

AN INVESTIGATION INTO THE PROCEDURE OF
ASSESSING NUTRITIONAL STATUS OF
REHABILITATIVE GERIATRIC PATIENTS IN CANADA

SAMAN IQBAL

**An Investigation into the Procedure of Assessing Nutritional
Status of Rehabilitative Geriatric Patients in Canada**

By

Saman Iqbal, B. Sc (Diet).

**A thesis submitted to the
School of Graduate Studies
in partial fulfillment of the
requirements for the degree of
Masters of Science**

**Division of Community Health and Humanities
Memorial University of Newfoundland**

October, 2010

St. John's

Newfoundland and Labrador

Abstract

Malnutrition is a common problem in geriatric rehabilitative inpatients. There are several nutritional assessment tools available, but it is not known which tools dietitians use as none are validated for geriatric rehabilitative settings. Dietitians also use a number of indicators to assess nutritional status, but the associations between commonly used indicators of nutritional status are not known. This mixed design study used two data sources. One source was a cross-sectional survey of nutritional assessment processes of dietitians. Results showed that most dietitians used modified versions of different nutritional tools. The other source included secondary data obtained from rehabilitative patients in one facility. Analysis showed that weight loss was significant during acute care hospital stay. Serum albumin levels were not associated with weight indicators, but seemed to be indicative of ill health. The study underscored the importance of developing a standardized nutritional assessment tool for rehabilitative facilities across Canada.

Acknowledgments

I would like to acknowledge the dietitians who took the time out of their busy schedules for the interviews. They gave me valuable insight into the profession of Dietetics, which I hope one day to practice myself. I also thank the dietitians at the L. A. Miller Centre in St. John's, Newfoundland and Labrador, for collecting the nutritional data for the analysis.

I would especially like to thank Ms. Suja Varghese for helping me organize my research, providing me with data, knowledge, and insight, and for devoting her time and effort to help me edit this paper. I would also like to thank Dr. Veeresh Gadag for his input as my co-supervisor, and for helping me with the statistical analysis. As well, I am grateful to Dr. Barbara Roebathan for her contribution and support with my research as a member of my supervisory committee. I am also grateful of the comments and suggestions given by the external reviewers who critiqued this thesis. I also owe thanks to the Division of Community Health and Humanities at the Faculty of Medicine, Memorial University of Newfoundland, for helping me hone my research topic.

Lastly, I would like to thank my family, including my brothers and my parents, for their unending patience with me during this research.

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1.0 Introduction

Canada's population of adults over 65 years of age is increasing. Because health problems increase as adults get older, this increase in the elderly population will lead to a growing need for healthcare. Therefore, ensuring that proper support is available in Canada's geriatric healthcare settings should be of utmost importance. Geriatric rehabilitation aims to restore health and functionality to older adults after acute care hospitalization due to injury, disease or surgery. At present, malnutrition in older adults is a common and frequently under-diagnosed condition in hospitals and rehabilitation facilities (Finestone, Greene-Finestone, Wilson & Teasell, 1996). In fact, it is reported that patients staying in hospitals for two weeks or more are at greater risk of deterioration of their nutritional status (Constans, Bacq, & Brechot, 1992). Malnutrition during acute care and rehabilitation can lead to a number of problems, including increased length of stay, health complications, and higher hospitalization charges (Finestone et al, 1996).

The wide heterogeneity in the body composition of older adults and variability in their physiology and functional capacities makes it difficult to predict nutritional status in this population. Using just one or two indicators of nutritional status is not recommended to determine nutritional risk; using many sound indicators simultaneously predicts malnutrition much more accurately. However, "not every elderly individual seen in a geriatric clinic, hospital, or nursing home needs to have a battery of anthropometric, dietary, and laboratory tests to assess nutrition status" (Guigoz, Lauque, & Vellas, 2002). If the number of indicators used are too numerous and too complex or invasive to measure with ease, then assessing nutritional status can be long, cumbersome, and costly.

The challenge, then, is to use a minimum number of best predictors – valid, sensitive and specific, cost-effective, non-invasive, and easily available, to determine nutritional risk. Several nutritional screening and assessment tools have been developed that take a number of nutritional indicators into account. However, there are no validated nutritional assessment tools available for dietitians to base their inpatient rehabilitative assessment practices on. The Mini-Nutritional Assessment (MNA) and its variant, the Mini-Nutritional Assessment-Short Form (MNA-SF) are the most extensively validated tools used for community-dwelling and hospitalized older adults in North America, but they require reliable self-assessments of patients' health and mental status, which may be problematic for some geriatric rehabilitative inpatients who are cognitively impaired or unable to communicate. There are also hardly any studies examining which methods and tools are used by dietitians to assess nutritional status of these patients or how well the different nutritional indicators used to assess nutritional status of these patients relate to each other. As well, previous studies show that there is a large disparity between procedures of different geriatric rehabilitative settings across Canada, such as referral, admission, and screening criteria (Borrie, Stolee, Knoefel, Wells, & Seabrook, 2005). Some investigators have suggested that there should be some standardization of practice in inpatient geriatric rehabilitative settings across Canada (GTA Rehab Network, 2007; MacNeil & MacDonald, 2008), and the GTA Rehab Network (2008) has released specific criteria which must be fulfilled for geriatric rehabilitation facilities and units in the Greater Toronto Area. The results of this study may help to clarify some of these rehabilitative procedures and help to alleviate the disparity amongst rehabilitative settings.

2.0 Aim of the Study

The study was aimed to address and fill a gap in current research regarding the nutritional assessment practices of dietitians working in geriatric rehabilitative units and facilities, and to study how various geriatric facilities/units differ in their nutritional assessment processes. This was done by surveying the opinions, attitudes, and screening and assessment practices of dietitians working in geriatric rehabilitative facilities across Canada, as well as information regarding the processes of rehabilitation of their facilities. However, because clear insight into best practices of nutritional assessment in older adults is not yet established, popular practices may not necessarily be the most appropriate or the most effective methods of nutritional assessment. Therefore, a second set of data was analyzed from a previously completed unpublished study to examine the relationships between several common indicators which are usually used by dietitians to assess nutritional status of geriatric patients upon rehabilitation admission. The results of this study could provide clarity of the procedures of assessing nutritional status of geriatric rehabilitative patients, and recommendations given by this study could provide a basis for monitoring, stabilizing, and improving the nutritional status of geriatric inpatients in rehabilitative care. Rehabilitative dietitians and units could use these recommendations to model and/or re-evaluate their practices and systems of inpatient geriatric rehabilitation. The results of this study could also provide a clear picture of how different dietitians and units across Canada provide nutritional care during geriatric rehabilitation.

2.1 Objectives

The objectives of this study are:

(1) to illuminate the process of nutritional screening and assessment of geriatric rehabilitative inpatients by investigating current nutritional screening and assessment practices of dietitians in various geriatric rehabilitative facilities and units across Canada, such as which tools and indicators are used and what dietitians think about these instruments,

(2) to study the similarities and variations in nutritional and rehabilitative care by comparing procedures in different facilities/units such as admission, information transfer, and screening processes, as well as by comparing nutrition assessment practices used by different dietitians and,

(3) to observe the relationships between common indicators measured during nutritional assessment of geriatric rehabilitative inpatients, such as BMI, weight loss, appetite and physical activity, and serum albumin values, and how well their results collaborate with one another when assessing nutritional status in these patients, by analyzing secondary data collected from medically stable, non-osteoporotic patients at a geriatric rehabilitative facility in St. John's, Newfoundland and Labrador from September 2007 to April 2008.

3.0 Literature Review

3.1 The elderly population

The fact that Canada's population is aging is well known. As the "baby boomer" generation (those born between 1946 to 1965) gets older, and as life expectancy increases, the proportion of older adults will grow from one in eight people in 2001 to an estimated 1 in four people by 2041 (Health Canada, 2002). As this population increases, the need for geriatric rehabilitative services will likely increase as well (GTA Rehab Network, 2007).

While most older adults in Canada report being in good health, physical limitations due to health problems, as well as utilization of health care services, increase with age (Health Canada, 2002). Also, "seniors are generally far more likely to be hospitalized than Canadians from other age groups and hospitalization rates increase with age in later life. The hospital stay of seniors also tends to be longer than for younger people" (Health Canada, 2002).

3.2 Geriatric rehabilitation

"Geriatric rehabilitation aims to restore and maintain the highest possible level of function despite the disabling effects of illness and injuries" (Jonsson et al, 2003).

According to the American Academy of Physical Medicine and Rehabilitation [AAPM&R] (2010), the goal of geriatric rehabilitation is to restore pre-injury quality of life, and the GTA Rehab Network (2008) states that the purpose of geriatric rehabilitation is to facilitate social reintegration and independence in older adults who have experienced

a limitation or loss of function. Inpatient geriatric rehabilitation is provided to patients who require 24-hour hospitalization, and may be provided in a rehabilitation unit integrated within a hospital, or in a dedicated rehabilitation facility (GTA Rehab Network, 2008). Patients may have been admitted due to problems arising from normal aging processes, cardiovascular events such as heart attacks and strokes, and skeletal problems such as amputations and osteoarthritis (AAPM&R, 2010), and are expected to be discharged to home or their preferred accommodation after rehabilitation (GTA Rehab Network, 2008). In inpatient geriatric rehabilitative facilities, a multidisciplinary team of different health professionals, including dietitians, usually work in tandem with one another to address issues of concern with patients (GTA Rehab Network, 2008; Jonsson et al, 2003). In some facilities, registered dietitians are alerted or referred to if other staff members such as speech or physical therapists notice signs of nutritional risk in patients during therapy (Asai, 2004).

3.3 Nutritional status of geriatric rehabilitative patients

Russell et al (2009) state that the nutritional status of a person is their health status as relating to the nutrients in their diet. Harris and Haboubi (2005) define poor nutritional status, or malnutrition, as “a state in which a deficiency, excess or imbalance of energy, protein and other nutrients causes adverse effects on body form, function and clinical outcome”. According to Finestone, Greene-Finestone, Wilson, and Teasell (1997), 49% to 60% of patients undergoing rehabilitation are malnourished. A study conducted by Donini et al (2004) showed that 56.1% of patients admitted for inpatient geriatric rehabilitation were classified as malnourished. Nutritional risk is defined by the Dietitians

Association of Australia (2001) simply as the risk of poor nutritional health, with risk factors being characteristics that increase the likelihood of poor nutritional status.

Preadmission imbalances in the intake of energy, protein, and key nutrients could result in poor nutrition. It is well known that the prevalence of overweight and obesity is rising among all ages in North America (Kruger, Ham, & Prohaska, 2009). Excess weight is linked with many health problems, such as diabetes and heart disease, and may lead to physical impairments as well as higher mortality (Zhang et al, 2007). However, “in the older population, undernutrition rather than overnutrition is the main cause for concern, since its relation to morbidity and mortality is stronger than that of obesity” (Harris & Haboubi, 2005). Undernutrition, or poor nutrition, in older adults can lead to functional and physical impairment, and interfere with recovery after diseases and medical procedures (Harris & Haboubi, 2005; Omran & Salem 2002).

3.4 Reasons for poor nutritional status among older adults

Illness and physical trauma such as surgery could affect nutritional status during hospitalization and rehabilitation. However, the main cause of poor nutrition among older adults is inadequate food intake. In a study by Frisoni et al (1995), a lower intake of major nutrients such as protein and carbohydrates was strongly predictive of mortality in older adults. The following factors can affect proper food intake in older patients:

- Age
- Medication use
- Mental health
- Physical health

- Behavioural factors.

3.4.1 Age

Older adults often eat less than when they were younger because changes in their digestive tract make food pass through their systems more quickly, resulting in earlier satiety (Asai, 2004). This is accompanied by a natural decline in the senses of taste and smell as aging occurs (Callen & Wells, 2005; Schiffman, 2009). While changes in smell are the same in all older adults, the sense of taste tends to decline more in people who smoke or have smoked in the past (Asai, 2004).

3.4.2 Medication

Prescription medication use can also decrease or alter tastes and smells, making food unappealing (Schiffman, 2009). Taking multiple medications, or polypharmacy, can also cause unintentional weight loss because the medication can interfere with nutrient absorption or metabolism (Omran & Salem, 2002). Most older adults already use multiple medications; admission to hospitals or rehabilitation facilities can add to the amount of medications, compounding on negative side-effects (Suja Varghese, personal communication). Side effects of medications can include nausea, vomiting, constipation, diarrhea, and dysphagia, which can all cause loss of appetite (Asai, 2004).

3.4.3 Mental health

Mental disorders can also affect food consumption. Depression is a common cause of poor intake among older adults (Payne, 2009). In fact, “one of the leading causes of involuntary weight loss in the elderly is depression” (Callen & Wells, 2005). Depression in the elderly is often untreated, can complicate illnesses, and can interfere with therapy

during rehabilitation because the patient may not be motivated to participate (Wells, Seabrook, Stolee, Borrie, & Knoefel, 2003). Antidepressants have been shown to increase appetite and help regain lost weight, but heavy doses can cause other side effects such as delirium (Asai, 2004). Dementia is another mental disorder commonly associated with poor food consumption and weight loss among older adults (Ritchie & Kvale, 2009). In late stage dementia, patients become unable to swallow or move and thus lose the ability to maintain oral nutrition (Ritchie & Kvale, 2009). Other psychological factors such as neurodegenerative disorders (Li & Lewis, 2009) or paranoia of being poisoned among the very old (Omran & Salem, 2002) can also lead to decreased intake.

3.4.4 Physical health

Studies have shown that older adults with balance and gait problems are more likely to have poor nutritional status compared to older adults who do not have balance problems (World Health Organization [WHO], 1995). Functional challenges such as weakness and inability to feed oneself can often lead to weight loss (Asai, 2004).

Oral problems such as poor dentition and periodontal diseases are also a major cause of poor intake/unintentional weight loss among older adults (Niedert & Dörner, 2004). Physical illness, disease, and infection can also cause unintentional weight loss in older patients due to decreased appetite, especially when pain management after surgery or a fracture is inadequate (Asai, 2004; Kubrak & Jensen, 2007).

3.4.5 Behavioural factors

Unwillingness to change eating patterns, hospital food dislike, and deliberately restrictive diets, as well as behaviours such as alcohol and tobacco use are linked with

poor nutrition among older adults (Asai, 2004; Callen & Wells, 2005; Omran & Salem, 2002).

3.5 Screening and Assessing Nutritional Status

Nutritional screening is the initial process of identifying individuals in healthcare settings as well as the community who are malnourished or at risk of being malnourished (Anthony, 2008; Charney, 2008; Green & Watson, 2006; Kubrak & Jensen, 2007).

Effective nutritional screening has been shown to increase knowledge and awareness of nutrition issues in hospital staff, detect malnutrition in more patients that might have otherwise gone untreated, ensure that timely nutritional treatment is carried out, and reduce length of stay and cost of healthcare (Babineau, Villanon, Laporte, & Payette, 2008). The Royal College of Physicians has “identified nutritional screening as an integral part of clinical practice” (Harris & Haboubi, 2005). As well, according to the GTA Rehab Network (2008), nutritional screening is an essential component of geriatric rehabilitation programs, and is necessary criteria for dedicated geriatric rehabilitation facilities and units in the Greater Toronto Area. Those individuals who test positive for nutritional risk during screening should be referred to dietitians or clinicians, who should conduct a comprehensive nutritional assessment and plan an appropriate nutritional intervention in order to reverse or prevent further decline in nutritional status (Babineau et al, 2008; Green & Watson, 2006; Kubrak & Jensen, 2007). Russell et al (2009) define nutritional assessment as “a comprehensive approach to define nutritional status using medical, nutrition, and medication histories, physical examination, anthropometric measurement, and laboratory data”. Nutritional assessments should be carried out regularly

during patients' hospital stays to ensure effective nutrition intervention (Mackintosh & Hankey, 2001).

Tools developed for screening and assessing nutritional risk usually contain a combination of several physiological, psychological, socioeconomic, and behavioural indicators of nutritional risk (Green & Watson, 2006). These indicators should be easy to use, valid non-invasive, and timely. Commonly used physiological nutritional indicators include anthropometric measurements such as height, weight, and skinfold measurements and calculations such as Body Mass Index (BMI), as well as biochemical indicators including protein and immune markers.

3.5.1 Anthropometrics

Anthropometric measurements are easy to use and inexpensive physical measurements (Lewis & Bell, 1990). They are designed to "provide a crude assessment of fat stores and muscle mass" (Omran & Salem, 2002). There are several anthropometric methods used in clinical practice (Morley, 2009).

3.5.1.1 BMI

BMI is measured as weight in kilograms divided by height in metres squared (kg/m^2). It has been proven as an easy, cost-effective, and reliable tool to determine nutritional status at a population level (Health Canada, 2003). In adults between the ages of 18 and 65, a BMI below 18.5 kg/m^2 is classified as underweight, and is associated with increased risk of ill health, whereas a BMI of 18.5 kg/m^2 to 24.9 kg/m^2 is considered normal body weight, and associated with least risk of ill health (Health Canada, 2003). A BMI of 25.0 kg/m^2 to 29.9 kg/m^2 is considered overweight, corresponding to increased

risk of ill health, and a BMI of 30.0 kg/m² or higher is classified as obese, with health risk ranging from high to extremely high (Health Canada, 2003).

According to Health Canada (2003), BMI “is the most useful indicator, to date, of weight-related health risk”, although it should be used as one part of a complete health risk assessment for individuals. A study by Sebo, Beer-Borst, Haller, and Bovier (2008) shows that BMI is a more reliable and consistent measure of obesity than waist circumference or waist-hip ratio when used by primary care doctors. In fact, “BMI tends to perform even better than more sophisticated measures like fat-free mass of adipose tissue-free mass estimated by dual-energy X-ray absorptiometry” (Sebo et al, 2008). Laporte et al (2001) suggest using a screening test that includes BMI and albumin level, or BMI and percentage weight loss if albumin values are not available, and Beck and Oveson (1998) state that the simplest methods to use for nutritional screening are anthropometric measures such as BMI and weight loss. In fact, reviews conducted by Kubrak and Jensen (2006) and Green and Watson (2006) show that nearly all tools used for nutritional screening include weight and/or BMI measurements to assess nutritional status.

However, while BMI is one of the most common indicators used in nutritional risk assessment, it is not without its weaknesses. The main concern with BMI is that it does not distinguish between muscle mass and body fat, and is therefore not an accurate measure of health risk due to excess fat in some populations (Cook, Kirk, Lawrenson & Sandford, 2005; Prentice & Jebb, 2001). Also, “BMI is not sensitive enough to recognize small yet clinically-significant weight losses. For example, a patient who experiences a 10% weight loss would not always be deemed by BMI to be at risk” (Cook et al, 2005).

Health Canada (2003) cautions that while BMI is a good indicator of nutritional status at a population level, it is not intended as a target for nutritional intervention in individuals. This is because there are other factors that may have an impact on nutritional health at an individual level, such as lifestyle, physical activity, and genetics (Health Canada, 2003). As well, relying solely on body weight and BMI “can be misleading as changes could be due to dehydration, ascites, edema, disease, and age” (Kubrak & Jensen, 2006). Regardless, BMI is still widely used in clinical and hospital settings, and is consistently accurate in predicting morbidity and mortality among underweight as well as overweight patients (Olsen, Dehlendorff, Petersen, & Andersen, 2008).

Using BMI among older adults is especially difficult. Sixty nine percent of British specialist dietitians using BMI as a measure of nutritional status in older adults feel that its use is limited and not suitable for older patients (Cook et al, 2005). For one, studies show that while being underweight increases mortality risk in older adults, a degree of overweight is actually associated with lower mortality (Cook et al, 2005; Grabowski & Ellis, 2001; WHO, 1995). Health Canada (2003) has also concluded that “relative risk of mortality and morbidity in seniors with BMIs within the overweight range (BMI 25.0 to 29.9) is less than that for young and middle-aged adults”.

Another difficulty with using BMI among older adults is that the cutoff points used for younger adults cannot be used with older adults because BMI tends to change with age (Beck & Oveson, 1998; Health Canada, 2003; WHO, 1995). Older people are a very heterogeneous group due to physiological and environmental factors (Ledikwe et al, 2003), and cutoff points that apply to people 60-69 years of age might not apply to people 70 years and above (Beck & Oveson, 1998). Therefore, Health Canada (2003) has

broadened BMI standards for older adults, stating that an appropriate BMI for adults 65 years and over may start just above 18.5 kg/m² and extend into the overweight range of 25 – 29.9 kg/m². While these recommendations may be good for general use in the population, they are too vague for dietitians using BMI in clinical and hospital settings.

BMI is also not ideal as a nutritional risk indicator among older adults because age-related changes in height due to vertebral compression, loss of muscle tone, and changes in the spine may make these measurements inaccurate or difficult to obtain (WHO, 1995). Self-reports may also be inaccurate, as older adults tend to over-report their height and under-report weight (Gunnell et al, 2000).

3.5.1.2 Weight change

Cook et al (2005) state that the key to preventing nutritional related complications is to identify nutritional risk as soon as possible and rectify the problem before it reaches clinical significance. Many studies suggest that the best way to examine nutritional risk is by examining degree of weight change (Beck & Oveson, 1998; Corrada, Kawas, Mozaffar & Paganini-Hill, 2006). Although body weight usually declines after the age of 65 due to reduction in body water (WHO, 1995), any natural weight loss that occurs with age is probably less than 1% per year (Beck & Oveson, 1998). According to the American Dietetic Association [ADA] (2000), percentage of weight change is considered significant if there is a loss of 1-2% of body weight in 1 week, 5% in 1 month, 7.5% in 3 months, or 10% in 6 months. Even though it is easier to monitor weight changes in a long term care facility such as a nursing home (Omran & Salem, 2002), observing the rate and timing of unintentional weight loss in acute care is still a more sensitive predictor of nutritional status than other methods such as BMI (Kubrak & Jensen, 2007). Clinical

goals for maintenance of weight in the elderly should be set for within 10% of usual body weight (WHO, 1995). Usual body weight is used for these goals instead of desired weight because anthropometric standards are lacking for the elderly, and data for average weights in older adults is outdated (Omran & Salem, 2002).

3.5.1.3 Body circumference and skin-fold measurements

Health Canada (2003) suggests using waist circumference in addition to BMI for measuring excess abdominal fat in all populations. WHO (1995) states that calf circumference “is considered to provide the most sensitive measure of muscle mass in the elderly” because it can provide insight into fat-free mass changes that accompany aging and decreased activity. A study by Portero-McLellan et al (2010) also showed that calf circumference was positively correlated with nutritional status of elderly patients. Other circumference measures include upper and mid-arm circumference (Harris & Haboubi, 2005). However, circumference measurements on their own may be of limited value, as Sebo et al (2008) discovered that because some of these measurements, namely waist and hip circumferences, are more recent, practitioners may lack the knowledge, familiarity and training to use these measurements properly. Also, there is a lack of standardization for these methods, as different sources recommend different measurement sites and techniques to use (Sebo et al, 2008).

Skinfold measurements are conducted by measuring the thickness of skinfolds using calipers in certain areas (Morley, 2009). Subscapular, triceps, supra-iliac, biceps, thigh, and calf skinfolds can be measured, though the effectiveness of these can vary with age, gender, or race (Harris & Haboubi, 2005).

“Body circumferences and skinfold thickness measurements are useful for initial classification of patients, but are generally not sufficiently precise for short-term follow-up and monitoring” (WHO, 1995). While body circumferences and skinfold measurements may be useful in determining fat and muscle mass, their use is limited when limb edema is present, or in disabled or elderly people in whom these measurements may be difficult to obtain (Harris & Haboubi, 2005; WHO, 1995).

3.5.2 Biochemical indicators

Biochemical markers can be used to assess nutritional risk as well as risk of morbidity and mortality (Kubrak & Jensen, 2007). Among these, markers of protein deficiency, immune status, lipid levels, and vitamin and mineral deficiency are commonly measured (Morley, 2009).

3.5.2.1 Protein markers

The most commonly observed marker of protein status is serum albumin. A serum albumin value of less than 35 – 40 g/l should be of clinical concern (Laporte, Villalon, & Payette, 2001; Lewis & Bell, 1990; Omran & Salem, 2002). Albumin is not an optimal tool for diagnosing nutritional status or determining the immediate effectiveness of nutrition intervention in acute care, because its accuracy may be affected by its long half-life, disease, and the effect of medication (Fuhrman, 2002; Kubrak & Jensen, 2007; Lewis & Bell, 1990). Nevertheless, serum albumin has high prognostic significance towards patient outcome (Kubrak & Jensen, 2007). According to Fuhrman (2002), serum albumin is indicative of morbidity and mortality, and relates to how sick a patient is rather than how much protein they need. In acute care patients in particular, serum albumin levels

may be more related to hydration status or inflammation than nutrition status (Bouillanne et al, 2005). During chronic and long-term care, however, serum albumin is useful for determining and continually monitoring changes in nutritional status (Omran & Salem, 2002). Compared to albumin, prealbumin (also known as transthyretin) is a more sensitive predictor of changes in protein levels in an acute setting than albumin because it has a short half-life and is not affected by age (Omran & Salem, 2002), although its short half-life makes it less effective for patients in long-term care settings. Other effective protein indicators include transferrin, retinol-binding protein, insulin-like growth factor-I, C-reactive protein, urinary urea nitrogen, and urinary creatinine (Morley, 2009).

3.5.2.2 Immune function

Testing and monitoring immune function is important in older adults because a weakened immune system can increase the chances of infection after disease, stress, and surgery (Lewis & Bell, 1990). Some commonly observed indicators of immune function are total lymphocyte count, white blood cell count, and interleukins (Morley, 2009; Omran & Salem, 2002).

3.5.3 Tools and tests

There are many nutritional screening tools and tests available for use, but only a few have been validated (Anthony, 2008; Mackintosh & Hankey, 2001). According to Charney (2008), "a valid nutrition screening test is one that accurately identifies the nutrition problem of interest". The validity of a tool is usually determined by comparing it to another tool that has already been validated or is considered "best practice" (Anthony, 2008). Several conditions must be met before a nutrition screening tool or test is

implemented in a healthcare setting. Screening tools ideally should be simple, acceptable to the staff and patients, quick, noninvasive, cost-effective, and contain no laboratory data that are not already available (American Society on Aging [ASA], 2006; Kubrak & Jensen, 2007). They should have high sensitivity and specificity values, that is, they should accurately detect nutritional risk in individuals who may be malnourished, and distinguish them from patients who are truly not at nutritional risk (Charney, 2008; Green & Watson, 2006). Screening tests should also be reliable by being consistent in their results when repeated multiple times in similar conditions (Anthony, 2008; Mackintosh & Hankey, 2001). However, choosing a test that has high validity and reliability is not enough. The test must also be suitable for the setting in which it is being used (Green & Watson, 2006). Since the screening process is usually simple and rapid, hospital staff such as nurses and hospital aides should be able to screen patients for malnutrition (ASA, 2006; Kubrak & Jensen, 2007).

Three validated screening tools that are highly recommended in the literature are the Mini-Nutritional Assessment (MNA) and Mini-Nutritional Assessment-Short Form (MNA-SF), Malnutrition Universal Screening Tool (MUST), and Subjective Global Assessment (SGA). Other available screening tests and tools include the Nutritional Risk Screening (NRS 2002) developed by the European Society for Parenteral and Enteral Nutrition (ESPEN) (Kondrup, Rasmussen, Hamberg & Stanga, 2003), the Short Nutritional Assessment Questionnaire (SNAQ©) developed by Kruizenga et al (2005), the Malnutrition Screening Tool developed by Ferguson, Capra, Bauer, and Banks (1999), the DETERMINE questionnaire developed by the Nutrition Screening Initiative (NSI) (ASA, 2006; Omran & Salem, 2002; Callen & Wells, 2005), and the Malnutrition Risk

Scale (SCALES) developed by Morley (1989). These tools can be used for adults of all ages, but the MNA is specifically designed for use among older adults.

3.5.3.1 MNA and MNA-SF

A popular and very extensively tested nutrition screening and assessment tool is the MNA (Green & Watson, 2006), a validated screening tool in use that was designed by Nestlé and validated specifically for older adults (Guigoz et al, 2002; Omran & Salem, 2002). While the full 18 question MNA form is used for a complete assessment of an individual, there is a shorter six-question version of this tool known as the Mini-Nutritional Assessment-Short Form (MNA-SF) used only to screen patients for risk of malnutrition or malnutrition (ASA, 2006). Both versions of the tool take a short amount of time to complete, and they are highly sensitive and specific (Guigoz et al, 2002). Studies have shown the MNA to have a sensitivity (the ability to predict presence of malnutrition correctly) of 70% or higher, and a specificity (the ability to predict absence of malnutrition correctly) of 70% or higher, with the MNA-SF having a sensitivity of 86% to 100% and a specificity of 36% to 100%. The MNA detects changes in nutritional status before a change in serum protein levels is evident, and it can also be effectively used to monitor nutritional status in patients during ongoing nutritional treatment (Anthony, 2008). However, it can only be successfully completed if patients are able to give a reliable self-assessment of their health and mental status (Anthony, 2008).

3.5.3.2 MUST

The MUST, developed by the British Association of Parenteral and Enteral Nutrition (BAPEN), is a fast test that uses a combination of BMI, unintentional weight loss, and acute disease effect to screen for malnutrition or risk of malnutrition (Anthony,

2008; Harris & Haboubi, 2005). Though it was developed for use in the community, studies have shown that it can also be used reliably and with validity in hospital and acute care settings (Harris & Haboubi, 2005). Due to the implementation efforts of BAPEN, the MUST is widely used in the U.K. and most European countries (Anthony, 2008).

3.5.3.3 SGA

The SGA is another well-used screening and assessment tool, developed by Detsky et al (1987). It has been rigorously tested in many healthcare settings, has a high inter-rater reliability among nurses, and is cost effective (Kubrak & Jensen, 2007). Kubrak and Jensen (2007) recommend the use of SGA as a diagnostic tool in acute care because of its high validity and reliability in this population, although it is not specific for older adults. It requires some training to conduct the SGA as it was originally designed (Kubrak & Jensen, 2007), however, and it has been shown that “the performance of this tool depends on the administrator’s experience” (Omran & Salem, 2002). Therefore, many clinicians have altered it according to their own interpretation (Anthony, 2008). As well, it is not an early detector of nutritional deficiency because it uses several laboratory values (Omran & Salem, 2002).

3.6 Challenges in Nutritional Assessment of Geriatric

Rehabilitation for Dietitians

Assessing nutritional status in the elderly is particularly challenging because of physical changes that occur during the process of aging. Lean muscle mass decreases and tends to be replaced by fat tissue, which causes functional decline and physical instability in older people (Carter, 1999). As well, the wide heterogeneity in socioeconomic and

lifestyle patterns of adults and older adults makes assessment of nutritional status difficult to generalize (Miller, Morley, & Rubenstein, 1995).

For assessing nutritional status in hospital and rehabilitative settings, it is important to use predictors which are valid, sensitive and specific, cost-effective, non-invasive, and easily available. However, this is impeded by a lack of consensus for cutoff points and ranges used for nutritional risk indicators such as biological and anthropometric measurements (Bouillanne et al, 2005; Kubrak & Jensen, 2007). Until recently, many national and international nutritional surveys did not even include data on adults over the age of 80 (Callen & Wells, 2005). This leads to different researchers using different reference values in studies (Kubrak & Jensen, 2007). For example, in the case of serum albumin in adults 65 years and older, Laporte et al (2001) use 35-55 g/l as a normal range, Lewis and Bell (1990) state that a value less than 40 g/l should be of concern, and Omran and Salem (2002) list a value of less than 38 g/l as suspicious. Serum albumin levels tend to decrease with age, although levels lower than 35 g/dl are still associated with adverse health effects in older adults (Salive et al, 1992; Veering, Burm, Souverijn, Serree, & Spierdijk, 1990). Similarly, the ADA has set recommended BMI ranges to be 24-27 kg/m² (NSI, 1991) and 22 – 27 kg/m² (NSI, 1992) for older adults on previous occasions. The most recent recommendations given by Health Canada (2003), according to which the ideal BMI in older adults may range from 18.5 kg/m² to anywhere in the overweight category may be too vague to be used appropriately in clinical practice.

Another problem is that there is currently no level of standardization in place for nutritional assessment in geriatric rehabilitation in Canada (Bouillanne et al, 2005), and not many studies have examined dietetic practices in Canadian geriatric rehabilitation

facilities, so the processes of effective geriatric rehabilitation are misunderstood and not well defined (MacNeil & MacDonald, 2008). As well, involvement of healthcare professionals, inclusion criteria for admission to rehabilitation facilities, and assessment techniques of patients' health status can vary, and because of this, "the rehabilitation experience of older patients can be quite different from one province to another and within regions of one province" (MacNeil & MacDonald, 2008). Additionally, Foltz, Schiller, and Ryan (1993) conducted a study of nutrition screening and assessment practices of dietitians in nutrition support, though not in geriatrics specifically, in the U.S.A., and discovered that although most institutions had policies for nutrition screening and assessment, the assessment practices of most dietitians varied greatly from institutions. Similarly, Borrie, Stolee, Knoefel, Wells, and Seabrook (2005) stated that there is a large disparity between the clinical procedures in use at different geriatric rehabilitative settings across Canada. However, a study by Beaupre et al (2005) of standardizing physical therapy in tertiary care hospitals, while improving outcomes in patients with lower social status, did not improve functional recovery overall in older adults with hip fractures, although this study did not focus specifically on nutrition.

4.0 Methodology

4.1 Study Design

This study is a mixed study design consisting of a cross-sectional survey of dietitians working in geriatric rehabilitative facilities, as well, as of secondary analysis of data from geriatric rehabilitative inpatients in St. John's, Newfoundland and Labrador.

4.2 Study population

To gather data on the systems of rehabilitation centres and the dietetic practices of nutritional screening and assessment in geriatric rehabilitative facilities, the study population consisted of dietitians working in such facilities in the provinces of Newfoundland and Labrador, Ontario, and Alberta. Because the opinions of the dietitians studied would have been most effectively obtained by conducting qualitative interviews, telephone surveys were done using a self-developed questionnaire as an interview guide. There are no clear guidelines on how many interviews are enough in qualitative analysis. According to Boyce and Neale (2006), "the general rule about interviewing is that you will know when you have done enough when you hear the same information from a number of stakeholders". A study by Guest, Bunce and Johnson (2006) showed that in a relatively homogenous sample, six interviews were enough to identify major themes, with data saturation occurring in 12 interviews. Because the interview data collected from dietitians was to be analyzed qualitatively, and timely completion of the study was essential, a small sample size of 5 to 10 dietitians was selected. An internet search was conducted to identify inpatient rehabilitative facilities specifically designed for older

adults in various provinces of Canada, including in-hospital units as well as individual rehabilitative centres that were affiliated with regional health authorities. Through telephone correspondences with switchboard operators or admission offices, dietitians in these facilities were contacted for potential participation in the study, and contact information (email address or phone number) for seven dietitians was obtained. Upon contact, one dietitian was unavailable, and one dietitian did not follow up after initial correspondence, hence five dietitians – one from Newfoundland and Labrador, one from Alberta, and three from Ontario – constituted the sample size.

To obtain nutritional status data from geriatric rehabilitative inpatients, all available data were taken from a previously conducted unpublished study called “Effectiveness of BMI standards in determining the nutritional risk of geriatric rehabilitative patients” (Varghese, 2009). This study examined 100 medically stable, non-osteoporotic inpatients 65 years or older admitted to rehabilitative units (2N and 2 South) at the L. A. Miller Center, a geriatric rehabilitative facility in St. John’s, Newfoundland and Labrador. The data were collected over a period of seven months, from September 2007 to April 2008, by dietitians working in this facility, and included information that the dietitians usually obtained to assess patients on initial admission. In this previous study, patients were excluded if they had stayed in the acute care facility for more than three months prior to transfer to the rehabilitative centre, and osteoporotic patients were excluded because loss of bone density in these patients may affect changes in weight.

4.4 Ethics

This study was approved by the Human Investigation Committee [HIC] (see Appendix 1) and the Research Proposals Approval Committee (see Appendix 2). For secondary use of the data in the study “Effectiveness of BMI standards in determining the nutritional risk of geriatric rehabilitative patients”, approval was also requested and granted from Suja Varghese, the primary investigator of the study (see Appendix 3), as per the request of the HIC.

4.4.1 Consent process

Due to the sensitive nature of the dietitian interviews, it was important to ensure that free and informed consent was given before the interviews were conducted. After initial contact with dietitians was made, a cover letter explaining the study and a letter of consent were sent to them by email for review. These documents are included in Appendix 4. Agreement by the dietitian to set a time for the interview was taken as initial consent. Before the telephone interview, any questions or concerns about consent were addressed, and verbal consent was obtained by using a script, which is included in Appendix 5.

4.5 Instruments used for data collection

For the dietitian interviews, an interview form was developed with the aid of dietitians at the L. A. Miller Centre in St. John's, Newfoundland and Labrador and sent to dietitians, along with preliminary information about the study to facilitate better preparation for the interview. This form is included in Appendix 6 and contained closed and open-ended questions regarding:

- the system of the rehabilitation centre
- the screening and assessment process,
- and the existing level of standardization.

Table 4.1 shows how the questions in the interview form were organized.

Table 4.1 Sections of the dietitian interview questionnaire

The system of the rehabilitation centre	<p>Q1. How do patients get admitted to the rehab centre?</p> <p>Q2. How much previous medical information is available to you on initial admission?</p> <p>Q3. How closely do you work with your interprofessional team during rehabilitation?</p> <p>Q4. How satisfied are you with this system?</p>
The screening and assessment process	<p>Q5. What indicators do you use to determine nutritional status? How are they measured, if applicable?</p> <p>Q6. Does your facility/unit have a nutritional screening tool to determine risk level of all patients on admission?</p> <p>Q7. If yes, does your facility/unit generate dietitian consults for all patients identified as nutritionally at risk? If not, please explain how/whether patients identified as being at risk after screening are assessed.</p> <p>Q8. Are there any standard screening/assessment tools used? If so, which ones?</p> <p>Q9. If there are, have these tools been validated by you? (By comparing to other tools, or by doing a study?)</p> <p>Q10. Do you use a tool to measure and evaluate the outcome of nutritional intervention? If so, which one?</p> <p>Q11. How satisfied are you with these methods and tools?</p>
Level of standardization	<p>Q12. Is there a standardized procedure of nutritional assessment? That is, are there standardized protocols and policies in place with respect to nutritional assessment of patients?</p> <p>Q13. How satisfied are you with this level of standardization?</p>

The interview form was used as a general guide for conducting informal interviews.

This allowed for additional discussion during the interview and facilitated better acquisition of qualitative data.

To observe how different commonly used nutritional indicators related to each other, data was taken from a previous study “Effectiveness of BMI standards in determining the nutritional risk of geriatric rehabilitative patients”. A chart review tool was previously developed to collect this data for the study. This tool is included in Appendix 7. The data included indicators of nutritional risk that were used by dietitians to assess patients’ nutritional status on admission to the rehabilitation facility. Height was self-reported, and weight was measured upon admission to the rehabilitation facility. Patients were also asked about their usual weight prior to hospital admission approximately 3 months earlier, and current (rehabilitation admission) and usual (pre-hospitalization) BMI values were calculated for all patients. Severity of weight loss was also determined by calculating percentage of weight loss according to the formula given by the ADA (2000):

$$\% \text{ Weight change} = \frac{\text{Usual weight} - \text{Current weight}}{\text{Usual weight}} \times 100$$

The percentage weight loss value obtained from this calculation was interpreted using the ranges given by ADA (2000), which are shown in Table 4.2.

Table 4.2 Nutritional risk categories according to time frame and percentage weight loss (ADA, 2000)

	Nutritional Risk		
Time frame	Low	Moderate	Severe
1 month	<2%	2.5%	>5%
3 months	<5%	5-7.5%	>7.5%
6 months	<7.5%	7.5 – 10%	>10%

Level of appetite/intake on admission was also determined through meal observation and plate waste. As well, level of physical activity prior to hospital admission was self-reported by patients because it may have been related to current BMI. Lastly, admission serum albumin values were collected from patients' charts.

4.6 Data analysis

Data obtained from dietitian interviews was analyzed qualitatively and coded according to common themes that arose. Demographic characteristics of the dietitians interviewed were also collected, such as gender, province of employment, full-time or part-time status, and roles in other rehabilitative settings, although due to the small sample size, statistical relations were not analyzed. The data were also analyzed qualitatively by observing pertinent and common themes that were raised during the interviews and coding responses together accordingly.

Data obtained from 100 inpatients at a geriatric rehabilitative facility were analyzed quantitatively. Some variables were analyzed categorically, whereas others were continuous variables. This is shown in Table 4.3.

Using SPSS version 17.0, demographic characteristics were observed by using descriptive statistics such as frequencies and percentage distributions, and results were shown graphically. As well, means and standard deviations were observed for the continuous variables of age, albumin level, rehabilitation admission BMI, and pre-hospitalization BMI. Because normality of data was assumed during statistical analysis of these continuous variables, bar charts depicted the normality of the data was also graphed.

4.6.1 Age, rehabilitation admission BMI and serum albumin level

Relationships among these variables were analyzed using SPSS version 17.0. Age differences were analyzed for the variables of weight stability, appetite, pre-

Table 4.3 Quantitative variable types and categories

Variable	Type	Categories
Age	Continuous	
Gender	Categorical	1 = Male 2 = Female
Weight stability	Categorical	1 = Severe weight loss 2 = Moderate weight loss 3 = Mild weight loss 4 = Stable weight
Level of appetite/intake	Categorical	1 = Poor 2 = Fair 3 = Good 4 = Excellent
Pre-hospitalization level of activity	Categorical	1 = Sedentary 2 = Moderately active 3 = Fairly active 4 = Very active
Serum albumin	Continuous	
BMI on rehabilitation admission	Continuous	
Usual BMI prior to acute care hospitalization	Continuous	

hospitalization activity level, serum albumin level, rehabilitation admission BMI, and pre-hospitalization BMI. Since age is a continuous variable and weight stability, appetite and pre-hospitalization activity level are categorical variables, associations of age were analyzed using the analysis of variance (ANOVA) procedure. The ANOVA procedure tests the hypothesis that the means of two or more groups are equal (Daniel, 2005). Rehabilitation admission BMI and serum albumin level associations between the categorical variables of weight stability, level of appetite, and pre-hospitalization level of activity were also analyzed using the ANOVA procedure.

For age differences between the continuous variables of serum albumin level, rehabilitation admission BMI and pre-hospitalization BMI, linear correlations were determined by calculating the Pearson's correlation coefficient and comparing the resulting p-value to a 5% level of significance ($\alpha = 0.05$). This method was also used to analyze linear relationships between rehabilitation admission BMI and serum albumin upon rehabilitation admission, and pre-hospitalization BMI and rehabilitation admission serum albumin. Scatter graphs and histograms (bar charts) were also plotted to visually demonstrate significant results.

4.6.2 Gender

Using SPSS version 17.0, gender differences were analyzed as well. Because gender is a nominal variable with only two categories, significances between gender and other categorical nutritional variables including weight stability, appetite and pre-hospitalization level of activity were examined by generating cross-tabulations, and

comparing Pearson's chi-square p-value value to $\alpha = 0.05$ at a 95% level of confidence.

These differences were also observed visually by using bar charts.

Gender differences for continuous albumin levels, and admission and usual BMI values were analyzed by doing independent sample t-tests, which test the difference between the means of two independent groups (Daniel, 2005), in this case, male and female.

5.0 Results

5.1 Dietitian Interviews

Dietitian responses to all questions in the interviews are included in Appendix 8. Of the five dietitians interviewed, all five were female. Three dietitians worked in Ontario rehabilitation facilities, one in Alberta, and one in Newfoundland and Labrador. Three were full time, and two were part time. With the exception of two dietitians who worked in the same facility, all dietitians worked in separate centres. In addition to their roles in geriatric rehabilitation, the dietitians interviewed also had responsibilities in a variety of other nutrition care settings, including nursing homes, outpatient clinics, and home visits for community dwelling patients.

5.1.1 Summary of responses

Patients to all rehab facilities where the five dietitians worked were only accepted if they were referred by a health care professional, or if they fit the facility's specific criteria. All dietitians reported accepting referral patients from other hospital and health care facilities, including day hospitals as well as nursing homes. Two facilities also accepted personal referrals for outpatients, provided the referrals were either backed by physicians and family, or the patients fit the facility's criteria.

Two dietitians reported screening patients for nutritional risk upon admission, whereas three did not. The two dietitians that did screen patients did not use a specific tool. One dietitian used a combination of BMI and serum albumin level for screening, based on research articles. The other dietitian reported that patients were nutritionally screened in general upon hospital admission but not for rehabilitation admission, stating

that all patients used to get screened using specific criteria when admitted to the rehabilitation facility but did not anymore because almost all patients were rated as being high priority. Interestingly, the two dietitians interviewed who worked in the same facility did not have the same screening methods; one assessed all of her patients on admission, but the other used a self-developed screening process to screen her patients before assessment. For nutritional assessment, all dietitians working in the same facility used the same assessment forms. Most dietitians used a modified version of several standard, validated forms, taking in parts of each that suited their practice to create their own assessment tools. It was mentioned by one dietitian that the reason dietitians in her facility did not use any of the standard forms available was because they were all developed for use with outpatients.

Usage of different indicators of nutritional status used by dietitians for nutritional screening and assessment are shown in table 5.1. BMI, weight loss, laboratory values such as serum albumin, appetite level, and level of activity were among the most commonly measured nutritional indicators. Four out of five dietitians usually measured height and calculated BMI. The remaining dietitian reported that she did not measure BMI upon initial admission unless the patient was at risk of malnutrition because there were no appropriate reference ranges for older adults, and the values that she used were over 20 years old. Height was usually measured upon admission by nursing staff, but when it was not, self-reported height was used. Occasionally, if height could not be measured, arm-span was used to estimate it. All dietitians measured weight on or soon after admission, but one dietitian did not measure it on an ongoing basis unless weight change was an issue. Weight change during acute care hospitalization was also observed

Table 5.1 Table of dietitian responses to “What indicators do you use to determine nutritional status?”

Dietitian code	Height	Weight	BMI	Albumin	BUN	Level of appetite	Level of ac- tivity	Recent weight change	Waist circum- ference	Skinfold measure- ments	Other
01	✓	✓	✓	✓		✓	✓	✓			✓
02		✓		✓	✓	✓	✓	✓			✓
03	✓	✓	✓	✓		✓		✓			✓
04	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
05	✓	✓	✓	✓	✓	✓	✓	✓			✓

by all dietitians. Initial or usual body weight reported by the patients was compared with current BMI, and the four dietitians who measured weight on an ongoing basis also kept track of any weight changes during rehabilitation. All five dietitians included serum albumin levels in nutritional assessment of patients, and three included blood urea nitrogen (BUN). All but one dietitian also included a variety of other laboratory values, including vitamin B12, folate, glucose, electrolytes, and lymphocytes. One dietitian stated that she would prefer to get lab values such as prealbumin and vitamin D but that they were costly and not usually done. Most dietitians did not measure waist circumference or skinfold thickness. Reasons given for not measuring these were that they were not always accurate for seniors, and that staff were not always trained to conduct these measurements properly. Additional nutritional indicators included medication use, oral problems, and skin condition. Interestingly, only one dietitian reported including food history and usual patterns into her inpatient assessment. As well, only one dietitian, who provided nutritional care for outpatients, included socioeconomic factors such as living situation of patients into her assessment.

Most dietitians assessed level of appetite and level of physical activity, usually by communicating with patients and other health professionals and nurses. All five dietitians were highly satisfied about the level of communication regarding patient issues within their facility, noting that nutritional issues that were noticed by other health professionals or nursing staff were communicated promptly to the dietitian. However, three dietitians were displeased with the lack of proper outcome variables that could be used to measure effectiveness of nutritional intervention. Two of these dietitians felt that nutritional

indicators such as weight change and BMI were not sufficient in measuring outcomes, and that functionality should also be taken into account.

Four of the dietitians did not have a formal standardized procedure of nutritional assessment for older adults. However, most dietitians and staff working in the same facility used the same procedures and forms. One dietitian indicated that there was standardization of dietetic practices in her district or area, mentioning a dietitian's handbook available from her health region. As well, one dietitian reported that a procedure of nutritional care was being standardized through her city with the help of electronic processes and databases, and nutritional outcome processes were being adapted citywide.

5.1.2 Commonly arising themes

By qualitatively analyzing interview results, common topics that arose during the interviews were selected and responses were grouped into the following themes:

- The importance of observation
- Collaboration and communication
- Research-based practice
- Time constraints
- Links with the community
- Computer database use
- Roles and responsibilities of dietitians
- Change and evolution of practices
- Validation through use

- Lack of clarity across rehabilitative units and health regions
- Freedom of practice

5.1.2.1 The importance of observation

Several nutritional indicators were measured by observing the patients. For example, appetite and physical activity level assessments were usually done through patient observation, either by the dietitians, other health professionals, or by other staff such as nurses. In general, dietitians indicated that staff members at their institutions were very good at picking up nutritional “red flags” in patients and bringing them to the dietitian’s attention. Most dietitians also observed patient progress on an ongoing basis using progress notes to determine the effectiveness of nutritional intervention.

5.1.2.2 Collaboration and communication

The level of communication within the facilities was usually very strong. Four of the dietitians worked very closely with their interprofessional teams, and one dietitian said that she learned a lot about other health fields when she started working in her facility. Three of the five dietitians attended rounds on a weekly basis, during which they communicated and collaborated with other health professionals such as physicians, occupational therapists, and speech pathologists in their facility to address patient issues and concerns. The two dietitians in the same facility who did not attend rounds due to a high turnover rate of patients communicated afterwards with those who did, although one of these dietitians reported communicating more with doctors and pharmacists than with other staff. As well, standard consults were not usually generated for screened patients, as dietitians used referral notes or communication with hospital staff to ascertain a patient’s

nutritional status. However, aside from the subject of nutritional assessment, some dietitians wished that separate teams in their facility would collaborate more about their charting practices, and that the admission and referral procedures of their facility more unified so that “everyone was speaking the same language”.

Three out of five dietitians reported that the level of communication with other facilities in their health region was also very high. Most dietitians had access to all or some previous medical history and records were usually available for transfers from day hospitals, nursing homes, and other acute care facilities. Two dietitians working in the same facility, however, reported that their facility did not always get complete or the most current information about transferred patients. About 20% of the time, according to one of these dietitians, notes and consults received on admission were outdated or inaccurate, causing confusion upon patient and dietitian interaction.

Level of communication with sources outside the health region, however, was not always high. For some patients who were referred by other sources in the community such as family doctors or geriatric outreach programs, only partial medical record and histories were available, and in some cases, such as when patients came from rural areas of a province, it was difficult to contact the referring physician to obtain more data.

5.1.2.3 Research-based practice

Dietitians considered it important to have a practice that was based on research. One dietitian based her screening practices on research articles that recommended using a combination of BMI and serum albumin level to screen patients for risk of malnutrition. All five dietitians cited research-based forms of nutrition assessment. All dietitians used different modified versions of several nutritional assessment tools, including the Mini-

Nutritional Assessment (MNA), the Short Nutritional Assessment Questionnaire (SNAQ), the Malnutrition Universal Screening Tool (MUST), the Clinical Nutrition Risk Screen from the American Dietetic Association (ADA), and other tools developed and used by the facilities on previous occasions. One dietitian reported that the Mini-Nutritional Assessment – Short Form (MNA-SF), while not used in her rehabilitation facility, was used by the day hospital to screen patients for risk of malnutrition. Another dietitian was starting to use the nutrition care progress tool from the ADA to measure nutritional outcomes. Changes to assessment practices were also usually based on existing research.

5.1.2.4 Time constraints

Inpatient stay in rehabilitation was for about a month and a half, which required dietitians and other hospital staff to be efficient when providing rehabilitation. Timely nutritional assessment was paramount. Most dietitians linked their satisfaction of the nutrition assessment procedure with its timeliness, ease, and efficiency. One dietitian reported being dissatisfied because of length of nutritional assessment, saying that she would like to spend more time interacting with patients than filling out paperwork. Similarly, another dietitian wished the tools of nutritional assessment were more efficient so that she could follow up with her patients sooner.

While three dietitians reported that they were able to see patients very quickly after admission, two dietitians were unsatisfied that they had to wait for some time after admission to see patients, which may have resulted in initial consultation notes being outdated or inaccurate by the time the dietitian was able to see the patients. This delay may have also worsened nutritional problems and shortened the time dietitians had to assess and give proper nutritional care to patients before discharge.

5.1.2.5 Links with the community

In addition to hospitals, all facilities also accepted patients referred by a family doctor. As well, all facilities accepted patients referred by community outreach programs and physician groups. Most dietitians mentioned a geriatric outreach team that operated in the community to assess and recommend patients for rehabilitation.

5.1.2.6 Computer database use

During referral of patients, the information transfer process was usually facilitated more efficiently using computer health databases that dietitians were able to access. Computer databases and processes also aided diet technicians and admission staffs in the patient admission process, which ensured that all patients were treated in a similar manner. "Electronic patient records" and "Meditech" were two of the computer databases mentioned by dietitians.

5.1.2.7 Roles and responsibilities of dietitians

One dietitian mentioned that the role of the dietitian has changed. In the past, dietitians used to be much more impersonal, and would rely more on charts and notes in their practice. In the present, however, dietitians have become much more involved in the care process of patients. Four of the five dietitians reported communicating with patients and the patients' families to get nutritional information and to set desired goals for nutritional outcome.

Most dietitians also had dietetic roles other than in the inpatient facility; for example, one dietitian was responsible for nutrition care in a nursing home, one dietitians also worked with outpatients, and one dietitian worked with outpatients as well as conducting home visits for patients with mobility problems. The volume of patients in

facilities varied, and the workload and responsibilities of dietitians varied accordingly. For example, a facility with approximately 25 patients only had one part-time dietitian, whereas another facility with approximately 90 of patients had two full-time dietitians and one part-time dietitian.

5.1.2.8 Change and evolution of practices

None of the dietitians surveyed used a standard tool for assessment, but all five of them used parts of different ones, as well as older tools used in their facility, to generate new tools they found appropriate for their practice. Improvement upon existing assessment forms was an ongoing process in all facilities, with comprehensiveness of assessment, ease of use, and length of the tool being the main focuses.

One disadvantage of the continuous change of the assessment process was that there seemed to be a period of uncertainty while change was underway. One dietitian reported being dissatisfied because while the process of nutritional assessment was currently being addressed in her facility, it was still incomplete. As well, when a procedure of nutrition care was new, there was room for improvement. Such was the case with the outcome processes dietitians used. One dietitian felt that standardized language of the outcome process was still new, and that better outcome measures were needed. Another dietitian believed that patient outcome included more than just nutritional measures and factors such as functionality should also be considered, especially in her facility where almost 50% of the patients were admitted with hip fractures. Another dietitian also echoed this sentiment, stating that functionality is more important in rehabilitation and focusing on nutrition and weight changes may not be enough, but no outcomes measures have been validated.

5.1.2.9 Validation through use

Although none of the self-developed final assessment forms that dietitians used were validated through research, two dietitians stated that they were validated through repeated use in their facility. One dietitian said that she would like to formally validate the tool she used in the future.

5.1.2.10 Lack of clarity across rehabilitative units and health regions

A few dietitians wished there was more clarity about geriatric dietetic practices across regions. One dietitian stated that sometimes the procedure of nutritional assessment was unclear and not the same across programs. In this regard, two dietitians believed that it was “about time” for this study to be conducted, saying that it would be great to get some insight about what other dietitians were doing.

5.1.2.11 Freedom of practice

While one dietitian believed that it would be preferable if everyone “talked the same language” across different areas of the country, another dietitian said that while it would nice to have something research-based that she could use to guide her practice, she enjoyed the freedom to do things the way she liked.

5.2 Nutrition-Related Data

The sample of geriatric rehabilitative patients taken from a facility in Newfoundland and Labrador included 56 males (56%) and 44 females (44%) (see figure 5.1).

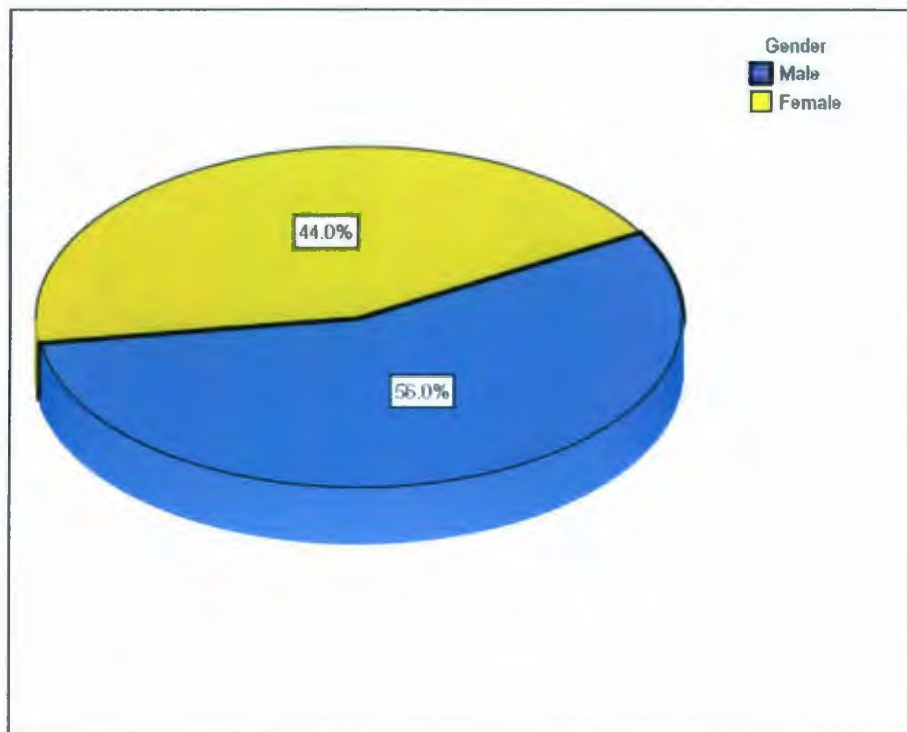


Figure 5.1 Pie chart of gender distribution of a sample of 100 geriatric rehabilitative patients

Sample gender-stratified and total means and standard deviations for age, serum albumin level and BMI upon rehabilitation admission, and usual BMI prior to acute care hospitalization are arranged in table 5.2. The average age of the patients in this sample was 75.8 years old.

Mean serum albumin level was 30.4 g/dl, which was lower than the normal albumin reference range of 35–40 g/dl (Laporte et al, 2001; Lewis & Bell, 1990; Omran & Salem, 2002), and therefore could have predicted high nutritional risk and poor clinical outcome on average among these patients. There is some evidence that serum albumin levels tend to decrease with age, but levels lower than 35 g/dl are still associated with adverse health effects in older adults (Salive et al, 1992; Veering et al, 1990).

Table 5.2 Sample means and standard deviations of age, rehabilitation admission serum albumin level, BMI on rehabilitation admission, and pre-hospitalization BMI

(n=100)

	Age		Albumin Level		Admission BMI		Pre-hospitalization BMI	
Gender	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Male	75.0	6.8	30.3	6.6 g/dl	24.5	4.7	26.9	5.1
	yrs	yrs	g/dl		kg/m ²	kg/m ²	kg/m ²	kg/m ²
Female	76.7	7.6	30.6	5.4 g/dl	25.4	5.6	26.7	5.1
	yrs	yrs	g/dl		kg/m ²	kg/m ²	kg/m ²	kg/m ²
TOTAL	75.8	7.2	30.4	6.1 g/dl	24.9	5.1	26.8	5.2kg/m ²
	yrs	yrs	g/dl		kg/m ²	kg/m ²	kg/m ²	m ²

Mean rehabilitation and pre-hospitalization BMI values were 24.9 kg/m² and 26.8 kg/m² among the sample respectively, indicating that on average this sample was not under nutritional risk according to the BMI recommendations (starting over 18.5 kg/m² and ranging above 24.9 kg/m²) given by Health Canada (2003). Bar graphs of these statistics showed a normal curve for each statistic. These graphical representations are included in Appendix 9 – Figures 1-4. Gender stratification showed that men tended to have lower BMI values than women upon admission even though there were no

differences between the mean BMIs of two gender groups prior to acute care hospitalization.

Percent counts of the sample within the categories of weight stability, level of appetite/intake, and pre-hospitalization level of activity are shown in table 5.3-5.5.

Table 5.3 Percent counts of the sample among the categories of weight stability

(n=100)

	Weight stability			
	Severe weight loss	Moderate weight loss	Mild weight loss	Stable weight
% count	41.0%	13.0%	8.0%	38.0%

Table 5.4 Percent counts of the sample among the categories of level of appetite

(n=100)

	Level of appetite			
	Poor	Fair	Good	Excellent
% count	6.0%	17.0%	65.0%	12.0%

Table 5.5 Percent counts of the sample among the categories of pre-admission level

of activity (n=100)

	Pre-admission level of activity			
	Sedentary	Fairly active	Moderately active	Very active
% count	22.0%	42.0%	20.0%	16.0%

To summarize, the average BMI of the sample upon rehabilitation admission was 24.9 kg/m², and 75% of the patients had good or excellent appetites upon rehabilitation admission, but 64% of patients tended to be sedentary or fairly active prior to acute care stay, more than half of the patients had lost significant weight during acute care stay, and mean albumin levels of the sample were lower than the normal albumin reference range of 35-40 g/dl.

5.2.1 Age differences

Results of the ANOVA procedure between age and weight stability, appetite, and pre-hospitalization level of activity are shown in table 5.6. While age did not have a significant association with weight stability (p-value=0.210) or appetite (p-value=0.201), there was a significant association between age and pre-hospitalization level of activity (p-value=0.003). Figure 5.2 is a histogram which shows this relationship, confirming the common knowledge that people become less mobile as they get older.

Table 5.6 Analysis of variance (ANOVA) of linear associations between ages of the sample and categorical variables of weight stability, appetite, and pre-hospital level of activity (n=100)

	Age	
	ANOVA F-value	Sig. (p-value)
Weight stability	1.278	0.210
Appetite	1.291	0.201
Pre-hospital level of activity	2.344	0.003

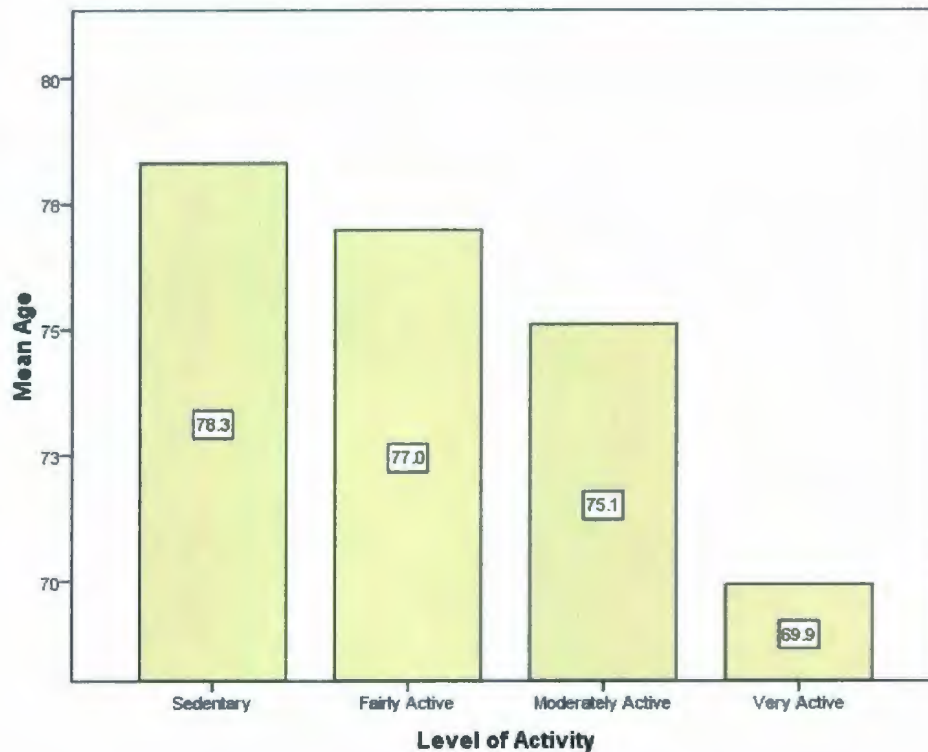


Figure 5.2 Histogram of the mean of age of the sample in each category of pre-hospitalization activity level (n=100)

Correlation analysis of age, serum albumin levels, and BMI values showed that age did not have any significant correlation with BMI on rehabilitation admission at a 95% level of confidence (p-value=0.117). These results are shown in table 5.7. Although age also did not have a significant association with serum albumin at a 95% level of confidence (p-value=0.063), there still seemed to be a linear relationship between the two. A scatter plot showed that serum albumin tended to decrease as patients got older (see figure 5.3). Similarly, there was no significant association between age and pre-hospitalization BMI at a 95% confidence level (p-value=0.058), but there seemed to be a

linear relationship between the two nevertheless. A scatter plot showed that BMI also tended to decrease as patients got older (see figure 5.4).

Table 5.7 Linear correlation analysis between ages of the sample and the continuous variables of rehabilitation admission serum albumin and BMI, and pre-hospitalization BMI in geriatric rehabilitative patients (n=100)

	Age	
	Pearson Correlation	Sig. (p-value)
Albumin	-0.186	0.063
Admission BMI status	-0.158	0.117
Pre-hospitalization BMI status	-0.190	0.058

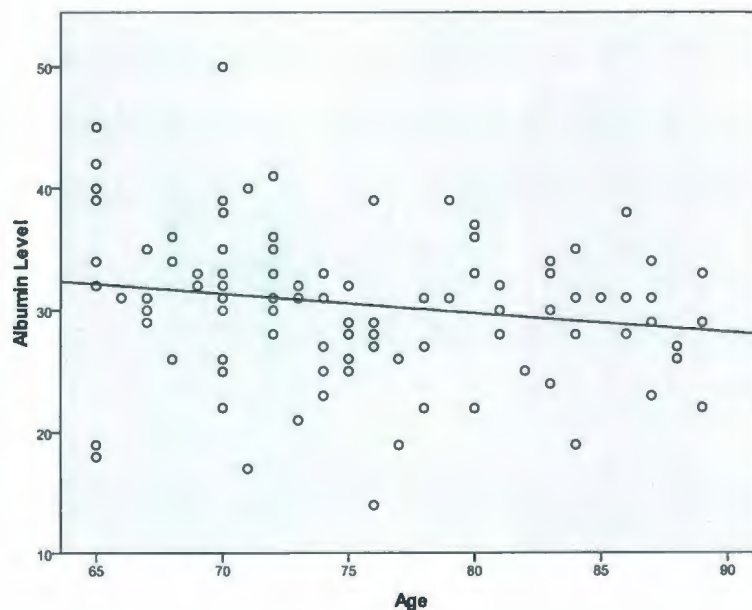
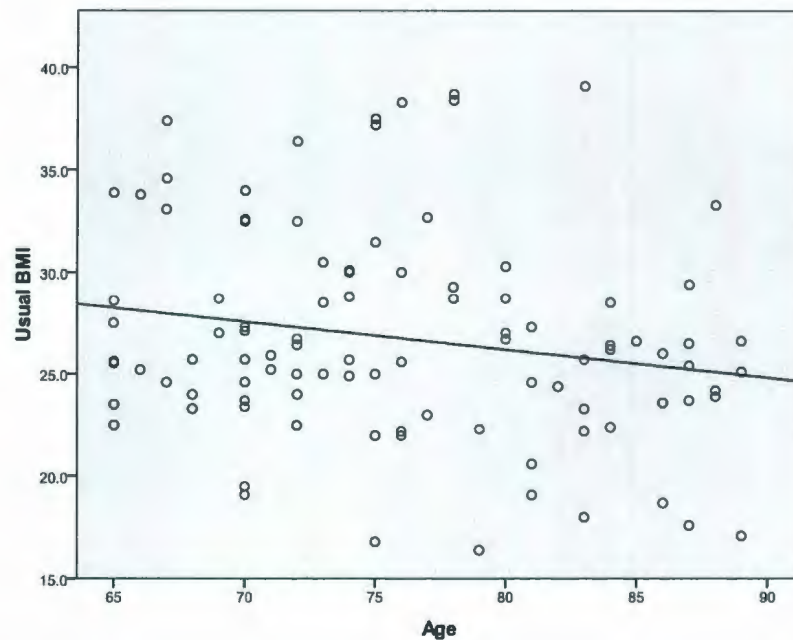


Figure 5.3 Scatter plot of age versus admission serum albumin level with interpolation line (n=100)



**Figure 5.4 Scatter plot of age versus pre-hospitalization BMI with interpolation line
(n=100)**

In summary, patients tended to become significantly less physically active as they aged, and also tended to have lower BMIs and serum albumin levels with increasing age, although these associations were not significant at a 95% level of confidence.

5.2.2 Gender differences

Cross-tabulations of gender versus weight stability, level of appetite and pre-hospitalization level of activity are included in Appendix 10 – Tables 1-3.

Results of chi square analyses between gender and weight stability, appetite, and pre-admission level of activity are shown in table 5.8.

These results showed that gender had a significant association with weight stability (p-value=0.016). A visual demonstration of this relationship showed that curiously, more males suffered from severe weight loss (53.6% of males) whereas more

Table 5.8 Chi-square values of analysis between gender of the sample and the continuous variables of weight stability, appetite, and pre-hospitalization activity level among geriatric rehabilitative patients (n=100)

Variable	Pearson Chi-Square Value	Degrees of freedom	P-value (2-sided)
Weight stability Severe Moderate Mild Stable	10.391	3	0.016
Appetite Poor Fair Good Excellent	5.554	3	0.135
Activity Sedentary Fairly active Moderately active Very active	8.869	3	0.031

females tended to have stable weight (52.3% of females) (see figure 5.5).

There was also a significant relationship between gender and pre-hospitalization level of activity (p-value=0.031); men tended to be more active than women, which is consistent with the traditional beliefs about gender and activity level. 52.3% of women were classified as “fairly active” in comparison to 33.9% of men, and 25.0% of men were classified as “very active” compared to 4.5% of women. These differences are shown in figure 5.6. Appetite level was not significantly associated with gender (p-value=0.135).

An independent sample t-test examining the association of gender with serum albumin levels and BMI values showed that there was no significant relationship between

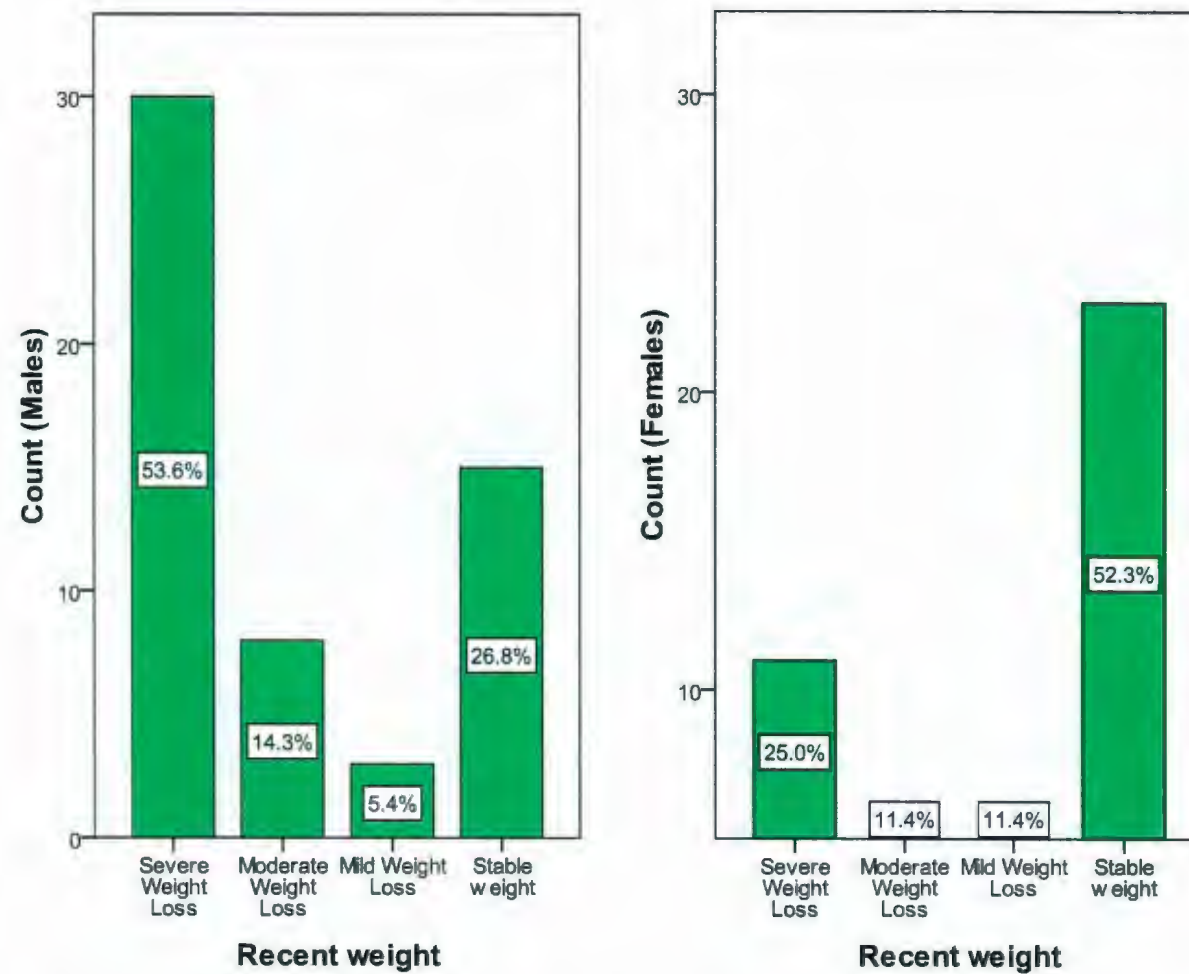


Figure 5.5 Percent of subjects versus weight stability, stratified by gender (n=100)

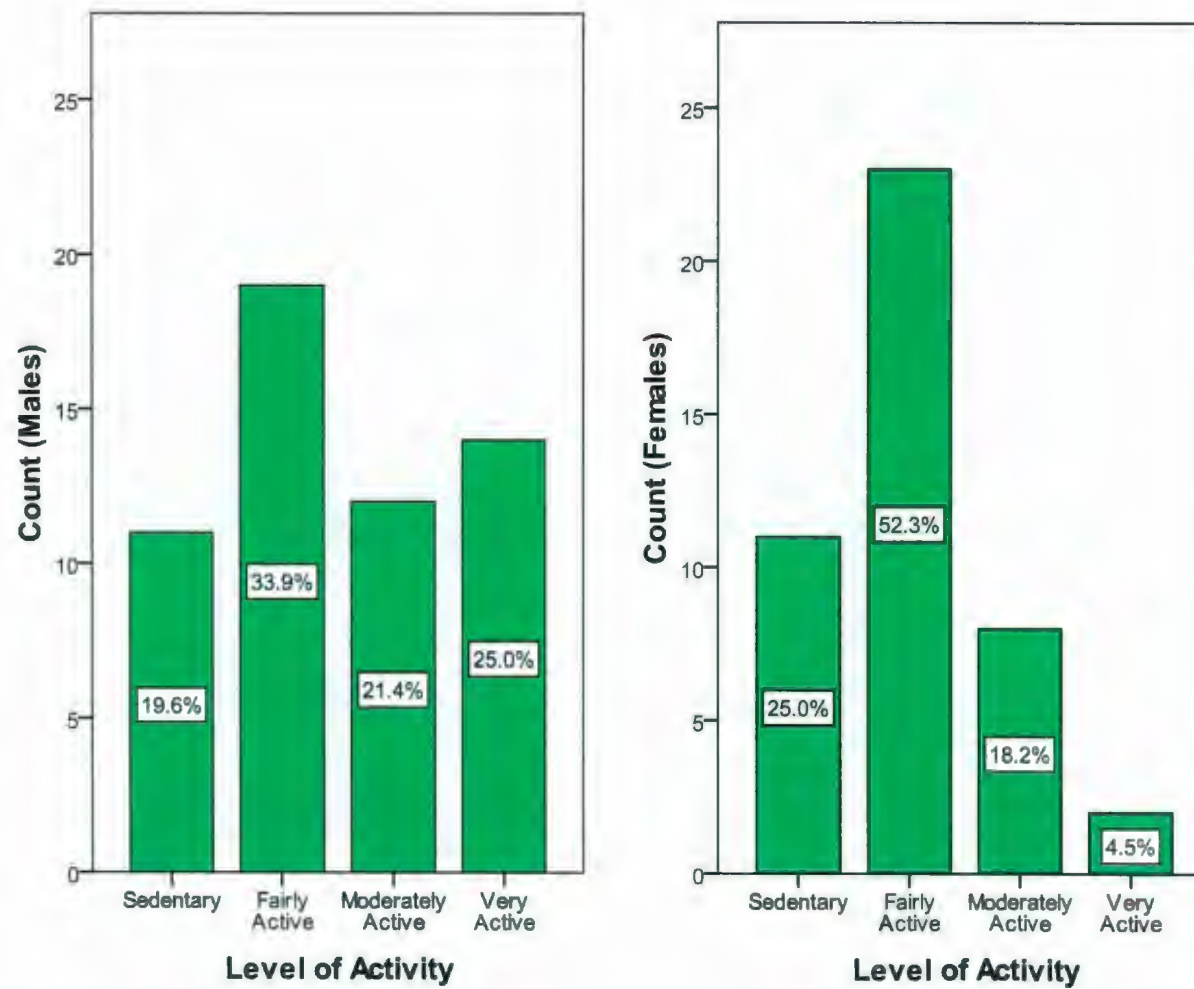


Figure 5.6 Percent of subjects versus pre-hospitalization level of activity, stratified by gender (n=100)

gender and serum albumin (p-value=0.827), BMI on rehabilitation admission (p-value=0.382), and BMI prior to acute care hospitalization (p-value=0.846). These results are shown in table 5.9.

Table 5.9 Independent sample t-test of gender of the sample versus the continuous variables of rehabilitation admission serum albumin level, BMI on rehabilitative admission, and pre-hospitalization BMI (equal variances assumed, n=100)

	Gender	
	T value	Sig. p-value (2-tailed)
Serum albumin level	-0.219	0.827
BMI on rehabilitation admission	-0.878	0.382
Pre-hospitalization BMI	0.194	0.846

In summary, males tended to be more active than women before acute care hospitalization, but also curiously tended to have more significant weight loss during acute care stay than women.

5.2.3 BMI on rehabilitation admission

Results of the ANOVA procedure between rehabilitation admission BMI and weight stability, appetite, and pre-hospitalization level of activity are shown in table 5.10. Rehabilitation admission BMI was significantly linearly associated with weight stability (p-value=0.019), but not with appetite (p-value=0.837) or pre-hospitalization level of activity (0.431). The relationship between weight stability and BMI on rehabilitation

Table 5.10 Analysis of variance (ANOVA) of association between rehabilitation admission BMI of the sample and the categorical variables of weight stability, appetite, and pre-hospital level of activity (n=100)

	Rehabilitation admission BMI	
	ANOVA F-value	Sig. (p-value)
Weight stability	3.479	0.019
Appetite	0.283	0.837
Pre-hospital level of activity	0.926	0.431

admission is demonstrated graphically in figure 5.7. Individuals who had severe weight loss during acute care stay (BMI=23.3 kg/m²) tended to have lower BMI values than individuals who had stable weight (BMI=26.8 kg/m²). It is important to note that even among older adults who suffered from significant (severe or moderate) weight loss, the mean BMI value (23.7 kg/m²) was in the normal range of starting above 18.5 kg/m² and going above 24.9 kg/m² as recommended by Health Canada (2003).

The ANOVA analysis showed that rehabilitation admission BMI was not significantly associated with pre-hospitalization activity level. However, further examination by plotting a histogram (see figure 5.8) showed an association: individuals who were usually sedentary tended to have a significantly higher mean BMI upon rehabilitation admission (26.3 kg/m²) than individuals who were usually very active (24.3

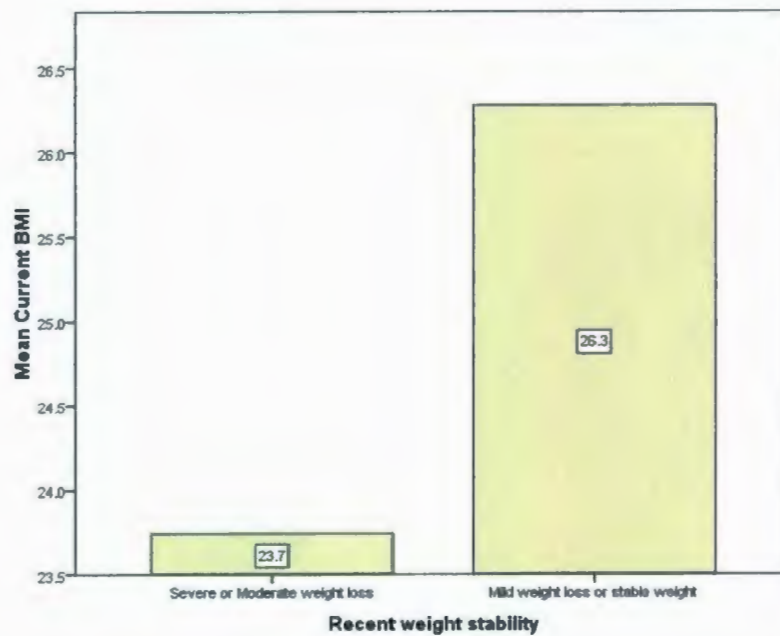


Figure 5.7 Histogram of recent weight stability versus rehabilitation admission BMI
(n=100)

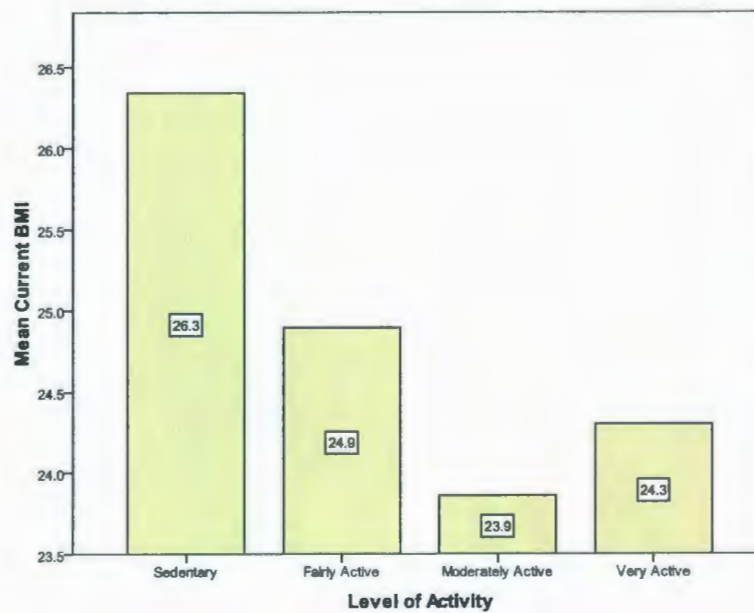


Figure 5.8 Histogram of pre-hospitalization level of activity versus rehabilitation admission BMI (n=100)

kg/m²), but there was no significant change in admission BMI between patients who were moderately active (23.9 kg/m²) and patients who were very active (24.3 kg/m²).

In conclusion, weight loss during acute care stay and level of activity prior to acute care hospitalization were significantly associated with BMI upon rehabilitation admission.

5.2.4. Serum Albumin levels on rehabilitation admission

Results of the ANOVA procedure between rehabilitation admission serum albumin levels and weight stability, appetite, and pre-hospitalization level of activity are shown in table 5.11. Rehabilitation admission serum albumin level was significantly linearly associated with appetite (p-value=0.000) and pre-hospitalization level of activity (0.013), but not with weight stability (p-value=0.398). The relationship between appetite and serum albumin levels on rehabilitation admission is demonstrated graphically in figure 5.9. Older patients with good or excellent appetites tended to have higher serum albumin values than patients with poor or fair appetites, although these values were still not as high enough to fall in the normal 35-40 g/dl reference range. As well, figure 5.10 shows that older patients who were very active had the highest serum albumin levels compared to other activity levels.

Correlation analysis of rehabilitation admission serum albumin with rehabilitation admission BMI (p-value=0.831) and pre-hospitalization BMI (p-value=0.510) showed that neither BMI values were significantly correlated with serum albumin levels at rehabilitation admission in older adults. These results are included in table 5.12.

Table 5.11 Analysis of variance (ANOVA) of association between rehabilitation admission serum albumin level of the sample and the categorical variables of weight stability, appetite, and pre-hospital level of activity (n=100)

	Serum Albumin	
	ANOVA F-value	Sig. (p-value)
Weight stability	0.996	0.398
Appetite	7.400	0.000
Pre-hospital level of activity	3.811	0.013

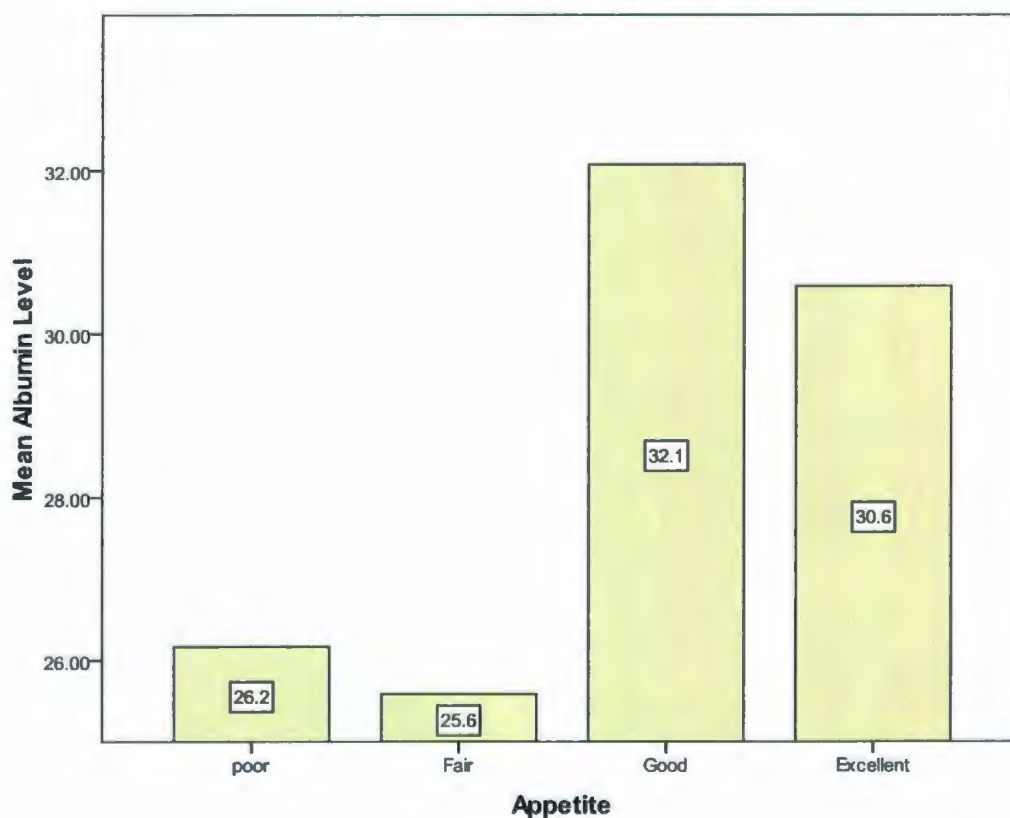


Figure 5.9 Histogram of rehabilitation level of appetite versus rehabilitation admission serum albumin level (n=100)

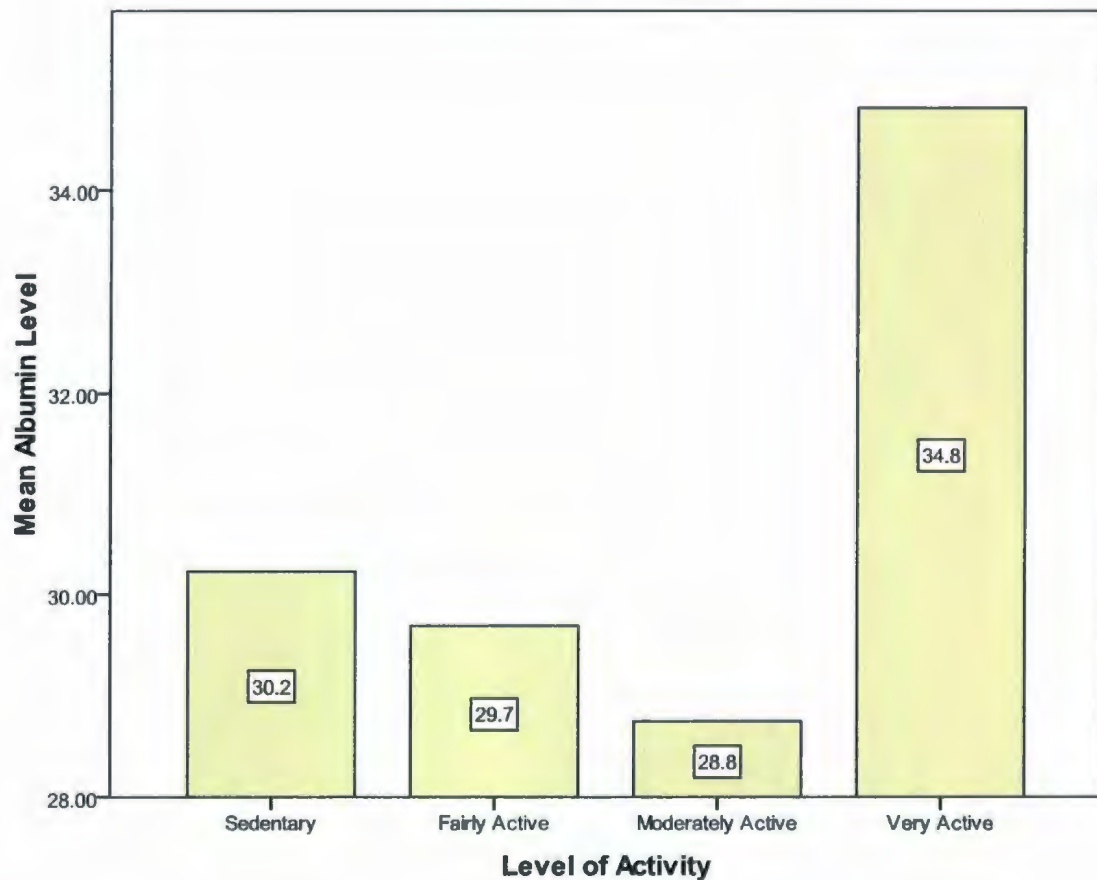


Figure 5.10 Histogram of pre-hospitalization level of activity versus rehabilitation admission serum albumin level (n=100)

Table 5.12 Linear correlation analysis between rehabilitation admission serum albumin of the sample and the continuous variables of rehabilitation admission BMI and pre-hospitalization BMI in geriatric rehabilitative patients (n=100)

	Serum Albumin	
	Pearson Correlation	Sig. (p-value)
Admission BMI status	0.022	0.831
Pre-hospitalization BMI status	-0.067	0.510

In summary, serum albumin upon rehabilitation admission was significantly higher in older patients who had good or excellent appetites during rehabilitation and were usually very active prior to hospitalization, but was not significantly associated with weight stability or BMI values.

6.0 Discussion

This project provided an excellent opportunity to identify some of the challenges faced by dietitians working in rehabilitative settings across Canada, and to study the relationships between different indicators used to assess the nutritional status of geriatric rehabilitative inpatients.

6.1 Lack of standardization of nutritional assessment

Results of the interviews revealed that although dietitians within facilities conducted similar nutritional assessments, assessment practices differed from institutions. This was consistent with Foltz, Schiller, and Ryan (1993)'s study which found that although most institutions had policies for nutrition screening and assessment, the assessment practices of most dietitians varied greatly from institutions. All dietitians used self-developed assessment tools which were validated through experience. In addition, the dietitians surveyed believed that there is a lack of clarity for practice in their field. They also felt that research into nutritional assessment in inpatient geriatric rehabilitation was lacking. Dietitians were also displeased with the lack of information about effective nutrition outcome monitoring. However, dietetic practice-based research which illuminates these practices in geriatric rehabilitation is sparse.

Results of the study showed that the geriatric rehabilitation facilities/units the dietitians worked at seemed to have similar procedures of rehabilitation: admission and information transfer processes were comparable, largely due to usage of computer systems, and all facilities/units had high levels of communication between multi-disciplinary teams of health professionals. Specific criteria for the systems of

rehabilitations, such as admission, referral, and nutritional screening procedures, such as the geriatric rehabilitation framework released by the GTA Rehab Network (2008) which includes criteria that must be met by all rehabilitative geriatric facilities and units in the Greater Toronto Area, would maximize consistency throughout institutions and health regions, and may lead to more efficient processes of geriatric rehabilitation.

Ideally, all geriatric rehabilitation facilities should have the same processes and criteria (GTA Rehab Network, 2007). However, the diversity of older adults across Canada (Miller et al, 1995), communication issues between other healthcare providers, and the current lack of research into appropriate nutritional factors and reference ranges for older adults (Kubrak & Jensen, 2007) makes this difficult. As well, while there are many validated tools available for older adults, such as the MNA, none of these tools have been validated for geriatric rehabilitative inpatient settings where patients may lack the ability to assess their health and mental status or to communicate their self-assessment. Clinical leadership as well as research and policy initiatives should be taken to develop and validate a nutritional assessment tool for these patients according to current research, and to standardize this tool in these settings to ensure consistency while allowing dietitians the freedom to modify their practices accordingly.

6.2 Screening versus assessment

The results of this study showed that more than half of the rehabilitative patients sampled suffered from significant weight loss during acute care stay, and BMI values were affected accordingly. Serum albumin values in the sample were also low, which could have been predictive of higher morbidity and mortality and poor clinical outcome

(Fuhrman, 2002). This study also revealed that dietitians tended to complete comprehensive nutritional assessments for their patients upon admission as opposed to screening. Screening may be helpful in identifying nutritional issues at a preliminary stage and could be used for appropriate allocation of dietetic resources, and is required in geriatric rehabilitation facilities and units in the Greater Toronto Area (GTA Rehab Network, 2008), but proper screening depends on the sensitivity and specificity of the tool being used and the individuals conducting the screening (Charney, 2008). Therefore, in order to deliver appropriate and timely nutritional intervention, it is advisable for dietitians to do a comprehensive initial nutritional assessment and follow-up. If dietetic resources or time are inadequate, a simple screening instrument that could be easily administered by non-dietary staff in the rehabilitation facility could be used, but dietitians should ensure that the screening tool is evaluated and tested before implementation in a clinical setting, and is highly sensitive and specific so that patients with nutritional risk are not missed (Charney, 2008).

6.3 Indicators of nutritional status

In geriatric rehabilitative settings, it is important for dietitians to use indicators of nutritional status that are valid, sensitive and specific, easy, non-invasive, and inexpensive. Common indicators used for initial and on-going nutritional assessment by dietitians interviewed in this study were weight status (BMI), severity of recent weight loss, level of appetite and physical activity, and biochemical values such as serum albumin. From the results of this study, it was difficult to say which nutrition-related

indicators may be best for predicting nutritional risk in geriatric rehabilitative patients upon admission, because the clinical and nutritional outcome of patients was not known.

Patients in this study tended to be more active before hospitalization than community dwelling older adults according to the Canadian Community Health Survey [CCHS]; 16% of patients in this sample were very active and 64% were sedentary or fairly active compared to 10% of very active and 71% of inactive older adults in the CCHS survey (Statistics Canada, 2005).

It was found from this study that weight loss is common during acute care stay among older adults. Studies have found that even small amounts of unintentional weight loss among older adults can lead to increased risk of mortality (Newman et al, 2001).

Therefore, monitoring the weight loss of geriatric patients may be of more value as a nutritional assessment indicator than weight status (Kubrak and Jensen, 2007).

Interestingly, gender seemed to be associated with the severity of weight loss during acute care stay in the patients studied, with males having more severe weight loss than females.

This may be explainable by noting that weight loss was calculated by comparing rehabilitation admission weight to pre-hospitalization weight, which was self-reported.

Studies show that there is a systematic bias when height and weight are self-reported, which may have affected the results reported in this study (Gunnell et al, 2000).

Any comorbidities or confounding factors among genders, as well as differences in length of stay, may have also affected these results. This relationship between gender and in-hospital weight loss including any associated health factors should be studied further.

Additionally, although more than half of the patients in the sample suffered from severe or moderate weight loss during their acute care stay, 77% had good or excellent appetites

on admission to the rehabilitation facility. These results are not surprising because prior medical conditions and complex medical procedures during acute care stay could have contributed to significant weight loss but patients should be generally medically stable with good appetites upon rehabilitation admission.

BMI is one of the most widely used indicators of nutritional status used in clinical and hospital settings (Olsen et al, 2008). BMI in this study seemed to be associated with weight loss during hospitalization and pre-hospitalization level of activity. Pre-hospitalization BMI tended to decrease as patients got older, though not significantly. It is important to note that this may have been because rather than patients losing weight as they got older, patients with normal BMIs may have lived longer than patients with higher BMIs. According to the BMI values of the geriatric patients in the sample, a very small number of patients could be classified as having poor nutritional status using the Health Canada (2003) recommendations. This is consistent with the CCHS data (Statistics Canada, 2005), which classify 2.9% of community dwelling older adults in Newfoundland and Labrador as underweight. However, the fact that analysis showed that more than half of the patients included in this study's data suffered from significant weight loss during their acute care stay suggested that, as Cook et al (2005) stated, BMI may not be sensitive enough to recognize small yet clinically-significant weight losses in patients, or that the available cutoff points provided by Health Canada (2003) may not have been specific enough to detect nutritional risk in this sample. One dietitian interviewed for this study was also hesitant to use BMI for nutritional assessment of her patients because reference ranges available for clinical use were inappropriate or outdated for older adults.

Serum albumin is also commonly observed in assessing nutritional status, and its usefulness in predicting clinical and functional outcomes is well-known (Kubrak & Jensen, 2007; Fuhrman, 2002). The mean serum albumin level of the sample in this study was low enough to indicate health risk, and serum albumin levels on rehabilitation admission were significantly lower in people who had poor appetites and low activity levels. However, the results of this study did not show any significant associations with weight indicators of nutritional status such as BMI and weight loss during acute care hospitalization. This shows that serum albumin may have been associated with morbidity rather than nutritional status, because low appetite and activity levels may have been indicative of illness. This result is consistent with research that serum albumin may be a better indicator of morbidity rather than nutritional needs (Bouillanne et al, 2005; Fuhrman, 2002; Kubrak & Jensen; Lewis & Bell, 1990). As well, although all dietitians interviewed used serum albumin values to assess their patients, serum albumin reference ranges may not be appropriate for assessing nutritional risk in older adults because serum albumin tends to decrease with age (Salive et al, 1992; Veering et al, 1990). This was also shown in this study, which showed that serum albumin tended to decrease as patients got older, although this association was not significant.

Omran and Salem (2002) have noted that anthropometric standards are lacking for the elderly, and data for average weights in older adults is outdated. Most dietitians interviewed also did not use anthropometric indicators such as skinfold and circumference measurements because they felt that the standards available were inappropriate for use among their patients. Better reference ranges for nutrition-related

indicators among institutionalized older adults are needed (Bouillanne et al, 2005; Kubrak & Jensen, 2007).

Research that leads to the development and validation of assessment/outcome tools appropriate for hospital-based inpatient rehabilitation services is needed. Larger studies that attempt to determine appropriate reference ranges and standards for nutritional indicators used to determine nutritional risk among geriatric rehabilitative patients are also warranted. As well, a longitudinal study analyzing nutritional status on admission with final clinical outcome may be helpful in determining which nutrition-related indicators are able to predict nutritional risk in geriatric rehabilitative patients.

6.4 Limitations

The limitations of this study are as follows:

- Due to time limitations, a small sample size was used to collect qualitative data. Due to this small sample size, statistical analyses could not be conducted. As well, because the sample size was small, data saturation may not have occurred. More studies on a larger scale would be useful.
- Dietitians may have forgotten to mention any additional nutritional indicators or assessment forms they used during the interview that were not listed in the interview questionnaire that was provided.
- Results obtained from nutritional data of geriatric rehabilitative patients may be generalizeable only in the province of Newfoundland and Labrador, and may not accurately reflect geriatric rehabilitative patients across Canada.

- Height, usual weight and pre-hospital level of activity of geriatric rehabilitative patients included in secondary data were self-reported, and may not have been as accurate as objective measurements (Gunnell et al, 2000).
- As the previous study “Effectiveness of BMI in determining nutritional risk of geriatric rehabilitative patients” was a cross-sectional study examining the nutritional risk indicators on admission, final rehabilitative status of the patients in the sample was not included, and therefore the effectiveness of the indicators in predicting the nutritional and overall well-being of these patients could not be analyzed.

7.0 Conclusion

Determining the nutritional risk of patients on admission to geriatric rehabilitation facilities/units and initiating timely and appropriate nutrition intervention is crucial in optimizing nutritional status of geriatric rehabilitative patients. In dietetic practice, comprehensive initial nutritional assessments and follow-ups during rehabilitation may be warranted, though basic initial screening may be used for allocating resources. While this study could not attest to the validity of the indicators used to determine nutritional status because the final rehabilitative outcome of the patients was not known, many studies suggest that weight loss may be the best way to predict poor nutritional status. This study showed that BMI upon rehabilitation admission may not have been as sensitive in indicating poor nutritional status as weight loss during hospitalization.

This study revealed that most rehabilitation facilities and units had similar systems of admission, referral, and information transfer. Development and implementation of specific criteria would ensure maximum consistency of these practices among rehabilitative units. Results also revealed that many dietitians use different modified versions of several nutritional screening and assessment tools to assess the nutritional status of their geriatric rehabilitative patients. Efforts should be made by dietitians and policy makers to develop and validate a nutritional assessment tool for these patients, and standardize its use in rehabilitation facilities across Canada. Further studies to observe how standardization of a nutritional assessment tool may affect rehabilitative outcomes in geriatric rehabilitative units may be useful. As well, research into appropriate cutoff points and reference ranges of nutrition-related indicators for geriatric patients, especially

BMI and serum albumin, is warranted. Unification and clarification of the outcome process and development of better outcome measures for determining the effectiveness of nutritional intervention would also improve professional accountability and credibility. Further research into these outcome procedures could help to define goals of patient care plans better, and could facilitate effective monitoring and evaluation of nutritional intervention.

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rural Chinese. *Internal Medicine Journal*, 38, 580-586.

APPENDICES

Appendix 1

Human Investigations Committee Approval



Faculty of Medicine

Human Investigation Committee
2nd Floor, Eastern Trust Bldg.
95 Bonaventure Avenue
St. John's, NL Canada A1B 2X5
Tel: 709 777 6974 Fax: 709 777 8776
hic@mun.ca www.med.mun.ca/hic

March 26, 2009

Reference #09.54

Ms. Saman Iqbal
Community Health
Faculty of Medicine

Dear Ms. Iqbal

RE: An investigation into the procedure of assessing nutritional status of rehabilitative Geriatric patients in Canada

Your application received an expedited review by the Human Investigation Committee. Full approval was granted for one year effective March 26, 2009.

This approval will lapse on **March 26, 2010**. It is your responsibility to ensure that the Ethics Renewal form is forwarded to the HIC office prior to the renewal date. *The information provided in this form must be current to the time of submission and submitted to HIC not less than 30 nor more than 45 days of the anniversary of your approval date.* The Ethics Renewal form can be downloaded from the HIC website <http://www.med.mun.ca/hic/downloads/Annual%20Update%20Form.doc>

The Human Investigation Committee advises THAT IF YOU DO NOT return the completed Ethics Renewal form prior to date of renewal:

- *Your ethics approval will lapse*
- *You will be required to stop research activity immediately*
- *You may not be permitted to restart the study until you reapply for and receive approval to undertake the study again*

Lapse in ethics approval may result in interruption or termination of funding

For a hospital-based study, it is your responsibility to seek the necessary approval from Eastern Health and/or other hospital boards as appropriate.

Modifications of the protocol/consent are not permitted without prior approval from the Human Investigation Committee. Implementing changes in the protocol/consent without HIC approval may result in the approval of your research study being revoked, necessitating cessation of all related research activity. Request for modification to the protocol/consent must be outlined on an amendment form (available on the HIC website) and submitted to the HIC for review.

This research ethics board (the HIC) has reviewed and approved the research protocol and documentation as noted above for the study which is to be conducted by you as the qualified investigator named above at the specified site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Human Investigation Committee currently operates according to *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* and applicable laws and regulations. The membership of this research ethics board is constituted in compliance with the membership requirements for research ethics boards as per these guidelines.

Notwithstanding the approval of the HIC, the primary responsibility for the ethical conduct of the investigation remains with you.

We wish you every success with your study.

Sincerely,



John D. Hamett, MD, FRCPC
Co-Chair
Human Investigation Committee

Richard S. Neuman, PhD
Co-Chair
Human Investigation Committee

C C Dr. R. Gosine, c/o Office of Research, MUN
Mr. W. Miller, c/o Patient Research Centre, Eastern Health
HIC meeting date: April 2, 2009



RECEIVED APR 05 2010

ETHICS RENEWAL / CLOSURE FORM HUMAN INVESTIGATION COMMITTEE

Last Approval Date: 03/26/2009

Reference Number: 09.54

Title of Study: "An Investigation into the Procedure of Assessing Nutritional Status of Rehabilitative Geriatric Patients in Canada."

Principal Investigator(s): Saman Iqbal

Email of PI or Key Contact: s.iqbal@mun.ca

The Tri-Council Policy Statement (TCPS) on Ethical Conduct for Research Involving Humans (1998) (article 1.13) requires ongoing review by the approving REB at least on an annual basis. The information provided in this form must be current to the time of submission and submitted to the HIC not less than 30 nor more than 45 days of the anniversary of your approval date.

- *Incomplete forms will not be accepted and may result in delay in the review and approval process*
- *If the project is complete – please submit the applicable Study Closure form (for clinical trials).*

RECRUITMENT/DATA COLLECTION

Has the study started?

(YES) / NO

If yes, please provide the following numbers for either A OR B.

	Total planned	Total to date at local site
A. Participants	5-10	5
B. Health Records, tissue samples, Questionnaires		

If more or fewer than expected, why?

Please give the date of the most recently approved consent form (DD/MM/YY): 27/11/09 N/A

For Clinical Trials Only (ICH & Health Canada require SAEs/unexpected events be reported to the REB)

(N/A)

SERIOUS ADVERSE EVENT/S (SAE's) or UNEXPECTED EVENTS

Since Last Approval

- Have DSMB/ QSR reports been submitted?
- Have you reported local SAE's?
- If yes, please provide number of **local** events:
- Have you reported deviations to the sponsor?
- Have you requested waivers?

YES / NO

YES / NO

YES / NO

If yes # _____

YES / NO

If yes # _____

Other studies:

Have there been unexpected events or problems related to participant risk since original approval or last ethics renewal? YES / **(NO)**

If yes, please describe the events/problems: _____
(Add an addendum to this form if necessary)

STUDY STATUS AT LOCAL SITE (circle all that apply)

Intervention/data collection active YES / **(NO)** / NA
Closed to recruitment/accrual **(YES)** / NO / NA
Participants in follow up YES / **(NO)** / NA
Site closed [clinical trials only] YES / NO / **(NA)**
For secondary use of data only is Data Transfer Complete **(YES)** / NO / NA

KNOWLEDGE TRANSFER

Have participants been informed of study findings? YES / **(NO)** / N/A

Have findings been presented/published? YES / **(NO)** / N/A

Indicate where: _____

- Ethics approval is required if there is ongoing subject contact or data collection/transfer is active.
- If the project is in analysis or the writing stage, ethics approval is not required and the file may be closed.
- Please forward a summary of findings or published abstract to the HIC Office once the study is complete.

I am requesting renewal of ethics approval

Yes ☒ No ☐

OR *I am requesting that HIC close the file*

Yes ☐ No ☐

SAMAN IQBAL

Name typed or printed

Saman

Signature

04 05 2010

Date

For HIC Office Use Only:

This project was reviewed on April 6, 2010 by _____
Date

Full Board Review ☐

Expedited Review ☒

Ethics Approval for this project (HIC # 09.54) has been granted for a period of 12 months effective on

March 26, 2010

Approval Date

f

Signature Chair

APPROVED APR 06 2010

Date

Appendix 2

Research Proposal Approval Committee (RPAC) Approval



Eastern Health

**Department of Research
Corporate Strategy & Research
Rutter Building, 22 Pearl Place
P.O. Box 13122
St. John's, NL A1B 4A5
Tel: (709) 752-4636
Fax: (709) 752-4733**

April 14, 2009

Ms. Saman Iqbal
Community Health
Faculty of Medicine
Health Sciences Centre
300 Prince Philip Drive
St. John's, NL A1B 3V6

Dear Ms. Iqbal:

Your research proposal HIC #09.054 – *"An investigation into the procedure of assessing nutritional status of rehabilitative geriatric patients in Canada"* was reviewed by the Research Proposals Approval Committee (RPAC) of Eastern Health at its meeting on April 14, 2009 and we are pleased to inform you that the proposal has been approved.

The approval of this project is subject to the following conditions:

- The project is conducted as outlined in the HIC approved protocol;
- Adequate funding is secured to support the project;
- In the case of Health Records, efforts will be made to accommodate requests based upon available resources. If you require access to records that cannot be accommodated, then additional fees may be levied to cover the cost;
- A progress report being provided upon request.

If you have any questions or comments, please contact Donna Bruce, Manager of the Patient Research Centre at 777-7283.

Sincerely,

Mike Doyle, PhD
Director of Research
Corporate Strategy & Research
Chair, RPAC

cc: Ms. Donna Bruce, Manager Patient Research Centre

Appendix 3

**Request and release letters for secondary use of
data from the study “Effectiveness of BMI in
determining nutritional risk of geriatric
rehabilitative patients”**

March 8, 2009

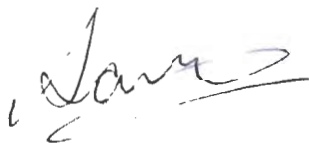
Saman Iqbal
Community Health, Faculty of Medicine
Memorial University of Newfoundland
St. John's NL A1C 5S7

Suja Varghese
Clinical Dietitian
Dr. L.A. Miller Centre
100 Forest Road
St. John's NL A1A 1E5

Dear Ms. Varghese,

I am writing to request the use of data from your study entitled "Effectiveness of BMI in determining nutritional risk of geriatric rehabilitative patients" for secondary use. I am completing a M.Sc. thesis project called "An investigation into the procedure of assessing nutritional status of rehabilitative geriatric patients in Canada", and would like to use the data used in your study for analysis. This data includes BMI, recent weight loss, appetite level, level of activity, and serum albumin, for 100 medically stable non-osteoporotic patients at the L.A. Miller Centre.

Sincerely,

A handwritten signature in dark ink, appearing to read 'Saman Iqbal', with a stylized flourish at the end.

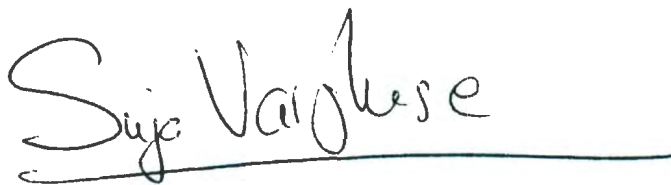
Saman Iqbal

March 9, 2009

Saman Iqbal
Division of Community Health and Humanities
Faculty of Medicine
Memorial University of Newfoundland
St. John's, NL
A1C 5S7

I agree to release the data collected for the study "Effectiveness of BMI standards in determining the nutritional risk of geriatric rehabilitative patients" (HIC # 06.234) for your proposed study "An investigation into the procedure of assessing nutritional status of rehabilitative geriatric patients in Canada"

Sincerely

A handwritten signature in black ink that reads "Suja Varghese". The signature is written in a cursive style and is underlined with a single horizontal line.

Suja Varghese MSc RD
Clinical Dietitian
Dr. L. A. Miller Centre Site- Eastern Health

Appendix 4

Samples of cover and consent letters to dietitians

Saman Iqbal
Community Health, Faculty of Medicine
Memorial University of Newfoundland
St. John's NL A1C 5S7
(709) 579-1686
s.iqbal@mun.ca

Dear Sir/Madam,

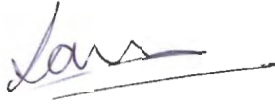
As a dietitian who assesses the nutritional status of geriatric patients in rehabilitative facilities, you have been asked to participate in a M. Sc. research project titled "An Investigation into the Procedure of Assessing Nutritional Status of Rehabilitative Geriatric Patients in Canada", being conducted at the Community Health section of the Faculty of Medicine at Memorial University of Newfoundland. The primary investigator of this study is Saman Iqbal, who is a graduate student supervised by Ms. Suja Varghese (M. Sc., RDt.) and Dr. Veeresh Gadag (M. Phil., Ph. D).

This study will examine the way dietitians across Canada detect poor nutrition in adults 65 years or older who are admitted to geriatric rehab facilities after hospitalization, and provide recommendations for re-evaluation of the nutrition assessment process used by dietitians and facilities in geriatric rehabilitation. Because there is no level of standardization for geriatric rehabilitation in Canada, comparing the nutritional processes and indicators used by different dietitians can provide a clear picture of how dietitians across Canada provide geriatric rehabilitation. Dietitians from various geriatric rehabilitation facilities in different provinces across Canada will be interviewed over the phone, and the responses will be analyzed appropriately.

Attached with this letter is a letter of consent and the interview form the investigators will use to analyze your responses. These documents are included as preliminary reading material so that you may consider the questions being asked, and decide if you wish to participate. Please read these materials carefully, as the letter of consent informs you of your rights and the responsibilities of the researchers conducting this study, and prior understanding of the interview questions will facilitate a more thorough review. You do not have to fill or send anything out. If you do wish to participate, an interviewer will contact you via telephone at a time already set by you and the investigator. Before the interview, consent will be discussed, and any questions or concerns you may have about taking part in the study will be addressed. If you are still willing to participate, formal verbal consent will be obtained from you, and the interview, lasting approximately 30 minutes to 1 hour, will be conducted.

If you have any questions or concerns about the study, consent, or interview process, please feel free to contact the principal investigator, Saman Iqbal, at (709) 579-1686, or at s.iqbal@mun.ca. We look forward to hearing from you.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Saman', with a horizontal line drawn underneath it.

Saman Iqbal
M. Sc. (Med.) Candidate

Letter of Consent:
**“An Investigation into the Procedure of Assessing Nutritional Status of
Rehabilitative Geriatric Patients in Canada”**

Primary investigator: Saman Iqbal, Community Health, Faculty of Medicine, Memorial
University of Newfoundland

If you decide not to participate in the study, this will not affect your employment or your daily life in any way. When you provide consent, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities. There are no physical risks for you in this study, although you may be inconvenienced by the time needed to read the given material and participate in the interview.

The research team will collect and use only the information they need for this research study. This information will include the information from study interviews and questionnaires, and any other documents related to the study that you may wish to provide. Although direct quotes from the interviews might be published, your name or the facilities associated with you will not be specified in any publication. Your name and contact information will be kept secure by the research team in Newfoundland and Labrador. It will not be shared with others without your permission.

Every effort to protect your privacy will be made. However, it cannot be guaranteed. For example we may be required by law to allow access to research records. By granting consent, you give us permission to collect information from you, share information with the people conducting the study, and share information with the people responsible for protecting your safety.

The members of the research team will see study records that identify you by name. Other people may need to look at the study records that identify you by name. This might include the research ethics board. You may ask to see the list of these people. They can look at your records only when one of the research team is present. You may ask the researcher to see the information that has been collected about you.

Information collected for this study will be kept for 5 years after the study completion date. If you decide to withdraw from the study, the information collected up to that time will continue to be used by the research team. It may not be removed. This information will only be used for the purposes of this study. Information collected and used by the research team will be stored securely at the primary investigator's home. Saman Iqbal is the person responsible for keeping it secure.

If you have any questions about taking part in this study, you can contact Saman Iqbal, the investigator who is in charge of the study at this institution, at (709) 579-1686 or s.iqbal@mun.ca. Or, you can talk to someone who is not involved with the study at all, but can advise you on your rights as a participant in a research study. This person can be

reached through Office of the Human Investigation Committee (HIC) at 709-777-6974 or hic@mun.ca

Appendix 5

Sample of verbal script for obtaining consent from dietitians

Verbal script/form for obtaining consent

You attest that you have read the letter of consent and have had the opportunity to ask questions/to discuss this study. You have received enough information about the study, and have received satisfactory answers to all of your questions. You have spoken to Ms. Saman Iqbal, the primary investigator, and she has answered your questions. You understand that you are free to withdraw from the study at any time, without having to give a reason. You also understand that it is your choice to be in the study and that you may not benefit. You agree to take part in this study.

Name of investigator: _____

Name of participant: _____

Date: _____

Verbal consent obtained: _____

Appendix 6

Sample interview form for dietitians

Study code: _____

Initials: _____

Interview form for Dietitians

1. How do patients get admitted to the rehab centre?

- ☐ other hospital/medical centre referral
- ☐ family doctor referral
- ☐ personal admittance
- ☐ other _____

2. How much previous medical information is available to you on initial admission?

- ☐ none
- ☐ some hospitalization records
- ☐ some medical history
- ☐ all pertinent hospitalization records and history
- ☐ other _____

3. How closely do you work with your interprofessional team during rehabilitation?

- ☐ not close at all
- ☐ somewhat close
- ☐ fairly close
- ☐ very close
- ☐ not applicable _____

4. How satisfied are you with this system?

- ☐ very dissatisfied
- ☐ somewhat dissatisfied
- ☐ neither satisfied or dissatisfied
- ☐ somewhat satisfied
- ☐ very satisfied

Please explain (what, if anything, would you like to change?):

5. What indicators do you use to determine nutritional status? How are they measured, if applicable?

- ☐ height
- ☐ weight
- ☐ bmi
- ☐ albumin
- ☐ BUN
- ☐ level of appetite _____
- ☐ level of activity _____
- ☐ recent weight change _____
- ☐ waist circumference _____
- ☐ skinfold measurements _____

Study code: _____

Initials: _____

☐ other

6. Does your facility/unit have a nutritional screening tool to determine risk level of all patients on admission?

☐ Yes

☐ No

7. If yes, does your facility/unit generate dietitian consults for all patients identified as nutritionally at risk? If not, please explain how/whether patients identified as being at risk after screening are assessed.

☐ Yes

☐ No _____

8. Are there any standard screening/assessment tools used? If so, which ones?

☐ None

☐ Mini-Nutritional Assessment (MNA)

☐ Mini-Nutritional Assessment-Short form (MNA-SF)

☐ Subjective Global Assessment (SGA)

☐ Malnutrition Screening Tool (MST)

☐ Malnutritional Universal Screening Tool (MUST)

☐ other

9. If there are, have these tools been validated by you? (By comparing to other tools, or by doing a study?)

☐ yes

☐ no

10. Do you use a tool to measure and evaluate the outcome of nutritional intervention? If so, which one?

☐ yes, a standard, validated tool _____

☐ yes, a self-developed tool _____

☐ no

11. How satisfied are you with these methods and tools?

☐ very dissatisfied

☐ somewhat dissatisfied

☐ neither satisfied or dissatisfied

☐ somewhat satisfied

☐ very satisfied

Study code: _____

Initials: _____

Please explain (what, if anything, would you like to change?):

12. Is there a standardized procedure of nutritional assessment? That is, are there standardized protocols and policies in place with respect to nutritional assessment of patients?

- ☐ no
- ☐ yes, in my facility
- ☐ yes, in my district/area
- ☐ yes, in my city
- ☐ yes, in my province
- ☐ other _____

13. How satisfied are you with this level of standardization?

- ☐ very dissatisfied
- ☐ somewhat dissatisfied
- ☐ neither satisfied or dissatisfied
- ☐ somewhat satisfied
- ☐ very satisfied

Please explain (what, if anything, would you like to change?):

14. Additional comments:

Appendix 7

Sample nutritional data collection form

DATA COLLECTION FORM**Initials:**

Assessment Indicators	Initial Assessment			
Weight Stability	Severe Wt loss 1	Moderate Wt loss 2	Mild Wt loss 3	Stable Wt 4
Appetite	Poor 1	Fair 2	Good 3	Excellent 4
Level of activity	Sedentary 1	Fairly active 2	Moderately active 3	Very active 4

Age:**Gender:****Serum albumin:****Height:****Admission Weight:****Usual Weight:****Admission BMI:****Usual BMI:**

Weight loss			
	Low	Moderate	Severe
1 month	<2%	2.5%	>5%
3 month	<5%	5-7.5%	>7.5%
6 month	<7.5%	7.5-10%	>10%

Appendix 8

Dietitian comments during interviews

Responses to "1. How do patients get admitted to the rehab centre?"

Dietitian 01: Family doctor referral is not common

Dietitian 02: Outpatients come from geriatricians working in hospitals; inpatients from emergency units. Also admit patients from community waitlists.

Dietitian 03: Inpatients come from hospitals. Outpatients from personal admittees. Also, geriatric outreach team goes into a patient's home and recommends admittance. Patients are also recommended for team by family & doctors

Dietitian 04: Most patients come from allied health professionals & nursing homes. Personal admission is acceptable as long as patients fit the criteria for rehab. Also recommendations from local outreach group of MDs. As well, dietitian does home visits for clients with mobility issues that have been in before

Dietitian 05: Referral has to be through a physician. Patients also come from long term care centres and nursing homes. There is consultation within a network of professions and other counties. Also accepts regional recommendations from the outreach geriatric program

Responses to "2. How much previous medical information is available to you on initial admission?"

Dietitian 01: Mostly all pertinent hospitalization records and history. also have a physician on staff to assess their condition and history. some hospitalization records if they're coming from acute care

Dietitian 02: Access to Meditech – computer program with info & notes going to the past 3 or 4 years

Dietitian 03: Notes are not always current

Dietitian 04: For rural places in community, family doctors are hard to contact or not available. Need blood work which can't get for outpatients. For self-referrals etc. not much information is available – have to rely on what they tell you. All pertinent hospitalization records and history for all day hospital patients.

Dietitian 05: Comprehensive notes mostly from hospital & from long term care. Varies but in general, most information is available. "Electronic patient record" is also available. From regional geriatric programs, there are notes but little medical history.

Responses to "3. How closely do you work with your interprofessional team during rehabilitation?"

Dietitian 01: Closer with doctors and pharmacists

Dietitian 02: Rounds every Wednesday & Friday. Initial assessment is done with geriatricians as well as GPs, and then individual assessments are conducted. Only ~ 25 inpatients

Dietitian 03: Close with speech pathologists & nursing. Dietitians don't attend rounds but other do & let them know

Dietitian 04: if someone in one team picks up an issue, they let other teams know. Rounds very regularly. Everything is based on goals of client & family, who are considered part of the team

Dietitian 05: Meet once a week for rounds. Also have a communication book. Work very closely with speech pathologists for eating problems. 2 dietitians split into two care teams. Align themselves with home care manager, nurse practitioner, geriatricians. Everyone gets to look at patients quickly.

Responses to "4. How satisfied are you with this system?"

Dietitian 01: somewhat satisfied. Sometimes information transferred is not current regarding diet e.g. swallowing issues. There is a waiting period before dietitians can get to patients

Dietitian 02: very satisfied. Learned a lot about medication, physio & speech language pathology after starting work in the facility. All work pretty well together, seeing everything, talking to everyone

Dietitian 03: somewhat satisfied. Team is very good. Patient turnover is about a month & a half, so lack of time does not allow for rounds. Family conference when close to patients

Dietitian 04: Somewhat satisfied. Lack of communication with GPs, lack of coordination etc.

Dietitian 05: Very satisfied. Access to all info is available. For 85 – 95% of patients, see patients within a week. With acute care, sometimes there is no dietitian around, so unit referral is greater

Responses to “5. What indicators do you use to determine nutritional status? How are they measured, if applicable?”

Dietitian 01: Height measured by nursing. Sometimes if not measured, then self-reported. Sometimes half-arm span is measured. Weight upon admission and every week. Patients are also asked for normal weight. Level of appetite is observed in dining room. Also reported from nursing or other staff members, and patient or family members are asked as well. Patients are asked about level of activity in therapy. Sometimes it is previously reported. Skin – pressure sores if at risk of breakdown

Dietitian 02: Weight measured every Saturday but not at first admission. BMI is calculated only if at risk of malnutrition. Patients are asked for their usual body weight and weight history. Family is called if dietitians can't get this information. Don't have a good reference range. Level of appetite is measured by plate waste. Snacks are also observed. Level of activity is measured by dietetic observations and chart notes with physiotherapists. Waist circumference is not measured because it's not really accurate for seniors, and staff is not trained to do skinfold measurements properly. B12, folate, TSH-h, medications – huge part of appetite. Food consistency – mouth pain, dentures, problems chewing. History of eating, usual food patterns

Dietitian 03: Height, weight, BMI, and albumin are done for screening. Level of appetite is part of the nursing care plan, measured by plate waste. For level of activity, the 1.2 reference value is used for calculations. Form used – lab values, more observation etc, difficulty eating, swallowing, medications

Dietitian 04: Weight is measured on initial assessment. Also always ask about usual weight. Repeat measurements if weight change is an issue. Level of appetite is rated from clients. Patients may be asked about level of activity, but usually dietitians wait for physio reports. Weight circumference is not always possible for nonambulatory patients, but is done when possible. Used to do skinfold measurements but not anymore. Glucose, HbA1C, lipid profiles, serum ferritin, hemoglobin, B12, lymphocyte count, electrolytes, creatinine

Dietitian 05: Height and weight are always part of the initial admission, and double-checked. Weight is measured once weekly minimum. Food intake records from nursing are used to assess level of appetite. Also talk to patients about appetite. Level of activity

is observed while in the facility. Socioeconomic factors – living situation, social work assessments. Prealbumin, CBC, electrolytes, HbA1C, 25-hydroxy-D

Responses to “6. Does your facility have a nutritional screening tool to determine risk level of all patients on admission?”

Dietitian 01: Patients may get a consult upon admission, but in general, try to see all patients on admission. All patients are assessed, but those referred by doctor for nutrition care are seen ASAP

Dietitian 02: Depending on age group. Most tools are only good for community dwelling

Dietitian 03: Dietitian screens everyone for malnutrition using BMI & albumin, based on a study

Dietitian 04: Team assessment; team collaborates if other issues become apparent

Dietitian 05: No formal tool used but patients get screened in general upon admission. Used to do a specific screening but since everyone was high priority so stopped. Day hospital dietitian’s nurse uses MNA-SF

Responses to “7. If yes, does your facility generate dietitian consults for all patients identified as nutritionally at risk? If not, please explain how/whether patients identified as being at risk after screening are assessed.”

Dietitian 01: N/A

Dietitian 02: N/A

Dietitian 03: For outpatients, get consults from doctors. Consults are not done for inpatients

Dietitian 04: N/A

Dietitian 05: Consults only done by day hospital. In general, nurses & practitioners recognize nutritional red flags very well.

Responses to “8. Are there any standard screening/assessment tools used? If so, which ones?”

Dietitian 01: MNA, MUST, & SNAQ. In the process of looking at this right now.

Including parts of each and revamping current form, which has lots of writing. Trying to make it easier and save time. Short day stays so interventions have to be quick

Dietitian 02: MNA is the closest. Modified an older form and added to it a lot. The original wasn't as comprehensive, so altered everything to work for her based on research

Dietitian 03: MNA. Made up a new one with others taken in- same one [dietitian 01] uses. Most standard ones are for outpatients

Dietitian 04: Used to use MNA but it was modified. Weight change tool used by selves – quick & easy. Used by all three dietitians. “Nutrition outcome measurement” form.

Dietitian 05: MNA, and MNA-SF is used on an ongoing basis in the day hospital.

Adapted from clinical nutritional risk screen from ADA. Assigned point risk – broad point range so patients are assigned priority

Responses to 9. “If there are, have these tools been validated by you? (By comparing to other tools, or by doing a study?)”

Dietitian 01: No

Dietitian 02: No. The original wasn't as comprehensive, so altered everything to work for her, such as B12 value of over 250 as based on research.

Dietitian 03: Might in the future. So far, been validated through use

Dietitian 04: Seems very difficult. Are results related to nutrition or medication, etc?

Dietitian 05: Through repeated use, it's validated

Responses to "10. Do you use a tool to measure and evaluate the outcome of nutritional intervention? If so, which one?"

Dietitian 01: Use progress notes and follow up weekly/individually

Dietitian 02: Use weight & albumin, and appetite

Dietitian 03: Dietitians consult every month, last two discussing some way that easy to measure, such as weight

Dietitian 04: Use same tool for assessment, called initial interview & discharge

Dietitian 05: Look at goals of patients and integrated plan of care. Starting to use nutrition care progress from ADA

Responses to "11. How satisfied are you with these methods and tools?"

Dietitian 01: Somewhat dissatisfied. Could do better with time, and spend more time with patients, not paperwork

Dietitian 02: Somewhat satisfied. Ideal body weight ranges missing. Ones she uses are ~ 20 yrs old. Prealbumin and vitamin D would be great but costly & not usually done

Dietitian 03: Somewhat satisfied. Ongoing process. Would be great to find out what others are doing. For outcome measurements, would need for more than dietitian outcomes. 50% of patients come in with fractures

Dietitian 04: Very dissatisfied. In rehab, need to look at functionality. Nutrition, weight changes not enough. Nothing's been validated.

Dietitian 05: Both somewhat dissatisfied and somewhat satisfied. Feel we need better outcome measures. The outcome process of standardized language is new.

Responses to “12. Is there a standardized procedure of nutritional assessment? That is, are there standardized protocols and policies in place with respect to nutritional assessment of patients?”

Dietitian 01: Patients with physician consults take priority. That’s just the way it’s been done for years

Dietitian 02: No

Dietitian 03: No

Dietitian 04: Use the same form among all three dietitians. Meditech and [regional authority]’s dietitian’s handbook

Dietitian 05: Diet techs work very closely so all patients go through same process. All use electronic patient record, and nutritional outcome process being adapted citywide

Responses to “13. How satisfied are you with this level of standardization?”

Dietitian 01: Somewhat dissatisfied. At times, wish she could get to patients as soon as they’re admitted. Also, consults and referrals are not always appropriate. Standardization would help. If tools were more efficient, could get to follow up sooner

Dietitian 02: Somewhat satisfied. Likes the way she does it. Has freedom. Pretty specialized unit so don’t know about standardization. Good to have something to work off of that’s research based.

Dietitian 03: Neither satisfied nor dissatisfied. Across places, it would be good to be talking the same language. Sometimes the procedure is not the same, and unclear across programs.

Dietitian 04: Very dissatisfied: for charting for outpatients, need better policies. May be a need for communication & collaboration. All teams should be doing similar things &

similar charts so there's less overlap. Very satisfied: all communicate together for nutritional assessment.

Dietitian 05: Somewhat satisfied. Evolving nutrition care process. In general happy that patients are seen very early

Responses to "14. Additional comments"

Dietitian 01: Very interesting, and about time. Look forward to it

Dietitian 02: Meal observations and observations in general are very important. Role of dietitians has changed. Used to be much more impersonal, relying on charts. Really involved in care now. Time allocation is good especially

Dietitian 03: Is great to survey what other people do. Continuity of what's being done. For day patients, screening is done & then full assessment. Don't evaluate outcome. Might do it for just outpatients. Workload might allow for a fuller assessment.

Dietitian 04: N/A

Dietitian 05: N/A

Appendix 9 – Figures 1-4

**Bar charts of sample demographics for geriatric
rehabilitative patients in Newfoundland and
Labrador**

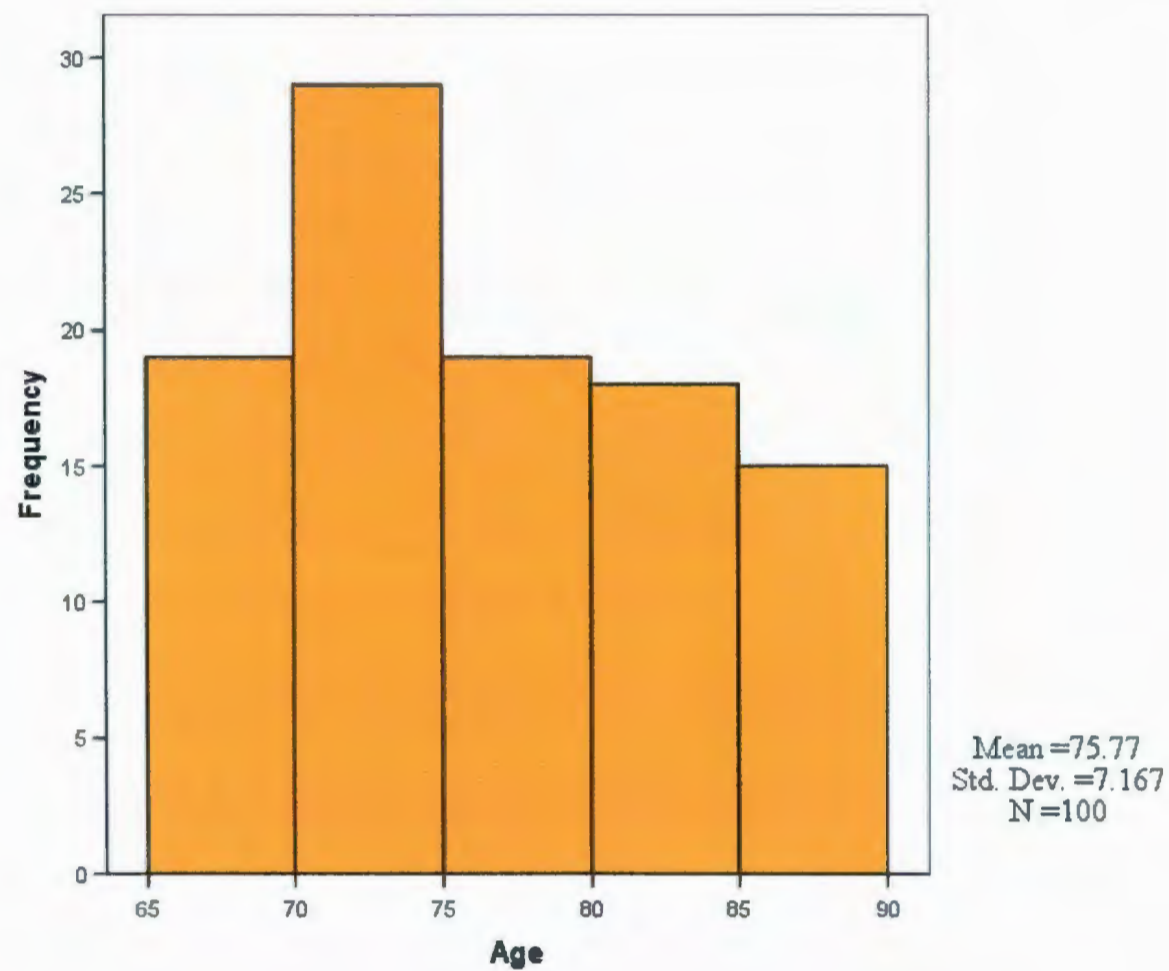


Figure 1 - Age distribution of 100 geriatric rehabilitative patients

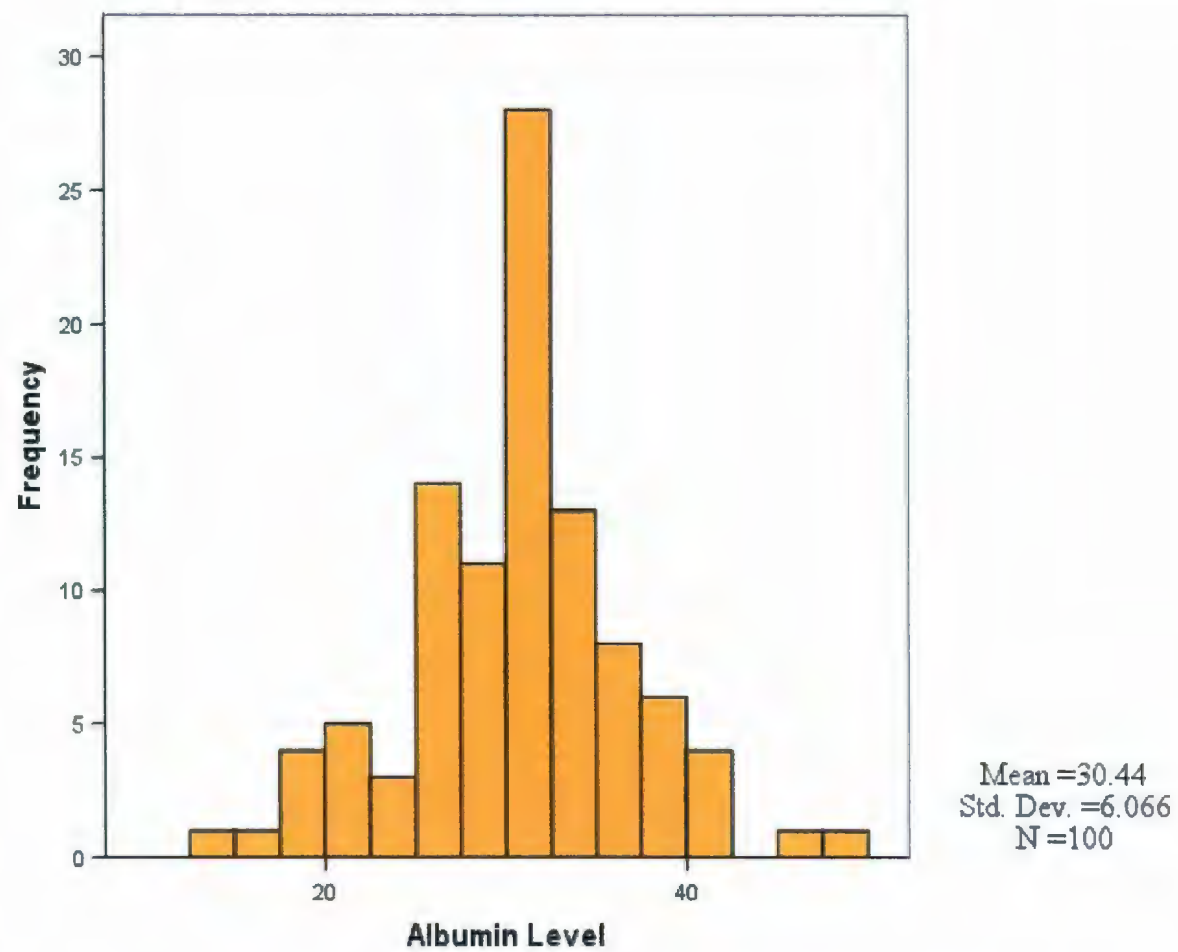


Figure 2 - Albumin levels of 100 geriatric rehabilitative patients

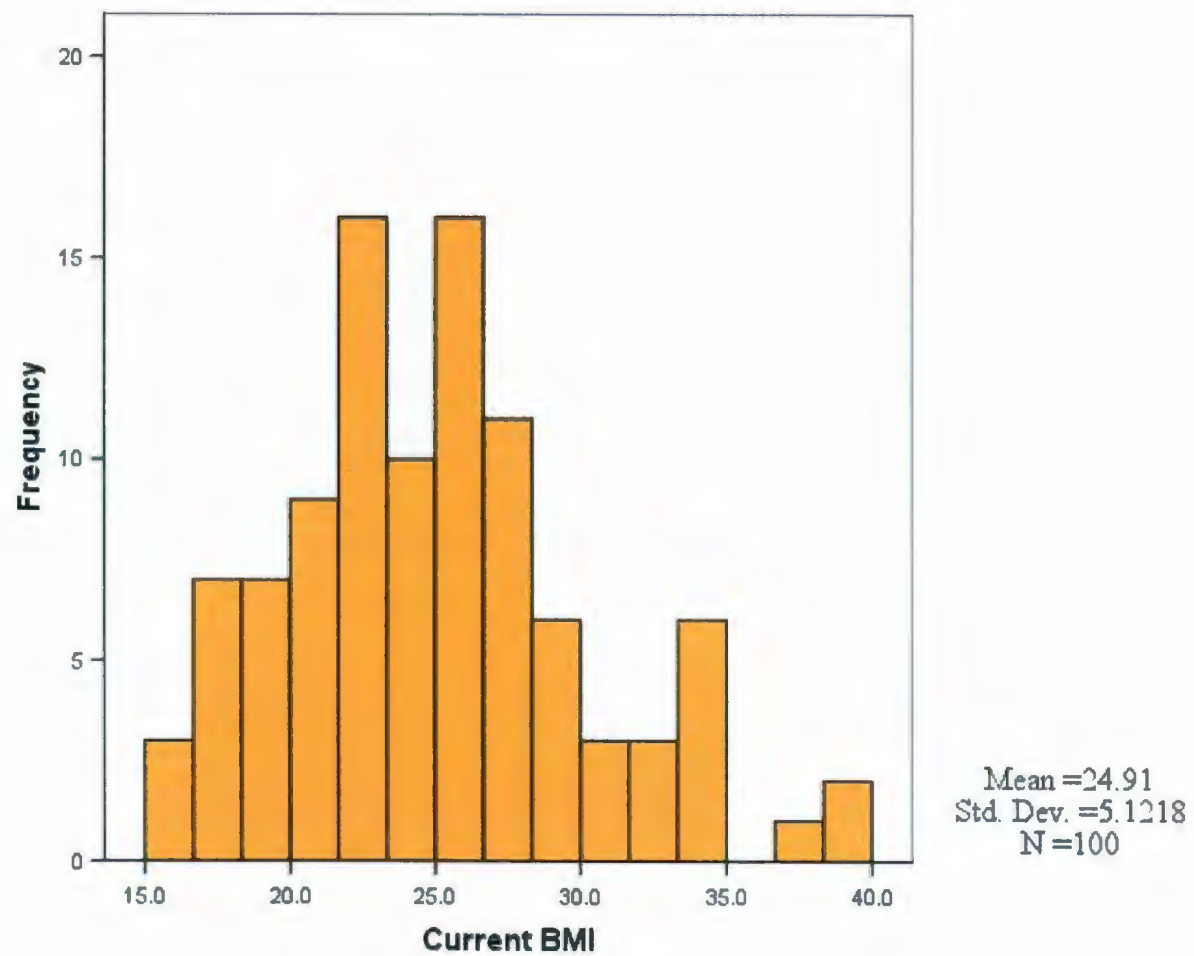


Figure 3 – Rehabilitation admission BMIs of 100 geriatric rehabilitative patients

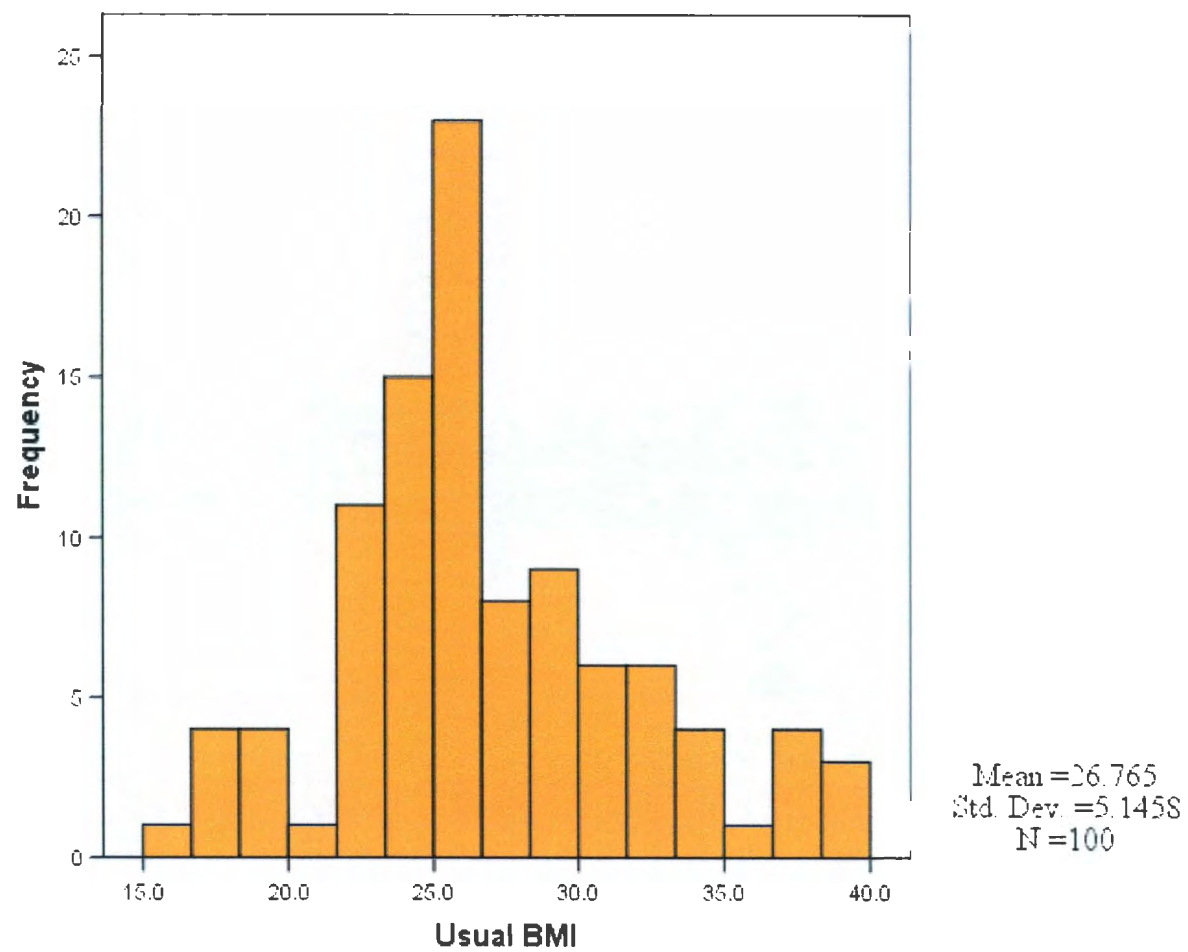


Figure 4 - Usual pre-hospitalization BMIs of 100 geriatric rehabilitative patients

Appendix 10 – Tables 1-3

Crosstabulations between gender and nutritional variables of geriatric rehabilitative patients

Table 1 - Gender versus Recent weight Crosstabulation

			Recent weight				Total
			Severe Weight Loss	Moderate Weight Loss	Mild Weight Loss	Stable weight	
Gender	Male	Count	30	8	3	15	56
		% within Gender	53.6%	14.3%	5.4%	26.8%	100.0%
	Female	Count	11	5	5	23	44
		% within Gender	25.0%	11.4%	11.4%	52.3%	100.0%

Table 2- Gender versus Appetite Crosstabulation

			Appetite				Total
			Poor	Fair	Good	Excellent	
Gender	Male	Count	4	7	35	10	56
		% within Gender	7.1%	12.5%	62.5%	17.9%	100.0%
	Female	Count	2	10	30	2	44
		% within Gender	4.5%	22.7%	68.2%	4.5%	100.0%

Table 3 - Gender versus Level of Activity Crosstabulation

			Level of Activity				Total
			Sedentary	Fairly Active	Moderately Active	Very Active	
Gender	Male	Count	11	19	12	14	56
		% within Gender	19.6%	33.9%	21.4%	25.0%	100.0%
	Female	Count	11	23	8	2	44
		% within Gender	25.0%	52.3%	18.2%	4.5%	100.0%



