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Nutritional Status and Clinical Outcomes of Residents Admitted to a Nursing Home

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NUTRITIONAL STATUS AND CLINICAL OUTCOMES OF RESIDENTS

ADMITTED TO A NURSING HOME

by

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ABSTRACT

Purpose The purpose of this research study was to describe the nutritional status (well nourished, at risk for malnutrition, or malnourished) of residents admitted to nursing homes and adverse clinical outcomes in those residents after four weeks.

Methodology A descriptive, correlational design utilizing medical record data was used to examine the relationship between nutritional status and adverse clinical outcomes of weight loss and pressure ulcers.

Results The sample (n=69) was predominately Caucasian (90%) with 38% having one or more pressure ulcers on admission. Most of the residents were admitted from an acute care facility (97%) and were either malnourished or at risk for malnutrition at the time of admission to a nursing home. At admission, there was no significant difference between the three groups of nutritional status (well nourished, at risk for malnutrition, and malnourished) in terms of pressure ulcers (F=1.127, p=0.33-). Just over half (52%) of the individuals remained at the nursing home at four weeks and of those 54% experienced a significant weight loss of 5% or more and 33% had one or more pressure ulcers. At four weeks, there were no significant differences between the three groups of nutritional status on the adverse clinical outcomes of weight loss (x^2=3.37, df=2, p=0.185) or pressure ulcers (F=1.600, -=0.216). However, the relationship between nutritional status at

admission and pressure ulcers at four weeks was significant (gamma value = 0.649; p = 0.016).

Conclusion Older adults admitted to nursing homes were either at risk for malnutrition or are malnourished. Older adults experience a significant unintentional weight loss of 5% or more at four weeks following admission to a nursing home that was not related to nutritional status at admission. There was a relationship between nutritional status at admission and the presence of pressure ulcers at four weeks with those with poorer nutrition being more inclined to develop pressure ulcers. Nurses caring for older adults in nursing homes need to initiate weight monitoring processes early after an individual has been admitted to mitigate the tendency of older adults to loose weight and develop pressure ulcers following admission to a nursing home.

DEDICATION

I want to thank the many individuals who supported me throughout my doctoral education. First, I am grateful to the expertise, guidance, and encouragement of my dissertation chair, Dr. Ann Mayo. Dr. Cynthia Connelly and Dr. Patricia Roth, my committee members, provided invaluable support and advice.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Appendix

CHAPTER ONE

This chapter provides an overview of the research to examine the nutritional status of residents admitted to nursing homes. The information contained in this chapter is presented within five sections. It begins with an overview of malnutrition in older adults, followed by the conceptual framework, the purpose, research questions, and the importance of this topic for nursing.

Overview of the Problem

Malnutrition has been considered a "hidden cost" of rising health care costs by extending hospitalization by as much as 12 days (Van Nes, Herrmann, Gold, Michel, & Rizzoli, 2001). Further, malnutrition puts individuals at risk for infection, delayed wound healing, pressure ulcer development, and functional decline (Flodin, Svensson, & Cederholm, 2000; Janssen, Katzmarzyk, & Ross, 2005; Seidell & Visscher, 2000; Snib, Raji, Markides, Ottenbacher, & Goodwin 2005; Woo, Ho, & Sham, 2001). In nursing homes, the incidence of malnutrition has been reported to be as high as 60% (LaPorte, Villalon, Thibodeau, & Payette, 2001). Although the Nursing Home Reform Act of 1987 (NHRA) addressed the prevention of malnutrition and dehydration in nursing home residents by mandating that nursing homes meet resident's nutritional needs, malnutrition in nursing homes remains a frequent and serious problem (Seiler & Stahelin, 1999).

Nurses are the first health professionals to assess residents admitted to nursing homes. Their assessment includes vital signs, skin, respiratory, cardiovascular, gastrointestinal assessment, and mental status evaluation. Although nurses evaluate the height and weight of residents, in most nursing homes, assessment of nutritional status is often cursory. A formal nutritional evaluation by a registered dietician is required by Medicare guidelines to be completed within one week of admission; however, an assessment by a registered dietician may not be completed for several days and in some cases weeks after a resident has been admitted to a nursing home. Consequently, weight loss, one indicator of poor nutritional status, may have already occurred before a resident has been identified as malnourished or at risk for being malnourished. Although weight monitoring occurs in nursing home residents, frequently a significant weight loss has occurred before the weight loss has been noticed and a nursing plan is implemented. This study of nutritional status in older adults will add to the understanding of malnutrition in nursing home residents by evaluating nutritional status at the time of admission, describing the characteristics of residents who are malnourished, and understanding the association between health outcomes and nutritional status.

Background and Significance

The physiological changes that occur with aging are complex, multifactorial, and may contribute to malnutrition in the elderly. On the average, both body weight and body mass index (BMI) increase until age 50-60 (Morley, 1997). After age 50 there is an increase in fat deposition and a decrease in lean muscle mass with a loss of up to 3 kg of

lean body mass per decade (Chapman, 2006). Loss of muscle mass begins at age 50 but it is not until age 60 that the loss is pronounced. The increase in body fat composition is due to a variety of factors, including a more sedentary lifestyle, reduced growth hormone secretion, declining sex hormone production, and reduced resting metabolic rate (Chapman, 2006). At age 60 there is a tendency for body weight to decrease with a loss of 5% or more over a period of several years (Chapman, 2006).

Usually, older adults become less hungry as they age. Caloric intake is less in older persons compared to younger persons (Wurtmann, Lieberman, & Tsay, 1988). This age related reduction in appetite and energy intake has been termed "the anorexia of aging" (Morley, 1997). In addition, taste and smell perception alters food intake. Gastrointestinal changes such as atrophic gastritis can lead to the malabsorption of necessary nutrients. Further, the delay of gastric emptying can cause reflux, heartburn, and a feeling of fullness. The side effects of medications are a major cause of anorexia and weight loss in older persons. Finally, oral disease and poor fitting dentures are additional factors contributing to a decrease in food intake.

Malnutrition contributes to muscle wasting, muscle atrophy, and muscle weakness causing changes in balance and strength, skin breakdown, and pressure ulcers. Further, muscle weakness, a consequence of a decrease in muscle mass and poor Vitamin D intake contributes to poor bone strength and the potential for falls (Chapman, 2006). Finally, malnutrition impairs the immune response predisposing individuals to infections and poor wound healing (Hudgens, Langkamp-Henken, Stechmiller, Herrlinger-Garcia, & Nieves, 2004).

Malnutrition

Malnutrition is a complex concept encompassing under nutrition, protein deficiency, and specific nutrient deficiencies. The terms malnutrition and under nutrition are used interchangeably in the literature. Keller (1993) noted that malnutrition is a broad term including 1) under nutrition resulting from insufficient food intake, 2) over nutrition caused by excessive intake of calories, 3) specific nutritional deficiencies, and 4) imbalances because of disproportionate intake of nutrients. In an extensive analysis of malnutrition, Chen, Shilling, and Lyder (2001) developed the concept of malnutrition in the elderly. They suggested that malnutrition in the elderly is a multidimensional concept including physical and psychosocial elements of faulty or inadequate nutritional status, undernourishment, poor appetite, muscle wasting, weight loss, and chronic illness. Further, they suggested that the psychosocial elements of loss, dependency and loneliness are critical elements of malnutrition in older adults. Although their analysis provides a fairly comprehensive framework for understanding malnutrition in older adults, their research does not describe antecedent events that can potentially trigger a weight loss, such as an admission to a nursing home.

For the purposes of this study, malnutrition is defined as insufficient food intake with an accompanying unintentional decrease in body mass. Because malnutrition in older adults is a multidimensional concept, it is defined in terms of body mass index (BMI), anthropometric indices, dietary practices, and functional status.

Unintentional weight loss

A closely related concept to malnutrition is weight loss in nursing home residents. Weight loss can be unintentional or intentional in an individual who is morbidly obese by caloric restriction. In a nursing home resident, an unintentional weight loss is defined as an unplanned decrease in body mass that occurs after admission to a nursing home. A common problem in the nursing home population, unintentional weight loss is also associated with adverse, costly clinical outcomes such as increases in the rates of acute care hospitalizations, mortality, and stroke (Lou, Dai, Huang, & Yu, 2007; Newman, Yanez, Harris, Duxbury, Enright, & Fried, 2001). A weight loss of 10 pounds within the last 6 months is considered a warning sign of poor nutrition health (Nutritional Screening Initiative, 1993). Although unintentional weight loss is a generic term, it has been conceptualized to include multiple etiologies for the weight loss, such as normal aged related weight loss, and weight loss due to an array of circumstantial events impacting an individual's ability to maintain a desired weight.

In summary, malnutrition and unintentional weight loss are closely related, but discrete concepts. The age related tendency to decreasing weight coupled with a circumstantial weight loss in an individual who is already lean puts the individual at risk for malnutrition and adverse clinical outcomes. This "additive adverse effect" is especially worrisome in lean individuals who are admitted to nursing homes. Consequently, unintentional weight loss in older adults in nursing homes consists of two components: the normal age related decrease in body mass and the non-normal decrease in body weight related to circumstantial events causing a weight loss.

Purpose of the Study

The purpose of this research study was to describe the nutritional status of residents admitted to nursing homes using the Mini Nutritional Assessment instrument and to describe adverse clinical outcomes in those residents at the end of a four week period. Specifically, this study was conducted to develop an understanding of nutritional status and possible malnutrition in nursing home residents recently admitted to a nursing home.

Study Aims

Aim #1 To describe the nutritional status of residents admitted to nursing homes utilizing the Mini Nutritional Assessment instrument at the time of admission.

Aim #2 To describe the differences in the admitting nutritional status between residents admitted from acute care facilities as compared to those admitted from the community.

Aim #3 To describe at four weeks following admission the difference in adverse clinical outcomes of weight loss and pressure ulcers between residents who are were well nourished at admission, residents who were at risk for malnutrition at admission, and residents who were malnourished at admission.

Aim #4 To describe relationships between the nutritional status of residents as measured by the Mini Nutritional Assessment score at admission and clinical outcomes (weight loss and pressure ulcers) at the end of a four week period following admission to a nursing home.

Research Questions

1. What is the nutritional status of residents who are admitted to nursing homes?

2. Is there a difference in nutritional status between residents who are admitted to nursing homes from acute care facilities compared to those admitted from the community?

3. At four weeks following admission to a nursing home, is there a difference in two adverse clinical outcomes (weight loss and pressure ulcers) between residents who are well nourished at admission, residents who are at risk for malnutrition at admission and residents who are malnourished at admission?

4. What is the relationship between the nutritional status of residents measured by the Mini Nutritional Assessment score at admission and two clinical outcomes (weight loss and pressure ulcers) at the end of a four week period following admission to a nursing home?

Conceptual Framework

The results of this research study describe several characteristics of malnutrition in older adults in nursing homes. The defining characteristics or salient features of malnutrition include the demographic attributes of age, gender, setting prior to admission, and nutritional status on admission to a nursing home.

The conceptual framework of nutritional status of older adults in nursing homes was drawn from the published literature. The framework presented includes three components: a) demographic attributes (age, gender, and setting prior to admission, b) nutritional status at admission to a nursing home, and c) adverse clinical outcomes (see

Figure 1). This study utilized this three component framework to describe the nutritional status of residents on admit and adverse clinical outcomes in those residents at the end of a four week period.

Demographics characteristics are operationalized to include age, gender, ethnicity, and setting prior to admission. Age is measured in years. Gender is measured as either male or female. Prior admission status is measured by admission from an acute care facility or admission from the community. The acute care facility is a hospital. The community includes a resident's home, an assisted living facility or another nursing home.

The concept of Nutritional Status on Admission is operationalized as nutritional status using, clinical markers as measured by the Mini Nutritional Assessment instrument.

The concept of adverse clinical outcome is operationalized to consist of weight loss and pressure ulcers. Weight loss is measured in number of pounds lost since admission. Pressure ulcers are defined according to standardized pressure ulcer staging criteria and are measured using those criteria (National Pressure Ulcer Advisory Panel 2007 Staging definitions. Available at www.npuap.org. Accessed April, 2011). In addition, worsening or improvement in existing pressure ulcers, as well as the development of new pressure ulcers, was measured.
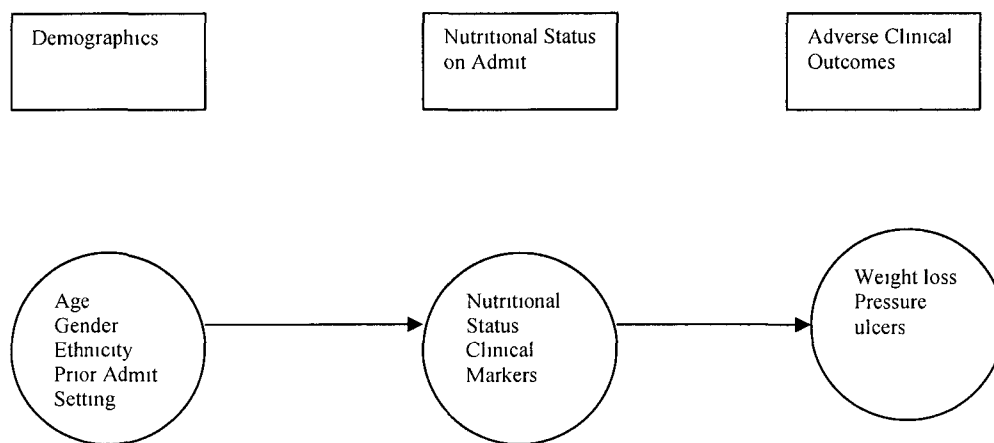
Figure 1 Conceptual Framework "Demographic and Nutritional Factors Relating

Adverse Clinical Outcomes in a Nursing Home Population"

Definition of Terms

Older adult- An individual over the age of 65.

Body mass index- Body mass index (BMI) has been accepted as the gold standard for determining whether an individual is underweight, overweight or at ideal body weight. Malnutrition caused by underweight in older adults is considered a BMI less than or equal to 18.5 kg/height in meters squared (kg/m2) and severe malnutrition caused by underweight as less than 16 kg/m2.

Nutritional risk is a term used to indicate risk for low weight and poor nutritional health and is a BMI less than 24 kg/m2 (Watson, Leslie, & Hankey, 2006).

Malnutrition-Malnutrition in older adults is a multidimensional concept including anthropometric indices, cognitive, and functional status. Malnutrition is defined in terms of body mass index, mid-arm circumference, calf circumference, current dietary practices, and functional status. In this study malnutrition is measured by the Mini Nutritional Assessment instrument and is a score < 17 (Vellas, Guigoz, Garry, Nourhashemi, Bennahum, Lauque, & Albarede, 1999).

At risk for malnutrition- This term is also defined in terms of anthropometric indices, current dietary practices, and functional status. It is measured by the Mini Nutritional Assessment instrument and is a score < 23.5 (Vellas et al., 1999).

Well nourished- This term is also defined in terms of anthropometric indices, current dietary practices, and functional status. It is measured by the Mini Nutritional Assessment instrument and is a score of > or equal to 24 (Vellas et al., 1999).

Nursing homes- "A facility with three beds or more that is either licensed by its state, certified as a nursing facility under Medicare, identified as a nursing care unit of a retirement center" (National Center for Health Statistics, 1991).

Skilled care-Skilled care is a level of care in skilled nursing facilities involving physical, occupational or speech therapy. It is also care that requires the professional assistance of a licensed nurse such as wound care, tube feedings and intravenous fluids or antibiotics. Patients who are admitted for skilled care receive at least one of the previous modalities (www.medicare.gov/glossary).

Custodial care- Custodial care is care that is non-skilled. It is care that assists with Activities of Daily Living, such as bathing, dressing, and feeding (www.medicare.gov/glossary).

Pressure Ulcers-Any lesion caused by unrelieved pressure resulting in damage of underlying tissue. Pressure ulcers usually occur over bony prominences and are staged to reflect the degree of tissue damage observed. Stage I pressure ulcers are defined as nonblancheable erythema of intact skin. Stage II pressure ulcers are defined as partial thickness skin loss involving the epidermis or the dermis. Stage III pressure ulcers are defined as full skin thickness loss with damage to the underlying subcutaneous tissue. Stage IV pressure ulcers are full skin thickness loss with extensive damage to muscle, bone or supporting structures (National Pressure Ulcer Advisory Panel 2007 Staging definitions. Available at www.npuap.org. Accessed April, 2011).

Setting prior to admission- Setting prior to admission is the place, acute care facility or community that the resident had been at before being admitted to the nursing home.

Implications for Nursing

Nursing research in older adults residing in nursing homes has gained momentum in the last decade. Most studies focus on quality outcomes and staffing of nursing homes. A few studies have examined the use of supplements, staffing and feeding assistance during mealtimes (Johnson, Nasser, Banow, Cockburn, Voegeli, Wilson, & Coleman, 2009; Simmons, & Schnelle, 2006). Some studies have evaluated adverse clinical outcomes in patients who are malnourished (Culp & Cacchione, 2008; Langkamp-Henken, Hudgens, Stechmiller, & Herlinger-Garcia, 2005). No study could be identified that evaluated the nutritional status of patients on admission to a nursing home and considered setting prior to admission as a potential contributor to nutritional status.

Nursing knowledge can be advanced by this research study of nutritional status in older adults admitted to nursing homes in several ways. First, clinical nursing practice in nursing homes is facilitated by the use of evidence based assessment measurements and outcomes to evaluate nutritional status. Assessing the nutritional status of residents upon admission using an instrument such as the Mini Nutritional Assessment instrument may be a valuable baseline assessment. Registered nurses may be able to quickly identify patients who are malnourished and implement a treatment plan for improvement of nutritional status and prevention of pressure ulcers. Early implementation of independent

nursing strategies such as ordering daily weights on residents or ordering health shakes and dietary consultations may prevent weight loss and other adverse clinical outcomes.

This research study adds to the understanding of the concept of malnutrition in older adults by further examining the trajectory of weight change (e.g. unintentional weight loss) in residents who are admitted to a nursing home. The nutritional status of patients admitted to nursing homes from acute care facilities and the community will be better understood as a possible antecedent event contributing to poor clinical outcomes. The adverse health outcomes of pressure ulcers and weight loss will be better understood in terms of nutritional status.

CHAPTER TWO

REVIEW OF THE LITERATURE

This chapter provides a review of literature, beginning with an overview of the concept of nutrition in older adults focusing specifically on factors contributing to malnutrition. Malnutrition in older adults admitted to nursing homes is dependent on a number of complex factors in a resident who is often frail with comorbid conditions. Much research remains to be done on refining the conceptual model of malnutrition in older adults. In this chapter, the theoretical and empirical literature regarding nutrition and normal aging, malnutrition in older adults, conceptual knowledge of malnutrition in older adults, measurement of nutritional status, unintentional weight loss, and clinical outcomes of malnutrition is reviewed and critiqued. This investigation is informed by previous research and literature on nutrition in older adults, malnutrition in older adults, body mass index, and the effects of malnutrition in older adults using search results from Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Medline representing the fields of nursing and medicine.

Nutrition and Normal Aging

Malnutrition in older adults is a complex phenomenon consisting of a spectrum of normal physiological changes and physical changes that occur with aging.

Sarcopenia

As individuals age, the body habitus undergoes changes with a redistribution of muscle mass and adiposity. Sacropenia is a condition in which an individual experiences a loss of muscle mass and strength accompanied by an increase in fat (Roubenoff, 2001). Sarcopenia is a normal physiological occurrence with aging involving a number of physiological mechanisms, such as intrinsic changes in muscle fibers, changes in motor units in the spinal cord, reductions in testosterone and estrogen, and activation of pro-inflammatory cytokines (Bales & Ritchie, 2002; Roubenoff, Harris, & Abad, 1998). Although the loss of muscle mass occurs at age 50, it is not until age 60 that the loss of muscle mass is most pronounced (Watson et al., 2006). Consequently, with normal aging there is a progressive increase in fat and decrease in muscle mass with a loss of up to 3kg of lean body mass per decade after age 50 (Chapman, 2006). The increase of body fat is due to a combination of physiological factors including a decrease in physical activity, reduced growth hormone secretion, a decline in sex hormone action, and reduced metabolic rate.

Although one of the consequences of sarcopenia is a reduction in the basal metabolic rate with a reduction in caloric requirements, many older adults consume considerably fewer calories than recommended to be healthy. In nutritional surveys conducted among community dwelling older adults, caloric intake below the Recommended Dietary Allowance has been consistently demonstrated. For example, in the National Health and Nutrition Examination Surveys (NHANES I and II), there was a significant decline in caloric intake and quantity of food consumed with aging. For

example, the mean energy intake declined by 1000-1200 calories in men and 600-800 calories in women between the ages of 20 and 80 (Wakimoto & Block, 2001).

Other Physiological Changes

Normal physiological changes that occur with aging may contribute to malnutrition in older adults. For example, the regulation of food intake changes with increasing age leading to the phenomenon of "physiological anorexia of aging" (Morley, 1997). The regulation of food intake is the result of numerous biochemical changes that occur with aging. For example, as individuals age, the amount of cholecystokinin, a satiating hormone, increases in the circulation (Morley, 1997). This increase in cholecystokinin contributes to a feeling of fullness even though an individual may not have consumed an adequate caloric intake. Increasing levels of leptin, a cytokine-like peptid associated with obesity may also contribute to anorexia. Other substances that contribute to satiety include the pancreatic hormone, amylin; cytokines, interleukin 1, and interleukin 2.

Physical Changes

Physical changes that accompany aging can also contribute to malnutrition. The senses of taste and smell become less acute and impact appetite. Xerostomia or dry mouth is a common condition of aging and may be the side effects of such drugs as antidepressants. Older adults may also experience a delayed gastric emptying causing food to remain in the stomach leading to an increased feeling of fullness.

Comorbid Conditions

Gastrointestinal changes such as atrophic gastritis can lead to a decrease in intrinsic factor causing malabsorption of essential nutrients such as vitamin B12 causing macrocytic anemia. Dysphagia, due to conditions such as stroke, dementia, Parkinson's disease, and other neuromuscular disorders can further contribute to an inadequate intake of food as individuals become fatigued with the increased neuromuscular effort required to safely swallow. In their study of nursing home residents, Kayser-Jones and Pengilly (1999) observed residents for swallowing difficulties and found that 55 per cent of the residents in two nursing homes had some degree of dysphagia ranging from mild to severe.

Other conditions that contribute to malnutrition include chronic diseases such as diabetes, chronic obstructive pulmonary disease, renal disease, and heart disease. Older adults residing in nursing homes are vulnerable to malnutrition and weight loss due to impaired cognitive and functional status. Nutritional deficiencies of folate and vitamin B12 are also associated with cognitive deficits. Other factors that contribute to malnutrition are poor fitting dentures, poor oral dentition, and impaired vision.

Protein Energy Under Nutrition

Although malnutrition consists of inadequate intake of micronutrients such as vitamins and minerals and macronutrients; protein energy under nutrition (PEU) is the most common etiology and the most worrisome. Protein energy malnutrition may range in severity from sub clinical protein deficiency to obvious signs of muscle wasting including edema, hair loss, and skin atrophy. In developed countries, PEU is most

common among the institutionalized elderly. Protein energy malnutrition has been associated with a variety of adverse clinical effects in the elderly including prolonged length of hospitalization and mortality (Sullivan, Walls, & Lipschitz, 1991). Sullivan's et al. (1991) prospective study included 109 patients admitted to a geriatric rehabilitation unit and followed one year after discharge. Of the 81 nutritional and nonnutritional variables studied, the best predictor of mortality was weight loss occurring the year prior to admission to the geriatric unit.

The research involving nutrition and normal aging firmly supports that normal age related biochemical changes occur with aging. Comorbid conditions such as diabetes, heart disease, pulmonary disease, and kidney disease further alter nutritional intake and contribute to nutritional deficiencies.

Conceptual Knowledge of Malnutrition in Older Adults

There is general agreement among experts that malnutrition and undernutrition are different although the terms are often used interchangeably in the literature. Keller (1993) noted that malnutrition is an overall term including 1) undernutrition resulting from insufficient food intake, 2) over nutrition caused by excessive food intake, 3) specific nutrient deficiencies, and 4) imbalances because of disproportionate intake in nutrients. In the proposed research study malnutrition will be examined in terms of insufficient food intake.

In an effort to understand the underpinnings of malnutrition in older adults Chen et al. (2001) identified five critical attributes essential in the analysis of malnutrition in

older adults: insufficient dietary intake, muscle wasting, weight loss, poor appetite, and a downward trajectory.

Antecedent factors contributing to malnutrition in older adults include loss, dependency, loneliness, and chronic illness (Chen et al., 2001). Finally, the consequences of malnutrition included an increase in morbidity and mortality, and a decrease in quality of life. Although their analysis of malnutrition in older adults is fairly comprehensive, it did not include normal age related changes in nutritional status such as the physiological phenomenon of sarcopenia. Further, their analysis is a general conceptual framework for malnutrition in older community dwelling adults and does not specifically include unique factors that affect the nursing home population, such as admission to a nursing home that may cause weight loss and malnutrition. Therefore, this study builds on Chen's et al. conceptualization of malnutrition by considering the antecedent events of admission to a nursing home that may contribute to malnutrition in older adults while utilizing consequences of malnutrition as clinical outcomes.

Measurement of Nutritional Status

Body Mass Index

Body mass index (BMI) has been accepted as the gold standard for determining whether an individual is underweight, overweight, or at ideal body weight. Many studies of malnutrition utilize BMI as a sole indicator of nutritional status. This measure is an important concept to understand since it is a clinical marker of nutritional status and is used as a standard measure of nutritional status in older adults in scientific literature. BMI is an index of weight-for-height universally used to describe obesity. In the nursing

home population, BMI is calculated by the dietician as part of the initial dietary assessment. Current national guidelines are that overweight be defined as BMI of 25kg/m^2 to 29 .9 kg/m^2 and obesity as 30kg/m^2. Individuals whose BMI is 18.5 k/m^2 are categorized as undernourished. Ideal body weight is considered to be 21-24k/m^2. This classification has been recommended for all adults regardless of age.

The prevalence of Body Mass Index (BMI) less than 21kg/m^2 in elderly adults (age 65 and older) is 10% to 25% in the community population, 23% to 85% in the nursing home population, and 33-55% in elderly in acute care facilities (Clark, Wahlquist, & Strauss, 1998; Flodin et al., 2000; Martin, Kayser-Jones, Stotts, Porter, & Froelicher, 2005; Stuck, Walthert, Nikolaus, Bula, Hohmann, & Beck, 1999). The wide ranges of BMI are due to the differences obtained when researchers use self report measurements of height and weight. No one has suggested that the wide ranges are attributed to inaccuracies in measurement of BMI. However, accurate measurement of BMI requires an accurate measurement of height, which can be problematic in older adults who have difficulties ambulating or standing. Some experts have suggested that either a knee span height or a demi-height be measured instead and converted into an adult height (Watson et al., 2006).

In numerous studies, BMI has been demonstrated to be an independent predictor of mortality (Sayhoun, Serdula, Galuska, Zhang, & Pamuk, 2004; Van Nes et al., 2001). In a Swedish study of older adults admitted to an acute care facility, Flodin et al. (2000) measured BMI and functional status to evaluate the relationship between BMI, functional status, and mortality at one year and found that one-third of the patients had a BMI < 20.

Their retrospective study findings supported an earlier study, the National Health and Nutrition Examination Survey that revealed that low BMI was associated with increased mortality (Tayback, Kumanyika, & Chee, 1990). The National Health and Nutrition Examination Survey was a large well conducted research study of white older adults aged 55 to 74 years of age that controlled for hypertension, smoking and poverty.

Conversely, higher BMI values are associated with a decrease in mortality in older adults. In a large longitudinal study of community dwelling men and women over the age of 65 with cardiovascular risk factors, higher BMI values were associated with lower mortality risk (Janssen, et al., 2005). The research suggested that the lower BMI contributes to mortality risk at around the seventh decade of life. Consequently, weight loss should not necessarily be considered beneficial in overweight older adults.

Although widely accepted as the gold standard for evaluating nutritional status, one of the weaknesses associated with the use of BMI to measure nutritional status is the inability of the BMI to distinguish between the loss of lean body mass and the loss of fat body mass. Whereas loss of fat body mass, especially central adiposity, may lower an older adult's risk for non-insulin dependent diabetes, loss of lean body mass in an older adult affects the individual's functional status in terms of ambulation, self- care, and the ability to engage in exercise to maintain lean body mass. Further, BMI is not sensitive enough to identify small but clinically significant weight loss (Cook, Kirk, Lawrenson, & Sandford, 2005). For example, an individual may lose 10% of his or her body weight and still have an ideal body weight (IBW). Nevertheless, in patients who are already thin, the use of BMI, in addition to close monitoring of weight, is perhaps one of the best

measurements available to evaluate nutritional status. Additional indices are, however, needed to evaluate individuals at risk for further weight loss.

Unintentional Weight Loss

Unintentional or involuntary weight loss is a closely related concept to malnutrition. Unintentional weight loss is the involuntary decline in total body weight over time and occurs in 27% of individuals over the age of 65 (Payette, Coulombe, Boutier, & Gray-Donald, 2000). In a nursing home resident, unintentional weight loss is defined as an unplanned decrease in body mass that occurs after admission to a nursing home (Watson et al., 2006).

The etiology of unintentional weight loss is multifactorial. Twenty-five per cent of all cases of unintentional weight loss are without an identifiable cause. Possible causes of unintentional weight loss include a wide spectrum of etiologies ranging from depression, cancer, cardiac disorders, and gastrointestinal diseases to neuromuscular disease. In an extensive review of the literature on weight loss in the elderly, Alibhai (2005) suggested that unintentional weight loss can be attributed to organic (neoplastic, non-neoplastic, age related), psychological (depression, anxiety, dementia), and non-medical (socioeconomic) etiologies. Additionally, unintentional weight loss can also be caused by a complex combination of etiologies, such as an individual with heart failure who is depressed and has poor fitting dentures. Consequently, a combination of factors can lead to weight loss in older adults.

Rapid, unintentional weight loss accompanied by functional decline has been referred to as "nutritional frailty". Whereas sarcopenia is a normal part of aging,

unintentional weight loss is not. Unintentional weight loss is associated with increased mortality and an unintentional weight loss of 5% body weight over a six month period needs to be investigated (Watson et al., 2006).

In a prospective study of intentional and unintentional weight loss in community dwelling older British men, Wannamethee, Shaper, and Lennon (2005) found that unintentional weight loss was associated with a significant risk in mortality whereas intentional weight loss was not. Men who lost weight as a result of personal choice experienced a significant reduction in mortality compared to men whose weight was lost unintentionally. This study supported the findings of an earlier study of women that revealed an unintentional weight loss of 20 or more pounds was associated with an increase in mortality risk (French, Folsom, Jeffery, & Williamson, 1999).

In a more recent study of clinical outcomes, Lou et al. (2007) found a trend toward decreasing BMI in elderly patients with dementia living in institutions in Taiwan over a three month time period. One third of the residents who had a low BMI experienced adverse health events including death, emergency room visits, falls, and pressure ulcers.

In a longitudinal study of weight changes in older adults, Newman, Lee, Visser, Goodpaster, Kritchevsky, Tylavsky, Nevitt, and Harris (2005) evaluated the relationship between weight loss or weight gain to changes in lean mass and fat mass in older adults ages 70-79 over a four year period. This research study included a large number of participants (n=2163) and objectively measured weight loss and weight gain rather than utilizing self report questionnaires. However, the researchers excluded individuals who

were wheelchair bound and individuals living in institutions. Although weight gain and weight loss were common, a weight loss of 5% was strongly associated with an increase in mortality. Furthermore, individuals who lost weight and had a lower initial weight experienced the highest absolute mortality rate. This finding suggests that weight loss in an already lean individual is a serious condition.

The National Health and Nutrition Examination Survey II (NHANES II) involved a nationwide study of 5,838 individuals ages 50 to 74 living in the community (Sahyoun et al., 2004). Thirteen per cent of the population included in the study reported a recent unintentional weight loss of >5% that was associated with increased mortality. Although this study included biochemical tests and a questionnaire involving involuntary weight loss, this study did not include objective measurements of weight loss or weight gain. Rather, respondents were asked if they had experienced a weight loss in the six months prior to the beginning of the study.

In summary, studies on both institutionalized and community dwelling older adults revealed unintentional weight loss is associated with an increase in mortality. Although these studies included large numbers of participants these studies consistently did not include individuals over the age of 80. These studies established that unintentional weight loss is associated with mortality; however, there is a lack of other outcome variables. Additionally, many of the large epidemiological studies involved the use of subjective self report answers to questions regarding weight loss as opposed to the objective measurement of weight loss obtained from researchers.

Table 1 Literature Review of Unintentional Weight Loss

Author/year Journal	Sample	Variables	Instruments	Major findings
Wannanmethee/ 2005 Archives of Internal Medicine	Prospective study of 4864 community dwelling British men 56-75. Study followed participants over a 7 year period	Unintentional & intentional weight loss, mortality	Questionnaire with questions related to smoking, alcohol and physical activity	Unintentional but not intentional weight loss was associated with significant risk of mortality.
Newman/2005 American Journal of Clinical Nutrition	Prospective study of 2163 community dwelling individuals over three years	Weight loss and weight gain		Weight loss occurred in 34% women and 27% men. Weight loss was more

				frequent. Weight loss was associated with an increase in mortality.
Lou/2007 Journal of Advanced Nursing	52 Nursing home residents with dementia	BMI, weight, mortality, ER visits, pressure ulcers, falls, hospital admissions	Barthel Index	3 month trajectory of a decrease in BMI. Dependency in eating was related to adverse health outcomes.

Outcomes of Malnutrition

Malnutrition has been considered a contributing factor to rising health care costs. In the acute care setting malnutrition has been linked to increased length of stay (Stratton, King, Stroud, Jackson, & Marinos, 2006). In addition, malnourished patients experience

slower wound healing when undergoing orthopedic procedures (Guo, Yang, Qian, Huang, Guo, & Tang, 2009). As in the weight loss studies, many of the studies evaluating malnutrition have utilized the outcome variable of mortality.

Lou et al. (2007) studied malnutrition in institutionalized older adults with dementia in Taiwan. They evaluated adverse outcomes that included mortality, emergency room visits, falls, fever, hospital admission, and new pressure ulcer development over a three month period. Their findings revealed an increasing trend of weight loss; however, it was unclear if adverse outcomes reached statistical significance since those statistics were not reported. Although their study was consistent with prior studies showing a trend of weight loss occurring after admission to a nursing home, their study is limited in view of the small number of participants. Therefore, further studies are needed to evaluate weight loss in individuals admitted to nursing homes utilizing a larger number of participants.

Low BMI was an independent predictor of one year mortality and a decline in functional status (Flodin, et al., 2000). Flodin et al. (2000) retrieved BMI and functional status data from hospitalized patients in order to evaluate the relationship between BMI, functional status, and mortality at one year. One-third of the patients had a BMI less than 20. Further, BMI was an independent predictor of one year mortality. Those patients with BMI less than 20 had a 48% incidence of mortality. Indeed, the worst functional status occurred in those with BMI less than 17 compared to those with a BMI greater than 24 who tended to be independent in their ADLs. The staff measured height and weight.

However, the study was weak in terms of selection bias because BMI was available in only 68 per cent of the participants.

Soderhamn, Bachrach-Lindstrom, and Ek (2007) screened 147 patients in a Swedish rehabilitation hospital for under-nutrition utilizing a nutritional screening instrument to assess weight loss and changes in dietary intake. Fifty-five per cent of the patients had a medium risk for under nutrition and 14% had a high risk for under nutrition. In addition, those patients who were undernourished had a poorer perception of their health. Patients were followed for twenty four months. Trained staff objectively measured height and weight. Patients who had amputations, vision loss, or had bandages were excluded from the study. The mean age of the participants was 77 years of age and the mean age of the non-participants was 80.9 years of age.

Van Nes et al. (2001) utilized the Mini Nutritional Assessment (MNA) Scale to identify clinical outcomes of elderly patients residing in geriatric hospitals in Switzerland. They prospectively analyzed the relationship of clinical outcomes of mortality and length of stay over a two year period. Malnourished individuals had a threefold increase in the death rate. In addition, the median length of stay was also closely related to the MNA, increasing from 30 days in those with a score of greater than 24 to 42 days in those with a score of less than 17 (p<0. 0002). Those with a score less than 17 were more likely to be discharged to a nursing home rather than back home.

In a similar study, Kagansky, Berner, Koren-Morag, Perelman, Knobler, and Levy (2005) utilized the MNA to evaluate nutritional status in elderly individuals over the age of 75. The participants were followed over a two year period. They found that low

MNA – 3 scores (a subscale of the MNA reflecting dietary habits) was associated with laboratory indexes of malnutrition and were lower in patients with infections, malignancy, pressure ulcers, dementia, recent orthopedic surgery, and CVA. Length of stay was correlated with low MNA scores demonstrating internal validity. In addition, the biochemical serum markers of transferrin, albumin, phosphorous, cholesterol, hemoglobin, and C reactive protein were correlated with total MNA and the MNA-3 subscale. Finally, a low MNA-3 score was an independent predictor of mortality.

In a small study of 24 subjects, Hudgens et al. (2004) examined the nutritional status of nursing home residents using the Mini-Nutritional Assessment tool to evaluate nutritional status and immune function in older residents with pressure ulcers. Seventy-one percent of the residents with pressure ulcers were either malnourished or at risk for malnutrition. The immune function as measured by whole body lymphocyte proliferation was significantly lower in the malnourished group.

Table 2 Studies of Outcomes of Malnutrition

Author/Year	Sample	Variables	Instruments	Major Findings
Lou/2007 Journal of Advances in Nursing	55 residents ages 64-97 in long term care facilities in Taiwan	Body weight	Barthel Index	18% of the residents were undernourished with BMI<18.5. There was a

				trend of decreasing BMI over the 3 month period.
Van Nes/2001 Age and Ageing	1319 patients with a mean age of 84 admitted to a tertiary hospital	Nutritional status, length of stay, mortality	MNA	An MNA<17 corresponding to malnutrition was associated with a three fold increase in mortality and an increase in discharge to a nursing home. Length of stay was also longer.
Hudgens/2004 Journal of Parenteral and Enteral Nutrition	24 elderly patients in nursing homes with a stage II or more	MNA Albumin, ESR, pressure ulcer stage, lymphocyte	MNA	Immune function is impaired in malnourished subjects with pressure ulcers

	pressure ulcer	proliferation and neutrophil respiratory burst		
Soderhamn/2007 Journal of Clinical Nursing	147 geriatric rehabilitation patients ages 65-91	BMI, perceived health, nutritional risk	Nutrition Form for the Elderly (NUFFE)	55% were at medium risk for malnutrition, 14% were at high risk for malnutrition, Patients with perceived ill health had high nutritional risk scores
Kagansky/2005 American Journal of Clinical Nutrition	414 geriatric patients ages 75-103	Nutritional status	MNA	17.6% were well nourished, 33.2% were at risk for malnutrition and 49.4% were malnourished.

				Length of stay was associated with nutritional status

Gap Analysis

Malnutrition can have devastating clinical consequences among older adults admitted to nursing homes. Our understanding of malnutrition in this vulnerable population is far from complete in terms of our knowledge of nutritional status of residents when they are admitted to nursing homes. No study has evaluated the nutritional status of individuals on admission to a nursing home; instead it is assumed that the nutritional status of individuals admitted to nursing homes is similar to the nutritional status of individuals living in the community. The days following an admission to a nursing home are critical. Small, but significant weight loss that has occurred in the acute care facility coupled with an additional small, but significant weight loss in the nursing home can lead to malnutrition and a host of physiological changes occurring as a result of malnutrition. Those changes can cause decline in functional status, poor wound healing and infectious processes to occur in already vulnerable individuals.

The previous discussion and tables identified several gaps in the literature concerning weight loss in older adults in nursing homes. Most of the studies on weight loss have focused on large epidemiological studies of weight loss in community dwelling adults. Furthermore, those epidemiological studies primarily focused on a younger

population of individuals. Only one study included individuals up to the age of 75. No study included persons over the age of 80. Although the findings of the large epidemiological studies may be generalizable to the very frail older individuals in nursing homes, studies of the nursing home population are needed.

As previously mentioned many studies have addressed weight loss in the community; however, there are no recent studies involving weight loss in older adults in nursing homes. In addition, there is no study examining the nutritional status of individuals at the time of admission to a nursing home. Some research has examined the nutritional status of individuals during their hospitalization or following an operative procedure; however, no study exits evaluating the nutritional status of individuals on admission to a nursing home to determine the trajectory of weight loss or weight gain and the clinical outcomes associated with malnutrition. Further, the nutritional status of individuals admitted to a nursing home from the community or the acute care facility is unknown.

As noted previously, many studies have included middle aged adults and older adults in evaluating weight loss and clinical outcomes. Few studies have included individuals who are 80 and above. This group of adults is a growing segment of the community dwelling population and the nursing home population. Further knowledge is needed to determine their nutritional status, clinical outcomes related to their nutritional status and the trajectory of weight loss and weight gain following admission to a nursing home.

In terms of studying clinical outcomes related to nutritional status, the large epidemiological studies evaluated mortality as an outcome of malnutrition. The smaller clinical studies have measured wound healing, length of stay in an acute facility, infection, hospitalization, and mortality.

Nursing Implications

Future research needs to be done to refine the conceptual model of malnutrition in nursing home residents. The model needs to be derived from clinical studies describing nutritional status of older adults when admitted to nursing homes including the characteristics of age, gender, and prior admission status. Descriptive data is needed to determine the characteristics of those patients who are malnourished and those patients who are at an increased risk for weight loss. Descriptive data on individuals who are malnourished or at risk for malnutrition will assist nurses in their assessment of older adults admitted to nursing homes.

Further, the trajectory of unintentional weight loss needs to be studied in individuals who are malnourished and at a risk for being malnourished by evaluating methods of early identification of unintentional weight loss. For example, specific health outcomes need to be measured in older adults who are malnourished and at risk for malnourishment after admission to a nursing home. By studying the occurrence of unintended weight loss in patients who are malnourished and at risk for being malnourished and describing the incidence of adverse health outcomes in those patients, future studies can be conducted to test interventions designed to correct malnutrition and minimize adverse outcomes.

Finally, nurses are concerned about the nutritional status of their patients. Nurses are instrumental in identifying residents who are malnourished and at risk for malnutrition because they complete the initial admission assessment and assess patients on a daily basis. It is important that they been given the necessary tools to carefully identify those patients who are borderline and at risk for further decline in nutritional status so that adverse outcomes can be averted

CHAPTER THREE

METHODOLOGY

The purpose of this research study was to describe the nutritional status of residents on admission to nursing homes and to understand the possible adverse clinical outcomes of weight loss and pressure ulcers in those residents four weeks post admission. This chapter provides a description of the research design, sample and sampling, instrumentation, data extraction procedures, and data analytic techniques. The protection of human subjects is also discussed.

Research Design

A descriptive, correlational design utilizing medical record data was used to examine the relationship between nutritional status and adverse clinical outcomes, specifically weight loss, and pressure ulcers. A correlational design is useful when data has already been collected and can be accessed at any time. A correlational design is appropriate for use in this study to describe the relationships between nutritional status and outcome variables for the intent of generalizing from a sample to a population (Munro, 2005). A descriptive correlational design is a study conducted in a natural setting without any attempt to modify or control the environment (Kerlinger, 1986). Further, a correlational study observes the size and the direction of relationships among variables.

Study Aims

Aim #1 To describe the nutritional status of residents admitted to nursing homes utilizing the Mini Nutritional Assessment instrument at the time of admission.

Aim #2 To describe the differences in the admitting nutritional status between residents admitted from acute care facilities as compared to those admitted from the community.

Aim #3 To describe at four weeks following admission the difference in adverse clinical outcomes of weight loss and pressure ulcers between residents who are were well nourished at admission, residents who were at risk for malnutrition at admission, and residents who were malnourished at admission.

Aim #4 To describe relationships between the nutritional status of residents as measured by the Mini Nutritional Assessment score at admission and clinical outcomes (weight loss and pressure ulcers) at the end of a four week period following admission to a nursing home.

Setting

The setting for this study is a nursing home in North County San Diego. The nursing home is representative of similar nursing homes in San Diego in terms of geographical location, socioeconomic status of residents, gender, and racial characteristics of residents. The nursing home is a 125 bed facility and privately owned by a large corporate entity. The nursing home is licensed by the State of California and

receives Medicare reimbursement. The administrator and director of the nursing home granted permission to the setting (see Appendix A).

Power, Effect, and Sample Size

The necessary sample size for this study will be determined by calculating the effect size, the desired power, and an acceptable significance level. In order to determine significance of statistical results, an adequate sample size must be utilized to minimize the possibility of "… drawing the wrong conclusion… with an errors of inference" (Munro, 2005). Effect size is the "degree to which a phenomenon exists" (Cohen, 1988). An effect size can be small (.10), medium (.30) or large (.50) (Cohen, 1988). Power is defined as the probability of rejecting the null hypothesis when it is false (Hinkle, 2003). According to Cohen (1988) power values are chosen from the range of .70-.90. The level of significance or alpha level is defined as the probability of making a Type I error when testing the null hypothesis. The most frequently used levels of significance are .05 and .01 (Hinkle, 2003). For this study, the alpha was set at .05 with the desired power at .80 and an effect size of .30. A medium effect size was chosen because this magnitude and degree of relationship is perceptible to the observer (Cohen, 1988). Using the formula $N = [L-V] + k + 1$ to calculate a power analysis and the table developed by Polit (1996) 100 was the minimum sample size required for this study to accomplish correlational testing.

Data Collection Procedures

In June 2010, 110 charts were pulled and reviewed for inclusion and exclusion criteria. Cases that meet the inclusion criteria were part of the study. The inclusion

criteria were new nursing home admissions of older adults 65 years of age and older. Exclusion criteria were cases of residents who were admitted before MNA data was collected as standard protocol, residents receiving hospice services, residents receiving enteral or parenteral feedings, residents with a current diagnosis of cancer, and residents who had been admitted and discharged within 72 hours and have been readmitted to the nursing home from another setting. A confidential identification number was assigned to each case to assure anonymity of each resident as data was extracted from the medical record and recorded on the investigator designed data collection form (see Appendix B).

All data collected for the purpose of this study is routinely recorded in the medical record as part of the standard of care in the setting. The researcher collected demographic data for each of the cases. Demographic data was extracted from the face sheet of each chart and included age, gender, ethnicity, and whether admission was from the acute care facility or the community.

Secondly, the researcher collected nutritional data from the medical record. The assessment of nutritional status is included in the initial assessment to the nursing home and is routinely completed by registered nurses who have completed the admission assessment. The Mini Nutritional Assessment instrument is used to assess nutritional status and is the standard of practice in this facility. In addition to the Mini Nutritional Assessment instrument scores, the admission weight and the weight at four weeks was collected.

Finally, the researcher collected information from the medical record regarding the presence of pressure ulcers at admission and at the end of the four week period. Skin

condition is routinely assessed on all residents as part of the nursing assessment and recorded on the treatment sheet as part of the daily documentation. This information includes presence or absence of pressure ulcers. If pressure ulcers were present, staging was recorded as well. The nursing assessment form and the treatment sheet were accessed during data collection to capture the number of pressure ulcers and stage of those pressure ulcers on admission and the number and stage of pressure ulcers at the end of the four week period.

Dependent Variables

The dependent variables or the outcome variables were weight loss and pressure ulcers. Weight loss was measured in pounds as the difference in weight between the resident's weight at admission and the resident's weight at the end of a four week period. Pressure ulcers were measured as the number of pressure ulcers at admission and the number of pressure ulcers at the end of the four week period. In addition to counting the number of pressure ulcers, the pressure ulcers were staged according to standardized staging criteria established by the Agency for Health Care Policy and Research Clinical Practice Guideline Treatment of Pressure Ulcers (National Pressure Ulcer Advisory Panel 2007 Staging definitions. Available at www.npuap.org. Accessed April, 2011). Pressure ulcers usually occur over bony prominences and are staged to classify the degree of tissue damage. Stage I pressure ulcers are defined as nonblanchable erythema of intact skin. Stage II pressure ulcers are defined as partial thickness skin loss involving the epidermis, the dermis, or both. Stage III pressure ulcers are loss of full thickness skin involving necrosis of subcutaneous tissue that may extend to fascia. Stage IV pressure ulcers are

full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone, or supporting tissue.   Pressure ulcers were staged at admission and at four weeks.

Independent Variables

The demographic variables are age, gender, ethnicity, and prior admission status from the acute care setting or home. Age was measured in years. Gender was measured as male or female. Ethnicity was measured according to National Institute of Health criteria as White, not of Hispanic origin; Hispanic or Latino; Black or African American; Asian, and American Indian or Alaskan Native. Prior admission status was measured as admission from the acute care facility or community. Nutritional status was measured as a numerical summative score.

Nutritional status was measured as a numerical summative score using the MNA formula. The maximum summative score is 30 points with the risk of malnutrition with lower scores. The sum of the MNA score distinguishes between elderly patients with: adequate nutritional status > 24, protein calorie under nutrition, MNA < 17; at risk for malnutrition, MNA between 17 and 23.5.

Data Sources

Medical records were the data sources for this study. The Mini-Nutritional Assessment instrument was used as a data extraction tool in order to calculate the nutritional status of residents. The MNA is the data source for collecting nutritional information on residents. Completing the MNA has been RN standard of practice when residents are admitted to the nursing home.

The MNA consists of 18 items including anthropometrical measurements of height, weight, BMI, weight loss, a global assessment of six items related to lifestyle, medication, and mobility, a dietary questionnaire of eight items related to number of meals, food and fluid intake, autonomy of eating, and a subjective measurement of perception of health and nutrition. These simple measures and brief questions can be completed in less than 10 minutes. The maximum summative score is 30 points with the risk of malnutrition with lower scores. The sum of the MNA score distinguishes between elderly patients with: adequate nutritional status > 24, protein calorie under nutrition, MNA < 17; at risk for malnutrition, MNA between 17 and 23.5. According to the Mini Nutritional Assessment instrument, nutritional status is defined as follows:

Malnutrition- Malnutrition in older adults is a multidimensional concept including anthropometric indices, cognitive and functional status. Malnutrition is defined in terms of body mass index, mid-arm circumference, calf circumference, current dietary practices and functional status. In this study, malnutrition is measured by the Mini Nutritional Assessment instrument and is a score of <17.

At risk for malnutrition- This term is also defined in terms of anthropometric indices, current dietary practices and functional status. It is measured by the Mini Nutritional Assessment instrument and is a score of 17-23.5.

Well nourished- This term is also defined in terms of anthropometric indices, current dietary practices and functional status. It is measured by the Mini Nutritional Assessment instrument and is a score of > or equal to 24.

As background, in addition to being used in clinical settings to assess nutritional status, the MNA has been utilized as a screening instrument (Vellas et al., 1999). The MNA was developed in France and the United States by geriatricians and researchers to screen for nutritional risk. The development of the MNA and validation of the MNA involved collaboration between the Departments of Internal Medicine and Clinical Gerontology, Toulouse University Hospital, France; the Clinical Nutrition Program, University of New Mexico; and the Nestle Research Center, Lucerne, Switzerland (Vellas et al., 1999). To develop the MNA three studies were conducted to establish reliability and validity.

The initial study was performed to compare a population of elderly individuals from the Geriatric Evaluation Unit, Toulouse University Hospital and healthy elderly from the "University of the Third Age" in Toulouse (Vellas et al., 1999). In this study, anthropometric measurements (BMI, brachial and calf circumferences, skin fold analysis), serum markers (albumin, transferin, C-reactive protein, cholesterol, vitamins A, D, E, B1, B6, B12, folate, copper, zinc and CBC), and functional geriatric assessment (Mini-Mental Status Examination, Activities of Daily Living Scale and Instrumentalities of Daily Living Scale) were completed to test reliability of the MNA with nutritional indices commonly used in clinical practice. The results of the MNA were found to be highly correlated with nutritional markers and therefore, a reliable measure.

Next, to evaluate the discriminatory potential of the MNA and to set threshold values, a second study was conducted (Vellas et al., 1999). This study enrolled both healthy and ill elderly individuals. Discriminate analysis was conducted to evaluate the

MNA's ability to distinguish malnutrition between standard measures of malnutrition that included clinical, dietary, and biological parameters. The result of the discriminate analysis revealed that 2.2% of the elderly were misclassified, with 0.8% changing nutritional status from well nourished to malnourished, and 1.4% changing nutritional status from malnourished to well nourished (Vellas et al., 1999). Therefore, the MNA correctly classifies nutritional status in 98 % of the cases. Less than1% of the individuals were classified as well nourished when in actuality they were malnourished. Further, no well nourished individual was classified as malnourished or at risk for malnutrition. Instrument sensitivity has been found to be 96%, specificity 98% and predictive value 97% (Vellas et al., 1999).

Finally, a third study evaluated the MNA threshold values in a group of healthy individuals in New Mexico to determine if the instrument could be utilized on healthy individuals in another cultural setting. Threshold values are a) adequate nutritional status of $\geq$24, b) protein calorie undernutrition $<$ 17, and, c) at risk for malnutrition.

Validity. For validation of the MNA, the instrument was measured against the results of nutritional assessments performed by two physicians trained in nutrition using dietary intake. The MNA was found to be highly correlated with anthropometric measurements (r=0.66, P <0.0001). As a research instrument, Vellas et al. (1999) demonstrated that MNA scores were consistently correlated with BMI, albumin, pre-albumin (r=0.70, P= 0.0001) and pro inflammatory markers (r=0.35, P<0.001).

Using validated clinical status as the gold standard, the MNA was assessed by two cross-validation studies to confirm the clinical utility of the MNA. In the first cross-

validation study, 78% of the 115 patients were correctly classified and in the second cross-validation study 72% of the 139 patients were correctly classified. These studies demonstrate that the nutritional status of approximately 75% of elderly patients can be correctly classified without the use of biochemical parameters (Thomas, 2008).

Reliability. The MNA was evaluated for inter-observer agreement using a group of hospitalized elderly patients (Gazzoti, 1997). The interobserver agreement level was calculated for the total score and for each item. The agreement was defined by Cohen's Kappa (K) with a value of 0.51 (95% CI 0.28-0.74) demonstrating a significant interobserver agreement

In addition to being a screening instrument, the MNA has been widely used in research settings. As a research instrument, Vellas et al. (1999) demonstrated that MNA scores were consistently correlated with BMI, albumin pre-albumin and pro-inflammatory markers. (Prognostic inflammatory and nutritional index (PINI = serum alpha-1acid glycoprotein x C reactive protein ÷ Albumin x ; transthyretin, Pearson correlation coefficient: $r=-0.35$, $p <0.0001$; Albumin, pearson correlation coefficient: $r=0.70$, $p<0.0001$).

Table 3 Validity of the MNA

Author	Population	Outcomes
Vellas/ 1999 Nutrition	147 geriatric patients	MNA and prognostic inflammatory index (PINI) r= 0.35, p<0.0001 PINI=serum alpha-acid glycoprotein x c reactive protein/albumin x transthyretin
Donini/2003 Journal of Nutrition, Health and Aging	167 geriatric patients	MNA and albumin r=0.46; p<0.01

Data Analysis

The Statistical Package for the Social Sciences (SPSS/17) was used for data analysis. Descriptive and inferential statistics were used to calculate the results. Descriptive statistics summarized the demographic items using ranges, means, and standard deviations for age, and weight. Percentages were used to report gender and prior admission status. Sample t test was used to determine significant differences between group means for non-categorical data. Pearson Chi-square was used to determine statistical significant proportions for categorical data. Logistic regression analysis was utilized to estimate the odds of incurring a weight loss of 5 per cent or more as established by the American Geriatric Society Position as a quality measure. The result from the multivariate logistics regression was reported as odds rations with 95%

confidence intervals. Reliability coefficients were calculated to measure internal

consistency of the MNA in this sample. The Somers D value and gamma were utilized to

calculate the relationships between nutritional status at admission and adverse clinical

outcomes at four weeks.

Protection of Human Subjects

In order to ensure protection of confidentiality and privacy, a variety of protective

mechanisms were utilized in this study. Since the data captured from medical records did

not involve subject contact, no written or verbal informed consent was anticipated.

However, the University of San Diego Investigational Review Board determined level of

risk to human subjects and the Board's instructions were followed (see Appendix C). To

guarantee anonymity of research data, each case was de-identified (assigned a study case

number). No personal identification information was recorded during this study to ensure

confidentiality. A codebook was developed that links medical record number of the case

to the study case number. This codebook was kept in a locked file cabinet. Deidentified

case study data forms were maintained in a separate locked file cabinet. Only the

principal investigator had access to the locked file cabinets. Findings of this study were

reported as aggregate data.

CHAPTER FOUR

RESULTS

The purpose of this research study was to describe the nutritional status of

residents admitted to nursing homes using the Mini Nutritional Assessment tool and to

describe adverse clinical outcomes in those residents at the end of a four week period.   In

this chapter the results of the study are presented.

Demographics

Demographic data was included as part of the chart abstraction form (see

Appendix A) and was designed to collect information that included age, gender,

ethnicity, prior admission status, nutritional status, and co morbidities.

Total sample was 69 cases. As shown in Table 4, the sample included more

females than males (47 women and 22 men) with a mean age of 83 years (SD 6.62) and a

range of 67 to 95 years. More than 90% of the sample were Caucasian (n=64), with 1%

Asian (n=1), 1% African-American (n=1), 1% Pacific Islander (n=1) and 1% other (n=1).

The majority of the sample (97%, n=67) were admitted from the acute care facility

compared to 3% (n=2) admitted from the community. Of the 69 cases that were studied,

36 cases remained in the nursing home for a four week period.

Co morbidities were collapsed into five separate categories and labeled one of

five disease conditions. The rationale for collapsing the co morbidities was to determine

the prevalence of major disease categories of individuals admitted to the nursing home.
The five categories of co morbid conditions included cardiovascular disease, respiratory
disease, endocrine disease, neurologic disease, and gastrointestinal disease. The mean
number of co morbid conditions was 2.9 (SD.92) with a range of one to five.

The majority (85% n=58) of the cases had cardiovascular disease as a co morbid
condition. Over half of the cases (62.3% n= 43) had neurological disease and 62% (n=43)
had endocrine disease as co morbid conditions.

The mean number of routine medications was 9.77 (SD 4.3) with a range of 2-24.
Medications ordered 'as needed' were not included in this study.

Table 4 Demographics

Characteristic	N (%)	Mean	Range
Gender			
Male	22 (32%)		
Female	47 (68%)		
Age		82.89	67-95
Ethnicity			
Caucasian	64 (90%)		
Hispanic/Latino	1 (1%)		
African American	1 (1%)		
Pacific Islander	1 (1%)		
Asian	1 (1%)		
Native American	0		
Prior Admission			
Acute Care Facility	67 (97%)		
Community	2 (3%)		
Pressure Ulcer			
At Admit	27 (39%)		
At 4 weeks	8 (23%)		
Weight		152	74-246
Post-operative	30 (43.5%)		

Routine Medications	9.77 (3-24)		
Co morbidity Categories			
Cardiovascular disease	59 (85.5%)		
Respiratory disease	24 (34.8%)		
Endocrine disease	43 (62, 3%)		
Neurologic disease	43 (62.3%)		
Gastrointestinal disease	31 (44.9%)		
Dentures	25 (36%)		

Nutritional Status

Aim #1 To describe the nutritional status of residents admitted to nursing homes utilizing the Mini Nutritional Assessment instrument at the time of admission.

Nutritional status was extracted from the charts using a data collection form designed to capture information that could be coded into nutritional status categories. As a result, almost half of the cases were at risk for malnutrition (49.3% n=34), 25% of the cases were malnourished at admission, and 22% were well nourished at admission.

Table 5 Nutritional Status

Nutritional Status	N (%)
Well Nourished	15 (21.7)
At Risk for Malnutrition	34 (49.3)
Malnourished	17 (24.6)

Aim #2 Describe the differences in the admitting nutritional status between residents admitted from acute care facilities as compared to those admitted from the community.

The sample size of cases admitted to the nursing home from the community was too small (n= 2) to calculate differences between the two groups utilizing a t test. According to Cohen's table, the minimal number of 3 subjects per group is necessary to calculate a t test (Munro, 2005). Further, in order to compute differences between two groups, there should be at least ten cases per variable to have a stable prediction equation (Nunnally and Bernstein, 1994).

Weight Loss and Pressure Ulcers

There was a wide range of resident admission weights in this study. The mean weight at admission was 154 (SD 43.2) pounds with a range from 73-246 pounds and a median weight of 150. Of the 69 cases that were studied, 36 (52%) cases remained in the nursing home for a four week period. Of those 36 cases (85%) experienced a weight loss at four weeks. Further, of those who experienced a weight loss, 54% (n=15) experienced a significant weight loss of 5% or more.

Table 6 Residents with Weight Loss at 4 Weeks

Weight Loss	N (%)
Weight Loss at 4 Weeks	28 (85)
Weight Loss >5% at 4 Weeks	15 (54)

In terms of pressure ulcers on admission, 39% (n=27) of those admitted to the nursing home had pressure ulcers on admission (see Table 7). Sixteen percent (16%) had one pressure ulcer; four percent (4%) had two pressure ulcers, and eleven percent (11%) had three pressure ulcers. Of the 69 cases that were studied, 36(52%) cases remained in

the nursing home for a four week period. At four weeks, 33% (n=8) had one or more

pressure ulcers.

Table 7 Residents with Pressure Ulcers

Pressure Ulcers at Admit	N (%)	Pressure Ulcers at 4 wks	N (%)
No pressure ulcers	41 (60.3)	No pressure ulcers	27 (77.1)
One pressure ulcer	11 (16.2)	One pressure ulcer	4 (11.4)
Two pressure ulcers	3 (4.3)	Two pressure ulcers	3 (0.8)
Three pressure ulcers	11 (15.9)	Three pressure ulcers	1 (.02)
Four pressure ulcers	1 (1.4)	Four pressure ulcers	0
Five pressure ulcers	1 (1.4)	Five pressure ulcers	0

Aim #3 Describe at four weeks following admission the difference in adverse

clinical outcomes of (a) weight loss and (b) pressure ulcers between residents who are

were well nourished at admission, residents who were at risk for malnutrition at

admission, and residents who were malnourished at admission

At four weeks post admission, there were no significant differences between the

three groups of nutritional status (well nourished, at risk for malnutrition and

malnourished) on the adverse clinical outcomes of (a) weight loss (x^2=3.37, df=2,

p=0.185). There was no difference between the three groups of nutritional status and (b)

pressure ulcers at four weeks (F=1.600, p=0.216).

Aim #4 Describe relationships between the nutritional status of residents as

measured by the Mini Nutritional Assessment score at admission and clinical outcomes

[(a) weight loss and (b) pressure ulcers] at the end of a four week period following

admission to a nursing home.

The relationship between nutritional status at admission and (a) weight loss at four weeks was not significant (Somer's D value = -.180; p = 0.343). Somer's D was chosen because level of data for the two variables was ordinal and dichotomous, respectively.

The relationship between nutritional status at admission and (b) pressure ulcers at four week was significant (Gamma value = 0.649; p = 0.016). The gamma was chosen because the level of data for the two variables was ordinal and ratio, respectively. Ratio level data was recoded into ordinal level so that gamma could be calculated.

Summary

The purpose of this research study was to describe the nutritional status of residents admitted to nursing homes using the Mini Nutritional Assessment instrument and to describe adverse clinical outcomes in those residents at the end of a four week period. This study consisted of a total 69 cases. Of the 69 cases, 36 cases remained in the nursing home for a four week period. The majority of the cases were women and the mean age was 82 years of age.

Most of the residents were admitted from an acute facility and were either malnourished or at risk for malnutrition. Just over half (52%) of the individuals remained at the nursing home at four weeks. Of those who remained at the nursing home for four weeks, 54% experienced a significant weight loss of 5% or more. Thirty-nine per cent of the residents were admitted to the nursing home with one or more pressure ulcers.

Since two residents were admitted from the community, the sample size was too small to calculate differences between residents admitted from the acute care facility and from the community.

There were no significant differences in admission nutritional status (well nourished, at risk for malnutrition, and malnourished) and adverse clinical outcomes of weight loss and pressure ulcers.

The admission nutritional status of individuals was not significantly related to loss of weight within the four week period following admission. However, the nutritional status at admission was associated with pressure ulcers at four weeks post admission.

In summary, the majority of residents admitted to the nursing homer were admitted from acute care facilities either malnourished or at risk for malnutrition. Further, many of the residents had pressure ulcers at the time of admission. In spite of their poor nutritional status and the prevalence of pressure ulcers, there was no difference between nutritional status and weight loss four weeks after admission. However, nutritional status at admission was associated with pressure ulcers after admission.

CHAPTER FIVE

DISCUSSION OF FINDINGS

The purpose of this research study was to describe the nutritional status of residents admitted to nursing homes using the Mini Nutritional Assessment instrument and to describe adverse clinical outcomes in those residents at the end of a four week period. In this chapter the research design and method, data analysis, and the overall results are summarized in the context of the conceptual framework for this study. In addition, implications for nursing practice, education, and research are presented.

The sample of 69 cases was obtained from data collected through a retrospective audit of patient records obtained from a skilled nursing home located in northern San Diego County.

Study Purposes

The purpose of this research study was to describe the nutritional status of residents admitted to nursing homes using the Mini Nutritional Assessment instrument and to describe adverse clinical outcomes in those residents at the end of a four week period. The conceptual framework for this study of nutritional status of older adults in nursing homes was drawn from the published literature. The framework presented included three components:

a) demographic attributes (age, gender and prior admission status), b) nutritional status at admission to a nursing home, and c) adverse clinical outcomes. This model was

a useful framework for conceptualizing the relationship between nutritional status and clinical outcomes of weight loss and pressure ulcers at the end of the four week period.

This model conceptualized the attributes of older residents admitted to nursing homes. Consistent with prior research studies, this study revealed that the overwhelming majority of individuals admitted to nursing homes are over the age of 80. Further, most of the residents had multiple co morbidities of cardiovascular disease and neurological impairment. Consistent with the large number of co morbid conditions was the large numbers of routine medications prescribed to residents.

With respect to admission from an acute care facility or the community, this study revealed that 97% of the residents admitted to the nursing home were admitted from an acute care facility. Although health care providers and directors of nursing homes are aware of the higher acuity of individuals admitted to nursing homes, no recent studies have revealed the finding that the large majority of patients are admitted to nursing homes from the acute care facility.

With respect to nutritional status, most of the residents admitted to the nursing home were either malnourished or at risk for malnutrition. This finding is consistent with previous studies that indicate malnutrition in nursing homes remains a prevalent problem (LaPorte, 2001).

Almost half of the residents remained in the nursing home for four weeks. Of those who remained at the nursing home, almost half of the residents experienced a significant weight loss of 5% or more. This unintentional weight loss was independent of nutritional status on admission. Consequently, well nourished, at risk for malnutrition,

and malnourished individuals experienced a weight loss. No previous study has found that weight loss in nursing home residents occurs irrespective of admission nutritional status. This finding contributes to the science of nutrition in older adults.

Study Limitations

This study had several limitations. First, the sample was obtained from one nursing home. Consequently, the research findings may not be generalizable to other nursing homes. Secondly, the sample size was small and advanced analysis was limited by the small sample size. In addition, the four week follow-up period may have been too short to observe significant changes. In addition, data was retrieved from nursing records and was dependent on the accuracy of nursing documentation. Finally, chewing and swallowing difficulties, depression, and social support were not included in the study; these may have been important variables in explaining nutritional status. Future studies might include a larger sample size including samples from several nursing homes, utilizing a prospective design, examining the effect of depression and social support as well as controlling for swallowing difficulties. Nevertheless, because of the limited research currently available, this study offers new nursing knowledge regarding nutrition among older adults admitted to nursing homes.

Implications for Nursing Practice

Nursing research in older adults residing in nursing homes has gained momentum in the last decade. This study adds to the growing body of nursing research that addresses nutritional status of older individuals due to the increasing numbers of older

individuals in society as a whole and the increased numbers of these individuals who will be admitted to nursing homes.

Nutritional Status

This study revealed that the majority of residents admitted to nursing homes are either malnourished or at risk for malnutrition. This finding indicates that both nurses working in acute care facilities and nursing homes need to implement strategies to monitor and improve nutritional status. Frequent monitoring of weight, appetite, and caloric intake by registered nurses needs to occur on a daily basis. In addition, nurses may also need to pay attention to biochemical markers of nutritional status including electrolytes, pre-albumin, and albumin levels

Adverse Clinical Outcomes at Four Weeks

Weight loss. Previous studies on weight loss in older adults have shown that individuals tend to lose weight as they age (Morley, 1997; Payette et al., 2000). This study revealed that older individuals experience a weight loss following admission to a nursing home. Consequently, this study's finding is consistent with aging studies. Almost half of the residents experienced a weight loss at four weeks. Further, nutritional status at admission was not related to weight loss at four weeks. Consequently, in this study, weight loss following admission to a nursing home occurs irrespective of nutritional status so older adults admitted to nursing homes are at risk for an acute loss of weight.

It is critically important for nurses caring for older adults in nursing homes to initiate weight monitoring processes early after an individual has been admitted.

Currently, many nursing homes utilize specialized wound care nurses who are responsible for monitoring and treating pressure ulcers and other wounds. A similar strategy could be implemented in regard to nutritional status and weight loss. One nurse could be designated as the nutritional nurse consultant and be responsible for a) maintaining current weight records, b) identifying malnourished residents and residents at risk for malnutrition, and finally c) ordering timely and appropriate nutritional interventions and increasing weight monitoring.

Pressure ulcers. The presence of pressure ulcers on admission to nursing homes remains an ongoing problem. Over a third of the residents to the nursing home had one or more pressure ulcers at the time of admission. At four weeks, 33% of the residents still in the nursing home had one or more pressure ulcers. There was a small decrease in the percentage of residents who had pressure ulcers at four weeks compared to the per cent age of residents who were admitted with pressure ulcers. However, there was a relationship between nutritional status at admission and the presence of pressure ulcers at four weeks, a finding consistent with prior studies (Lou et al., 2007). Nurses need to continue to be proactive regarding the management of pressure ulcers. Nursing homes need to continue to utilize specialized wound care nurses who consistently monitor wounds. In addition to providing expert wound care, the wound nurse needs to work closely with the dietician to improve the nutritional status of residents with wounds.

Implications for Education

Although nurses are aware of the importance of adequate nutrition in nursing home residents and the Omnibus Budget Reconciliation Act of 1987 (OBRA) mandates

the notification of the physician regarding weight loss, frequently a resident has experienced a significant weight loss before an intervention has been implemented. Advanced practice nurses still find that staff nurses working in nursing homes are reluctant to implement independent nursing actions that would address weight loss and poor nutrition. Frequently, the staff nurse waits for the physician or the dietician to recommend frequent weight monitoring or additional high protein, high calorie snacks. Nursing home orientation programs and continuing education programs need to include the importance of monitoring nutritional status of nursing home residents and the importance of the nursing diagnosis of malnutrition.

Nurses who staff nursing homes tend to be licensed vocational nurses and associate degree nurses. Almost one half of the nurses employed in nursing homes are associate degree prepared nurses with twenty-five per cent diploma graduates and twenty-two per cent bachelor of science prepared (Mezey & Harrington, 2004). Most have no preparation in geriatric nursing. The nursing curricula in those programs and Bachelor of Science in nursing programs consistently lack geriatric content, even though the content is mandated by many Boards of Registered Nursing (BRN), including the California BRN. Nurse educators responsible for nursing curricula across all levels of nursing education need to thoughtfully include geriatric content in nursing education programs. In a joint statement, The Hartford Institute for Geriatric Nursing at New York University and the American Association of Colleges of Nursing (2010) recommended that baccalaureate nursing programs include normal changes of aging that increase risks for geriatric syndromes and the use of evidenced base screening instruments for

conditions that predispose older adults to adverse events. They also recommended nursing curricula include the effective transition or transfers of older adults across levels of care. Finally, they recommended that nutrition content includes nutritional requirements of older adults across the health illness continuum.

Implications for Research

Further work still needs to be completed in order to address nutritional status and outcomes with larger patient populations in nursing homes. Malnutrition may be related to other adverse clinical outcomes such as length of stay, delirium and functional status. In view of the increasing epidemic of obesity, further research involving older adults will need to include examining the incidence of particular types of malnutrition such as sarcopenia and obesity.

Nursing home processes may contribute to the trajectory of weight loss in nursing home residents. These processes include consistency and timeliness of obtaining admission weights, the frequency of monthly or weekly weights, and the timely consultation of a dietician. These and other factors that may contribute to this trajectory of weight loss need to be identified through research. Additional factors may include individual characteristics of older adults admitted to nursing homes, including oral or swallowing difficulties, dietary restrictions or preferences, and functional disorders related to eating. Further, the identification of specific nursing interventions that correct the tendency to loose weight needs to be identified utilizing empirical research.

Conclusion

This study demonstrated that patient medical record data can be used to complete an assessment instrument that stratifies nutritional risk categories. Using this method of data extraction, the majority of residents admitted to nursing homes were either malnourished or at risk for malnutrition. This study revealed that older individuals in addition to experiencing a slow chronic loss of weight, experience an acute weight loss following admission to a nursing home. Further, this study revealed that most of the residents admitted to nursing homes had been transferred from an acute care facility to the nursing home indicating that individuals admitted to nursing homes receive nursing care that had previously been provided in the acute care setting. The finding that older individuals are admitted to nursing homes from acute care facilities indicates that both nurses working in acute care facilities and nursing homes need to implement strategies to address nutrition and weight loss in the older adults they care for. Frequent monitoring of weight, appetite and caloric intake by registered nurses needs to occur on a daily basis. In addition to addressing important electrolyte imbalances, nurses also need to pay attention to biochemical markers of nutritional status including pre-albumin and albumin levels.

This study showed that there is a trajectory of weight loss following admission to a nursing home and that this trajectory occurs for at least a four week period. Further, since there is a tendency for older adults to lose weight after admission to a nursing home, nurses caring for older adults in nursing homes need to initiate processes early after an individual has been admitted. Currently most nursing homes utilize specialized

wound care nurses who are responsible for monitoring and treating pressure ulcers and

other wounds. A similar strategy could be implemented in regard to nutritional status and

weight loss. One nurse could be designated as the nutritional nurse consultant and be

responsible for a) maintaining current weight records, b) identifying malnourished

residents and residents at risk for malnutrition, and finally c) ordering timely and

appropriate nutritional interventions and increasing weight monitoring.

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Appendix A: Letter of Agreement
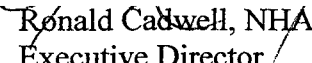
March 2, 2010

RE: Sheryl Nespar, NP

Dr. Jane Georges, PHD, RN
Institutional Review Board, University of San Diego
5998 Alcala Park
San Diego, CA 92110

Dear Dr. Georges and Institutional Review Board:

I understand that Ms. Nespar is conducting a study, "Changes in Functional Status of
Home Health Cardiac Patients," as part of her doctoral dissertation in Nursing. I am
delighted to support her in this valuable endeavor. We will make available to her
appropriate data from our database that has been redacted of patient identifiers.

It is always a pleasure to support someone in their pursuit of academic achievements,
more so, when that person is a valued member of your own healthcare team.

Sincerely,

Ronald Caldwell, NHA
Executive Director

cc: Sheryl Nespar, NP

Appendix B: Data Collection Form

Date __ __ / __ __ / __ __ __ __   Study ID No. _____

Age __ __ __

Gender: [ ] Male =1   [ ] Female=2

Race/Ethnicity: [ ] White=1   [ ] African American=2   [ ] Latino=3
                 [ ] Asian=4   [ ] Native American=5
                 [ ] Pacific Islander=6   [ ] Other=7

Prior admission: [ ] Acute care =1   [ ] Community =2

Admission height   __ __ __

Admission weight __ __ __
Weight 4 weeks post admit   __ __ __

Weight loss [ ] No=0   [ ] Yes=2
      Y≥5%
      N<5

Nutritional score_____

Total number of pressure ulcers on admit: __ __
Stage 1 pressure ulcers: __ __
Stage 2 pressure ulcers: __ __
Stage 3 pressure ulcers: __ __
Stage 4 pressure ulcers: __ __

Total number of pressure ulcers 4 weeks post admit: __ __
Stage 1 pressure ulcers: __ __
Stage 2 pressure ulcers: __ __
Stage 3 pressure ulcers: __ __
Stage 4 pressure ulcers: __ __

Postoperative: [ ] No=1   [ ] Yes=2

Number of co-morbidities in top 5: ____
Cardiovascular: [ ] No=1   [ ] Yes=2

Respiratory: [ ] No=1   [ ] Yes=2
Endocrine: [ ] No=1   [ ] Yes=2
Neurologic: [ ] No=1   [ ] Yes=2
Gastrointestinal: [ ] No=1   [ ] Yes=2

Number of routine medications: __ __

Dentures: [ ] No=1   [ ] Yes=2