitians, as part of the care team, can play a vital role in preventing the insidious onset of protein-calorie malnutrition for elderly individuals with dysphagia by early diagnosis and nutrition intervention. A study by Brody, Touger-Decker, VonHagen, and O'Sullivan Maillet (2000) supports early dysphagia screening by the dietitian as part of their initial nutrition assessment. A strong agreement was found between the dietitian's assessment of the patient's swallowing ability and the speech-language pathologist's assessment, suggesting that dietitians can effectively identify patients with dysphagia. Diet management is an important aspect of treatment for individuals with dysphagia. Therefore, the dietitian's specialized knowledge in nutritional adequacy and diet modification is integral in the care of these individuals. The provision of appropriate dysphagia assessment and treatment has important quality-of-life ramifications for the elderly. With proper dietary management residents can continue to enjoy the taste of food and also take part in the social dining room experience.

The nutritional treatment for individuals who are able to safely manage oral feeding is the dysphagia diet. Dysphagia diets are often implemented with the intent to decrease the risk of choking and/or aspiration pneumonia and typically involve various stages (or diets) with food texture modification and/or increased liquid viscosity (BCDNA, 1992; McCallum, 2003; Pardoe, 1993). Although slight deviations of the allowed foods on each of the diets would be seen among facilities, typically the diets involve a progression of more challenging food. For instance, an individual receiving a pureed diet would receive food that is pureed, smooth, and cohesive while someone assessed to be safe on a minced diet is allowed more solid, moist food that is ground and finely diced. Although elderly individuals with dysphagia are "at risk" nutritionally and their diet plays a significant role in their treatment, very little information is available with respect to the dietary intake of this population.

Several researchers have suggested that smaller, more frequent meals may be of benefit for individuals with dysphagia for managing feeding fatigue associated with certain feeding disorders. (Layne, 1990; Logemann, 1990; Task Group, 1993). Feeding fatigue is a broad term that refers to fatigue that can occur during eating due to conditions that can delay or make the normal process of eating and swallowing difficult. For instance, some individuals with dementia or cerebral vascular accidents (CVA) may have difficulty recognizing food and fluid in the mouth and thus fail to initiate chewing or swallowing. This inability to recognize oral stimuli and initiate swallowing can make the processes of eating and obtaining adequate nutrition more effortful and time consuming (Logemann, 1990). Likewise, any conditions resulting in reduced alertness and energy levels can affect an individual's ability to safely swallow as well as participate in eating throughout the entire meal (Task group, 1993). Results of a small pilot study found that serving six small meals to residents with severe dysphagia reduced fatigue and distress (coughing and choking) during meals. (Task Group, 1993, pp. 27-31). However, no studies have quantitatively assessed the effect of meal frequency on energy, nutrient, and fluid intake among this population. Broadening our knowledge in this area is important as it may assist dietitians in providing better nutritional management of older adults with dysphagia.

Research Objective and Hypothesis

The main objective of this research was to examine the influence of meal frequency (meals reduced in volume and spread throughout the day) on energy intakes of elderly, long-term care residents diagnosed with dysphagia. More specifically, the intent of this study was to determine if serving a five-meal pattern versus a traditional three-meal pattern would result in improved energy intakes. The hypothesis is that the quantity of food that could be consumed at each of three meals is a limiting factor for energy intake for elderly people with dysphagia. Therefore, providing a five-meal pattern was hypothesized to improve energy intakes because shorter, more frequent feeding episodes could reduce feeding fatigue and provide more opportunity for nourishment.

Literature Review

Elderly individuals, in particular those with dysphagia, are vulnerable to reduced intake and thus it has been suggested would potentially benefit from smaller, more frequent meals. Therefore the primary focus of the literature review was twofold: 1) to review the history and theory behind the use of small, frequent meals as a form of diet therapy and 2) to identify previous research that had investigated the impact of meal frequency, or had examined the impact of between meal snacks, on food intake of elderly residents. The intent of the proposed study was to add to the knowledge already attained from the previous studies by building on their results and methodologies.

The emergence of small, frequent meals as a method of diet therapy used in hospitals and outpatient diet counseling started in the 1960's (Norton, 1966). The radical trend of using a five-meal delivery system was started by the insistence of Dr. Carroll, a hospital surgeon on the staff at De Paul Hospital in St. Louis, who complained that patients at his hospital were being served too much food at a meal with not enough time between meals. The concept of serving two main meals a day, interspersed with three light snacks was considered the best option; it alleviated Dr. Caroll's concern as well as reduced plate wastage and prevented the inconvenience of holding trays for patients undergoing tests. In October 1966, a survey of 58 hospitals in the United States that had tried or was presently using the five-meal pattern was completed with the purpose of evaluating the effectiveness of the system (Watson, 1968). Results from the survey showed that the five-meal delivery system improved patient morale, reduced the number of missed meals because of tests or examinations, and improved the quality of food being served. The five-meal pattern did not continue to be popular and today hospitals in Canada and the United States use the traditional three-meal pattern of food delivery. However, the delivery of between meal nourishment for patients based on individual assessment is still common in clinical practice.

Despite the change back to the standard meal delivery system the use of small, frequent meals as a form of diet therapy is still cited in nutrition and meal program manuals as a method for nutritional therapy (BCDNA, 1992; Robertson, Mintz, & Ens, 1995; Task Group, 1993). Such a diet may be recommended for those patients whose illness or condition has contributed to poor appetite and reduced intake (Clusky & Dunton, 1999). Isaksson (1982) suggests that providing a series of smaller meals spread over the whole day could prevent under-nutrition, which is common among hospitalized patients. The theory behind using this diet is to encourage food intake by preventing the person from being overwhelmed with large quantities of food and to minimize fatigue that can occur with eating. In addition, the distribution of energy throughout the day allows more opportunity to obtain nourishment.

Research in the area of meal frequency and its effect on the dietary intake of elderly people is limited and varies considerably in methodology and approach. Two larger nutrition surveys of free-living elderly adults examined the contribution of snack consumption to energy and nutrient intake. In the United States, the National Food Consumption Survey (NFCS) surveyed 2655 adults aged 65 and above, and found that the quality of the diet, which was defined by the consumption of selected nutrients as a percentage of the 1989 Recommended Dietary Allowances (RDA), was associated with higher energy intakes (Murphy, Davis, Neuhaus, & Lein, 1990). More importantly, the percent of caloric intake from snacks was associated with increased energy intakes but not with decreased quality of the diet. Individuals with higher quality diets had a higher percent of calories from snacks than individuals with poor quality diets. In Europe, the Survey in Europe on Nutrition and the

Elderly (SENECA) studied 807 individuals aged 74-79 years, and also showed that for some European towns, a higher daily energy intake was related to a higher percentage of energy from snacks and/or frequency of meals (Haveman-Nies, de Groot, & van Staveren, 1998).

Results from these two population surveys suggest that small, frequent meals may be an effective method for improving the quantity and quality of the diet for older individuals. Further support of this nutrition intervention is provided by Redondo et al. (1997). Their study examined the influence of the number of meals taken per day on energy and nutrient intakes of 150 elderly people. Significant correlations were found between the number of meals consumed (two, three, or four meals) and the contribution of intakes to meeting recommended requirements for some of the measured nutrients in this study: thiamine ($r=0.27$, $p<0.05$), pyridoxine ($r=0.22$, $p<0.05$), magnesium ($r=0.27$, $p<0.05$), and fiber ($r=0.27$, $p<0.05$). Energy, protein, vitamin C, riboflavin, calcium, and iodine were not correlated with number of meals consumed, however, intakes were closer to the recommended intake when three or four meals were consumed versus when only two meals were taken.

Experimental research in this area has focused on the effect of providing both energy dense food and between-meals snacks on the nutritional intake of hospitalized patients. A randomized, control trial that included 143 hospital patients from the medical, orthopedic, and elderly care wards examined the effect of providing fortified meals and between meal snacks on energy and protein intakes (Gall, Grimble, Reeve, & Thomas, 1998). The control group (N=81) was offered the regular hospital menu and the intervention group (N=62) was offered fortified foods and snacks that provided an extra 22.2 g protein and 966 kilocalories per day above the regular menu. Trained nursing staff collected food intake data over three consecutive days using estimated food records. Diet intervention of fortifying food and providing between meal snacks significantly increased mean energy intake in the entire intervention group by 17.5% (from 1404 +/- 62 kcals/day to 1650 +/- 65 kcals/day. On the female elderly care unit (a subset of the study group) mean energy increased by 19.6% for the intervention group (N=9), as compared to the control group (N=15). No significant increase in protein intakes was noted between the control and experimental group. Despite the effectiveness of the dietary intervention, researchers noted a high "wastage" of the fortified food and snacks (i.e., fewer than 250 kcal of the 966 kcal added were consumed), suggesting that smaller portion sizes or less food fortification could have been used with the same effectiveness.

A crossover study by Odlund Olin et al. (1996), that included 36 elderly patients (52-96 years), also found that high-energy hospital food was effective in increasing energy intake of long-stay elderly hospital patients. Subjects were given six weeks of regular hospital food and six weeks of high-energy meals and snacks while the volume of food served during meals remained constant. During the high-energy period regular hospital food was served at breakfast, and the lunch and dinner meals consisted of regular hospital food enriched with natural ingredients such as oil and cream. Intakes were estimated by eye measurement and recorded in quartiles for five to seven days of each week of the study. Increasing the energy content of the lunch and dinner meal by 50% led to an increased energy intake of 50%, while the volume of food consumed remained the same regardless of the energy density of the food. It is important to note that the increased energy consumed from the fortified food resulted in a simultaneous decrease in energy intake from the snacks served between the meals, thus resulting in an overall increase in energy of 35%.

The results from these two studies have important implications as they suggest that for the elderly it may be the volume of food consumed at a meal rather than energy that limits voluntary energy intake. This may be of particular relevance for elderly individuals with dysphagia who are risk for inadequate intake. Secondly, the high degree of waste suggests that there may be a combined effect of the two treatments, i.e. food fortification and between meal nourishment, on the food intake. Between meal nourishment as part of the nutrition intervention likely contributed to improved energy intake, however, the contribution to increasing energy intake is difficult to interpret because the effects of energy density and meal frequency were being assessed together.

Two studies that indirectly examined the effect of meal frequency on food intake of elderly residents have shown conflicting results. Cluskey and Dunton (1999) investigated the effect of reducing the volume of food and beverages served at meals on the intake of food and fluid of 31 elderly residents living in a personal care section of a long-term care facility. Residents were served the standard three meals for five days and then, five weeks later, were served the same menu but reduced in portion size. Snack consumption was monitored by care staff during the two study periods and based on the observations snack intake was reported to be the same during both study periods. Results showed that total grams of food consumed was significantly less for three of the five days during the small meal period, thus suggesting that serving smaller meals may not be effective in improving food intake, because snack intake did not increase to compensate for the smaller meals. The strength of this finding, however, is lessened by the methodological limitations in this study. The total weight of food consumed was measured as opposed to the intake of individual food items. Therefore, calories consumed or intake of single nutrients cannot be compared between the study periods. The total mean food consumed included both the combined weight of food and fluid thus making it difficult to interpret the impact that reduced portions had on just food intake alone. In addition, snacks consumed between meals were monitored but not measured by precise weighing thus the contribution of snacks to total food intake may be inaccurately estimated. It was noted by the researchers that if smaller portions are to be served at meal times it is important to ensure that between-meal feedings are being consumed. Furthermore, it was suggested that subsequent investigations exploring this area should examine consumption of individual food items and include measured snack consumption.

In contrast to the previous study, Turic, Gordon, Craig, Ataya, and Voss (1998) examined the effect of providing three meals plus between meal nourishment on the energy and nutrient intake of elderly nursing home residents. They found that the addition of between meal snacks or nutritional supplements had a positive impact on the amount of food consumed by the elderly residents. Sixty-eight "at nutritional risk" residents were randomly assigned to receive either three snacks or three 8 oz supplements in addition to regular meals for a six-week period. Dietary intake was assessed using three-day food records obtained by the dietitian or dietetic student during the study period. Energy intakes at baseline were 55% of the RDA for men and 65% of the RDA for women, using values recommended for person's aged 51 years and older. Results showed that the addition of snacks or supplements improved resident's intake at three and six weeks, and that intake from the between meal feedings did not displace intake of food at meals, but rather added energy and important nutrients to their diets. Energy intakes increased by 30% for the snack group and 50% for the group receiving nutritional supplements. Although snacks contributed to increased energy and nutrient intakes, residents in the supplement group had significantly higher intakes of all nutrients. It is important to note that the average energy intakes from meals alone at week three and six were also below the RDA, thus supporting the use of between meal nourishment for obtaining energy intakes that are closer to recommended requirements.

Only one study could be found that examined the outcomes of providing small, frequent meals to elderly residents with dysphagia. At St Peter's Hospital in Hamilton, Ontario, a trial was conducted using a multi-mini-meal diet for a one-month period with six fragile residents who presented with severe dysphagia and required approximately one hour of feeding time each per meal (Task Group, 1993, pp. 27-31). The multi-mini-meal diet consisted of six meals of at least one beverage and a minimum of one food item, and meals were 20 minutes in duration and spaced two to three hours apart. During the study period, weekly weights were measured for each resident and food intake and individual responses to the diet were recorded daily. A reduction in fatigue and distress as measured by signs of coughing and choking was reported during the study period. Although the study by St Peter's Hospital did not report on the food intake analysis and the sample size was small, the research showed a positive (although subjective) outcome measure of reduced fatigue with eating. This provides support that shorter feeding periods for elderly individuals with dysphagia may be effective at reducing fatigue and distress caused by eating. Staff acceptance to the change was very positive and despite the initial difficulties of working in the extra meals, the multi-mini-meal diet was incorporated into the hospital's meal management program.

The use of small, frequent meals has been suggested for improving medical, nutritional, and emotional well-being for individuals with dementia (Ford, 1996). The "dementia diet" proposed by Ford (1996) consists of five small meals lasting approximately 10 to 15 minutes in duration, with all foods being finger foods that can be eaten with or without utensils. Some of the benefits of the diet cited by the author included: decreased flavor fatigue, decreased risk of choking as well as improved intake and greater enjoyment of mealtime. Unfortunately the author did not provide data to support the outcomes; therefore, these positive changes can only be interpreted as potential benefits of this diet.

Summary. It is apparent from the current literature that elderly individuals with dysphagia are at risk of becoming under-nourished through a reduced food intake and that dietary intervention should focus on increasing the energy density of food and/or increasing the volume of food being consumed using between meal nourishment. The researcher of this study has chosen to look at the effect of meal frequency on intake, as opposed to food fortification, because individuals with dysphagia are at risk for dehydration and feeding fatigue. Fortifying food while still providing only three meals would not address these risks. For the elderly with dysphagia, the literature already provides some evidence for the use of smaller, more frequent meals because of the positive outcome of reduced fatigue associated with the use of this diet. This finding is particularly important for individuals with dysphagia as reducing feeding fatigue can have a positive impact on reducing the risk of choking and/or aspirating (Task Group, 1993, pp. 27-31). Additional research is needed to determine if smaller meals that are more frequent can also have a positive impact on improving the energy, nutrient, and fluid intake of this population.

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Chapter 2: Does Providing Small, Frequent Meals Improve the Nutritional Intake Among Elderly Residents with Dysphagia Who Live in Extended Care?

Introduction

Dysphagia is a broad term used to encompass all anatomical or physiological abnormalities that interfere with the normal process of swallowing (Task Group, 1993, p. iii). The prevalence of dysphagia is high among the geriatric population. Studies have shown that swallowing disorders may affect between 30-70% of residents living in health care facilities, (Kayser-Jones & Pengilly, 1999; Layne, Losinske, Zenner, & Ament, 1989; Steele, Greenwood, Ens, Robertson, & Seidman-Carlson, 1997; Siebens et al., 1986) and general population surveys (Bloem et al., 1990; Lindgren & Janzon, 1991) suggest that approximately 5-16% of older people describe having symptoms of dysphagia. One of the potential consequences of dysphagia is inadequate dietary intake and, if left untreated, it can lead to weight loss, dehydration, and protein-calorie malnutrition (PCM). The ramifications of PCM include immune suppression, reduced respiratory sufficiency, frequent infections, mental confusion, and decreased survival (Hudson, Daubert, & Mills, 2000; Veldee & Peth, 1992). Smithard et al. (1996) found that stroke patients who presented with dysphagia had a higher rate of mortality (37% versus 6%) compared to those without swallowing problems.

Improving food intake among elderly persons with dysphagia is challenging because of several factors that can interfere with the normal process of eating. Treatment often requires the exclusion of certain foods from the diet because of their consistency, (Curran & Gother, 1990; Martin, 1991; Pardoe, 1993) and the provision of food and fluid modified in texture that is not well received by the individual (Anonymous, 1996; Hotaling, 1992; Ramage, Ross, & Hadden, 1998). In addition, the act of eating for persons with dysphagia can be a lengthy and labored process that can lead to diminished physical tolerance for eating and early cessation of meals (Logemann, 1990; Ramage et al., 1998; Task Group, 1993, pp. 27-31). Individuals with dysphagia often require longer meal times because of delays in swallow initiation or disruptions such as drooling, clearing of mucous, or coughing while eating. Also, elderly people with dysphagia often rely on others to provide them with food and fluid, and research has shown that dependence on others for feeding assistance is a major risk factor for inadequate intake and poor nutritional status (Berkhout, Cools, & Van Houwelingen, 1998; Kayser-Jones & Schell, 1997; Musson et al., 1990; Rudman, Abbasi, Isaacson, & Karpiuk, 1995). Any one of these factors may contribute to malnutrition by reducing a person's total oral intake.

Several studies, using biochemical and anthropometric indices, have found an association between dysphagia and malnutrition (Sheppard, Liou, Hochman, Laroia, & Langlois, 1988; Sitzmann, 1990; Smithard et al., 1996; Moghissi & Teasdale, 1980). Nevertheless, very little information is available with respect to the dietary intake of elderly residents with dysphagia although they are "at risk" nutritionally. Appropriate diet treatment has important quality-of-life ramifications for elderly people with dysphagia: proper treatment enables individuals to continue to enjoy the experience of eating as well as maintain their nutritional status. Several researchers have suggested that smaller, more frequent meals may benefit people with dysphagia for managing fatigue problems. (Layne, 1990; Logemann, 1990; Robertson, Mintz, & Ens, 1995; Task Group, 1993). Results of a small pilot study found that serving six small meals to residents with severe dysphagia reduced feeding fatigue and distress (Task Group, 1993, pp. 27-31). However, no studies have quantitatively assessed the effect of meal frequency on energy, nutrient and fluid intake among this population.

The main objective of this research was to examine the influence of meal frequency on nutrient intake among elderly, long-term care residents diagnosed with dysphagia. The hypothesis was that the volume of food that can be consumed at each of three meals is a limiting factor for energy, macronutrient, and fluid intake of elderly persons with dysphagia. The main focus of this study was on energy intake with the intent to determine if serving a five-meal pattern versus a traditional three-meal pattern would result in improved energy intake among this population. Thus, providing a five-meal pattern was hypothesized to improve energy intake because shorter, more frequent feeding episodes could reduce feeding fatigue and provide more opportunity for nourishment.

Methods

Participants. The study population consisted of elderly residents who presented with dysphagia and were living in extended care at the start of the study. Participants resided at one facility that consisted of three different extended care buildings, two of which used a tray-line meal delivery system and the third that had a dining room meal service. The three buildings together comprised seven floors, with each floor having two 25-bed units. Medical charts were reviewed to identify eligible residents for inclusion in the study. Inclusion criteria included: age of at least 65 years, prior diagnosis of dysphagia, and receiving a texture modified diet due to swallowing difficulties. Diagnosis of dysphagia was based on a prior meal assessment done by the swallowing team that is experienced in evaluating swallowing disorders for this population. Residents with dysphagia were receiving one of five different texture modified diets available at the facility (pureed diet, dysphagia pureed diet, minced/pureed diet, minced diet, and dysphagia minced diet). Residents were excluded from participation if they were receiving enteral nutrition support, considered medically unstable to complete the timeframe of the study, or receiving a diabetic diet and therefore already receiving small, frequent meals. Eligible residents were recruited by means of a study information letter. Residents or a family member provided informed consent for their participation in the study. The study protocol was reviewed and approved by the University of British Columbia's Ethics Board (see Appendix A for certificate of approval).

Nutritional assessment and medical history. Nutritional status was determined using the Mini Nutritional Assessment tool (MNA) that has been validated for use with the elderly population (Vellas et al., 1999). A score above 23.5 points suggests the person is in a normal state of nutrition and no further action is required, while a score between 17 and 23.5 suggests risk for malnutrition and possible need for nutrition intervention. A score below 17 is suggestive of malnutrition requiring nutrition intervention. Medical information such as the individual's feeding ability, presence of medical conditions associated with dysphagia, and whether the individual required greater than 20 minutes to feed was also collected from the medical chart. Further details on other information collected from the medical chart are provided in Appendix B.

Research design. The experiment used a repeated cross over design that involved two four day study periods. Given an attrition rate of 10%, a total of 42 subjects was required for an 80% probability of detecting a difference due to treatment at a two-sided 0.05 significance level, if the true difference was 194.0 calories (+/- 15% change based on an estimated average energy intake obtained in previous research by Turic, Gordon, Graig, Ataya, & Voss (1998). In order to facilitate the project three participants on each of the 14 units were randomly selected (total of six participants per floor), and then participants on each unit were randomly assigned into one of two groups. The process of random selection involved placing the names of all eligible subjects on the unit into a container and then drawing a name until three subjects consented to participate. For the first study period, one group received the regular menu and portion sizes (standard three-meal pattern) while the other group received the same total energy spread over five meals. In the second study period, four weeks later, the same repeated cycle menu was served but the meal pattern was reversed for the two groups.

A repeated measure design in which subjects receive both treatments was chosen in order to control for known extraneous variables that could affect the food intake of participants. In addition to different methods of meal delivery, other factors such as an individual's food preferences, feeding ability, and staff's experience with feeding can have an impact on food intake. By using a within-subject design, these differences among subjects are controlled.

Menu development. The five-meal menus were developed for each diet modification using the existing menu and portion size standards already implemented at the facility. The main objective of this study was to compare energy intakes between the two study periods; therefore the five-meal menus were designed primarily to be similar to the three-meal menus in energy content. Table 2.1 displays the mean energy and macronutrient contents of the research menus, including the contribution of supplements by those who received them. A meal was defined as the delivery of food item(s) that were either substantial in nutrient value or provided a minimum of 200 kcalories and separated from the next meal by at least one hour (Redondo et al., 1997). Using these criteria meals were grouped into "breakfast," "mid-morning meal," "lunch," "early-afternoon meal", and "supper." Food Smart Nutrition Management Solutions computer program version Five (Sasquatch Software Corporation, North Vancouver, British Columbia, 2001) was used to analyze total calories for development of both meal patterns. Table 2.2 provides an example of a five-meal menu and a three-meal menu for the dysphagia pureed diet (see Appendix C for menu template and sample menus for other diet textures used during the study).

Table 2.1: Mean Energy, Macronutrients, and Fluids Provided in Research Diets

Meal	Energy (kcal)	Protein (g)	Carbohydrate (g)	Fat (g)	Fluids (ml)
3-a-day	1661 +/- 185	66 +/- 13	258 +/- 25	42 +/- 10	1116 +/- 387
5-a -day	1651 +/- 177	59 +/- 14	271 +/- 32	39 +/- 10	1148 +/- 330

Values were estimated by taking the averages of the four days for each type of diet followed by each of the 31 study participants (pureed, dysphagia pureed, minced, minced/pureed). Energy, macronutrient and fluid contributions from supplements were included for those who received them.

Table 2.2: Sample Five and Three-Meal Menu for Dysphagia Pureed Diet

Dysphagia Pureed Diet Five- Meal Menu	Dysphagia Pureed Diet Three- Meal Menu
Breakfast 175 ml Hot Oatmeal Cereal 110 ml Custard 120 ml Thick Orange Juice 3x Milkers; 1x Sugar Salt/Pepper	**Breakfast** 175 ml Hot Oatmeal Cereal 110 ml Custard 120 ml Thick Orange Juice 120 ml Thickened Ensure® (part of diet standard) 120 ml Pureed Peaches 3x Milkers, 1x Sugar Salt/Pepper
Mid-Morning Meal 120 ml Thickened Ensure® (part of diet standard) 120 ml Pureed Peaches	
Lunch 120 ml Thick Drink 120ml Thickened Ensure®** 60 ml Pureed Sweet & Sour Pork 50 grams Mashed Potatoes 30 grams Pureed Green Beans 110 ml Butterscotch Pudding Salt/Pepper	**Lunch** 120 ml Thick Drink 120 ml Thickened Ensure®** 90 ml Pureed Sweet & Sour Pork 65 grams Mashed Potatoes 60 grams Pureed Green Beans 110 ml Butterscotch Pudding Salt/Pepper
Early-Afternoon Meal 80 ml Lemon Pudding 120 ml Thick Drink	
Supper 30 grams Pureed Fish with Cheese Sauce 50 grams Mashed Potatoes 30 grams Pureed Broccoli 110 ml Applesauce 120 ml Thick Drink 120 ml Thickened Ensure® ** Salt/Pepper	**Supper** 60 grams Pureed Fish with Cheese Sauce 65 grams Mashed Potatoes 60 grams Pureed Broccoli 110 ml Applesauce 120 ml Thick Drink 120 ml Thickened Ensure®** Salt/Pepper

1421.0 calories; 43.8g protein; 245.5g CHO; 30.5g fat * values without supplement	1428.0 calories; 55.6g protein, 228.5g CHO; 33.7g fat *values without supplement
** Thickened supplement given at lunch and supper for a therapeutic reason was incorporated into the five and three meal menus and 30% of the participants on this diet received these supplements	
1901.3 calories; 55.5g protein; 340.9g CHO; 37.0g fat * values with supplement	1908.6 calories; 67.2 protein, 323.9 g CHO; 40.2g fat * values with supplement

Collection of food and fluid intake data. Detailed food and fluid intake data were measured over four days for all participants using precise individual weighing. This method was chosen because it is considered more accurate than the 24-hour food recall or estimated food records (Gibson, 1990). Research has shown that food intake measurements taken over three to seven days are adequate to attain estimates of average daily intake (Cluskey & Dunton, 1999; Haveman-Nies, de Groot, & van Staveren, 1998; Murphy, Davis, Neuhaus, & Lein, 1990; Turic, Gordon, Graig, Ataya, & Voss, 1998).

For the one building that had dining room service (N=17), each food item delivered to the resident was measured by weighing each food and fluid item separately in the dining room just before it was served and measuring the waste after the meal was completed. For the two buildings that had tray line service (N=16), drinks were weighed separately and labeled by room number in the kitchen before tray line service began, and food items such as soup, dessert, and main entree were weighed separately during tray line service. The main entree was weighed on one plate before delivery to participants and the waste remaining was measured separately for each individual food item making up the entree. To obtain the estimated delivery weight of the individual entree food items, the average of three weights for each item (measured in grams) was calculated and used as baseline. The amount consumed by participants was determined by weighing the food as served and then subtracting the returned amount.

With this population diet treatment is often based on individual needs therefore, deviation from the developed menu was considered necessary when certain food items were not considered safe for a person to swallow or when food allergies/intolerances prevented intake. Individual menu changes to accommodate food preferences were not encouraged but were honored if requested by resident or care staff. Any change to the meal was recorded, food/fluid weighed and when possible the change was kept consistent between study periods. Supplements, such as milkshake or thickened Ensure®, given for therapeutic reasons were considered during menu development. Thus, any participant receiving a nutritional supplement before the start of data collection continued to receive this product during the two study periods.

In addition, participants and /or family members were asked to record and notify staff of any food or fluid that was consumed which hospital staff had not provided. In this instance, when food and/or fluid could not be weighed, the amount consumed was entered as volume instead of weight for the data analysis. To ensure accuracy of data collection, colored tape was used to identify study trays that were to be left for the researcher and assisting food service staff to pick up. When meal trays were accidentally dissembled before re-weighing, nursing staff reported the food/fluid intake for individual items as a percentage of amount consumed by residents.

Data analysis. The food and fluid consumed by each participant were analyzed for macronutrient content using Food Smart Nutritional Management Software computer program (North Vancouver, British Columbia, 1997), which contained all in house recipes. Total energy, protein, carbohydrate, and fat intakes were calculated for the two study periods and a paired t-test was used to determine whether there was a significant difference in energy intakes between the three-meal and the five-meal study period, with results considered significant at $P<0.05$. The SPSS computer software package (Version 11.5, SPSS Inc, Chicago IL, 2003) was used for this statistical analysis. For calculating total fluid consumed, fluid was defined as any food that is usually drunk (Kayser-Jones, Schell, Porter, Barbaccia, & Shaw, 1999) or is liquid at room temperature before being thickened (Jaradeh, 2001). For example, milk, coffee, tea, juice, soup, and thickened juice were identified as fluid.

Results

Participant characteristics. Out of a possible 66 residents who met the study's criteria for inclusion, 37 were selected to participate with four being excluded prior to starting the study due to a sudden change in their medical condition. Leaving thirty-three subjects who consented to participate and entered the study. Data from two of the subjects was excluded in the final data analysis due to a significant change in diet and/or swallowing ability during the study period thus, the final study sample consisted of 31 participants. Chi-square analysis was performed to compare several descriptive characteristics between participants (N=33) and non-participants. Results indicated no statistical differences between the two groups, with the exception of the prevalence of residents requiring longer than 20 minutes to feed. In the study group the prevalence of long feeds was 35.5% compared to 60.6% in non-participants, a difference that was statistically significant ($P<0.026$). See Appendix D for complete data on comparison of participants and non-participants. Table 2.3 provides a description of the study sample, which included five men and 26 women who ranged in age from 71 to 96 years. Results indicate that the majority of participants received pureed diets, consumed therapeutic supplements, required feeding assistance, and had some degree of cognitive impairment.

In addition, results of the nutritional parameters collected (see Table 2.3), suggest that the participants in this study were at nutritional risk as evidenced by the assessment tools of Body Mass Index (BMI) and Mini Nutritional Assessment (MNA). All 31 of the participants received a score less than 23.5 on the MNA, indicating the need for further assessment and nutritional intervention. Fifty-five percent (n=17) of the participants were identified as being at nutritional risk and 45% (n= 14) were identified as being malnourished with a score below 17.0 on the MNA screen. Body Mass index of participants ranged from 13 kg/m^2 to 28 kg/m^2, with 51% having a low BMI (<20 kg/m^2) that is associated with increased health risk due to being underweight. For the results of other descriptive characteristics collected, see Appendix E.

Table 2.3: Characteristics of Study Sample (N=31): Average Age, Prevalence of Medical Conditions, Feeding Ability, Dietary Intervention, and Nutritional Profile

	N	(%)
Average Age (y)	85 +/- 6.4	
Medical Conditions		
Dementia	27	(87.1 %)
Cerebral Vascular Accident	16	(57.1 %)
Identified as Long Feed (greater than 20 minutes to feed)	11	(35.5 %)
Receiving Nutritional Supplements	21	(67.7%)
Feeding Ability		
Dependent	27	(87.1%)
Independent	4	(12.9%)
Diet Texture		

Pureed	10	(32.3%)
Dysphagia Pureed	10	(32.3%)
Minced	8	(25.8%)
Minced/pureed	3	(9.7%)
Dysphagia Minced	0	(0%)
Fluid Consistency		
Thin Fluids	17	(54.8%)
Thickened Fluids	14	(45.2%)
Average Weight (kg)	53.4 +/- 10.1	
Average Body Mass Index (BMI; kg/m^2)	20.4 +/- 3.4	
Average MNA Total Score (maximum points=30)	16.3 +/- 3.7	

MNA = Mini Nutritional Assessment (Vellas et al., 1999). Low scores indicate higher risk for malnutrition.

Energy intakes. The average amount of calories received was 1661 kcalories and 1651 kcalories for the standard three-meal pattern and the five-meal pattern respectively. The subjects consumed an average of 80 % of the energy served for both meal patterns. Offering of the additional meals on the five-meal pattern was consistent: only 10% (N=24) of the meals were not received for various reasons (for example, no nursing time, resident asleep or resident busy with other activities) and 2% (N=5) of the meals were turned down by residents. Reporting of participants' intake as opposed to precise weighing occurred more often on the mid-morning and early-afternoon meal delivery (18%) compared to the standard meal delivery times (<1%).

The investigation was implemented in a real life setting and therefore actual energy intake was determined by including all food and/or fluid consumed by participants and all menu days regardless of whether the additional meals were received. Results of the paired sample t-test revealed that the average energy intake did not differ significantly between the three and five meals whereas the mean protein intake was greater with three meals and the mean carbohydrate and fluid intake were greater with five meals (see Table 2.4 for comparison of average calories, macronutrient, and fluid intakes consumed between the meal patterns). Results of the paired sample t- test revealed similar results when data analysis included only days when all scheduled meals were received (see Appendix F for discussion and results). Results of the individual responses to the five-meal pattern revealed that the energy intake for the majority of participants (N=19) did not differ clinically for the two meal patterns (less than 10% change in energy intake between three and five-meal pattern). Of the remaining 12 residents, two individuals increased energy intake on the five-meal pattern by more than 25%, while one individual decreased energy intake on the five-meal pattern by more than 25%. Estimated energy requirement (EER) for this sample is determined to be 1476 +/- 224 calories using a sedentary level of activity (Institute of Medicine, 2002). Results of the paired sample t-test comparing mean energy intake (1325 kcals) of participants to their estimated requirement indicated that energy intake was significantly below the standards (T= -3.193, P=0.003).

Table 2.4: Comparison of Mean Energy, Macronutrients, and Fluids Consumed between Three and Five Meals

Variable	Three Meals	Five Meals	T	P
Energy (kcal/day)	1325 +/-207	1342 +/- 177	-0.582	0.565
Protein (g/day)	51 +/- 10	48 +/- 10	2.383	0.024
Carbohydrate (g/day)	208 +/- 43	220 +/- 42	-2.442	0.021

Fat (g/day)	34 +/- 9.0	32 +/- 9.0	1.883	0.069
Fluid (ml/day)	612 +/- 176	698 +/- 156	-3.210	0.003

Discussion

The high incidence of progressive neurological diseases combined with age-related changes in swallowing physiology predisposes older persons to dypshagia, and subsequent risk for protein-calorie malnutrition and dehydration. The consequences of malnutrition and dehydration are serious medical conditions compromising the health and quality of life of the older person. Accordingly, nutrition interventions that reduce these risks would be beneficial for the older population. Although researchers have suggested that the provision of smaller, more frequent meals may be of benefit, the results of this study found no difference in energy intake when elderly individuals with dysphagia received five versus three meals daily, and only a small difference in fluid intake.

This study was implemented in a real-life setting and therefore limitations inherent to this type of research are acknowledged. However, the researcher felt it equally as important to determine the effectiveness of the intervention within the typical setting of the care facility. The intervention was implemented using usual nursing staff levels and the data analysis is reflective of actual food and fluid consumed regardless of whether all meals were offered or consumed, or whether family members provided additional food items. Implementation of the five-meal menu posed some challenges and a few issues were identified based on observations by the researcher and informal opinions of staff communicated to the researcher during the study. The majority of the participants were dependent on staff for feeding and even though the additional meals were offered, it is difficult to know with certainty that feeding was stopped because the resident was finished, or because of workload issues and time constraints placed on staff. As found in the study by Ramage et al., 1998, the priority that staff members placed on the extra meals was low compared to other duties they needed to complete, such as the task of bathing and dressing. This became evident mostly for the mid-morning meal, which was reported by some of the staff to be the busiest time for them. Some nursing staff felt that there was not enough time between the meals for residents to be hungry before the next meal and felt that the majority of the calories were spread over too short of a period. Although having an early supper and adding a mid-evening meal was considered as an alternative to the mid-morning meal during the design of the study, this was not possible due to the limited number of night staff and the inability to change the schedule of the standard three meals.

Other considerations related to the implementation of this research in a practice setting include the need to deviate from the study menu when this was considered necessary for swallowing safety, food intolerance, and requested food preferences. Furthermore, in the development of the menus, it was only feasible to focus on the energy received because of the hospital food service system that required standard measurements to be consistent for all diets. Similarly, the additional meals had to be readily available foods that were easy to assemble and serve and therefore, in this case tended to be food choices that were higher carbohydrate content, such as muffins, milkshakes, puddings, etc. Therefore, it is likely that the difference in macronutrient intake between meal patterns was due to the differences in the available menus, which were not matched on macronutrient content. However, the primary objective was to determine whether energy intakes could be increased, and this did not occur.

A secondary finding from this study was the large percentage of residents that were identified as being at nutritional risk. The etiology of malnutrition is multi-factorial, however, this study tends to support previous research that has documented an association between dysphagia and poor nutritional status. The average MNA score below 17.0 suggests that the participants in this study may be nutritionally compromised and the low average BMI (20.4 kg/m^2) suggests an increased health risk for this population. Research has shown that for older persons, a BMI below 22.0 kg/m^2 is associated with greater dependency in Activities of Daily Living and increased risk of mortality (Landi et al., 1999). In this study, the majority of participants were receiving assistance with feeding as well as the softest diet texture available. Other studies looking at the nutritional status of older persons living in care facilities have reported similar values to the BMI observed in this study sample (Tajima, Nagura, Ishikawa-Takata, Furumoto, & Ohta, 2004; Turic et al., 1998; Young, Binns, & Greenwood, 2001).

Several factors such as prolonged feeding time, reliance on others for feeding, and diet palatability have been suggested to negatively impact oral intake in individuals with dysphagia. In this study the average energy intake of 1325 calories was significantly below estimated requirements, but was similar to the intakes reported for the general senior population living in care facilities (Barr et al., 1983, Johnson, Smiciklas-Wright, Soucy, Rizzo, 2004; Tajima et al., 2004). Similarly, the fluid intake of this sample (612 +/- 176 ml) was sub-optimal and similar to the low fluid intake reported in a study of stroke patients on a thickened fluid dysphagia diet (Finestone, Foley, Woodbury, & Greene-Finestone, 2001). Average fluid intake was significantly greater on the five meal menu suggesting that fluid offered between meals was consumed and did not displace calories. This finding supports other studies that have found the quantity of fluid consumed at meal times to be insufficient to meet fluid needs (Kayser-Jones et al., 2004). Elderly persons with dysphagia are particularly vulnerable to reduced fluid intakes and offering fluids between meals would be an effective strategy to increasing fluids and minimizing risk of dehydration. A limitation of this present study is that it did not account for the water content of solid food, nor liquids that may have been given with medication, and therefore likely underestimated actual fluid intake. However, given the very low intakes it is possible that the total fluid consumed including food sources was still be below the minimum goal of 1500 ml/day suggested by researcher Chernoff (as cited by Kayser-Jones, Schell, Porter, et al., 1999).

Although routinely providing five meals a day did not produce the desired effect on energy intakes, some residents with dysphagia may benefit from this clinical intervention as was noted for two residents in this study. However, in absence of effective global strategies for promoting energy intake in this group, individualized assessment and intervention should be used. Offering foods high in energy and nutrient density, individualizing meal plans by considering one's food preferences, and evaluating current dysphagia diets for palatability and acceptance are alternate strategies that could be considered for those able to consume food orally. Meals are an important component of the care plan and ensuring adequate nutritional intake requires a coordinated team approach. For example, a dining program that has well-trained staff, provides ongoing monitoring and evaluation of swallowing ability, and offers a second sitting at lunch to allow more time for eating has been shown to be effective (Musson et al., 1990).

The majority of research in the area of diet management for dysphagia has focused primarily on texture modification and standardizing diet guidelines. Results of this study suggest the need for further investigation of the nutritional status of this population and the degree of nutritional risk as compared to the general elderly population. Focus group studies that investigate the barriers to feeding residents with dysphagia as well as studies examining the role of diet in the nutritional management of dysphagia would be beneficial. Of primary concern is that low energy intakes may not be adequate to maintain weight or to meet micronutrient requirements. Although the five-meal pattern increased fluid intake, energy intake was not improved. Furthermore, implementation of a global five-meal menu posed some challenges within the structured setting of a care facility. Findings suggest that dietitians may need to consider other intervention strategies for increasing the energy intake among this vulnerable group.

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Chapter 3: General Discussion and Conclusion

Dysphagia is a complex medical condition that is prevalent among elderly persons living in nursing homes; therefore, dietitians working in care facilities may find their knowledge in diet modification and nutrition important to the care of elderly persons with dysphagia. The results of this study have several implications for dietitians working with seniors who have swallowing impairments. Firstly, diet is integral in treatment for those who are able to consume food orally and therefore it is important for dietitians to be aware that this population is "at risk" nutritionally. Several factors such as prolonged feeding times, disruptions due to coughing, and fatigue are potential contributors to reduced food intake. Subsequently, low energy intake may result in weight loss, deficiencies in protein and necessary vitamin and minerals. Studies that have looked at the nutritional status of elderly residents living in care facilities have identified nutritional deficiencies in one or more essential nutrients in up to 50% of nursing home residents (Rudman, Abbasi, Isaacson, & Karpiuk, 1995). The low Mini Nutritional Assessment score found in this study does raise some concerns with regard to the nutritional status of the subjects in this study. However, possible limitations of the MNA tool with this particular population (elderly residents with dysphagia) need to be considered. Firstly, two of the questions: self-view of nutritional status and self-view of general health are subjective and since the majority of residents in this study had cognitive impairment, these questions were answered most often by direct care staff. Thus, we need to keep in mind that the results of these questions are open for interpretation. Secondly, the tool asks two questions pertaining to known risk factors for malnutrition such as poor mobility and place of residence; the subjects in this study automatically lost three points because they were wheel-chair bound and lived in extended care. Given that many of the subjects would have lost points for the above mentioned questions and the findings of a mean

MNA score of 16.3 was very close to the cut off score of 17.0 (score below indicates malnutrition) it is possible this score over estimated the actual degree of nutritional compromise.

Secondly, it is important for dietitians to continually re-evaluate nutrition interventions in their practice to ensure that they are meeting the needs of the client. Small, frequent meals have been a recommended form of diet therapy for those patients whose illness or condition has contributed to poor appetite or reduced intake. The theory behind using this diet is to encourage intake by minimizing fatigue and preventing the person from being overwhelmed by too much food. Results of this study suggest that serving five meals per day may not be an effective strategy for improving energy intake among elderly persons with dysphagia who live in extended care. This study did not evaluate degree of dysphagia severity and therefore it is possible that those with severe dysphagia would have greater fatigue and lower intakes and thus may respond differently. However, the finding that 67 % of study participants were identified as a high choking/aspiration risk by nursing staff suggests at least a moderate level of dysphagia severity for the study population.

It is also important to evaluate the treatment within the context of meal delivery, especially when it essential that staff give between meal nourishment in order to supplement for small portions at meal time. The researcher was able to proceed with this study because Care Leaders (RN's) were asked in the beginning to provide feedback on the feasibility of conducting such as study as well as effective ways to communicate information about the research to direct care staff. Eliciting the input from the nurses was an important factor in successful completion of this study. The number of participants from each unit was relatively small (three participants per unit) and considered manageable by the Care Leaders. However, the ability to maintain a five-meal pattern with a larger number of residents over a longer period time would have likely been much more difficult. For instance, due to the magnitude of labour involved in weighing of food and fluid and providing additional meals, it was not considered logistically possible to carry out the study over several weeks. Likewise, it was felt that a shorter time of four days would reduce inaccuracy in weighing of food and fluid that could occur due to staff fatigue and acclimation to the study procedures. Given that older persons may have established their eating patterns by this age, it is possible that the four day study period was insufficient in duration to measure any adaptations in intake as a result of the five meals. For example, it is theoretically possible that intake may have increased (or decreased) over a longer period of time as residents adapted to the change in meal pattern.

Thirdly, results of this study highlight the value of a coordinated team approach to the nutritional care of this population and dietitians should work closely with speech language pathologists and occupational therapists to ensure appropriate balance of nutrients when diet restrictions due to dysphagia are necessary. Observation during meal rounds to identify early signs of dysphagia and as well as continual monitoring of weight, food intake, and hydration status is essential. A recent study by Brody et al. (2000) has highlighted the importance of a multidisciplinary approach with the dietitian's role involving assessment and identification of probable dysphagia. Early nutrition intervention has several important ramifications for this vulnerable group, such as improved muscle strength and swallowing ability (Vreugde, 1994), increased survival and quality of life. Meals are an important part of the day for most residents and eating with others is one of the pleasurable activities available to them to enjoy. Dietitians involved in the care of this population should have understanding of the complexity of care required for these individuals. The present study, implemented in a real life setting of a care facility, did not show that energy intake was improved when five meals were served. Certainly, factors such as staff workload, timing of the meals, and differences in staff attitudes towards meal priority could have had an influence. Studies looking at the factors contributing to poor nutritional status among this population and their impact on oral intake would be beneficial in determining nutrition intervention strategies and educational opportunities for care staff.

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Appendix B: Small, Frequent Meals Research Project Data Collection

Date of data collection: ______________________________

Signature of collector: ______________________________

BACKGROUND INFORMATION

Resident's Initials__________________

Room Number_____________________

Building FP BP WP

Age _________

Gender M F

Date of admission__________________

DIET INFORMATION (from diet kardex in kitchen)

Current Diet Texture:

Minced Minced-Pureed Pureed Dysphagia-Minced Dysphagia-Pureed

Fluid Consistency:

Thick Thin Thick with some thin fluids allowed

Diet Additions to improve nutritional status:

High Pro/calorie diet	Y	N
High protein desserts only	Y	N
In between meal snacks	Y	N
Supplements	Y	N Specify _____________

Swallowing Management:

Any food restrictions due to swallowing (identified in red pen in dislike column)Y N

Specify____

____

NUTRITIONAL STATUS: Complete Mini Nutritional Assessment

MEDICAL HISTORY (from medical chart)

Parkinson disease	Y	N
MS	Y	N
ALS	Y	N
Muscular dystrophy	Y	N
Dementia/Alzheimer's	Y	N
CVA/Stroke	Y	N
Dementia/alzheimer's	Y	N
Esophageal lesions/strictures	Y	N
Aclasia	Y	N
Chronic UTI's	Y	N
Pneumonia	Y	N
Chronic constipation	Y	N

SWALLOWING MANAGEMENT (from medical chart)

Initial Swallowing Assessment date: ______________________

Swallowing Reassessment done Y N Date of latest: ____________

Diet type recommended in latest assessment: ________________________________

Diet recommended is currently being given by kitchen Y N

Feeding Status: (as assessed by Nurse/Primary care giver)

Independent Assistance Total feed

Independent = able to self feed without any problems

Assistance= able to self feed with some difficulty

Total feed= unable to eat without assistance

Resident is identified as high aspiration or choking risk Y N

Long feed (> 20 minutes to complete a meal) Y N

If long feed usual time required to complete meal_____________________________

Difficult feed Y N

Why_____________________________

Appendix C: Menu Guide and Sample Menus

Table C.1: Menu Guide for Pureed Diet		Menu Guide for Dysphagia Pureed Diet	
3-Meal Pattern	**5-Meal Pattern**	**3-Meal Pattern**	**5-Meal Pattern**
Breakfast 114 ml Juice 175 ml Hot cereal Egg Muffin 120 ml Milk or Milkshake** Coffee/tea	Breakfast 175 ml Hot cereal Egg Milk or Milkshake** Coffee/tea Mid-morning meal Juice or milkshake served with a muffin, pureed fruit, or high protein dessert	Breakfast 120 ml Thick juice 175 ml Hot cereal/3 creamers 120 ml Thickened Ensure® (standard) 120 ml Pureed fruit 110 ml Custard	Breakfast 120 ml Thick Juice 175 ml Hot cereal/3 creamers 110 ml Custard Mid-morning meal 120 ml Thickened Ensure® 120 ml Pureed Fruit
Lunch 120 ml Drink or Milkshake* 180 ml Strained soup 90 ml Pureed entrée /protein 60g Pureed vegetable 65g Mash potatoes /gravy 110 ml Pureed dessert Coffee/tea	Lunch 180 ml Strained soup 60 ml Pureed entrée/protein 30g Pureed vegetable 50g Mash potatoes /gravy 80 ml Pureed dessert Coffee/Tea Early afternoon meal Juice or milkshake** Pureed high protein dessert	Lunch 120 ml Thick Drink 90 ml Pureed entrée/protein 60g Pureed vegetable 65g Mash potatoes/gravy 110ml Pureed dessert 120 ml Thickened Ensure**®	Lunch 120 ml Thick Drink 60 ml Pureed entree/protein 30g Puree vegetable 50g Mash potatoes/gravy 80 ml Pureed dessert 120 ml Thickened Ensure**® Early afternoon meal 120 ml Thick Drink 110 ml Pureed high protein dessert
Dinner 120 ml Drink or Milkshake** 180 ml Strained soup 60g Pureed meat 60g Pureed vegetable 65g Mash potatoes /gravy 110 ml Pureed dessert Coffee/tea	Dinner 120 ml Drink or Milkshake** 180 ml Strained soup 30g pureed meat 30g Pureed vegetable 50g Mashed potato/ gravy 110 ml Pureed dessert Coffee/tea	Dinner 120 ml Thick Drink 60 g Pureed meat 60g Pureed vegetable 65g Mash potatoes /gravy 110ml Pureed dessert 120 ml Thickened Ensure** ®	Dinner 120 ml Thick Drink 30g Pureed Meat 30g Pureed vegetable 50g Mashed potatoes /gravy 110 ml Pureed dessert 120 ml Thickened Ensure**®

Table C.2: Menu Guide for Minced Diet		Menu Guide for Minced/pureed Diet	
3-Meal Pattern	**5-Meal Pattern**	**3-Meal Pattern**	**5-Meal Pattern**
Breakfast 114 ml Juice 175 ml hot cereal Egg or sausage 1 slice Toast 120 ml Milk or milkshake** Coffee/tea	Breakfast 175 ml Hot cereal Egg or sausage 120 ml Milk or milkshake Coffee/tea Mid-morning meal Juice Muffin	Breakfast 114 ml juice 175 ml Hot cereal Egg 1 slice toast 120 ml Milk or Milkshake** Coffee/tea	Breakfast 175 ml Hot cereal Egg or toast 120 ml Milk or Milkshake** Coffee/tea Mid-morning meal Juice or milkshake served with a pureed fruit or high protein dessert
Lunch 120 ml Drink or Milkshake** 180 ml Soup 4x 1/4 Sandwich or Full Entree 110 ml Dessert Coffee/tea	Lunch 180 ml Soup 2x 1/4 sandwich or ½ serving Entrée 80 ml Dessert Coffee/tea Early afternoon meal juice or milkshake** served with a high protein dessert or fruit or muffin	Lunch 120 ml Drink or Milkshake** 180 ml Strained soup 90-120 ml Minced Entree 65g Mashed Potatoes 60g Pureed vegetable 110 ml Pureed dessert	Lunch 180 ml Strained soup 60-90 ml Minced Entree 50g Mashed Potatoes 30g Pureed vegetable 80 ml Pureed dessert Early afternoon meal juice or milkshake** high protein pureed dessert
Dinner 120 ml Drink 90 ml Minced meat 45g Hot chopped vegetable 65g Mashed Potato/gravy Cake portion 120 ml Milkshake** Coffee/tea	Dinner 120 ml Drink 60 ml Minced meat 45g Hot chopped vegetable 50g Mashed potato/ gravy Cake portion 120 ml Milkshake** Coffee/tea	Dinner 120 ml Drink 90 ml Minced meat 60g Pureed vegetable 65g Mashed Potatoes/gravy 110 ml Pureed dessert 120 ml Milkshake** Coffee/tea	Dinner 120 ml Drink 60 ml Minced meat 30g Pureed vegetable 50g Mashed Potatoes /gravy 110 ml Pureed dessert 120 ml Milkshake** Coffee/tea

Table C.3: Sample Five and Three-Meal Menu for Pureed Diet

Pureed Diet Five-Meal Menu	Pureed Diet Three-Meal Menu
Breakfast 120 ml 2% Milk or Milkshake** 175 ml Hot Oatmeal Cereal 1 Boiled Egg 1x Margarine 200 ml Coffee 1x Milkers, 2x Sugar Salt/Pepper **Mid-Morning Meal** 2x3 Soft Coffee Cake 1x Jam 114 ml Orange Juice **Lunch** 180 ml Strained Cream of Carrot Soup 60 ml Pureed Sweet & Sour Pork 50 grams Mashed Potatoes 30 grams Pureed Green Beans 110 ml Butterscotch Pudding 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper **Mid-Afternoon Meal** 114 ml Apple Juice or 120 ml Milkshake** 110 ml Lemon Pudding **Supper** 120 ml Crystal Drink or Milkshake** 180 ml Strained Tomato Rice Soup 30 grams Pureed Fish with Cheese Sauce 50 grams Mashed Potatoes 30 grams Pureed Broccoli 110 ml Applesauce 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper	**Breakfast** 120 ml 2% Milk or Milkshake** 114 ml Orange Juice 175 ml Hot Oatmeal Cereal 1 Boiled Egg 2x3 Soft Coffee Cake 1x Margarine, 1x Jam 200 ml Coffee 1x Milkers, 2x Sugar Salt/Pepper **Lunch** 120 ml Crystal Drink or Milkshake** 180 ml Strained Cream of Carrot Soup 90 ml Pureed Sweet & Sour Pork 65 grams Mashed Potatoes 60 grams Pureed Green Beans 110 ml Butterscotch Pudding 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper **Supper** 120 ml Crystal Drink or Milkshake** 180 ml Strained Tomato Rice Soup 60 grams Pureed Fish with Cheese Sauce 65 grams Mashed Potatoes 60 grams Pureed Broccoli 110 ml Applesauce 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper
1547.6 calories; 58.4g protein; 232.0g CHO; 43.6g Fat (values without supplement 3x daily) 1913.3 calories; 77.9g protein, 270.1g CHO; 58.9g fat (values with supplement 3x daily)	1551.1 calories; 63.6g protein; 228.6g CHO; 43.6g Fat (values without supplement 3x daily) 1919.3 calories; 87.9g protein; 268.7g CHO; 59.4g Fat (values with supplement 3x daily)

Table C.4: Sample Five and Three-Meal Menu for Minced/Pureed Diet

Minced/Pureed Diet Five-Meal Menu	Minced/Pureed Three-Meal Menu
Breakfast 120 ml 2% Milk or Milkshake** 175 ml Hot Oatmeal Cereal 1 Boiled Egg 1x Margarine 200 ml Coffee 2x Milkers, 2x Sugar Salt/Pepper **Mid-Morning Meal** 120 ml Milkshake 120 ml Pureed Fruit **Lunch** 180 ml Strained Cream of Carrot Soup 60 ml Sweet & Sour Pork 50 grams Mashed Potatoes 30 grams Pureed Green Bean 110 ml Butterscotch Pudding 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper **Mid-Afternoon Meal** 114 ml Apple Juice or 120 ml Milkshake** 110 ml Lemon Pudding **Supper** 120 ml Crystal Drink or Milkshake** 30 grams Cut-up Fish with Cheese Sauce 50 grams Mashed Potatoes 30 grams Pureed Broccoli 110 ml Applesauce 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper	**Breakfast** 120 ml 2% Milk or Milkshake** 114 ml Orange Juice 175 ml Hot Oatmeal Cereal 1 Boiled Egg 1 Slice Toast 1 x Margarine, 1x Jam 200 ml Coffee 2x Milkers, 2x Sugar Salt/Pepper **Lunch** 120 ml Crystal Drink or Milkshake** 180 ml Strained Cream of Carrot Soup 120 ml Sweet & Sour Pork 65 grams Mashed Potatoes 60 grams Pureed Green Beans 110 ml Butterscotch Pudding 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper **Supper** 120 ml Crystal Drink or Milkshake** 60 grams Cut-up Fish with Cheese Sauce 65 grams Mashed Potatoes 60 grams Pureed Broccoli 110 ml Applesauce 200 ml Tea 1x Milker, 1x Sugar Salt/Pepper
1437.2 calories; 58.9g protein; 208g CHO; 40.8g Fat (values without supplement 3x daily) 1801.8 calories; 84.1g protein; 240.0g CHO; 56.4g Fat (values with supplement 3x daily)	1435.0 calories; 68.3g protein; 204.3g CHO; 38.8g Fat (values without supplement 3x daily) 1803.2 calories; 93.5g protein; 236.4g CHO; 54.5g Fat (values with supplement 3x daily)

Table C.5: Sample Five and Three Meal Menu for Minced Diet

Minced Diet Five-Meal Menu	Minced Diet Three-Meal Menu
Breakfast 120 ml 2% Milk or Milkshake** 175 ml Hot Oatmeal Cereal 1 Boiled Egg 1x Margarine 200 ml Coffee 2x Milkers, 2x Sugar Salt/Pepper **Mid-Morning Meal** 114 ml Orange Juice 2x3 Soft Coffee Cake **Lunch** 180 ml Strained Cream of Carrot Soup 60 ml Sweet & Sour Pork 50 grams Rice 45 grams Chopped Mixed Vegetables 110 ml Butterscotch Pudding 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper **Mid-Afternoon Meal** 114 ml Apple Juice or 120 ml Milkshake** 80 ml Lemon Pudding **Supper** 120 ml Crystal Drink or Milkshake** 30 grams Cut-up Fish with Cheese Sauce 50 grams Mashed Potatoes 45 grams Chopped Broccoli 1 portion Applesauce Cake 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper	**Breakfast** 120 ml 2% Milk or Milkshake** 114 ml Orange Juice 175 ml Hot Oatmeal Cereal 1 Boiled Egg 1 Slice Toast 1x Margarine, 1x Jam 200 ml Coffee 2x Milkers, 2x Sugar Salt/Pepper **Lunch** 120 ml Crystal Drink or Milkshake** 180 ml Strained Cream of Carrot Soup 120 ml Sweet & Sour Pork 75 grams Rice 45 grams Chopped Mixed Vegetables 110 ml Butterscotch Pudding 200 ml Tea 1x Milkers, 1x Sugar Salt/Pepper **Supper** 120 ml Crystal Drink or Milkshake** 60 grams Cut-up Fish with Cheese Sauce 65 grams Mashed Potatoes 45 grams Chopped Broccoli 1x portion Applesauce Cake 200 ml Tea 1x Milker, 1x Sugar Salt/Pepper
1594.4 calories; 53.4g protein; 228.2g CHO; 42.4g fat (values without supplement 3x daily) 1869.0 calories; 76.5g protein; 259.5g CHO; 58.1g Fat (values with supplement 3x daily)	1503.0 calories; 62.4g protein; 221.3g CHO; 40.5g Fat (values without supplement 3x daily) 1872.1 calories; 86.7g protein; 253.5g CHO; 56.3g Fat (values with supplement 3x daily)

Appendix D: Statistical Comparison Between Participants and Non-Participants

Descriptive Variable	Participants	Non-participants	Pearson Chi Squared	P
Gender (% female)	84.8	75.8	0.862	0.353
Fluid Consistency (% thick fluids)	48.5	66.7	2.233	0.135
Diet Interventions (%)				
High protein/calorie diet	24.2	9.4	2.554	0.110
High protein desserts only	27.3	28.1	0.006	0.939
Between meal snack	24.2	9.1	2.727	0.099
Receiving nutritional supplement	69.7	63.6	0.273	0.602
Special food restrictions due to swallowing	48.5	56.3	0.393	0.531
Medical Conditions (%)				
Parkinsons	3.1	9.1	1.001	0.613*
Multiple Sclerosis	0	3.0	0.985	1.00*
ALS	0	3.0	0.985	1.00*
Muscular Dystrophy	0	0	**	**
CVA/stroke	55.2	51.6	0.076	0.782
Dementia/alzheimer's	87.9	93.9	0.733	0.672*
Esophageal lesions/stricture	3.1	3.0	0.000	1.00*
Aclasia	0	0	**	**
Chronic urinary tract infections	45.5	31.3	2.216	0.330
History of pneumonia	12.1	24.2	1.630	0.202
Chronic constipation	60.6	72.7	1.091	0.296
Feeding Ability (%)				
Independent with feeding	12.1	3.0	1.948	0.355*
High choking risk	69.7	78.1	0.598	0.440
Long feed (>20 min)	33.3	60.6	4.972	0.026
Challenging feed	39.4	56.3	1.850	0.174
			T	P
Age (yr)	85 +/- 6.3	86 +/- 6.7	-0.549	0.585
Height (cm)	162 +/- 9.5	162 +/- 11.7	0.154	0.878
Weight (kg)	53.5 +/- 9.9	52.3 +/- 9.2	0.520	0.605
MNA score	16.3 +/- 3.6	15.1 +/- 4.1	1.301	0.198

Participants (N=33) include the two subjects that consented to participate and completed the study but were excluded in the final data analysis due to changes in diet texture/swallowing between study periods.

* Fisher exact test used for cells with expected count less than five

** No statistics are computed because variable is constant

Appendix E: Characteristics of Study Sample (N=31)

	N	%
Average height (cm)	162.0 +/- 9.6	
Diet Interventions		
High protein/calorie diet	7	22.6%
Between meal snacks	7	22.6%
Medical Conditions		
Parkinson's Disease	1	3.3%
Multiple Sclerosis	0	
ALS	0	
Muscular Dystrophy	0	
Esophageal lesion/stricture	1	3.3%
Aclasia	0	
Urinary tract infections	13	41.9%
Chronic constipation	18	58.1%
Feeding Ability		
Identified as high aspiration/choking risk	21	67.7%
Identified as a challenging feed (i.e. closing mouth, prolonged chewing, difficult to position)	12	38.7%

Appendix F: Data Analysis of Ideal Situation and Results

The intent of this study was to evaluate the five meal menu in a real life setting, therefore the first data analysis conducted included all menu days/meals and all food and fluid consumed by participants regardless of whether the additional meals were offered or refused. The results from this analysis termed "real situation" are reported in the main body of the report. This section will report on the data analysis completed based on exclusion criteria that were established in order to minimize some of the effects that would occur in a practice based research setting, such as meals not being offered because of workload issues, resident asleep etc. For the "ideal situation," day(s) were excluded from the data analysis when the additional meal(s) were not offered to a participant for whatever reason. However, meal(s) were included in the ideal data when the participant was offered the meal but chose not to consume it. In addition, any food or fluid given to participants by staff or family members outside the menu was not included in the total calories. However, substitution of individual food items (outside the study menu) that occurred for reasons associated with allergies, dysphagia safety, and food preferences were included in the data analysis.

The results of the paired sample t-test showed that the energy intake did not differ significantly between the three and five-meal pattern for the "ideal situation" (1283 $\pm$ 190 kcal/d versus 1320 $\pm$ 167 kcal/d, respectively; $T = -1.38$, $P = 0.178$). With this criterion the number of "ideal days" used in the data analysis varied among participants, with some of them having less than three days of intake records. The researcher recognizes that this may not be a sufficient number of days to be reflective of actual intake and thus is a limitation of this methodology. However, the results of the "ideal situation" used in combination with the "real situation" provide stronger support for the conclusion that the five-meal pattern did not increase energy intake significantly.