

# Perceptions of Vitamin D Supplementation in Long-Term Care Facilities

by

Amy Ludwig, B.Sc. (Honours)

A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

In partial fulfilment of the requirements of the degree of

MASTER OF SCIENCE

Department of Human Nutritional Sciences

University of Manitoba

Winnipeg

Copyright ©2015 by Amy Ludwig

## ABSTRACT

**Introduction:** Vitamin D deficiency is prevalent among older adults in long-term care (LTC) contributing to increased risk of falls and fractures, and decreased quality of life. The primary factors include limited dietary sources containing vitamin D, poor dietary intake, and low sunlight exposure. Vitamin D supplementation is recommended in LTC; however this practice varies across Canada.

**Objectives:** The objectives of this study were to 1) examine the perceptions of LTC health professionals, staff, and visitors (family and friends) regarding vitamin D supplementation in LTC facilities; and (2) determine what barriers exist in providing vitamin D supplementation to all residents in LTC facilities.

**Methods:** The study was conducted in two phases. Phase 1: Five focus group sessions (9-12 health professionals per group) were conducted in 5 LTC facilities within a Manitoba Regional Health Authority. Each focus group session was audio recorded to assist in generating themes. Phase 2: A self-administered nutrition survey was completed by LTC staff, health professionals, and visitors (family and friends) in all five recruited LTC facilities. Descriptive statistical analyses were conducted.

**Results:** Phase 1: A total of 51 individuals participated (mean age = 46.7 years  $\pm$  10.3; female = 90.2%). The majority of participants consisted of Registered Nurses, Health Care Aides, Clinical Dietitians, Pharmacists, Social Workers, Recreation Therapists, and Administrators. Phase 2: A total of 102 individuals participated with an average age of 48.4  $\pm$  13.8 years and were predominately (87.3%) female. Eighty-five percent of participants were LTC health professionals and staff, and 14.7% were visitors (family or

friend) of a LTC resident. The results from both phases found that perceptions were positive about providing vitamin D supplementation to residents. Eighty-two percent (phase 1) and 92.2% (phase 2) of participants thought that receiving a supplement would make a difference to the overall health of LTC residents. The major barriers to vitamin D supplementation were: cost (healthcare cost, cost of the supplement, and cost of laboratory tests for serum vitamin D levels), the complexity of residents due to swallowing problems and reluctance with taking medications, polypharmacy, physician resistance, and differences between participants' knowledge and education on vitamin D.

**Conclusions:** Providing vitamin D supplementation to LTC residents was deemed important and would improve their overall health, but more education is needed to prevent vitamin D deficiency in LTC.

## ACKNOWLEDGEMENTS

A special thanks to my advisor Dr. Christina Lengyel for her constant encouragement and support. Her guidance and advice throughout my Master's program was most helpful and for that I am forever grateful. Your trust and loyalty has made this Master's Thesis possible.

I thank my advisory committee members, Dr. Carla Taylor and Dr. Lorna Guse, who have rewarded me by learning more due to your expertise and knowledge on my Thesis project. In particular, I am grateful for your valuable feedback and guidance as your contribution was much appreciated.

I would also like to thank the 5 participating LTC facilities in Winnipeg for allowing me to conduct my research and being extremely helpful throughout the recruitment process. This study would not have been possible without these LTC sites. A special thanks to the individuals at each facility who helped me with the recruitment process, your assistance was a valuable contribution. I thank those who participated in this research project as your insight and input was most valuable and made this project possible.

I would also like to acknowledge funding from the University of Manitoba Graduate Fellowship (UMGF) and the Manitoba Graduate Scholarship (MGS) for providing me with financial support throughout my Master's Program. Sincere thanks for this funding that I received as it allowed for me to really focus on my research. This generous scholarship meant a lot to me and words cannot express my gratitude for this contribution.

To my research assistant and note takers, Elisabeth Harms, Dr. Lengyel, Mihiri Witharana, and Catherine Marshall, thank-you for your help throughout my data collection and analysis. Your assistance was much appreciated.

Lastly, I would like to thank my family for their constant support, especially my mother Patricia Ludwig. I am forever grateful for your emotional, professional, and financial support throughout this program. You are my inspiration, my mentor, and my best friend. Thank-you for always being a listening ear during my stressful moments and always finding the right words to tell me everything will be okay. To my mother, thank-you from the bottom of my heart for all your advice and your patience throughout my Master's Program. I am grateful to my two cats, Charlie and Neytiri, for always keeping me company while spending long hours writing my Thesis. Charlie you have been with me from my undergraduate years and through my graduate program, and you have been a constant comfort in my life.

I would like to dedicate my Thesis in loving memory of my 92 year old grandmother, Sonia Meta Blaschuk, who passed away on my Thesis Defense Date (January 21, 2015). I will always love you Nanny, you will be greatly missed.

**TABLE OF CONTENTS**

**ABSTRACT.....I**

**ACKNOWLEDGEMENTS.....III**

**LIST OF TABLES.....IX**

**LIST OF FIGURES.....X**

**LIST OF APPENDICES.....XI**

**LIST OF ABBREVIATIONS.....XII**

**CHAPTER 1: INTRODUCTION.....1**

    Overview.....1

    Research Objectives.....4

    Research Questions.....4

    Chapter Summary.....5

**CHAPTER 2: LITERATURE REVIEW.....6**

    Demographics of Older Adults in Canada.....6

    Older Adults in Manitoba.....7

    Physiological Changes with Aging related to Nutrition.....9

    Health Conditions Common among Older Adults.....15

    Older Adults residing in Long-Term Care Facilities.....17

    Nutritional Issues for Older Adults in Long-Term Care: Overview.....18

        Malnutrition.....28

        Vitamins and Minerals.....30

Importance of Vitamin D.....	32
Risk of Vitamin D Deficiency for Older Adults.....	40
Vitamin D Supplementation Practice.....	42
Attitudes and Beliefs of Staff regarding Vitamin D Supplementation.....	48
Theoretical Framework.....	49
<b>CHAPTER 3: METHODOLOGY.....</b>	<b>53</b>
The Setting.....	54
Ethics.....	56
Phase 1: Focus Groups.....	56
The Sample.....	56
Recruitment.....	56
Development of Tools.....	57
Data Collection.....	59
Data Analysis.....	60
Phase 2: Nutrition Survey.....	63
The Sample.....	63
Recruitment.....	63
Development of Tools.....	63
Data Collection.....	65
Data Analysis.....	66

<b>CHAPTER 4: HEALTH PROFESSIONALS’ PERCEPTIONS OF VITAMIN D SUPPLEMENTATION IN LONG-TERM CARE FACILITIES.....</b>	<b>67</b>
Introduction.....	67
Methods.....	72
Study Design.....	72
The Setting.....	72
Ethics.....	72
The Sample.....	74
Recruitment.....	74
Development of Tools.....	75
Data Collection.....	76
Data Analysis.....	77
Results.....	80
Participant Characteristics.....	80
Nutrition Survey Results.....	80
Focus Group Themes.....	83
Discussion.....	98
Take Away Points.....	107
<b>CHAPTER 5: UNDERSTANDING THE PERCEPTIONS AND BARRIERS THAT EXIST FOR PROVIDING VITAMIN D SUPPLEMENTATION IN LONG-TERM CARE FACILITIES.....</b>	<b>108</b>
Introduction.....	108

Purpose.....	109
Methods.....	110
Setting, Sample, and Recruitment.....	110
Development of Tools.....	110
Data Collection Procedure.....	111
Statistical Analysis.....	111
Results.....	112
Participant Characteristics.....	112
Perceptions.....	112
Barriers.....	113
Discussion.....	118
Perceptions.....	118
Barriers.....	119
Study Limitations.....	119
Relevance to Practice.....	120
<b>CHAPTER 6: GENERAL DISCUSSION.....</b>	<b>121</b>
Limitations.....	130
Implications of Findings.....	131
Summary.....	133
<b>REFERENCES.....</b>	<b>134</b>
<b>APPENDICES.....</b>	<b>147</b>

## LIST OF TABLES

Table 2.1	Common Chronic Conditions for Canadian Older Adults.....	16
Table 2.2	Vitamin D Dietary Reference Intake (DRI) for Older Adults in North America.....	34
Table 2.3	Reference Values for Serum 25-hydroxyvitamin D.....	35
Table 2.4	Dietary Sources of Vitamin D.....	37
Table 2.5	Provincial Policies and Recommendation for Vitamin D Supplementation in Canadian LTC Facilities.....	43
Table 3.1	Characteristics of Participating LTC Sites.....	55
Table 4.1	Characteristics of Participating LTC Sites.....	73
Table 4.2	Demographic Characteristics of Focus Group Participants.....	81
Table 4.3	Participants Perceptions about Vitamin D.....	82
Table 5.1	Participant Characteristics.....	114
Table 5.2	Participants' Responses to Perception and Barrier Questions.....	115
Table 5.3	Comparison of Nutrition Survey Responses between Nursing Staff (n=46) and Other Participants (n=56).....	117

## LIST OF FIGURES

Figure 2.1	Health Belief Model.....	52
Figure 6.1	Main Themes Related to Study Objectives.....	126

## LIST OF APPENDICES

Appendix A	Recruitment Poster for Focus Groups.....	147
Appendix B	Nutrition Survey for Focus Groups.....	149
Appendix C	Moderator’s Guide for Focus Groups.....	152
Appendix D	Informed Consent Form for Focus Groups.....	155
Appendix E	Recruitment Poster for Nutrition Survey.....	158
Appendix F	Nutrition Survey.....	160
Appendix G	Informed Consent Form for Survey.....	163

## LIST OF ABBREVIATIONS

25(OH)D	25-hydroxyvitamin D
AI	Adequate Intake
DRI	Dietary Reference Intake
EAR	Estimated Average Requirement
FSA	Food Service Assistant
g	grams
HBM	Health Belief Model
HCA	Health Care Aide
IU	International Unit
kcal	kilocalorie
L	Litre
LPN	Licensed Practical Nurse
LTC	Long-Term Care
mL	millilitre
ng	nanogram
nmol	nanomole
NH	Nursing Home
NP	Nurse Practitioner
oz	ounce
PCH	Personal Care Home
PSW	Personal Support Worker
PTH	Parathyroid Hormone
QOL	Quality of Life
RD	Registered Dietitian
RDA	Recommended Dietary Allowance
RHA	Regional Health Authority
RN	Registered Nurse
RPN	Registered Practical Nurse
SPSS	Statistical Package for Social Sciences
tsp	teaspoon
UL	Tolerable Upper Intake Level
µg	microgram

# CHAPTER 1

## INTRODUCTION

### Overview

The aging population is increasing worldwide with 7.9% of older adults living in Canadian LTC facilities (Statistics Canada, 2012a). The population is aging due to the influx of baby boomers (individuals born between 1946-1965), longer life expectancy, and an increased awareness of the need for improved quality of life (QOL) at older ages (Statistics Canada, 2006; McNaughton, Crawford, Ball, & Salmon, 2012; Doupe et al., 2011). It is projected by 2056, 27.2% of the Canadian population will be older adults (Statistics Canada, 2006). As a senior gets older there is a greater chance that they will live in a collective dwelling (residences for senior citizens or health care and related facilities) that requires professional health monitoring, constant care and support (Statistics Canada, 2012a).

The prevalence of malnutrition can be high in LTC facilities, ranging from 5-85% (Lengyel, Whiting, & Zello, 2008; Reimer & Keller, 2009; American Dietetic Association, 2005a). Malnutrition increases the risk of infection, hospitalization, morbidity, mortality and decreases QOL of older adults (Bostrom, Van Soest, Kolewaski, Milke, & Estabrooks, 2011; Arvanitakis et al., 2008). There are many risk factors that are associated with malnutrition which include poor dietary intake, restricted diets, medication usage, poor supportive networks and assistance with eating, inadequate staffing, psychological factors (depression, dementia), medical factors and health status

(poor dentition, dysphagia), and nutrition knowledge and support (Bostrom et al., 2011; Bocock & Keller, 2008; American Dietetic Association, 2005a).

Vitamin D is a fat-soluble vitamin that aids in calcium absorption and bone formation, which is essential in bone health (Insel, Turner, & Ross, 2006; Holick et al., 2005; Bischoff-Ferrari, Giovannucci, Willett, Dietrich, & Dawson-Hughes, 2006). In older adults, vitamin D helps prevent bone loss and fractures. Supplementing with vitamin D can help reduce the risk of falls in older adults (Bischoff-Ferrari et al., 2006; Demontiero, Herrmann, & Duque, 2011). The most important related compounds of vitamin D are vitamin D<sub>2</sub> (ergocalciferol) and vitamin D<sub>3</sub> (cholecalciferol). Our skin makes vitamin D<sub>3</sub> and supplies about 90% of our vitamin D (Holick, 2006). Vitamin D is found in a few dietary sources such as oily fish (tuna, salmon, mackerel, sardines), fish oils (cod liver oil), eggs, and fortified milk and margarine. The only natural sources of vitamin D are fatty fish and egg yolks (Health Canada, 2012). The limited number of foods that naturally contain vitamin D and those that are fortified (milk, margarine, orange juice, yogurt), make it almost impossible to meet vitamin D recommendations through food alone without recommending unrealistic daily consumption of these foods (Winnipeg Regional Health Authority, 2013). In 2010 vitamin D nutrient recommendations (Dietary Reference Intakes) increased from 400 IU/day to 600 IU/day for 51-70 years of age and from 600 IU/day to 800 IU/day for those 70 years of age and older and this increase is challenging to achieve by consuming food alone (Ross et al., 2011; Health Canada, 2010).

Institutionalized older adults are at risk for vitamin D inadequacy due to several factors such as poor dietary intake, poor nutritional status, age-related physiological

decrease of vitamin D synthesis, and limited exposure to sunlight due to being institutionalized (Holick, 2006; Winnipeg Regional Health Authority, 2013; Demontiero et al., 2011). Insufficient 25-hydroxyvitamin D leads to reduced ability to absorb calcium and phosphorus, leading to poor bone health, osteoporosis, and increased risk of bone fracture. A recent study conducted by Sitter and Lengyel (2011) found that among 14 LTC residents in Winnipeg, 83% had insufficient levels of 25-hydroxyvitamin D (25(OH)D) irrespective of the season. In LTC residents, vitamin D deficient levels are as high as 76-79% (Hamid, Riggs, Spencer, Redman, & Bodenner, 2007; Demontiero et al., 2011). In adults, vitamin D deficiency can lead to osteopenia and osteoporosis which in turn could result in osteomalacia, muscle weakness (proximal muscle wasting and decreased muscle strength ) and an increase in fracture risk (Holick, 2007; Hamid et al., 2007).

It is recommended that a vitamin D supplement be provided to all residents in LTC (Winnipeg Regional Health Authority, 2013, 2008). A previous Canadian study found that LTC staff firmly believed that their residents should be supplemented with vitamin D (Lau et al., 2010). Vitamin D supplementation improves bone health for older adults and can help to significantly improve the reduction in risk of osteoporotic fractures, especially hip fractures, for older adults with insufficient 25(OH)D levels (Holick, 2007; Hamid et al., 2007). In Canada, recommendations for vitamin D supplementation vary between provinces and there is no policy at the provincial level implementing routine vitamin D supplementation in LTC facilities (Canadian Agency for Drugs and Technologies in Health, 2010; Winnipeg Regional Health Authority, 2013). More research is needed to understand why vitamin D supplementation in LTC facilities

is not being implemented and set as a requirement. There is extensive literature showing the benefits of vitamin D supplementation, and its positive role in the prevention of osteoporosis, osteomalacia, frailty, and fracture risk in older adults. The results from this study identified barriers for vitamin D supplementation and might assist in the development of practical solutions and interventions for consistent supplementation within Manitoba LTC facilities.

### **Research Objectives**

This research seeks to address the following objectives in order to enhance the knowledge of vitamin D supplementation for older adults from the perspective of LTC health professionals, staff, family, and friends.

1. To examine the perceptions of LTC health professionals, staff, and visitors (family and friends) regarding vitamin D supplementation in LTC facilities.
2. To determine what barriers exist in providing vitamin D supplementation to all residents in LTC facilities.

### **Research Questions**

This project seeks to answer the following questions:

1. What are the perceptions of LTC health professionals, staff, and visitors (family and friends) on vitamin D supplementation for LTC residents?
2. What barriers exist for providing vitamin D supplementation to LTC residents?

## **Chapter Summary**

This study was conducted in two phases. Phase 1 consisted of focus groups (qualitative and quantitative methodology) with participants who were LTC health professionals and staff. Phase 2 consisted of a nutrition survey (quantitative) and participants were LTC health professionals, staff, and visitors (family and friends). This thesis is structured as a paper-based manuscript and includes the following:

**Chapter 2** presents a critical review of the literature describing the demographics of older adults in Canada and Manitoba, nutritional issues associated with this population, malnutrition, and the importance of vitamin D and supplementation within LTC facilities.

**Chapter 3** describes the mixed methods design used in this research project, consisting of a qualitative (focus groups) and quantitative (nutrition surveys) components for data collection and analysis.

**Chapter 4** presents the first manuscript titled, “Health Professionals’ Perceptions of Vitamin D Supplementation in LTC Facilities.”

**Chapter 5** presents the second manuscript titled, “Understanding the perceptions and barriers that exist for providing vitamin D supplementation in LTC Facilities.”

**Chapter 6** provides a general discussion of the research for phases 1 and 2, limitations, implications of findings, and a summary.

## CHAPTER 2

### LITERATURE REVIEW

#### *Demographics of Older Adults in Canada*

The population is aging worldwide. In Canada, 14.8% of the population are older adults (individuals aged 65 years and older) and the older population is continuing to increase (Statistics Canada, 2012b). The number of older adults is expected to almost double between 2005 (4.2 million) and year 2036 (9.8 million) (Statistics Canada, 2006; Doupe et al., 2011). It is projected by 2056, that 27.2% will be older adults. The population is aging due to the influx of baby boomers (individuals born between 1946-1965), longer life expectancy, and an increased awareness of the need for improved QOL at older ages (Statistics Canada, 2006; McNaughton et al., 2012; Doupe et al., 2011).

Life expectancy is different for men and women. Women generally have a longer life expectancy compared to men and have partners who are older (Statistics Canada, 2012a). However, there is an upward shift of men living longer so that the proportion of males and females will become more even in the future (Statistics Canada, 2006).

Living arrangements of older adults vary as they age. For seniors aged 65 years and older, 92.1% reside in private dwellings or households as either alone, with others, or as couples, whereas, 7.9% of seniors live in collective dwellings, such as residences for senior citizens or health care and related facilities (Statistics Canada, 2012a). Collective dwellings consist of special care facilities such as nursing homes (NH), residences for senior citizens, hospitals for LTC or chronic care and personal care homes (PCH) in Manitoba. As a senior gets older there is a greater chance that they will live in a

collective dwelling that requires professional health monitoring, constant care and support (Statistics Canada, 2012a). For men and women living in special care facilities between the ages of 65 to 74 there were no significant differences in numbers. However, for seniors aged 85 and up, it was found that 33.4% of women compared to 21.5% of men lived in special care facilities (Statistics Canada, 2012a). The 2011 census, reported that 83.9% of senior citizens aged 65 years and older were living alone in a senior citizen residence. With increased age it is found that more senior women live alone in special care facilities than compared to men (Statistics Canada, 2012a).

### ***Older Adults in Manitoba***

Similar to other Canadian provinces Manitoba's population is projected to age in the next few decades (Center on Aging, 2010). In 2012, it was estimated that Manitobans aged 65 years and older accounted for 14.2% of the provincial population (Statistics Canada, 2012b). The number of older Manitobans is projected to increase to 21.7% by the year 2031 (Statistics Canada, 2006). In Canada, Manitoba ranked seventh for the proportion of seniors aged 65 years and older (Statistics Canada, 2006). In 2006, it was determined that 75.2% of Manitobans aged 65 years and older lived in urban areas (Center on Aging, 2010).

In Manitoba, the predominance of women 65 years and older is higher than compared to men (Center on Aging, 2010). However, it is projected that for senior men between 80-84 years of age there will be an increase from 39% in 2005 to 43% in 2021 (Statistics Canada, 2006). Another note of projection is the gap between senior men and

women aged 75-84, which is expected to become more even by 2031 (Center on Aging, 2010).

Living arrangements for Manitoban seniors in LTC facilities vary as they age. In 2007, Manitoba Health data indicated that 12.2% of Manitoban seniors aged 75 years and older resided in PCH (Manitoba Health, 2007/2008). In Manitoba, 3% of seniors aged 75 years and older were admitted to a PCH from 2009/2010 to 2010/2011 (Manitoba Health, 2010/2011). PCH are defined as residential facilities in which seniors aged 75 years and older are primarily admitted due to a chronic condition or disability (Manitoba Health, 2010-2011). More than 90% of all PCH residents are 75 years and older (Doupe et al., 2011). In Manitoba, there were a total of 125 PCH in 2010-2011 and 37 PCH in Winnipeg (Manitoba Health, 2010-2011). The overall median length of stay in Manitoba based on 2009/2010 - 2010/2011 was 1.94 years with a median wait time of about 10 weeks for admission into a PCH. Regionally, the length of stay varied between North Eastman with 2.73 years compared to Winnipeg with 1.73 years (Manitoba Health, 2010-2011). Therefore, admission into PCH and length of stay vary substantially across Manitoba.

### ***Physiological Changes with Aging related to Nutrition***

There are many physiological changes that go along with the process of aging (Saxon, Etten, & Perkins, 2010). Age-related changes are seen in the sensory systems, gastrointestinal system, musculoskeletal system, thirst sensation, and susceptibility to electrolyte imbalances. Food is one of the main sources of pleasure and contentment in the later years. However, it is important to be aware of an older adult who has an acute or chronic disease when recommending nutritional approaches and requirements (Ritchie & Bales, 2009; Saxon et al., 2010). Nutritional needs are influenced by age-related changes in a variety of body systems, for instance, decreased enzyme production and changes in the mucosa in the digestive system, decreased kidney function, changes in blood vessels and decreased cardiac output, alterations in lung function, changes in carbohydrate metabolism which produces a decline in insulin response and glucose intolerance, loss of lean body mass, decrease in total body water and protein, and altered temperature regulation. These changes and other age-related changes all affect digestion, absorption, utilization, and excretion of food in older adults (Saxon et al., 2010).

Sensory systems that are of major concern with aging are gustation (taste), olfaction (smell), audition (hearing), vision (sight), tactile (touch), vestibular (balance), and kinesthetic (“muscle sense”) (Saxon et al., 2010). Sensory properties are important as they help to influence food choices and provide ideas about a food’s nutritional value. Sensory losses that interfere with the ability to obtain and appreciate food can lead to inadequate intake of nutrients and calories (Ritchie & Bales, 2009). The prevalence of changes in taste and smell perception occur during normal aging but are heightened at ages 70 to 80 and this is often complicated by co-morbid conditions and treatments such

as medications. When these sensory signals are compromised, food selection and intake, absorption of nutrients, motivation to eat and ultimately nutritional status are negatively impacted (Ritchie & Bales, 2009). Deficiencies, excess or imbalances in dietary intake among older adults are often due to changes in taste and smell perception. During the aging process, when taste and smell sensations are affected, as well as other senses such as vision and hearing, it can decrease an older adult's QOL (Ritchie & Bales, 2009). Taste perception gradually declines with age and this change is noticed around 60 years of age and especially after age 70 (Linton, 2007). Since food tends to taste bland, older adults like to add more salt, sauces, sugar, or spices to enhance the flavor of food and obtain a satisfying taste. Factors contributing to the enjoyment of food are changes in taste receptors, poor fitting dentures which can modify eating patterns, eating alone, and loss of appetite due to lack of physical inactivity. Additionally, medications can also alter changes in taste perception or cause an unpleasant aftertaste or dry mouth (Saxon et al., 2010). The sense of smell is a nasal chemical sense that plays a critical role in the motivation to eat, selection of edible foods, avoidance of spoiled foods, personal safety and hygiene, and ultimately nutritional status (Ritchie & Bales, 2009; Saxon et al., 2010). Similar to taste, olfactory receptors are constantly being replaced but due to age-related changes not all receptors will be replaced. It may be necessary to increase olfactory stimulation due to age-related changes in smell by enhancing cooking odors to permeate the eating area (Saxon et al., 2010). Aging seems to cause a more noticeable difference in smell than compared to taste (Ritchie & Bales, 2009; Saxon et al., 2010).

Age-related changes in hearing gradually increase with age (Saxon et al., 2010).

Linton (2007) describes that approximately 40% to 50% of those aged 75 and over

experience hearing loss. Age-related hearing impairments can be disabling as it can affect an older adults QOL and can be mistaken for mentally incompetence (Saxon et al., 2010). Hearing loss can impact older adults as it can lead to social isolation and depression. Impairment of hearing loss can affect nutritional status by reducing sensory input from textural cues such as crispiness (high-frequency sounds) and crunchiness (low-frequency sounds) (Ritchie & Bales, 2009).

There are many unfavourable age-related physiological changes in the visual system that lead to sensory losses, such as, decreased visual acuity, light and dark adaptation, visual threshold, increased sensitivity to glare, and peripheral vision (Saxon et al., 2011; Ritchie & Bales, 2009). As a result of aging, significant loss of peripheral vision can influence physical activity and social interactions. Older adults with this type of loss have a greater chance of spilling food and are not able to see drinks or objects that are placed within their visual periphery (Saxon et al., 2010). Impaired vision can dramatically affect nutritional status because it interferes with mobility such as driving, food preparation, activities of daily living, difficulty reading food labels, use of utensils, difficulty monitoring food quality and safety by appearance, identifying food and eating utensils, and difficulty distinguishing the color and variety of food at the table. All of these factors play a role in the motivation to eat and the enjoyment of the eating experience (Ritchie & Bales, 2009).

Lastly, the somatosensory system is comprised of a variety of receptors in the skin, such as nerve endings that provide sensations of touch, pressure, pain, and temperature. Nutritional status can be affected by age-related somatosensory changes due to reduced oral sensitivity which impairs the ability to differentiate textures of food;

reduced tactile sensitivity making food preparation and use of utensils challenging; difficulty perceiving heat which can not only decrease pleasure from food but also become a safety issue if food or beverages are served at boiling temperatures; and reduced temperature perception in fingers increasing the risk for burns (Ritchie & Bales, 2009).

The gastrointestinal (GI) system is basically healthy through the lifespan of an individual and causes the least problems in older adults compared to other organ systems. Many GI complaints in the older adult population are rarely contributed by age-related changes in GI function (Saxon et al., 2010; Ritchie & Bales, 2009). More often the prevalence of associated co-morbidities, diseases, and polypharmacy generate the GI complaints (Ritchie & Bales, 2009). For instance, hiatal hernia (heartburn), gallstones, diverticulitis, and colon cancer are particularly prevalent in older adults (Saxon et al., 2010). However, the status of the GI system has a significant influence on the nutritional state of an older adult because various disease conditions can influence the absorption of nutrients and the ability to consume a well balanced diet. Few of these complaints are due to a specific aging process in the gut and are more related to lifestyle factors (Ritchie & Bales, 2009; Saxon et al., 2010). For instance, poor dietary choices, lack of adequate fluid intake, lack of bulk within the diet, excessive straining on bowel movements and lack of exercise (Saxon et al., 2010).

Other physiological age-related changes that affect nutritional status are decreased lean body mass, increased fatty tissue, and lower metabolic rate which leads to a decrease in the requirement of calories to maintain their optimal body weight (Saxon et al., 2010). Age-related musculoskeletal changes are not critical but they do produce disorders and

limitations that cause a significant effect on physical and psychological distress which in turn impacts QOL (Saxon et al., 2010). The most significant changes that occur within the skeletal system due to the aging process are gradual loss of calcium from the bone, bone mass, bone density and bone strength. Aging also affects the cartilage in the body's joints which reduces flexibility of normal cartilage, hydration in cartilage also decreases, and changes in cartilage of the intervertebral discs. Lastly, tendons and ligaments decrease in strength and water content with age (Saxon et al., 2010). Specific age-related changes in muscles are a decline in muscle strength and a decrease in muscle mass and contractile force. All of these changes and limitations in the musculoskeletal system play a part in an older adult's ability to go grocery shopping, cook, eat, remove food from bags, open boxes and cans and store food (Saxon et al., 2010). With musculoskeletal limitations all of these tasks can become daunting for an older adult. Arthritis, inflammation or degenerative changes in body joints commonly associated with the aging process, can produce issues handling food at the grocery store, pushing a grocery cart, and transporting food, which affects these individuals nutritional status (Saxon et al., 2010).

The stimuli to thirst, ability to conserve sodium and concentrate the urine are impaired in older adults (Ritchie & Bales, 2009). This makes an older adult more susceptible to dehydration, especially in association to acute or chronic illnesses. The main reason for dehydration in older adults is impairment in the thirst mechanism and thus inadequate fluid intake (Ritchie & Bales, 2009; Saxon et al., 2010). Dehydration is one of the most common fluid and electrolyte imbalances observed in older adults. Dehydration impairs homeostasis, disrupts functions in many major body organs such as

urinary and circulatory systems, causes mental confusion, and elevates body temperature. Adequate fluid intake is just as important as food intake for older adults (Saxon et al., 2010). The aging process produces a decreased ability for older adults to detect thirst and/or older adults may voluntarily reduce their fluid intake to prevent frequent urination. Physical limitations may also play a role in the prevention of obtaining needed and required fluids, as well as, those with mental disorders may not acknowledge thirst or be motivated to drink fluids (Saxon et al., 2010). Other factors that increase dehydration in older adults are warm temperatures, individuals who are demented, impaired mobility, and individuals over 85 years of age (Larson, 2003). Therefore, there are many age-related physiological changes that affect an older adult's nutritional status.

### ***Health Conditions Common among Older Adults***

For Canadian seniors, good mental and physical health, and well-being are important for seniors to take part in activities of daily living (Statistics Canada, 2006). There are many related factors that affect a senior's health, for instance, socio-economic status, level of education and literacy, social networks, social support, and social participation. In 2002, it was noted that mortality rates for all seniors have significantly decreased in the past 11 years except for seniors aged 90 years and older (Statistics Canada, 2006). Statistics Canada (2006) indicated that the main causes of death for seniors in Canada were cancer and heart disease. Senior men are more likely to die from cancer than senior women. Conversely, for heart disease, it was found to be prevalent in both men and women (Statistics Canada, 2006). In 2006, Statistics Canada indicated that the most common chronic conditions for older adults in Canada were arthritis or rheumatism, high blood pressure, back problems, cataracts, heart disease, diabetes, urinary incontinence, stroke, bowel disorder, Alzheimer's or other dementia, and epilepsy (Table 2.1).

Table 2.1. Common Chronic Conditions for Canadian Older Adults

<b>Common Chronic Conditions for Canadian Seniors</b>	<b>Prevalence in Senior Women</b>	<b>Prevalence in Senior Men</b>
1. Arthritis or rheumatism	54.7%	37.7%
2. High blood pressure	47.1%	37.3%
3. Back problems excluding arthritis	26.1%	21.6%
4. Cataracts	24.5%	16.0%
5. Heart disease	18.1%	21.8%
6. Diabetes	11.9%	15.6%
7. Urinary incontinence	12.0%	8.9%
8. Stroke	3.9%	5.2%
9. Bowel disorder	4.9%	2.8%
10. Alzheimer's or other dementia	1.7%	2.4%
11. Epilepsy	0.6%	0.7%

\*Age range for senior women and senior men: 65 years of age and over

(Adapted from Statistics Canada, 2006)

In 2009/2010, evidence shows the most common cause of death in Manitoba was circulatory disease (30%) followed by cancer (28%) (Manitoba Health, 2010-2011). In Manitoba, the life expectancy for seniors aged 65 years and older in 2006 was found to be around 20.8 years for women, as oppose to 17.6 years for men. Alternatively, mortality rates for Manitoban seniors aged 60 years and over are decreasing (Center on Aging, 2010). The most common chronic conditions diagnosed in 2007 for Manitoban seniors were high blood pressure, arthritis/rheumatism, back problems, heart disease and diabetes (Center on Aging, 2010).

### ***Older Adults residing in Long-Term Care Facilities***

LTC facilities can be referred to as PCH, NH, and LTC (Health Canada, 2004). Older adults are the main residents of LTC facilities. Most Canadian provinces have initiated plans to expand care options in this area due to the expected increase in the aging population (Doupe et al., 2011). LTC facilities bring together a range of services for persons who are dependent on help with basic activities of daily living over an extended period of time (Organisation for Economic Co-operation and Development, 2005). LTC facilities provide 24 hours, 7 days a week living accommodation for older adults in a supervised setting for personal care and professional health services (Health Canada, 2004). Help with basic activities include bathing, dressing, eating, getting in and out of bed and/or a chair, moving around, and using the bathroom. Many resident needs are most often due to becoming weaker as they age and chronic conditions which cause physical or mental disability (Cranswick & Dosman, 2008; Organisation for Economic

Co-operation and Development, 2005; Viveky et al., 2012). When older adults can no longer take care of themselves in their own home setting they are assessed and panelled into a LTC facility (Cranswick & Dosman, 2008). The demand for LTC grows exponentially with age and the majority of older adults in LTC facilities are 80 years of age and older. Due to the growing number of older adults, this will likely lead to an increase in demand for LTC services (Organisation for Economic Co-operation and Development, 2005; Canadian Union of Public Employees, 2009).

### ***Nutritional Issues for Older Adults in Long-Term Care: Overview***

Health, energy and QOL are all dependent upon healthy food choices and adequate nutritional intake. Unappealing and unpalatable diets may lead to poor fluid and food intake, which can result in weight loss, undernutrition, dehydration, and other negative health effects (American Dietetic Association, 2005a). The human body requires basic nutrients such as carbohydrates, fats, proteins, vitamins, minerals, and water to build and repair tissues, supply energy, and regulate essential body processes (Saxon et al., 2010). Maintaining good nutritional status for LTC residents can be a challenge. LTC residents often have chronic illnesses, specific complex care regimens, and other factors that impair dietary intake making it common to develop nutritional problems (Sloane et al., 2008). In view of this, it is a challenge for LTC providers to assess, manage, and meet the nutritional needs of the LTC residents. LTC residents often are at risk for poor nutrition, which can lead to increased infections, slower wound healing, greater risk of falls and fractures, contribute to confusion and impaired

cognition, and lower health-related QOL (Sloane et al., 2008; American Dietetic Association, 2005a). As noted in the literature, the prevalence of poor nutrition for institutionalized older adults ranges from 2-41% (Sloane et al., 2008; Bell, Tamura, Masaki, & Amella, 2013; American Dietetic Association, 2005a; Crogan & Shultz, 2000). Additionally, weight loss is also common among LTC residents and is affected by many chronic conditions (Sloane et al., 2008; Bell et al., 2013; Boccock & Keller, 2008; American Dietetic Association, 2005a). There are many factors that contribute to the prevalence of nutritional problems among LTC residents, such as, physiological changes with aging that can lead to decreased food intake due to loss of appetite and changes in taste perception, chronic illness, use of medications, poor oral health, dysphagia, role of specialized diets and supplements, psychosocial factors which involve personal issues, the relationship between the resident and the LTC provider during mealtime, physical environment of the dining room and organizational issues with the LTC staff, and poor oral intake (Sloane et al., 2008; Reimer & Keller, 2009). All of these common nutritional problems that arise in LTC can contribute to the persistent problem of malnutrition (Reimer & Keller, 2009).

Chronic diseases and medications are some of the primary factors underlying malnutrition and weight loss in LTC residents (Sloane et al., 2008). Significant weight loss is categorized into unintentional weight loss or expected weight loss (Sloane et al., 2008; Boccock & Keller, 2008). For patients with dementia, they struggle with the ability to remember how to eat and swallow. Depression is one of the major factors associated with poor nutrition, anorexia, unintentional weight loss, and malnutrition. Medications can induce weight loss in many different ways, such as, confusion or lethargy, decreased

appetite, nausea, vomiting, alteration in taste receptors, dry mouth, dysphagia, abdominal cramps, bloating or diarrhea (Sloane et al., 2008).

Oral health problems have a significant impact on the nutritional status of a LTC resident as it limits food choices and dietary intake. There are many issues that affect oral health, for instance, periodontal disease, caries and missing teeth, poor-fitting dentures or loss of dentures, and decreased chewing ability (Sloane et al., 2008; Sahyoun, 2004). Poor oral health has a negative impact on caloric intake which contributes to a decreased intake of protein, fat, fiber, carbohydrates, calcium, and antioxidants. This also contributes to the loss of pleasure and satisfaction of eating (Sloane et al., 2008). Many LTC residents (30-60%) suffer from dysphagia (swallowing disorder) which is often secondary to dementia, stroke, decreased strength, infection, inflammatory disease, or decreased salivary flow (Kayser-Jones & Pengilly, 1999; Sloane et al., 2008; American Dietetic Association, 2005a). There are two recognized types of dysphagia in LTC residents, oropharyngeal and esophageal phase dysphagia. Both types of dysphagia implicate difficulty chewing, swallowing, and passage of food (Sloane et al., 2008). Dysphagia is a common nutritional roadblock in LTC residents.

Specialized diets in LTC facilities are used to help regulate and address the nutritional needs of residents with chronic diseases of which have been shown to play a role in unintentional weight loss due to restriction of familiar foods and replacement with those that are often unpalatable, unappetizing and bland (American Dietetic Association, 2005a). The American Dietetic Association (2005a) has made recommendations to help facilitate nutritional status and QOL by suggesting and enhancing the diet prescription for older adults in LTC facilities. Residents with congestive heart failure can be controlled

with the use of medications and a mild restriction on sodium intake. For LTC residents with hypertension, the Dietary Approaches to Stop Hypertension (DASH) can be used to help manage blood pressure. The DASH diet is high in calcium, magnesium, and potassium and low in sodium, cholesterol, and saturated fat. Altering the menu can help to reduce sodium intake by using fresh or frozen foods rather than processed or prepared foods, reduce the usage of salt while cooking by adding more spices to enhance the flavor of food, and not placing salt shakers on the tables (American Dietetic Association, 2005a). The role of oral supplementation in LTC residents has been used to increase caloric intake due to issues dealing with unintentional weight loss and malnutrition. Lauque et al. (2000) determined that LTC residents who were malnourished or at risk for malnutrition receiving protein-energy oral supplementation resulted in an increase in body weight, daily protein and energy intake, and nutritional status. However, there is limited data available regarding appropriate timing, frequency, and dosage of supplements. Supplement administration tends to be given less frequently than intended and the LTC staff spend little time helping residents when taking supplements (Sloane et al., 2008).

Psychosocial issues play a major role in the QOL of LTC residents which in turn affects their nutritional intake (Crogan & Shultz, 2000; Slone et al., 2008). A number of factors come into play that can contribute to problems resulting in weight loss and poor food and/or fluid intake (Sloane et al., 2008). Psychosocial factors that require evaluation are personal factors such as pain, physical limitations or illness, cognitive impairment that require a greater need for help, and different ethnic, cultural and personal preferences; relationship factors which involve the interaction between the resident and

the LTC provider; physical environment which involve issues with the mealtime experience and dining decor; and organizational issues with the LTC staff (Sloane et al., 2008; Reimer & Keller, 2009; American Dietetic Association, 2005a). Focusing on mealtime care is important in the prevention of nutritional issues and malnutrition in LTC facilities (Reimer & Keller, 2009).

Chronic illness and physical disability are personal factors that both impact oral intake (Sloane et al., 2008). Particular disorders that prevent self-feeding are dementia, tremor, fatigue, and hemiparesis. Dementia is one of the most common personal issues in the LTC setting that affects oral intake. Residents suffering from advancing dementia lose the ability to self-feed, recognize food or utensils, hold food or get food to the mouth, and verbalize their needs and preferences. They also have difficulties with distraction, spit food out, or may turn their head away from food during the eating process. Residents suffering from this cognitive impairment may also excessively walk or pace affecting the ability to sit and eat and consume sufficient amount of calories to prevent weight loss (Sloane et al., 2008). For many LTC residents they do not express their personal preferences for specific foods or ways in which the food should be presented during mealtimes. This is a result of residents being quiet, not wanting to complain, and/or unable to communicate (Reimer & Keller, 2009). Crogan and Shultz (2000) established that the most common barriers to nutrition care in LTC facilities were that the residents did not like the food that was being served and did not think the food looked appetizing. Consideration of ethnic, cultural and religious preferences for LTC residents can be of a challenge when there is a need to replace or modify some of these traditions in order to correct nutritional imbalances. In order to adequately deliver

positive mealtimes in LTC facilities it is important to consider any attachment to religious meaning or preservation of cultural tradition to specific ethnic foods (American Dietetic Association, 2005a; Reimer & Keller, 2009). Attaining cultural food preferences can be difficult in a LTC facility as it is trying to meet everyone's medical and nutritional needs and requirements (Reimer & Keller, 2009).

The relationship between the resident and the LTC provider during mealtime is another psychosocial issue. Communication, attitudes, and beliefs of the LTC staff are extremely important in providing positive mealtimes for the residents (Reimer & Keller, 2009; Sloane et al., 2008). The mealtime environment can often be rushed and focused on tasks to be completed which results in poor communication between staff and the residents. With this type of hurried approach, it can result with feelings of anxiety among both the resident and the staff, and the staff becoming impatient with residents who eat slowly (Sloane et al., 2008). Staff can also differ in the type of feeding assistance they provide, for instance, some staff are referred to as social feeders, technical feeders, or both. For the staff who feel social feeding is important, they focus on social interaction and communication during mealtime, whereas, technical feeders focus on providing adequate food intake and mealtime routines (Reimer & Keller, 2009). Ultimately, the goal to increase food intake during mealtimes is to provide verbal prompting and social interaction between the resident and the staff and to ensure staff have positive attitudes during mealtime (American Dietetic Association, 2005a).

The physical environment of the dining room is another psychosocial issue that affects food and fluid intake. Often the dining room in a LTC facility can be noisy and chaotic with loud televisions, utensils and plates clattering, and staff shouting or speaking

loud to one another which results in the residents becoming distracted during mealtimes (Sloane et al., 2008). It is crucial to focus on the mealtime environment and ensure that the dining experience is enjoyable for the LTC residents (Reimer & Keller, 2009).

Creating a more homelike, smaller environment can help decrease a busy and distracting dining room. By changing dining room decor, design, approach of how meals are served, or providing a small group in a quiet area can help to encourage and stimulate residents to eat and socialize (Sloane et al, 2008; Reimer & Keller, 2009). For residents who choose to eat in their rooms they are often served last, the food is cold, they are not in a proper position to eat, eat alone, and staff are rarely there to provide assistance. This type of physical environment is not conducive for adequate food and fluid intake and often results in low intake (Sloane et al., 2008).

Lastly, organizational issues with the LTC staff are other psychosocial factors that are associated with poor intake. Insufficient staff training, inadequate staffing, workload and supervision constraints are some of the main problems for quality of care at mealtimes in LTC facilities. Proper staff training is important for providing the appropriate knowledge, attitudes and behaviours during mealtimes and proper techniques and skills necessary for feeding assistance (Sloane et al., 2008; Reimer & Keller, 2009; Crogan & Shultz, 2000). Appropriate staff training is also important in the detection of undernutrition and its associated risk factors (Crogan & Shultz, 2000). Pelletier (2004) demonstrated that certified nursing assistants differed in their knowledge and training of how to apply proper feeding techniques. It was discovered that during their training program the information provided was not sufficient in how to manage dysphagia and difficult feeding behaviours of LTC residents. Due to this lack of knowledge, dealing

with dysphagia residents and feeding was limited, residents were not properly positioned during mealtime, staff failed on providing oral care after every meal due to time constraints, and expressed frustration towards residents who did not eat during mealtime (Pelletier, 2004). Crogan and Shultz (2000) found that training for nursing assistants was short with minimal nutritional training and little emphasis on feeding assistance. The importance of adequately trained nursing assistants is vital as they are involved in direct patient care (Crogan & Shultz, 2000).

Inadequate staffing is another problem that exists in LTC facilities. This results when there are differences in the number of staff during the day and evening shifts which indirectly affects proper eating and mealtimes (Reimer & Keller, 2009). Reimer and Keller (2009) noted that during lunchtime, there is often extra supervision, assistance, and more highly trained staff making the mealtimes for both staff and residents easier and more enjoyable. However, when staff was limited it was during suppertime which resulted in a more overwhelming, rushed dining atmosphere. Residents were fed quickly and forcefully, communication decreased between residents and the staff, and less attention was given for helping residents to stay clean (Reimer & Keller, 2009). Crogan and Shultz (2000) indicated that with inadequate staffing levels within LTC facilities, nursing assistants could not provide appropriate assistance for residents while eating and complete all tasks necessary due to time constraints. Simmons and Schnelle (2006) determined staff time requirements to different types of feeding assistance (social stimulation, verbal cuing, encouragement, physical guidance, and full physical assistance) to improve food and fluid intake. Across all types of feeding assistance, 35-40 minutes of staff time per meal was required to improve resident's intake by 15% or

more. A unique finding within this study was that residents who only required supervision and verbal cuing needed just as much staff time as those residents who required full physical assistance when eating. When staffing is inadequate it affects the quality and quantity of care during mealtimes which can lead to an increased risk for unintentional weight loss and malnutrition (Reimer & Keller, 2009; American Dietetic Association, 2005a).

Inadequate dietary intakes for residents in LTC facilities can result in specific nutrient deficiencies, malnutrition, and/or unintentional weight loss (Sitter & Lengyel, 2011; Lengyel et al., 2008). Sitter and Lengyel (2011) discovered that based on Canada's Food Guide recommendations, around 50% of older adults in LTC facilities in Winnipeg, Manitoba consumed less than 50% of the recommended serving for all four food groups. For example, one of the food groups that residents did not consume daily servings was dark orange and dark green vegetables. Vitamin D levels for residents at time A (2-3 months after relocation into a LTC facility) and time B (four months later) were both insufficient. At time A, 75% of residents had insufficient 25(OH)D levels and 8% were deficient, and at time B 83% of residents had insufficient 25(OH)D levels (Sitter & Lengyel, 2011). Lengyel et al. (2008) demonstrated that 32-100% of LTC residents consumed inadequate intake of folate, magnesium, zinc, vitamin E, vitamin B<sub>6</sub>, vitamin C, and especially noted in female residents was thiamine and protein. Women compared to men had a greater prevalence of inadequate intake for every nutrient except zinc and vitamin C. Results from this study also found that mean intake for dietary fibre, calcium, and vitamin D were below the adequate intake (AI) recommendations for both men and women. During this study, the recommended dietary allowance (RDA) for vitamin D

was not yet developed. In spite of meals and snacks, the majority of residents did not meet their nutrient requirements (Lengyel et al., 2008). Wendland, Greenwood, Weinberg, and Young (2003) demonstrated that two types of diets (unrestricted or lactose free) did not meet the RDA for individuals aged 70 and over before consumption. Based on the RDA of 2,000 kcal/day it was noted that there were certain vitamins and minerals that were deficient, such as, vitamin E, pantothenic acid, calcium, copper, manganese, zinc, and dietary fibre. These results indicated that even if residents consumed all meals provided, they would not be able to attain the recommended dietary requirements for these micronutrients. When evaluating the actual nutrient intakes for these residents, the mean intake was 1,000-1,200 kcal/day with estimates of inadequacy for calcium (100%), niacin (72%), thiamine (69%), protein (49.6%), vitamin C (29.8%), riboflavin (22%), and phosphorus (19.1%) (Wendland et al., 2003). Gloth, Tobin, Smith, and Meyer (1996) discovered that LTC residents had inadequate mean intakes for vitamin B<sub>6</sub>, zinc, and magnesium. Therefore, based on all these studies in LTC facilities, it was noted that residents were not meeting their nutrient requirements via dietary intake.

## ***Malnutrition***

The prevalence of malnutrition can be high in LTC facilities, ranging from 5-85%, as residents do not consume adequate amounts of energy and nutrients (Lengyel et al., 2008; Reimer & Keller, 2009; American Dietetic Association, 2005a, 2005b; Wendland et al., 2003; Arvanitakis et al., 2008; Nieuwenhuizen, Weenen, Rigby, & Hetherington, 2010). A range of malnutrition was noted in the Torma, Winblad, Cederholm, and Saletti (2012) study, in which 30% of LTC residents were malnourished, 63% were at risk for malnutrition and only 7% were well-nourished based on dietary intake. They also reported that reduced nutritional status was associated with a decline in function and cognition. There are a variety of definitions of malnutrition. According to the Canadian Malnutrition Task Force (2012) malnutrition is defined as, “issues with undernourishment, overnutrition, single-nutrient deficiencies, and nutrient imbalances. Overnutrition is a condition of excess energy and nutrient intake over time, which can lead to obesity”. Malnutrition may be diagnosed based on the International Consensus Guideline Committee (Jensen et al., 2010; Canadian Malnutrition Task Force, 2012) as the following: starvation-related malnutrition (decreased food intake with no inflammation present), chronic disease-related malnutrition (inflammation is chronic but mild or moderate and inadequate intake of nutrients and/or energy to meet increased needs), and acute disease-or injury-related malnutrition (inflammation is acute and severe, and therefore nutrients and/or energy are inadequate to meet increased needs).

Malnutrition in older adults is multifaceted. Malnutrition can lead to mental and physical health care issues, increased risk for infection, hospitalization, mortality, and decreased QOL for older adults residing in LTC facilities (Canadian Malnutrition Task

Force, 2012; Arvanitakis et al., 2008; American Dietetic Association, 2005a; Bostrom et al., 2011). Malnutrition may also lead to reduced muscle strength, functioning of the immune system, alter the structure and functions of the gastrointestinal system, increased risk for falls and pressure sores, impaired wound healing, weight loss, and increased morbidity, which all result in poor clinical outcomes (Bostrom et al., 2011). There are many risk factors that are associated with malnutrition which include inadequate dietary intake, dehydration, loss of appetite, anorexia, restricted diets, social factors (poverty, social isolation, food availability and accessibility, lack of support from family and friends), psychological factors (depression, dementia, cognitive function), medical factors and health status (poor dentition, cardiac failure, dysphagia, infection, polypharmacy), organizational factors (lack of screening, inadequate staffing and staff training, poor feeding assistance), physiological factors associated with aging (muscle-wasting conditions such as sarcopenia and cachexia), functional ability, and nutritional support and knowledge (Bostrom et al., 2011; Bocock & Keller, 2008; American Dietetic Association, 2000, 2005a, 2005b; Chevalier, Saoud, Gray-Donald, & Morais, 2008; Nieuwenhuizen et al., 2010). Micronutrient inadequacy, which compromises of vitamins and minerals, is another common form of malnutrition found in LTC residents. This type of deficiency is linked to inadequate food intake (Wendland, Greenwood, Weinberg, & Young, 2003). In summary, older adults living in LTC facilities are at risk for malnutrition which is part of many contributing factors.

## *Vitamins and Minerals*

Micronutrients are comprised of vitamins and minerals which are required in small amounts within the body (Insel et al., 2006). Vitamins are defined as “organic compounds necessary for reproduction, growth, and maintenance of the body. Vitamins are required in minuscule amounts” (Insel et al., 2006). Vitamins are important as they have various functions which help to regulate body processes such as blood clotting, energy production, calcium balance, and maintain organ and tissue functions. There are two types of vitamins, fat-soluble (vitamins A, D, E, and K) and water-soluble vitamins (vitamins C and eight B vitamins). Fat-soluble vitamins have diverse functions, as they are absorbed, transported, and stored in the body, usually in larger amounts than the water-soluble vitamins (Insel et al., 2006). In contrast, minerals are inorganic substances. There are at least 16 minerals essential to health, some of which include sodium, chloride, potassium, calcium, phosphorus, and magnesium. The body requires these minerals in large quantities compared to other minerals, therefore, they are known as macrominerals. Macrominerals are defined as “major minerals required in the diet and present in the body in large amounts compared to trace elements” (Insel et al., 2006). Microminerals or trace elements are minerals that are required in small amounts in the body, such as iron, zinc, copper, selenium, iodine, fluoride, and manganese (Insel et al., 2006).

Due to age-associated changes in metabolism, there are certain nutrients that are of concern for older adults. These nutrients include vitamin D, vitamin B<sub>12</sub>, vitamin A, and iron (Brown, 2008). Age-related metabolic changes affect vitamin D status, independent of dietary intake, primarily due to decreased ability of the skin to synthesize

previtamin D<sub>3</sub> from its precursor, 7-dehydrocholesterol (Brown, 2008; Holick, 2006).

The aging process results in a decrease in vitamin B<sub>12</sub> blood levels even in healthy older adults due to the inability for older adults to utilize B<sub>12</sub> efficiently (Brown, 2008). Brown (2008) noted that the nutrients of concern for older adults due to low dietary intake are vitamin E, folate, calcium, magnesium, and zinc. Several studies have shown that energy, macronutrient, and micronutrient intakes are inadequate in LTC facilities (Adolphe, Whiting, & Dahl, 2009; Lengyel et al., 2008; Johnson, Smiciklas-Wright, Soucy, & Rizzo, 1995). Adolphe et al. (2009) have noted that three vitamins of concern for LTC residents are vitamin D, folate, and vitamin B<sub>12</sub>. Johnson et al. (1995) reported that female LTC residents consumed less than the RDA for energy, zinc, calcium and Vitamin D. In summary, vitamins and minerals play an important role and based on these findings there are certain nutrients (vitamin D, vitamin B<sub>12</sub>, folate, calcium, and zinc) that appear to be of concern for older adults.

### ***Importance of Vitamin D***

Vitamin D is a fat-soluble vitamin that aids in calcium absorption and bone formation, which are essential in bone health (Insel et al., 2006; Holick et al., 2005; Bischoff-Ferrari et al., 2006). Vitamin D is fundamental as it promotes bone growth (Hamid et al., 2007; Insel et al., 2006). In older adults, vitamin D helps prevent bone loss and fractures. Supplementing with vitamin D can help reduce the risk of falls in older adults (Bischoff-Ferrari et al., 2006; Demontiero et al., 2011). Vitamin D plays an important role in the maintenance of calcium and phosphate homeostasis (Brown, 2008; Insel et al., 2006; Holick et al., 2005). Blood calcium levels are regulated in the body by vitamin D and the parathyroid hormone (PTH). They work together by stimulating the body to move calcium back and forth between the blood and the reservoir of calcium in the bone (Holick, 2006; Insel et al., 2006). The active form of vitamin D is called calcitriol, which is an important regulator of blood calcium levels. In the small intestine, calcitriol works to increase the absorption of calcium and phosphorus. In bone, calcitriol and PTH stimulate the breakdown of bone, releasing calcium to the blood. Calcitriol also controls the rate of bone calcification. In the kidney, calcitriol and PTH stimulate the reabsorption of calcium when there are low levels of calcium in the blood, helping to decrease calcium excretion (Demontiero et al., 2011; Insel et al., 2006). Without vitamin D, only 10-15% of dietary calcium and about 60% of phosphorus is absorbed. When there are adequate levels of vitamin D, the interaction between calcitriol and the vitamin D receptor increases the effectiveness of absorption for intestinal calcium from 30-40% and to approximately 80% for phosphorus (Holick, 2007). Vitamin D is also involved in maintaining neuromuscular function (Holick, 2006). Vitamin D functions in its

metabolically active form as a steroid hormone which has an effect at the nuclear level. Nuclear vitamin D receptors are found in an assortment of tissues, such as muscle, bone, kidney, intestines and immunologic tissues (Hamid et al., 2007).

It is widely accepted that measuring serum 25-hydroxyvitamin D (25(OH)D) concentration is the best indicator and is the standard clinical measure of vitamin D status in humans (Holick, 2006; Millen & Bodnar, 2008; Lai, Lucas, Banks, & Ponsonby, 2011). Serum 25(OH)D is the major circulating metabolite of vitamin D and reflects vitamin D inputs from cutaneous synthesis and dietary intake (Millen & Bodnar, 2008; Calvo, Whiting, & Barton, 2004). Acceptable serum levels for 25(OH)D are 20 ng/mL (50 nmol/L) or greater which cover the requirements of at least 97.5% of the population (Table 2.2). These levels are essential in order to maintain proper concentrations of PTH, absorb calcium in the gut, and to build new bone by activating bone-forming cells. However, preferable 25(OH)D levels are between 90-100 nmol/L (36-40 ng/mL), which is normally not the case in many institutionalized residents (Demontiero et al., 2011; Bischoff-Ferrari et al., 2006). Cut points of serum 25(OH)D levels have not been established by a scientific consensus process (Health Canada, 2012). However, it is suggested that the optimal serum 25(OH)D level is  $\geq 50$  nmol/L (Table 2.3). People are at risk for vitamin D deficiency at serum 25(OH)D levels  $< 30$  nmol/L and are at risk for inadequacy at levels ranging between 30-50 nmol/L (Table 2.3).

Table 2.2. Vitamin D Dietary Reference Intake (DRI) for Older Adults in North America

<b>Life-stage Group</b>	<b>RDA</b>	<b>Serum 25(OH)D Level (corresponding to the RDA)</b>	<b>EAR</b>	<b>UL</b>
51-70 years (Male and Female)	600 IU/day (15 µg/day)	20 ng/mL (50 nmol/L)	400 IU/day (10 µg/day)	4,000 IU/day (100 µg/day)
71 + years (Male and Female)	800 IU/day (20 µg/day)	20 ng/mL (50 nmol/L)	400 IU/day (10 µg/day)	4,000 IU/day (100 µg/day)

(Table adapted from Ross et al., 2011)

**Recommended Dietary Allowance (RDA):** Average daily dietary nutrient intake level sufficient to meet nutrient requirements for nearly all (97-98%) healthy individuals.

**Estimated Average Requirement (EAR):** Average daily nutrient intake level estimated to meet requirements of half of healthy individuals.

**Tolerable Upper Intake Level (UL):** Highest average daily nutrient intake level likely to pose no risk of adverse health effects to almost all individuals in the general population.

(Institute of Medicine, 2006)

Table 2.3. Reference Values for Serum 25-hydroxyvitamin D

<b>Serum 25(OH)D Level</b>	<b>Vitamin D Status</b>
< 30 nmol/L	Vitamin D Deficiency
30-50 nmol/L	Vitamin D Insufficiency
≥ 50 nmol/L	Optimal Vitamin D Status
> 125 nmol/L	Potential Adverse effects

(Adapted from Ross et al., 2011)

The most important dietary forms of vitamin D are vitamin D<sub>2</sub> (ergocalciferol) and vitamin D<sub>3</sub> (cholecalciferol). Vitamin D<sub>2</sub> is found in a few plant foods and vitamin D<sub>3</sub> is found naturally in only a few animal-derived foods. Vitamin D<sub>2</sub> and vitamin D<sub>3</sub> constitutes what we know as vitamin D (Holick, 2006). Vitamin D is found in few dietary sources such as fatty fish (tuna, salmon, mackerel, sardines), fish-liver oils (cod liver oil), eggs, and fortified milk and margarine (Table 2.4). In Canada, the major sources of vitamin D are fortified foods which include cow's milk and margarine (Institute of Medicine, 2006; Health Canada, 2012). Goat's milk, fortified plant based beverages (fortified soy beverages), and some calcium-fortified orange juices are permitted to be fortified with vitamin D. Cheese and yogurt can be made with vitamin D-fortified milk, however, the final product does not contain as much vitamin D. The only natural sources of vitamin D are fatty fish and egg yolks (Health Canada, 2012).

Table 2.4. Dietary Sources of Vitamin D

<b>Fortified Dietary Sources</b>	<b>Amount</b>	<b>Natural Dietary Sources</b>	<b>Amount</b>
Milk (all store bought)	106-112 IU/250 mL	Salmon, cooked or canned	436-765 IU/75 g (2 ½ oz)
Fortified rice or soy beverage	88 IU/250 mL	Sardines, Pacific, canned	360 IU/75 g
Margarine	60 IU/10 g (2 tsp)	Mackerel, canned	189 IU/75 g
Yogurt (select brands)	7-60 IU/75 g	Tuna, white, canned	60 IU/75 g
Orange Juice	53 IU/125 mL	1 Egg Yolk	21-26 IU

(Adapted from Holick, 2006)

Limited number of foods that naturally contain vitamin D and those that are fortified, make it almost impossible to meet vitamin D recommendations through food alone without recommending unrealistic daily consumption of some foods (Holick, 2007, 2006). On the other hand, our skin makes vitamin D<sub>3</sub> and this supplies about 90 percent of our vitamin D. In the skin, UV radiation converts a form of cholesterol to cholecalciferol which travels to the liver. The liver converts both synthesized and dietary vitamin D to an intermediate form, which is sent to the kidney and converted to calcitriol (Holick, 2006).

The 2010 vitamin D dietary recommendations replaced the previous 1997 values (Health Canada, 2010). The 1997 report did not have adequate data available to determine EAR and RDA for vitamin D, therefore, AI values were used since an RDA could not be determined (Ross et al., 2011). The 1997 AI values for vitamin D were 400 IU/day for 51-70 years of age and 600 IU/day for 71 years of age and older. The 1997 AI values were replaced by the 2010 RDA levels and the new RDA is higher than the previous AI (Health Canada, 2010). The RDA for vitamin D for older adults in North America is 600 IU/day from 51-70 years of age and 800 IU/day for 71 years of age and older (Table 2.2).

Factors contributing to the high prevalence of vitamin D inadequacy are age-related decreases in cutaneous synthesis, low sunlight exposure due to being institutionalized, medications, poor dietary intake, and limited dietary sources of vitamin D (Holick, 2006; Demontiero et al., 2011; Lister, 2008). Age-related decreases in cutaneous synthesis affect vitamin D status, independent of dietary intake, primarily due to decreased ability of the skin to synthesize previtamin D<sub>3</sub> from its precursor, 7-

dehydrocholesterol (Holick, 2006). Adults over the age of 65 years produce four times less vitamin D in the skin compared with adults aged 20 to 30 years (Institute of Medicine, 2006). The decline of photochemical production may be due to the limited exposure to sunlight due to institutionalization or being homebound. Older individuals who live in northern latitudes are at greater risk for vitamin D deficiency as the skin makes no vitamin D from the sun at latitudes above 37 degrees north and below 37 degrees south of the equator for up to six months of the year during the winter season (Holick, 2006). Another reason that vitamin D is a concern for older adults, of whom use more medications than the younger generation, is that common medications may interfere with vitamin D metabolism. Medications that may adversely affect metabolism or bioavailability of vitamin D are anticonvulsants, corticosteroids, rifampin, and cholestyramine (Holick, 2006; Institute of Medicine, 2006). Poor nutritional status and high incidence of frailty leaves LTC residents at a high risk for vitamin D deficiency (Demontiero et al., 2011). Another issue of concern is the increased DRI for vitamin D from 1997 to 2010 for older adults, making it a challenge to achieve adequate vitamin D levels through food alone (Ross et al., 2011).

### ***Risk of Vitamin D Deficiency for Older Adults***

Vitamin D deficiency has become a worldwide issue and remains common in children and adults (Holick, 2007). Vitamin D deficiency in older adults remains an international problem regardless of latitude (Hamid et al., 2007). In a number of studies worldwide it has been found that vitamin D deficient levels are between 15% and 90% in independent, homebound and institutionalized older adults (Hamid et al., 2007). In LTC residents, vitamin D deficient levels are as high as 76-79% (Hamid et al., 2007; Demontiero et al., 2011). Recent epidemiologic studies have found an association between vitamin D deficiency and high fracture risk in LTC residents. There is a relationship between serum concentrations of 25(OH)D and muscle function in older adults and thus doubling vitamin D concentration levels would result in a 20% reduction in the risk of falling (Demontiero et al., 2011). Therefore, there is a strong correlation between vitamin D deficiency and its contribution to falls and fractures in the older adult population (Demontiero et al., 2011; Lyles, Schenck, & Colón-Emeric, 2008).

Vitamin D deficiency is reversible with sufficient supplementation (Hamid et al., 2007). In adults, vitamin D deficiency can lead to osteopenia and osteoporosis which in turn results in osteomalacia, muscle weakness (proximal muscle wasting and decreased muscle strength ) and an increase in fracture risk (Holick, 2007; Hamid et al., 2007). In the Bischoff-Ferrari et al. (2004) study, it was found that there was a 22% reduction in the risk of falls with increased supplementation of vitamin D as compared to the placebo or calcium alone. This study also indicated that supplementing with only 400 IU/day of vitamin D<sub>3</sub> is not sufficient for reducing the risk of falls, and that 800 IU/day of vitamin D<sub>3</sub> with calcium was required to reduce the risk of falls. Additionally, in another

randomized controlled trial LTC residents who received 800 IU/day of vitamin D<sub>2</sub> with calcium had a 72% reduction in the risk of falls compared to the placebo group (Holick, 2007).

Another issue with vitamin D deficiency is it can lead to a condition known as secondary hyperparathyroidism. Since deficiency results in low levels of calcium, this leads to an increase in PTH and resulting in high bone turnover. Secondary hyperparathyroidism results in a decrease in bone mineral density which in turn leads to an increased risk of hip fracture and an increase porosity in cortical bone (Eriksen & Glerup, 2002). Early identification of vitamin D deficiency in the older adult population and prompt initiation of vitamin D supplementation is important for prevention of falls and fractures (Demontiero et al., 2011).

### ***Vitamin D Supplementation Practice***

Vitamin D supplementation in LTC facilities is of increasing interest. In Canada, there is no policy at the provincial level for implementing routine vitamin D supplementation in LTC facilities despite current recommendations (Canadian Agency for Drugs and Technologies in Health, 2010; Winnipeg Regional Health Authority, 2013). Recommendations for vitamin D supplementation vary between each province and territory within Canada. It is recommended that a vitamin D supplement be provided to all LTC residents (Winnipeg Regional Health Authority, 2013, 2008; Ross et al., 2011). The Canadian Agency for Drugs and Technologies in Health (2010) indicate that the main issues leading to vitamin D deficiency in LTC facilities is lack of exposure to sunlight, poor diet, conditions that affect vitamin D synthesis or absorption, and age-related metabolic changes in which the skin is not as effective in converting vitamin D. On a National level, the First Nations and Inuit can be prescribed and covered for vitamin D supplementation by a practitioner under their drug benefits list. At the provincial level, there is no policy that enforces vitamin D supplementation in LTC facilities across Canada and recommendation for supplementation varies between each province (Table 2.5).

Table 2.5. Provincial Policies and Recommendation for Vitamin D Supplementation in Canadian LTC Facilities

<b>Province or Territory</b>	<b>Benefit under Provincial Drug Formulary</b>	<b>Follow Osteoporosis Guidelines</b>	<b>Provincial Policy</b>	<b>Recommendation</b>
British Columbia	Yes: Vitamin D <sub>2</sub> and Alendronate with VitaminD <sub>3</sub>	Yes	No	1 LTC facility (James Bay Lodge) recommends 1,000 IU/day
Yukon	Yes		No	~60% of LTC residents take an average of 1,000 IU/day of vitamin D
Northwest Territories	Yes: First Nations and Inuit		No	2010 article wanted to develop standard recommendations for vitamin D
Nunavut	Yes: First Nations and Inuit)		No	
Alberta	Yes: Vitamin D <sub>3</sub> with Alendronate		No	Varies as prescribed by physician 11 LTC facilities in Edmonton suggest 1,000 IU/day of vitamin D
Saskatchewan	Yes		No	RD support vitamin D supplementation Varies as prescribed by physician (~1,000 IU/day) with less than 40% of residents receiving vitamin D
Manitoba	Yes		No	Varies as prescribed by physician and not provided routinely A RHA developed a practice summary of recommended vitamin D supplementation

*Continued ...*

Ontario	Yes	Yes	No	Most LTC facilities provide 800-1,000 IU/day of vitamin D as recommended as part of their fall prevention program to aid in bone health protection
Quebec	No information on vitamin D supplementation			
New Brunswick	Yes		No	RD, NP, physician recommends prescribing vitamin D supplementation on an individual basis
Nova Scotia	Yes		No	Provincial government recommends Calcium + vitamin D supplementation, which is facility driven Only 1 LTC facility (Nakile Home) provides supplementation of 1,000 IU/day for 6 days/week to all residents on a routine basis or 50,000 IU/month to prevent polypharmacy
Prince Edward Island	Yes		No	
Newfoundland Labrador	Yes		No	Policy is being developed for calcium and vitamin D supplementation for LTC residents 1,000 IU/day of vitamin D and calcium is recommend for all residents on admission

(Adapted from Canadian Agency for Drugs and Technologies in Health, 2010)

In the Hamid et al. (2007) study, it was concluded that despite supplementation with vitamin D and calcium, there was still a significant number of LTC residents who remained vitamin D deficient. Vitamin D deficiency was defined as serum 25(OH)D levels less than 20 ng/mL and vitamin D insufficiency was identified as serum levels less than 30 ng/mL (Hamid et al., 2007). This study suggests that when the majority of residents are supplemented with 400 IU/day of vitamin D<sub>3</sub> it was not sufficient, as 49.4% of residents were vitamin D insufficient and 16% were vitamin D deficient (Hamid et al., 2007). Hollis (2005) concluded that older adults whom do not receive sufficient amount of sunlight exposure and/or dietary food sources of vitamin D require a daily supplement of vitamin D<sub>3</sub> above 2,000 IU/day. Furthermore, other studies have suggested that high doses of vitamin D may be more effective for residents who have vitamin D deficiency or malabsorption syndrome. It is recommended that residents should receive between 50,000 IU of vitamin D<sub>3</sub> as an initial dose followed by 800-1,000 IU/day of vitamin D<sub>3</sub> or 300,000 IU of vitamin D<sub>3</sub> every 3 months (Demontiero et al., 2011; Hamid et al., 2007; Larsen, Mosekilde, & Foldspang, 2004). Larsen et al. (2004) demonstrated that there was a significant reduction in fractures of hip, wrist, forearm, and spine when older adults received 100,000 IU of vitamin D<sub>3</sub> every four months for 5 years compared to placebo. Supplementing with higher doses of vitamin D less frequently may have more of an effect in correcting vitamin D deficiency and fracture risk, and attain a higher compliance rate (Bischoff-Ferrari et al., 2006).

Consistency and encouragement of supplementation use varies across LTC facilities which remains an issue. Hamid et al. (2007) found that LTC residents continue to receive inadequate calcium and vitamin D supplementation. Chandler et al. (2000)

demonstrated that among 47 LTC facilities in Maryland, USA with 1,427 LTC residents, only 5% of these residents received vitamin D or calcium supplementation. Kamel (2004) cross-sectional study found that in 177 Long Island, New York LTC residents, only 9% were prescribed vitamin D supplements and 12% were prescribed calcium. Nieuwenhuizen et al. (2010) reported that consumption and assistance for supplementation in the weak and dependent residents was not encouraged, of which was due to limited staffing. The staff had spent less than a minute per patient to encourage consumption of a nutritional supplement (Nieuwenhuizen et al., 2010). Viveky et al. (2012) examined the use of vitamin and mineral supplementation for residents in a Canadian LTC facility. This study found that out of 189 LTC residents, 48.7% received at least one supplement per day and 51.3% received no supplements. Vitamin D supplementation was the highest at 35.4%, followed by calcium at 25.9%, multivitamins at 19.5%, vitamin B and/or C at 19%, and vitamin A at 0.05%. It was concluded from this study that the residents consumed different types of vitamin and mineral supplements, there was variation in consumption frequency, and there was a low rate of vitamin D use as a separate supplement (Viveky et al., 2012).

Providing vitamin D supplementation has not only shown its effectiveness in reducing vertebral and nonvertebral fractures but it is the cheapest form of medication to use for the prevention of osteoporosis, falls and fractures (Hamid et al., 2007; Demontiero et al., 2011). A meta-analysis by Tang et al. (2007) indicated that supplementing with vitamin D and calcium together versus vitamin D alone had a 12% reduction in all types of fractures. Supplementation is easily tolerated, has minimal toxicity, is inexpensive, and has few reported drug interactions, but several obstacles

exist, such as polypharmacy (Demontiero et al., 2011; Hamid et al., 2007; Viveky et al., 2012). Many older adults residing in LTC facilities are on multiple medications, which are quite often costly. For medical staff in the LTC facility, the trend is to discontinue non-prescription items to reduce the number of oral medications per patient. Vitamins and minerals often fall into this category. The second issue with vitamin D supplementation is determining the correct dose for each individual. Additionally, the physician has to decide whether it is more beneficial for the patient to be on a multivitamin or supplement with vitamin D and calcium (Hamid et al., 2007; Viveky et al., 2012). Therefore, despite scientific evidence indicating the importance of vitamin D supplementation, it is difficult to assess and treat LTC residents as many facilities do not have protocols (Hamid et al., 2007).

### *Attitudes and Beliefs of Staff regarding Vitamin D Supplementation*

Limited research exists on the perceptions of front-line staff for vitamin D supplementation and on the attitudes, practices, and beliefs for osteoporosis awareness, management and fracture prevention (Lau et al., 2010). In the Lau et al. (2010) study, they used a questionnaire specific to 57 nurses and personal support workers (PSW) to determine whether they knew how to correctly administer bisphosphonates used for osteoporosis and whether they thought that their LTC residents should be supplemented with vitamin D. The results indicated that only 52% of nurses and 8.7% of PSW knew how to properly administer bisphosphonates, and that 68% of nurses and 44% of PSW firmly believed that their patients should be supplemented with vitamin D. This particular study helps to show that administration of bisphosphonates is poor and LTC staff feels strongly towards providing vitamin D supplementation for their residents (Lau et al., 2010). Hollis (2011) noted that healthcare providers should formulate their own opinions on vitamin D supplementation for each individual patient. In conclusion, research is limited on the perceptions of LTC health professionals, staff, and visitors for providing vitamin D supplementation to residents.

## **Theoretical Framework**

Qualitative research involves an interpretive, naturalistic approach focusing on a deeper significance that the subject attributes to the topic being researched (Creswell, 2013). Qualitative researchers study subjects in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring. This type of research begins with assumptions and theoretical frameworks that help to inform the research problem(s). Researchers in this area study the research problem(s) by using a qualitative approach to inquiry and collect data in a natural setting sensitive to the individuals and groups of people and places under study (Creswell, 2013). During data analysis, the researcher establishes patterns or themes. In the final report, the researcher ensures inclusion of the voices of participants, an in-depth description and interpretation of the research problem(s), and its contribution to the literature or a need for change. Within this process, a theoretical framework exists for the procedures involved in studying social or human problems. A theoretical framework is an approach to investigation (Creswell, 2013). For this research study, the Health Belief Model (HBM) will be used.

The HBM is a well-developed model and theoretical framework which describes “possible ways to influence people’s perceptions of risk” (Kerr, Weitkunat, & Moretti, 2005). The HBM assumes that, “people will take preventive action for their health and engage in health-promoting behaviours if they believe that they are at personal risk of contracting an illness (perceived susceptibility), perceive the potential seriousness of the illness and its sequelae (perceived severity), are convinced that the recommended measures are effective in reducing the risk or seriousness of impact (perceived benefits),

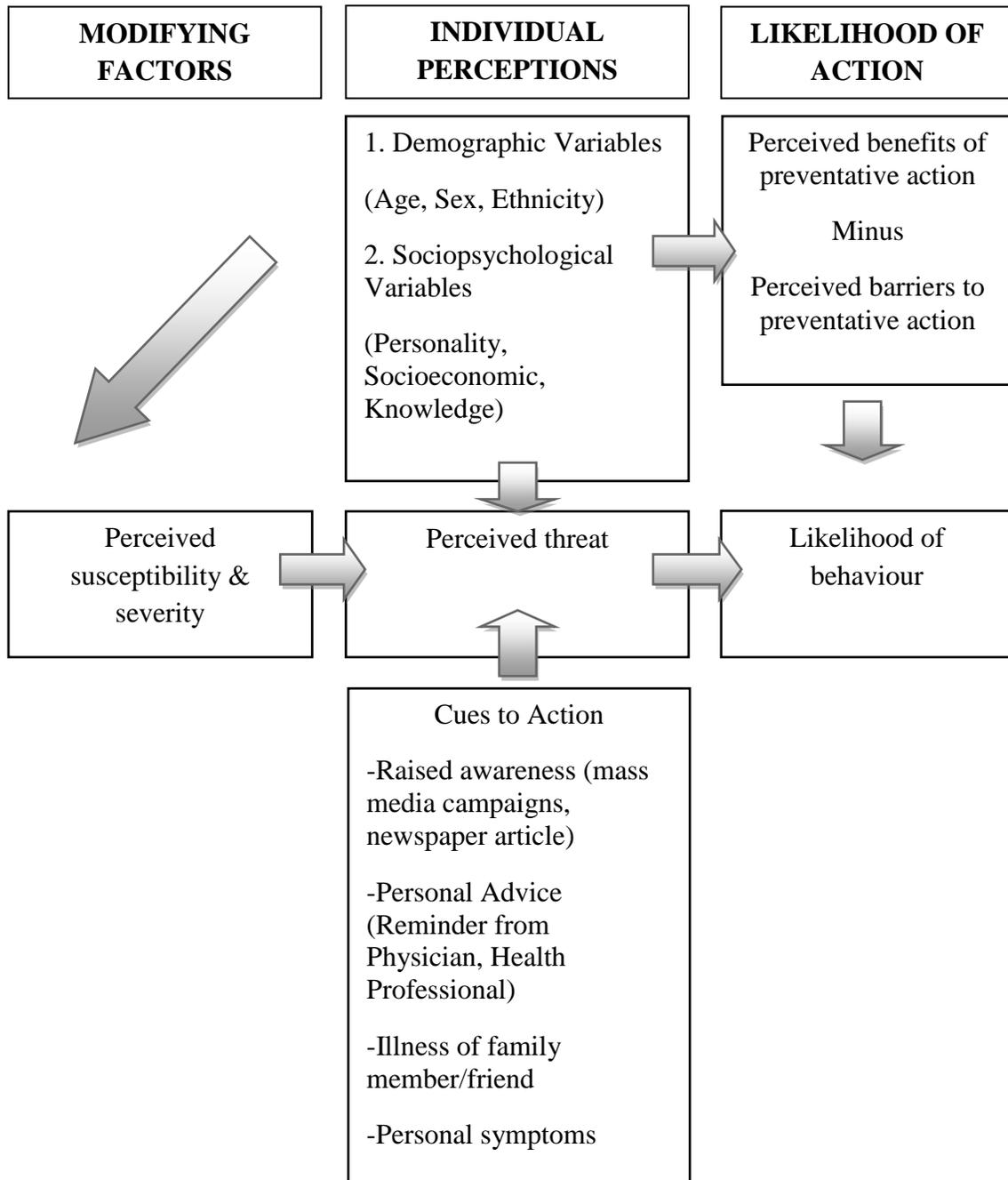
and are not hindered from engaging in preventive actions by costs, difficulties, or obstacles (perceived barriers). Further, the model assumes that the decision to take health-promoting action is prompted by triggers to behave or ‘cues to action’. Cues to action can be internal or external” (Kerr et al., 2005). Therefore, the HBM includes severity and susceptibility to a disease condition, perceived barriers and benefits related to behaviour change, and cues to action and motivation in oneself for behaviour change (Plawecki & Chapman-Novakofski, 2013; Hsieh, Novielli, Diamond, & Cheruva, 2001). All of these variables in the HBM are important in explaining health behaviours (Hsieh et al., 2001). A health threat can produce the motivation to change behaviour and then people can succeed in implementing that change (Figure 2.1) (Kerr et al., 2005). The HBM is an appropriate conceptual framework for interventions with short-term goals. The health communication part of the HBM also applies to frequent interventions and long-term change. People’s uncertainty when making health decisions can be utilized to propose processes and increase confidence (Kerr et al., 2005).

According to the health belief model, people will take action to prevent vitamin D deficiency (such as having screening tests) if they believe that they could be at risk of contracting vitamin D deficiency, believe in the potential seriousness of the condition (increased risk of falls and fractures and decreased quality of life), believe that recommended preventative measures will be beneficial and if there are few barriers to overcome in order to perform the action (inadequate staffing) (Kerr et al., 2005). The cue to action to obtain early identification of vitamin D deficiency might be encouraged by increased awareness in the mass media, personal symptoms, advice from physician to have a screening test for deficiency. In addition, the health communication part in the

HBM is an important component and involves the right communicator (physician) who is directive, authoritarian, and highly credible to motivate the individual to perceive the health threat of vitamin D deficiency more accurately and provide indications of preventive measures (educating the individual on primary sources of vitamin D) (Kerr et al., 2005).

The HBM has been used in a number of research studies focusing on osteoporosis prevention research and in predicting and understanding patient health behaviour in disease prevention and detection (Plawecki et al., 2013; Hsieh et al., 2001). The HBM has also been proven useful in the planning and evaluation of public health interventions (Kerr et al., 2005). In a study conducted by Hsieh et al. (2001) peri- and postmenopausal women were used to determine health belief factors associated with osteoporosis prevention behaviours. It was found that majority of women believed that osteoporosis is a serious condition but only a few felt susceptible to the condition. The HBM addresses unclear situations compounded with ambiguous information which do not clearly point to any one alternative. In this situation, people are more open to suggestive processes (Kerr et al., 2005).

Figure 2.1. Health Belief Model



(Modified from Kerr et al., 2005)

## **CHAPTER 3**

### **METHODOLOGY**

A sequential exploratory mixed-methods design was used. This project was conducted in two phases:

#### **Phase 1) Focus Groups (Quantitative and Qualitative);**

During each focus group session, data collection and analysis occurred with a nutrition survey (quantitative) following a focus group interview (qualitative).

Quantitative and qualitative data collection processes involved recruitment, permissions needed from each participating LTC site, consent from participants, and administration of instruments for data collection (Creswell, 2013). Quantitative and qualitative data analysis involved exploring the data, analyzing the data, and representing the data (Creswell, 2013).

#### **Phase 2) Nutrition Survey (Quantitative)**

A nutrition survey was used to examine the perceptions and identify the top two barriers that exist for vitamin D supplementation. Barriers that were identified in phase 1 focus group interviews were used in this survey to identify the top 2 barriers that exist within a larger sample size. Quantitative data was analyzed using descriptive statistics by the statistical software program SPSS (Statistical Package for Social Sciences) version #20.0 and the results are represented in tables.

### *The Setting*

Field work took place in five LTC facilities within a Regional Health Authority (RHA) in Manitoba. The participating LTC facilities differed from each other in reference to: size of facility, type of organization, and religious affiliation (Table 3.1).

Table 3.1. Characteristics of Participating LTC Sites

<b>LTC Facility</b>	<b>Size of Facility (# of LTC beds)</b>	<b>Type of Organization</b>	<b>Religious Affiliation</b>
A	235	Non-profit	Non faith based
B	288	Non-profit	Non faith based
C	200	For-profit	Faith based
D	100	Non-profit	Faith based
E	155	For-profit	Non faith based

## ***Ethics***

Ethical approval was received from the University of Manitoba Joint-Faculty Research Ethics Board (JFREB). Ethical approval was also obtained from each participating site prior to study commencement. The importance of ethics approval is to protect the rights of human participants. At no point were names of participants disclosed to other persons or on any documentation viewed by anyone other than the research supervisor, principal investigator, and research assistant.

### **Phase 1) Focus Groups:**

#### ***The Sample***

The sample consisted of five focus groups (nine to twelve participants per group) with a total of fifty-one participants (90.2% female; 9.8% male). Each focus group session was conducted in five LTC facilities. The participants consisted of registered nurses (RN), licensed practical nurses (LPN), health care aides (HCA), clinical dietitians, pharmacists, social workers, administrators, food service personnel, recreation therapists, physiotherapists, occupational therapist, rehabilitation aide, speech-language pathologist, and spiritual care personnel.

#### ***Recruitment***

The participants were recruited through the participating LTC sites via posters (Appendix A), department requests, emails, and announcements with the help of directors of care and/or clinical dietitians at each LTC facility. These various forms of

communication between the participants and the directors of care and/or clinical dietitians helped to increase awareness about the study to aid in the recruitment process. The inclusion criteria required that all participants must be 18 years of age and older. The exclusion criteria required that participants could not be a resident of the LTC facility nor an employee of maintenance, custodial, and security staff of the LTC facility. Job diversity was important in the recruitment process in order to obtain different perceptions from diverse educational backgrounds. Prior to each focus group session, the principal investigator received a table listing participant information from the coordinator (director of care and/or clinical dietitian) at each facility. The table consisted of participant names, job title, and contact information. The principal investigator confirmed participation with each participant via email and phone call reminders to confirm attendance. The purpose of the study, the objectives, and an explanation of what the focus group session involved was also clarified with each participant.

### ***Development of Tools***

Focus group sessions consisted of a nutrition survey followed by a focus group interview.

1a) A focus group nutrition survey (Appendix B) was developed by the principal investigator in consultation with the research supervisor. The survey was used to collect demographic data and examine the perceptions of health professionals and LTC staff regarding vitamin D supplementation in LTC facilities. The survey was two pages in length and consisted of twelve questions: five demographic questions (#1-5) and seven perception questions (#6-12). Questions were formatted to examine the perceptions of the target group, one of the research objectives. Demographic questions consisted of age,

gender, occupation, years of employment at the facility, and equivalent full-time (EFT) designation. Five perception questions contained dichotomous responses: 1 = yes and 2 = no and a yes no scale was used for each item. Two perception questions were classified in three categories: 1 = not important, 3 = somewhat important, and 5 = very important. A 5 point rating scale was used to scale responses for these two questions.

1b) A semi-structured Moderator's Guide (Appendix C) was developed by the principal investigator and the research supervisor and was implemented for each focus group interview. Standardized focus group methodology described by Krueger and Casey (2000) was used to aid in the development of the moderator's guide and planning the focus group interviews. The principal investigator also received training prior to conducting the focus group interviews. The Moderator's Guide consisted of an introduction, a brief overview of the study, group guidelines, a group ice breaker activity, five open-ended questions, and ended with closing remarks. The open-ended questions were based on the research objectives. Four questions (#1, #2, #4, and #5) were developed to discuss perceptions on vitamin D supplementation. One question (#3) was used to discuss barriers that may exist for providing vitamin D supplementation in each LTC facility. All four open-ended perception questions contained a probing question to help obtain a more comprehensive response from participants.

### ***Data Collection***

Focus group nutrition surveys (quantitative) and focus group interviews (qualitative) were administered. All participants were required to sign an informed consent form (Appendix D) prior to their involvement in the study followed by a nutrition survey (Appendix B) at the beginning of each focus group session. Both the consent form and the survey took approximately 15 minutes to complete. The principal investigator was present during each session to ensure that the consent forms and nutrition surveys were complete and to assist in clarification of any questions. Informed consents and surveys were collected by the principal investigator and the note taker. The surveys were confidential and participants' information was only identified by numerical code.

Following the completion of the informed consents and survey, the focus group interviews were conducted. Focus group interviews are used as a way of collecting qualitative data by involving a small number of participants in an informal group discussion, focused around a particular topic or set of issues (Silverman, 2004). The topic of focus was the assessment of perceptions regarding the need for and barriers of vitamin D supplementation among older adults in LTC. The principal investigator facilitated the discussion by the following parameters: introduction of questions, kept the discussion flowing, and ensured all participants were fully participating (Silverman, 2004). The flexibility of focus group research is it can be used for qualitative methods or used in combination with quantitative techniques as part of a mixed-method project (Silverman, 2004). The trained moderator was used to ask five open-ended questions and

facilitate group discussion with the aid of a semi-structured Moderator's Guide (Appendix C).

The principal investigator was the moderator for all five focus group sessions. The focus group interview took approximately 30 minutes to complete; 5 minutes to complete the introduction, overview of the study, group guidelines, and ice breaker activity and 25 minutes to discuss five open-ended questions (5 minutes/question). The moderator was mindful of time due to the sample being working participants and facilitated each session (consent form, survey, and interview) within a 45 minute time frame. Data saturation was observed at the fifth focus group thus no more focus groups were needed (Krueger & Casey, 2000; Morgan, 1997).

During each session, drinks and snacks were provided as a token of appreciation. The interviews were confidential and participants' information was only identified by first name. All focus group sessions were digitally recorded to allow for transcription and data analysis. During each session, there were a total of 3 audio recorders used and placed on the table to ensure the session was clearly recorded and all participant voices were heard. A note taker was present during each session to aid in recording the discussion and to document participant facial cues and expressions which is not visible on an audio recorder.

### ***Data Analysis***

1a) Focus group nutrition survey: In preparation for quantitative data analysis, a codebook was first developed prior to data entry. The principal investigator compiled and entered the data using SPSS version #20.0 for Windows (SPSS Inc., Chicago, IL).

The data was checked for accuracy by the principal investigator and the research supervisor. Statistical analysis was completed using descriptive statistics (i.e., means, standard deviations, frequencies, and percentages) for all variables. In addition, a chi-square test was used to compare data across LTC facilities by occupation. Chi-square test was completed to compare responses between nursing staff and other participants. The normality of the data determined if parametric or non-parametric tests will be used. A  $p$ -value  $\leq 0.05$  was used to signify statistical differences between all comparisons.

1b) Focus group interviews: Qualitative data analysis occurred in a sequential manner. During the transcription process, the digital audiotapes were transcribed verbatim by the principal investigator and resulted in 79 pages of transcribed text. Each transcription took several days to complete. A research assistant was chosen due to having an undergraduate degree in Human Nutritional Sciences and previous experience with data analysis for a large Manitoban research project. After each initial transcription, the principal investigator replayed the audiotapes twice and all transcriptions were reviewed by a research assistant to ensure accuracy (Creswell, 2013). The principal investigator participated in regular meetings independently with the research supervisor and the research assistant to ensure that the information was reported as accurate and complete (Creswell, 2013). The principal investigator ensured anonymity and confidentiality of participants by using only the participants first name and all data was securely stored on a password-protected computer and in locked filing cabinets.

Following transcription, the principal investigator re-read each transcript several times along with data from the note taker to ensure the following: a strong understanding of the important ideas, to immerse oneself in the details, and get a sense of the interview

as a whole before breaking it into parts (Creswell, 2013). Thematic analysis was used to analyze participant responses to the open-ended questions. In the initial phase, open coding was conducted primarily by hand, using printed copies of transcripts along with highlighters and pens to assign initial codes to significant statements for all five interview transcripts. The initial codes that were identified were nouns, verbs, and in vivo codes (Creswell, 2013). The next step involved examining every sentence, identifying new and repeated codes, and relationships between different codes. A codebook of codes was developed to aid in the organization of themes (“parent” codes) and sub-themes (“child” codes). The research assistant was provided a copy of the codebook, re-read the transcripts several times, and coded each transcript independently from the principal investigator. The principal investigator and the research assistant collectively met on several occasions to examine and compare the codes, their names, and the coding of significant statements. Intercoder agreement was established and the assigned codes for significant statements were agreed upon for all five transcripts. This ensured reliability and accuracy (Creswell, 2013; Creswell & Clark, 2007). Themes and sub-themes were reorganized in the codebook for clarity. The principal investigator then imported the transcripts and entered the codes into NVivo 10 QSR qualitative software (2010) to assist in organization of themes and patterns. Frequency of occurrence was obtained using NVivo to determine how frequently codes appeared by making a preliminary count for each code (Creswell, 2013). All codes were printed from NVivo software and thoroughly reviewed by the principal investigator to explore important quotes for each theme and sub-theme, overarching themes, and recurring concepts. This process assisted in the development of a table and a figure to represent major themes and important quotes.

## **Phase 2) Nutrition Survey:**

### ***The Sample***

The sample for the anonymous self-administered nutrition survey consisted of a total of 102 participants from five LTC facilities in a RHA in Manitoba. The participants consisted of nursing (RN, LPN, and HCA), food service personnel, recreation therapists, visitors (family and friends), administrators, clinical dietitians, social workers, rehabilitation aides, nursing clerk, nutrition clerk, occupational therapist, physician, physiotherapist, and an x-ray technologist.

### ***Recruitment***

Recruitment posters (Appendix E) and communication (emails and announcements) via directors of care and/or clinical dietitians assisted in recruiting participants for the study. Job diversity was important in the recruitment process in order to obtain different perceptions from diverse backgrounds. Participants were included in the survey if they were 18 years of age and older and were a visitor (friend or family) of a LTC resident. The exclusion criteria required that participants could not be a resident of the LTC facility nor an employee of maintenance, custodial, and security staff. In addition, the exclusion criteria required that participants from the focus groups could not participate in this survey.

### ***Development of Tools***

The nutrition survey (Appendix F) was developed by the principal investigator and the research supervisor and was used to expand on phase 1 of this study. During the

focus group interviews, participants identified barriers that they felt existed in their facility for providing vitamin D supplementation to residents. The identified barriers from phase 1 along with an in-depth literature review developed the categorical barrier question for this survey. The addition of the barrier question helped to address the top two barriers that exist with a larger sample size. This survey was also implemented to obtain demographic data of the survey participants. The anonymous self-administered survey was two-pages in length and consisted of twelve questions, four demographic questions (#1-4), seven perception questions (#5-11), and one barrier question (#12). Demographic questions consisted of age, gender, occupation, and whether the participant was employed at the facility. Five perception questions contained dichotomous responses: 1 = yes and 2 = no. Two perception questions were classified in three categories: 1 = not important, 3 = somewhat important, and 5 = very important. The barrier question contained ten categories to choose the top two barriers for providing vitamin D supplementation.

A pilot test was completed prior to phase 2 for face validity by five health professionals and two non-health professionals. This group was recruited on a voluntary basis by the principal investigator and the research supervisor. The participants were asked to complete the survey and provide feedback regarding the barrier question. Pre-testing of the survey helped to ensure questions were clear and easy to understand and to improve the quality of the barrier question. Modifications were made to content, format, and readability of the barrier question and were thoroughly reviewed by the principal investigator and the research supervisor.

### ***Data Collection***

The nutrition survey was conducted in all five recruited LTC facilities. The date and time frame for data collection at each site was predetermined by the directors of care and/or clinical dietitians and was scheduled based on what was convenient for each facility. A booth with the principal investigator present was set-up near the cafeteria or at the front of the facility to recruit individuals to fill out the survey. In addition, the directors of care and/or clinical dietitians aided in the recruitment process by making announcements to staff and visitors, posting the recruitment poster around the facility, and reminding staff about the voluntary survey. All participants were required to sign a consent form (Appendix G) prior to their involvement in the study followed by completing the nutrition survey (Appendix F). The principal investigator ensured that all consent forms and surveys were complete. The survey took approximately five minutes to complete. The surveys were confidential and participants' information was only identified by numerical code. After completion of the survey, participants were entered into a draw for one of five \$50 gift certificates per site for a local grocery store, as a token of appreciation. The draw was completed at each site following data collection and the winner was notified immediately. Providing a token of appreciation and guaranteeing participant's anonymity (participants were not asked to identify personal details such as name or telephone number) helped to increase the response rate.

## ***Data Analysis***

In preparation for quantitative data analysis, a codebook was first developed prior to data entry. Quantitative data collected from the survey was compiled and entered using SPSS version #20.0 for Windows (SPSS Inc., Chicago, IL). To ensure for accuracy, the principal investigator entered and checked the data and was rechecked by the research assistant. Statistical analysis was completed using descriptive statistics (i.e., means, standard deviations, frequencies, and percentages) for all variables. During the analysis process, two categorical variables (VitDAdequate and VitD18) were recoded to combine three categories “not important”/”somewhat important”/”very important” into two categories “important”/”not important”. This was completed to achieve similarity for the number of categories between all variables. After recoding both categorical variables (VitDAdequate and VitD18), descriptive statistics (frequencies) was performed. An additional statistical analysis (i.e., chi-square test) was used to compare data across LTC facilities by occupation. Chi-square test was completed to compare responses between nursing staff and other participants. To complete this analysis, the categorical variable “Job Title” was recoded into two categories “nursing staff”/”other participants”. The normality of the data determined if parametric or non-parametric tests were used. A  $p$ -value  $\leq 0.05$  was used to signify statistical differences between all comparisons.

## **CHAPTER 4**

### **Health Professionals' Perceptions of Vitamin D Supplementation**

#### **In Long-Term Care Facilities**

##### **INTRODUCTION**

The aging population is increasing worldwide with 7.9% of older adults living in Canadian LTC facilities (Statistics Canada, 2012a). The population is aging due to the influx of baby boomers (individuals born between 1946-1965), longer life expectancy, and an increased awareness of the need for improved QOL at older ages (Statistics Canada, 2006; McNaughton et al., 2012; Doupe et al., 2011). It is projected by 2056, that 27.2% of the Canadian population will be older adults (Statistics Canada, 2006). Similar to other Canadian provinces Manitoba's population is aging with 12.2% of Manitoban seniors residing in LTC facilities (Center on Aging, 2010; Manitoba Health, 2007/2008). The number of older Manitobans is projected to increase to 21.7% by the year 2031 (Statistics Canada, 2006).

Malnutrition is prevalent among older adults residing in LTC facilities, ranging from 5-85%, as residents do not consume adequate amounts of nutrients and energy (Lengyel et al., 2008; Reimer & Keller, 2009; American Dietetic Association, 2005a, 2005b). According to the Canadian Malnutrition Task Force (2012) malnutrition is defined as, "issues with undernourishment, overnutrition, single-nutrient deficiencies, and nutrient imbalances". Malnutrition increases the risk of infection, hospitalization, morbidity, mortality, and decreases QOL of older adults (Arvanitakis et al., 2008). There are many risk factors associated with malnutrition including poor dietary intake, health

problems, medication usage, poor supportive networks and assistance with eating, inadequate staffing and staff training, nutrition knowledge and support, functional disability and food accessibility (Bostrom et al., 2011; Bocock & Keller, 2008; American Dietetic Association, 2000, 2005a, 2005b).

Vitamin D is a fat-soluble vitamin that aids in calcium absorption and bone formation, which are essential in bone health (Insel et al., 2006; Holick et al., 2005; Bischoff-Ferrari et al., 2006). In older adults, vitamin D helps prevent bone loss and improves muscle integrity which helps to decrease the risk of falls and fractures (Bischoff-Ferrari et al., 2006; Demontiero et al., 2011). Vitamin D plays an important role in the maintenance of calcium and phosphate homeostasis (Brown, 2008; Insel et al., 2006; Holick et al., 2005). Without vitamin D, only 10-15% of dietary calcium and about 60% of phosphorus is absorbed. Serum 25-hydroxyvitamin D is the major circulating metabolite of vitamin D and reflects vitamin D input from cutaneous synthesis and dietary intake (Millen & Bodnar, 2008; Calvo et al., 2004). The most important dietary forms of vitamin D are vitamin D<sub>2</sub> (ergocalciferol) and vitamin D<sub>3</sub> (cholecalciferol). Our skin makes vitamin D<sub>3</sub> and this supplies about 90 percent of our vitamin D (Holick, 2006). Vitamin D naturally occurs in few dietary sources such as fatty fish (tuna, salmon, mackerel, sardines), fish-liver oils (cod liver oil), eggs, and in Canada all milks and margarines must be fortified (Institute of Medicine, 2006; Health Canada, 2012; Holick, 2006). Limited number of foods that naturally contain vitamin D and those that are fortified, make it almost impossible to meet vitamin D recommendations through food alone without recommending unrealistic daily consumption of some foods (Holick, 2007, 2006). Vitamin D is of particular interest as the nutrient recommendations (Dietary

Reference Intakes) have increased from 600 IU/day for 51-70 years of age and 800 IU/day for those 70 years of age and older, making it a challenge to achieve by consuming food alone (Ross et al., 2011).

Institutionalized older adults are at risk for vitamin D inadequacy due to several factors such as poor dietary intake, poor nutritional status, age-related metabolic changes, and limited exposure to sunlight (Holick, 2006; Demontiero et al., 2011). Age-related metabolic changes affect vitamin D status, independent of dietary intake, primarily due to decreased ability of the skin to synthesize previtamin D<sub>3</sub> from its precursor, 7-dehydrocholesterol (Holick, 2006). Adults over the age of 65 years produce four times less vitamin D in the skin compared with adults aged 20 to 30 years (Institute of Medicine, 2006). Insufficient 25-hydroxyvitamin D (25(OH)D) leads to reduced ability to absorb calcium and phosphorus, leading to poor bone health, osteoporosis, and increased risk of bone fracture. A recent study conducted by Sitter and Lengyel (2011) found that among 14 LTC residents in a city in Manitoba, 83% had insufficient levels of 25(OH)D irrespective of the season. In LTC residents, vitamin D deficient levels are as high as 76-79% (Hamid et al., 2007; Demontiero et al., 2011). Vitamin D deficiency is reversible with sufficient supplementation (Hamid et al., 2007). In adults, vitamin D deficiency can lead to osteopenia and osteoporosis which in turn results in osteomalacia, muscle weakness (proximal muscle wasting and decreased muscle strength ) and an increase in fracture risk (Holick, 2007; Hamid et al., 2007). Early identification of vitamin D deficiency in the older adult population and prompt initiation of vitamin D supplementation is important for prevention of falls and fractures (Demontiero et al., 2011).

Vitamin D supplementation in Canadian LTC facilities is of increasing interest. In Canada, there is no policy at the provincial level for implementing routine vitamin D supplementation in LTC facilities despite current recommendations (Canadian Agency for Drugs and Technologies in Health, 2010). Recommendations for vitamin D supplementation vary between each province and territory within Canada. It is recommended that a vitamin D supplement be provided to all LTC residents (Winnipeg Regional Health Authority, 2013, 2008; Ross et al., 2011; Hollis, 2005). In Manitoba, recommendations for vitamin D supplementation vary, are not provided routinely to LTC residents, and must be prescribed by a physician (Canadian Agency for Drugs and Technologies in Health, 2010). Hollis (2005) concluded that older adults whom do not receive sufficient amount of sunlight exposure and/or dietary food sources of vitamin D require a daily supplement of vitamin D<sub>3</sub> above 2,000 IU/day. In three studies, it was found that as little as 5-12% of LTC residents received vitamin D and/or calcium supplementation and supplementation was not encouraged (Hamid et al., 2007; Chandler et al., 2000; Nieuwenhuizen et al., 2010). Providing vitamin D supplementation has not only shown its effectiveness in reducing vertebral and nonvertebral fractures, but it is the cheapest form of medication to use for the prevention of osteoporosis, falls, and fractures (Hamid et al., 2007; Demontiero et al., 2011). A meta-analysis by Tang et al. (2007) indicated that supplementing with vitamin D and calcium together versus vitamin D alone had a 12% reduction in all types of fractures.

Supplementation is easily tolerated, has minimal toxicity, is inexpensive, and has few reported drug interactions, but several obstacles exist, such as polypharmacy (Demontiero et al., 2011; Hamid et al., 2007; Viveky et al., 2012). Many older adults

residing in LTC facilities are on multiple medications, which are quite often costly. For medical staff in the LTC facility, the trend is to discontinue non-prescription items of which vitamins and minerals often fall into this category. The second issue with vitamin D supplementation is determining the correct dose for each individual. Additionally, the physician has to decide whether it is more beneficial for the patient to be on a multivitamin or supplement with vitamin D (Hamid et al., 2007; Viveky et al., 2012). Therefore, despite scientific evidence indicating the importance of vitamin D supplementation, it is difficult to assess and treat LTC residents as many facilities do not have protocols (Hamid et al., 2007).

Limited research exists on the perceptions of LTC health professionals and barriers that may exist for providing vitamin D supplementation to residents. A Canadian study by Lau et al. (2010) found that LTC staff (nurses and PSW) firmly believed that their residents should be supplemented with vitamin D. Vitamin D supplementation practice has been adopted in very few LTC facilities across Canada and the exact reasons and the barriers to implementation have not been elucidated. This research project seeks to address the gaps in the literature by determining the perceptions of vitamin D supplementation for older adults from the perspective of LTC staff. The research objectives of this study were: (1) to examine the perceptions of LTC health professionals and staff regarding vitamin D supplementation in LTC facilities; and (2) to determine what barriers exist in providing vitamin D supplementation to all residents in LTC facilities.

## METHODS

### *Study Design*

An exploratory mixed-methods design was used. Focus groups were used as a way to help understand vitamin D supplementation in LTC from a homogenous sample of LTC health professionals and staff from the ground up. The survey was used to primarily collect participant characteristics. Focus group sessions consisted of the following: 1) nutrition survey (quantitative) and 2) focus group interviews (qualitative) which was conducted in five LTC facilities.

### *The Setting*

Field work took place in five LTC facilities within a Regional Health Authority (RHA) in Manitoba. Each LTC facility differed from each other in reference to: size of the facility, type of organization, and religious affiliation (Table 4.1).

### *Ethics*

Ethical approval was received from the University of Manitoba Joint-Faculty Research Ethics Board (JFREB). Ethical approval was also obtained from each participating site prior to study commencement.

Table 4.1. Characteristics of Participating LTC Sites

<b>LTC Facility</b>	<b>Size of Facility (# of LTC beds)</b>	<b>Type of Organization</b>	<b>Religious Affiliation</b>
A	235	Non-profit	Non faith based
B	288	Non-profit	Non faith based
C	200	For-profit	Faith-based
D	100	Non-profit	Faith-based
E	155	For-profit	Non faith based

### ***The Sample***

The sample consisted of five focus groups (nine to twelve participants/group) with a total of fifty-one participants (90.2% female; 9.8% male). Each focus group session was conducted in five LTC facilities. The participants consisted of nursing (RN, LPN, HCA), clinical dietitians, pharmacists, social workers, administrators, food service personnel, recreation therapists, physiotherapists, occupational therapist, rehabilitation aide, speech-language pathologist, and spiritual care personnel.

### ***Recruitment***

The participants were recruited through the participating LTC sites via posters, department requests, emails, and announcements with the help of directors of care and/or clinical dietitians at each LTC facility. These various forms of communication between the participants and the directors of care and/or clinical dietitians helped to increase awareness about the study to aid in the recruitment process. The inclusion criteria required that all participants must be 18 years of age and older. The exclusion criteria required that participants could not be a resident of the LTC facility nor an employee of maintenance, custodial, and security staff. Job diversity was important in the recruitment process in order to obtain different perceptions from diverse backgrounds. Prior to each focus group session the principal investigator received a table listing participant information from the coordinator (director of care and/or clinical dietitian) at each facility. The table consisted of participant names, job title, and contact information. The principal investigator confirmed participation with each participant via email and phone call reminders to confirm attendance. The purpose of the study, the objectives, and an

explanation of what the focus group session involved was also clarified with each participant.

### ***Development of Tools***

Focus group sessions consisted of a nutrition survey followed by a focus group interview.

1a) A focus group nutrition survey was developed by the principal investigator in consultation with the research supervisor. The survey was used to identify the sample and examine the perceptions of health professionals and LTC staff regarding vitamin D supplementation in LTC facilities. The survey was two pages in length and consisted of twelve questions: five demographic questions (#1-5) and seven perception questions (#6-12). Questions were formatted to examine the perceptions of the target group, one of the research objectives. Demographic questions consisted of age, gender, occupation, years of employment at the facility, and equivalent full-time (EFT) designation. Five perception questions contained dichotomous responses: 1 = yes and 2 = no and a yes no scale was used for each item. Two perception questions were classified in three categories: 1 = not important, 3 = somewhat important, and 5 = very important. A 5 point rating scale was used to scale responses for these two questions.

1b) A semi-structured Moderator's Guide was developed by the principal investigator and the research supervisor and was implemented for each focus group interview. Standardized focus group methodology described by Krueger and Casey (2000) was used to aid in the development of the moderator's guide and planning the focus group interviews. The principal investigator also received training prior to conducting the focus group interviews. The Moderator's Guide consisted of an

introduction, a brief overview of the study, group guidelines, a group ice breaker activity, five open-ended questions, and ended with closing remarks. The open-ended questions were based on the research objectives. Four questions (#1, #2, #4, and #5) were developed to discuss perceptions on vitamin D supplementation. One question (#3) was used to discuss barriers that may exist for providing vitamin D supplementation in each LTC facility. All four open-ended perception questions contained a probing question to help obtain a more comprehensive response from participants.

### ***Data Collection***

Focus group nutrition surveys (quantitative) and focus group interviews (qualitative) were administered. All participants signed an informed consent form prior to their involvement in the study followed by the completion of the nutrition survey at the beginning of each focus group session. Both the consent form and the survey took approximately 15 minutes to complete. The principal investigator was present during each session to ensure that the consent forms and nutrition surveys were complete and to assist in clarification of any questions. Informed consents and surveys were collected by the principal investigator and the note taker. The surveys were confidential and participants' information was only identified by numerical code.

Following the completion of the informed consents and survey, the focus group interviews were conducted. The topic of focus was the assessment of perceptions regarding the need for and barriers of vitamin D supplementation among older adults in LTC. The principal investigator facilitated the discussion by the following parameters:

introduction of questions, kept the discussion flowing, and ensured all participants were fully participating (Silverman, 2004).

The principal investigator was the moderator for all five focus group sessions. The focus group interview took approximately 30 minutes to complete; 5 minutes to complete the introduction, overview of the study, group guidelines, and ice breaker activity and 25 minutes to discuss five open-ended questions (5 minutes/question). The moderator was mindful of time due to the sample being working participants and facilitated each session (consent form, survey, and interview) within a 45 minute time frame. Data saturation was observed at the fifth focus group thus no more focus groups were needed (Krueger & Casey, 2000; Morgan, 1997).

During each session, drinks and snacks were provided as a token of appreciation. The interviews were confidential and participants' information was only identified by first name. All focus group sessions were digitally recorded to allow for transcription and data analysis. During each session, there were a total of 3 audio recorders used and placed on the table to ensure the session was clearly recorded and all participant voices were heard. A note taker was present during each session to aid in recording the discussion and to document participant facial cues and expressions which is not visible on an audio recorder.

### ***Data Analysis***

1a) Focus group nutrition survey: In preparation for quantitative data analysis, a codebook was first developed prior to data entry. The principal investigator compiled and entered the data using SPSS version #20.0 for Windows (SPSS Inc., Chicago, IL).

The data was checked for accuracy by the principal investigator and the research supervisor. Statistical analysis was completed using descriptive statistics (i.e., means, standard deviations, frequencies, and percentages) for all variables. In addition, a chi-square test was used to compare data across LTC facilities by occupation. Chi-square test was completed to compare responses between nursing staff and other participants. A  $p$ -value  $\leq 0.05$  was used to signify statistical differences between all comparisons.

1b) Focus group interviews: Qualitative data analysis occurred in a sequential manner. During the transcription process, the digital audiotapes were transcribed verbatim by the principal investigator and resulted in 79 pages of transcribed text. Each transcription took several days to complete. A research assistant was chosen due to having an undergraduate degree in Human Nutritional Sciences and previous experience with data analysis for a large Manitoban research project. After each initial transcription, the principal investigator replayed the audiotapes twice and all transcriptions were reviewed by a research assistant to ensure accuracy (Creswell, 2013). The principal investigator participated in regular meetings independently with the research supervisor and the research assistant to ensure that the information was reported as accurate and complete (Creswell, 2013). The principal investigator ensured anonymity and confidentiality of participants by using only the participants first name and all data was securely stored on a password-protected computer and in locked filing cabinets.

Following transcription, the principal investigator re-read each transcript several times along with data from the note taker to ensure the following: a strong understanding of the important ideas, to immerse oneself in the details, and get a sense of the interview as a whole before breaking it into parts (Creswell, 2013). Thematic analysis was used to

analyze participant responses to the open-ended questions. In the initial phase, open coding was conducted primarily by hand, using printed copies of transcripts along with highlighters and pens to assign initial codes to significant statements for all five interview transcripts. The initial codes that were identified were nouns, verbs, and in vivo codes (Creswell, 2013). The next step involved examining every sentence, identifying new and repeated codes, and relationships between different codes. A codebook of codes was developed to aid in the organization of themes and sub-themes. The research assistant was provided a copy of the codebook, re-read the transcripts several times, and coded each transcript independently from the principal investigator. The principal investigator and the research assistant collectively met on several occasions to examine and compare the codes, their names, and the coding of significant statements. Intercoder agreement was established and the assigned codes for significant statements were agreed upon for all five transcripts. This ensured reliability and accuracy (Creswell, 2013; Creswell & Clark, 2007). Themes and sub-themes were reorganized in the codebook for clarity. The principal investigator then imported the transcripts and entered the codes into NVivo 10 QSR qualitative software (2010) to assist in organization of themes and patterns. Frequency of occurrence was obtained using NVivo to determine how frequently codes appeared by making a preliminary count for each code (Creswell, 2013). All codes were printed from NVivo software and thoroughly reviewed by the principal investigator to explore important quotes for each theme and sub-theme, overarching themes, and recurring concepts.

## RESULTS

### *Participant Characteristics*

The five focus groups had a total of 51 participants with an average age of  $46.7 \pm 10.3$  years (Table 4.2). The participant's age ranged from 26 – 65 years with 90.2% of participants being female. The majority of participants (45.1%) consisted of nursing staff. The average years of employment were  $9.8 \pm 9.1$  years.

### *Nutrition Survey Results*

A summary of the survey responses are provided in Table 4.3. Of the 51 participants, 43.1% reported that they know about the latest 2010 vitamin D recommendations for adults, 76.5% know what vitamin D does in the human body, and 41.2% take a vitamin D supplement regularly. In addition, 71.4% of participants felt that all LTC residents should receive a vitamin D supplement and 81.6% think that vitamin D supplementation would make a difference to the overall health of the residents. There were no significant differences between nursing staff and other participants.

Table 4.2: Demographic Characteristics of Focus Group Participants

<b>Variables</b>	<b>Results % (n)</b>
Age (years) (n=51)	
Mean $\pm$ SD	46.7 $\pm$ 10.3
Range	26 – 65
Gender (n=51)	
Female	90.2 (46)
Male	9.8 (5)
Job Title (n=51)	
Nursing	45.1 (23)
Clinical Dietitian	9.8 (5)
Pharmacist	7.8 (4)
Social Worker	7.8 (4)
Administrator	5.9 (3)
Food Service	5.9 (3)
Recreation Therapist	5.9 (3)
Physiotherapist	3.9 (2)
Occupational Therapist	2.0 (1)
Rehabilitation Aide	2.0 (1)
Speech-Language Pathologist	2.0 (1)
Spiritual Care	2.0 (1)
Years of Employment (n=51)	
Mean (years) $\pm$ SD	9.8 $\pm$ 9.1
Range	1 month – 35 years
Equivalent Full-Time (EFT) (n=48)	
Mean $\pm$ SD	0.8 $\pm$ 0.2
Range	0.1 – 1.0

Table 4.3: Participants Perceptions about Vitamin D

<b>Survey Item (n=51)</b>	<b>Results (%)</b>
Knowledge of the latest 2010 vitamin D recommendations for adults	
Yes	43.1
No	56.9
Knowledge of what vitamin D does in the human body	
Yes	76.5
No	23.5
Consumption of a vitamin D supplement regularly	
Yes	41.2
No	58.8
Importance of consuming food to get an adequate supply of vitamin D for your health	
Important	68.6
Not Important	31.4
Importance of all individuals over 18 years of age to take a vitamin D supplement regularly	
Important	56.9
Not Important	43.1
Should all residents in long-term care (LTC) facilities receive a vitamin D supplement (n=49)*	
Yes	71.4
No	28.6
Providing vitamin D supplementation in long-term care (LTC) facilities would make a difference to the overall health of the residents (n=49)*	
Yes	81.6
No	18.4

\* Question left blank thus smaller sample size.

### *Focus Group Themes*

Following coding and thematic analysis of the focus group discussions, eleven themes emerged from the data relating to health professionals perceptions and barriers regarding vitamin D supplementation for LTC residents. The eleven major themes that emerged were the following: knowledge on vitamin D, education, medication usage, nutrition knowledge, food and eating practices, perceptions on supplementation, vitamin D product formulation, choice, barriers, evidence-based practice, and policy. There were thirty-eight sub-themes within the eleven major themes.

### *Knowledge on vitamin D*

All five focus groups discussed their knowledge on vitamin D relative to bone health, sun exposure, muscle function, and with relation to vitamin D and calcium. Mental health, immune function, multiple sclerosis, absorption and metabolism, overall health, QOL, and infant health were also topics that were discussed. Knowledge on vitamin D varied between the focus group participants with certain health professionals being more knowledgeable. Some facilities focused on specific areas about their knowledge on vitamin D and its importance to health. The knowledge that was most prominent about vitamin D was sun exposure, mental health, bone health, muscle function, and absorption and metabolism.

The most common sub-theme that was identified in relation to vitamin D was sun exposure. The lack of sun exposure for LTC residents was identified as a concern and

due to this participants felt that vitamin D supplementation was important as exemplified by these quotes:

*Most individuals living in long-term care we know that they don't go out in the sun, especially in their little shorts and top, or you know the amount of the time recommended to absorb the vitamin D, so I think that's extremely important.*

*In recreation, we're responsible to try and get people outdoors but they're wearing hats, they're wearing long sleeves, they're put in the shade, to prevent sun stroke, which can happen very quickly in elderly people. So they're just not getting the vitamin D.*

Knowledge about bone health and vitamin D was a common sub-theme discussed by majority of participants “the most important thing for vitamin D is for bone health”. Vitamin D was known to help improve bone structure and “increased or improved bone density”. A participant identified that “a lot of our elderly people have really poor bone density”. Many participants knew something about vitamin D and its relation to bone health.

Muscle function in relation to vitamin D and LTC residents was commonly shared illustrated by the comment “it helps prevent fractures and helps with gait”. Vitamin D was known to “improve skeletal muscle function and therefore reduce the risk of falls, especially in the elderly”. Some participants lacked knowledge on the specifics of how vitamin D intake improves bone health to reduce the negative outcome of falls and fractures.

A number of participants spoke of mental health and its connection to vitamin D. One facility discussed in greater depth the positive aspects of vitamin D with respect to mental health, cognition, and mood improvement:

*Generally you do kind of associate vitamin D as an antidepressant almost and depression is a huge problem in a LTC facility. Most residents I would say to a certain degree suffer from depression.*

*Vitamin D would help with their moods because a lot of our residents are depressed, they don't get out into the sun, and I think that vitamin D supplements would be beneficial for them.*

The knowledge on vitamin D absorption and metabolism was mentioned by a few participants explaining that the most important requirement for vitamin D is “for the absorption of calcium to build up bone”. One concern addressed the practical problem of “when they are out in the sun having topical creams on that prevent vitamin D being metabolized through the skin”. In addition to this concern, another participant identified age-related metabolic changes that affect vitamin D status, independent of dietary intake, due to decreased ability of the skin to synthesize previtamin D<sub>3</sub> from its precursor “even if they were to go outside their body can no longer synthesize vitamin D from the sun so their body actually won't get enough without supplementation.”

### *Education*

Participants identified a general lack of education on vitamin D in the various focus groups “I think a lot of education is lacking”. There was a general concern expressed with regard to not knowing about vitamin D:

*I really don't know that's sort of why I'm here, I don't know a whole lot about what vitamin D does except that it makes me feel good, so I'm sort of learning as I listen.*

A number of studies (Demontiero et al., 2011; Hamid et al., 2007; Holick, 2007; Bischoff-Ferrari et al., 2004;) have been conducted on vitamin D supplementation and bone health, however, some participants identified that they lacked education on the research that has been done on vitamin D, bone health, and its benefits for LTC residents:

*Have there been any studies on the benefits or short term because really you're looking at the short term benefits of vitamin D for people that are coming into a personal care home, if they haven't been on it before or is it just because we think it's good. Has there been any proof about improvement in bone density or improvement at all?*

As the previous quote demonstrates, several participants commented that there is a need for more education particularly from the provincial level, specifically a RHA, “you would have to have NAME OF A RHA wide education and have your doctors and other allied health professionals on board”. Participants also expressed concern about education on vitamin D not only to healthcare but also to the public:

*If we did more about educating the general population about vitamin D earlier in life we would get people coming into personal care homes who already knew the value of vitamin D and calcium, and then the battle would be won in the same way that all kinds of battles get won. When you start educating people about the advance care plan or healthcare directors earlier in life then by the time they get to us it's not that whole big fight anymore it's a more of a common thing.*

Along with education to healthcare and the public, prevention was also identified by a few participants as exemplified by this comment “prevention is the key. You need to educate the public before they become residents in a long-term care facility”.

### *Medication Usage*

All five focus groups addressed the concern of the amount of medications that LTC residents receive “we have polypharmacy going on and it’s just another pill we add, another pill”. Participants identified pill burden as a common concern in their respective facilities “there’s a concern with pill burden and not wanting to take one more pill”. In addition, there was general concern addressed that due to pill burden adding another tablet such as vitamin D would be one too many:

*I work giving people all their pills, up to you know like 200 pills in the morning. And sometimes they just think there’s just too many and if there’s something you can cut out, anything you can cut out just cut it out. I mean some people take like 15 pills in the morning and its making them nauseous and even though that multivitamin or whatever or the vitamin D would be great it’s just one more pill.*

### *Nutrition Knowledge*

A few participants were knowledgeable about vitamin D rich foods, RDA recommendations, and food fortification for vitamin D. One particular health profession (clinical dietitian) was most knowledgeable on vitamin D and nutrition and knew the specifics of foods that contain vitamin D (natural and fortified), nutrient recommendations, and foods that have been fortified with vitamin D. One participant suggested that vitamin D should be provided as a supplement in foods rather than giving a resident another pill:

*As far as the elderly are concerned the requirement is about 800 IU and, as you know, in terms of food it’s very difficult for these patients to get 800 IU/day. Given the fact that 1 cup of milk is 100 IU so you would have to basically drink 8 cups of milk and a lot of these elderly clients*

*just don't like milk number one. Then as far as the other foods maybe some fish, you know sometimes they don't like fish, so it's really hard to get enough vitamin D into them without having to supplement.*

*Maybe in an ideal world rather than using the pill form maybe fortifying other foods with vitamin D would be appropriate. Like I know they've done some fortification with vitamin D in orange juice so or let's fortify all the juices and those kinds of things.*

In contrast, the majority of participants were not aware of the specific recommendations for vitamin D and foods that naturally contain vitamin D. This was qualified by questions addressed during the focus group discussions:

*More vegetables, green vegetables, I don't know. I know their appetite isn't good but I don't see a lot of green vegetables on the trays at all, period.*

*Think of what foods contain vitamin D like if you ate...somebody help me... broccoli has everything, so if you ate a large salmon by yourself you know, but there's no cut off I don't think.*

### *Food and Eating Practices*

A small number of participants stated that poor dietary intake and poor vitamin D intake was common among LTC residents. Participants identified that the residents have poor appetite and therefore it is a challenge to consume food for nourishment. Of the vitamin D foods provided, milk was reported as the most common available item on their menus following fish:

*The only observation that I have here in the facility was that most of the elderly patients that we care for are very aloof in taking fish which is a good source of vitamin D. Although they take milk, sometimes the milk that their taking is light so it shows that they are more prone to fractures of this idiopathic in source because of this lack of vitamin D from their diet.*

*I think it's (vitamin D) a good supplement for them to have in LTC because their appetites are really poor, so if someone is getting a supplement that would be one way of them getting more vitamin D.*

### *Perceptions on Supplementation*

Positive perceptions for providing vitamin D supplementation to LTC residents were discussed in all focus groups. Vitamin D was considered as “being very inexpensive, it doesn't interact with medications, or it doesn't really interact with any disease states” and “it is a very small pill so it is easily consumed by residents”. In addition, participants identified that due to limited sun exposure, poor dietary intake, and limited food sources supplementation is important for residents in order to obtain vitamin D RDA levels:

*There's a plethora of evidence out there that does show that vitamin D supplementation is beneficial for falls reduction, if they're not in a fall, they're in wheelchairs it still helps with cognitive performance. Also if somebody has vitamin D deficiency which probably the majority of Canadians do because of our winters it can affect mood, it can affect muscle aches pains, pain ratings, and the elderly, especially because they do not get out to the outdoors very often at all even during the summer, supplementation I think would be necessary for every single resident regardless of if they're walking or in a wheelchair.*

*I agree that there's not enough vitamin D for patients in a long-term care facility because less exposure, decrease appetite, decrease availability of dairy products on the menu and diet in a lot of the personal care homes so I think it's good to have vitamin D supplementation it's a cheap and easy fix for something that patients should have thought of 20 years ago.*

Contrary to the positive perceptions, there were a few participants that viewed supplementation negatively. These participants considered that providing vitamin D was

too late to be of any benefit for the residents at this late stage in their life and would not reverse any bone damage:

*I don't know if vitamin D actually helps reverse any bone damage, I don't think so. So unless they have come in with it and they have been on it since their 50, then yes go ahead. But if they've come in and they now want to start then I'd say forget it, I think it's too late at that point.*

*To put people on vitamin D and calcium at the end of their life span is not worthwhile because by the time it works and kicks in it won't make any difference.*

*I think it'll probably be only good for them if it was for calcium or for another drug to help another drug work not so much for a resident. I don't think it is a fountain of youth health for them really.*

#### *Vitamin D Product Formulation*

Several participants discussed that the most common form of vitamin D available in their facility was a tablet. A few participants mentioned that the more suitable form for administration is a liquid, however, it is an “expensive formulation”:

*The vitamin D tablets can be crushed, so in individuals who have issues with chewing or swallowing it can be crushed and mixed with their juice or apple sauce. The liquid is more expensive and you need a larger volume for equivalency versus a small tablet. It's not available as an injectable in a PCH so you're limited essentially to oral routes.*

A vitamin D sublingual oral spray was also identified by a participant as another form of administration. The compound of vitamin D that is most commonly used is vitamin D<sub>3</sub> (cholecalciferol) as a participant explained, “vitamin D<sub>3</sub> is the most common that we see here in the facility”. Vitamin D dosing varies between each facility as some provide the daily dose of 1,000 IU/day, the weekly dose of 10,000 IU/week, or the monthly dose of 50,000 IU/month:

*There's weekly dosing, there's monthly dosing, there are other options if you want to cut down on the number of pills and passes and we normally recommend a weekly dosing to minimize the pills and the passes to be given.*

The majority of participants discussed the usage of a multivitamin in a LTC facility. Multivitamins were described as “huge”, “they smell horrible when crushed”, “not received well by residents”, and “taste awful”. The amount of vitamin D in a multivitamin (100-600 IU) was commonly discussed among participants as exemplified by this quote:

*The amount of vitamin D in a multivitamin is very small, its anywhere from 100-400 IU whereas like I said you would need a minimum of 1,000 IU/day and most people don't require a multivitamin for proper nutrition, the vitamin D is more important than say the other minerals and vitamins that are in that multivitamin and there's a lot more drug interactions that can be possible with a multivitamin as compared to just vitamin D alone.*

A few participants described as an alternative calcium and vitamin D combination tablet as “the size of horse pills”, “it's one of the largest pills in the system”, “tastes bad”, and “once you crush it, it is disgusting”:

*You can also get the combination with calcium and vitamin D but you're still not going to get the 1,000 IU combination with any other multivitamin versus the solo tablet.*

### *Choice*

Resident, family, and physician choice emerged as a theme among participants discussing vitamin D supplementation, “regardless of policy or procedure it's always their choice”. In order for vitamin D to be provided on a routine basis, the physician and the resident both have to be on board and if the resident is cognitively impaired then a

family member needs to approve the addition of a supplement. A few participants explained:

*Sometimes I feel like we are sort of giving things to residents because the family wants it but the resident themselves don't necessarily want it and they're spitting it out. I find that sometimes it's an ethical issue of hiding stuff in people's food. You know we do it because they do need it but at the same time who's choice is it really.*

*I think you need to treat everybody with consent and those that do want it, and that you would have of course, those individually based on what families wishes are. But if they are willing to take vitamin D and they are okay with that I would say they should get it regardless of their level.*

*If the physicians on board he's on board he'll supplement or if he doesn't want to he won't.*

### *Barriers*

Study participants identified six barriers that exist for the administration of vitamin D supplementation to residents which include the following: cost (healthcare cost, cost of laboratory tests for serum vitamin D levels, and cost of the supplement), complexity of residents, resistance of supplement use with families and loved ones, polypharmacy, physician resistance, and limited knowledge and education on vitamin D.

Cost to the healthcare system and cost of running a laboratory test for vitamin D was discussed among several participants. Healthcare cost for providing vitamin D was identified as an “increased cost”, “staffing cost”, “is a contributor to the bottom line cost of medications”, and “cost to the system”. A few participants described that “vitamin D levels are not routinely done in terms of labs and it's costly” and “the cost for running a vitamin D test may be more than the cost of just having vitamin D on board”. Others,

however, displayed an understanding for the cost of a vitamin D supplement “a fall cost is about what \$125,000/fall. Vitamin D is pennies a day”. Contrary to healthcare cost, vitamin D supplementation was viewed as “very inexpensive”, “it is covered”, and “the pill form now is relatively cheap”. Certain participants explained the cost of a vitamin D supplement:

*As for the cost, I know vitamin D is very minimal compared to many other pills and when you look at the cost of let's say a fracture if you can prevent one fracture out of how many people, the cost of vitamin D is next to nothing.*

*As far as the cost for running a vitamin D test that may even be more than the cost of just having vitamin D on board. I've read that vitamin D pill costs about 6 cents a day so that's very minimal.*

Several participants stated that the complexities of residents are barriers which add to the challenge in providing vitamin D supplementation. Participants discussed that a large number of residents have decreased appetite, complicated care regimens secondary to disease states, reluctance with taking medications, and dysphagia:

*You have a lot of dementia, a lot of cognitive decline with the elderly PCH and you just have that challenge with actually getting anything into them. So, it's not just a vitamin D supplement, it's a nutritional aspect you can't get a lot of nutritional elements into them and adding on another type of medication or any other supplement whether it be liquid, pill form, a lot of times it's spat back at you.*

A few participants mentioned that family members and loved ones of a resident can be a barrier due to their reluctance and questioning the value of certain medications “families and loved ones are either for or against medications”.

Polypharmacy was identified by a small number of participants as a barrier for providing vitamin D due to “overall pill burden” and residents not wanting “another pill”.

As one participant stated,

*As to the concept that its part of polypharmacy and getting lots of medications they're taking every day and this is just one more.*

During interviews, study participants shared comments that one of the biggest challenges faced are the physicians reluctance and bias in providing a vitamin D supplement to residents. Participants discussed that “not all physicians are on board with supplement use” and “to get the doctors educated on the importance”. Participants discussed the challenges associated with physicians in LTC:

*Would be prescriber's bias since its prescribers that have to order vitamin D supplementation, so if the prescriber is against vitamin D for whatever reason, it doesn't matter what anyone else really thinks.*

*As far as barriers I know NAME mentioned about the doctors and that's definitely a major barrier. You're either on board or you're not. Doctors either believe it or not and if they don't they won't order it.*

Limited knowledge and education on vitamin D was identified by several participants as a barrier. Participants discussed that residents, family members and loved ones, physicians, and the public need to be educated on the importance of vitamin D:

*I think its lack of knowledge that's why people aren't jumping on it or some people might think that it's the new trend.*

*There would probably have to be lots of education and families and informing them of the pros or cons or their ideas of vitamin D so it would be a lot of work but certainly would help expand the awareness of vitamin D beyond the facility.*

## *Evidence-based Practice*

In all five focus group interviews, a small number of participants discussed research that has been conducted on vitamin D supplementation primarily among the older adult population. Participants shared comments about the type of research that has been conducted “some studies have shown that 10,000 IU is okay per day”, “helps with behaviours and moods”, and “there were several studies that have been done in the past that have shown a reduction in some chronic diseases like multiple sclerosis and some types of cancers”. In addition, a few participants discussed their knowledge on vitamin D research:

*Lots of studies have been shown to help improve muscle strength and then in turn relate to the reduction in falls and also it's been known for better cognitive function in elderly, personal care homes as well.*

*They have looked at studies that have given supplementation to residents at a higher risk of falls and they've given nothing to residents at a high risk of falls for a certain period of time in a double-blind study and at the end of the results were there was a reduction in falls. There's been several studies of that nature in personal care homes to show supplementation does, how it exactly works...So the evidence is there that it does reduce falls, so the studies have been done so if you are one that practices evidence-based medicine you can't really deny that.*

*I've heard research say that in this hemisphere we don't get enough exposure to the sun, ever, to meet our needs as far as vitamin D is concerned. So we all should be on supplements I guess.*

*There's been a vitamin D practice summary that has been established for the region and Doctor NAME I believe was on that particular committee as he's the chief medical officer for the long-term care and so he was involved in that and that did get fanned through but...it's filtered through at the institutional level.*

Several participants discussed the importance of evidence based practice for providing vitamin D supplementation to residents as opposed to a policy or procedure in their facility, “it would require input from what would be best practiced as far as research is concerned and the medical field”. In one facility, participants explained the development of best practices for providing vitamin D supplementation to almost all of their LTC residents. At this particular facility, a participant explained the number of residents that are being given vitamin D supplements, “at least 90, 92 of our long-term care patients”. A participant at this facility explained how best practices for vitamin D supplementation was developed,

*I believe that Doctor NAME, NAME, and NAME that they...I don't actually know all the background but there is lots of research and whatnot put together and then those three people are the ones in charge of putting a policy together here at NAME OF FACILITY...Best practiced.*

Furthermore, participants from this facility discussed the process of adopting evidence-based practice for vitamin D supplementation which involved “memos”, “I believe that Doctor NAME educated the other physicians about vitamin D and that’s how it started”, and “was implemented routinely or at the quarterly med reviews”. However, participants mentioned that they did not notice any changes with residents after providing vitamin D supplementation as “we didn’t do any blood work to see if someone’s vitamin D was low we just provided it to almost everybody in long-term care”. One participant mentioned that there was a decrease in falls and fractures:

*We've had a steady decrease in falls and severe injury but there's been a number of other things that we put in place to decrease falls...For example things like fall mats that we put on the floor to decrease the risk for fracture, hourly rounding where we check on the patient every*

*hour to ensure that they don't need anything to prevent them from getting up unnecessarily without help...Bed alarms that tells us when the person is getting out of bed when they shouldn't be, those would be some examples.*

### *Policy*

Participants identified that to have a policy for vitamin D supplementation in their facility would be challenging due to several barriers that exist “there’s a lot of barriers and things that really have to be looked at closely before you made any sort of blanket policy in terms of vitamin D and calcium supplementation”. Another participant discussed that in order for a policy to become implemented it would have to “roll out from higher up that this is something that the NAME OF A RHA is saying is a standard across all personal care homes”. One participant stated that there would have to be evidence-based practice, education, choice, and then a policy could be developed:

*I think you would have to have evidence based practice because that's what most professions are leaning towards. You would have to have NAME OF A RHA wide education and have your doctors and other allied health professionals on board. Then you would look at your facility policies, even with a policy in place, you would have to have resident and family choice. And you might even have to have something in place like a waiver, similar to what you have with a flu vaccine. So I think it's a lot of work looking at having something blanket supplementation being promoted.*

## DISCUSSION

The objectives of this study were to examine the perceptions of LTC health professionals and staff and determine what barriers exist for providing vitamin D supplementation to all residents in LTC facilities. Little research exists on understanding the perceptions of LTC staff and what barriers exist for providing vitamin D to residents.

Participant perceptions were positive about providing vitamin D supplementation to LTC residents. The majority of participants in both the survey and the interview agreed that all LTC residents should receive a vitamin D supplement and would improve their overall health. In addition, more than half of participants reported in the survey that they felt vitamin D supplementation was not only important for LTC residents but also for individuals over 18 years of age. Similarly, in Lau et al. (2010) study it was found that 68% of nurses and 44% of PSW strongly felt their residents should be prescribed vitamin D supplements. In the present study, participants reported vitamin D supplementation is beneficial for residents due to decreased sunlight exposure and limited dietary sources of vitamin D. However, a small number of participants reported negative perceptions and felt that vitamin D supplementation would not change the outcome in the risk of falls and fractures as it is essentially “too late”.

Many participants reported that they had some knowledge on vitamin D and to obtain further nutrition knowledge is important. Knowledge about vitamin D varied between participants and LTC facilities. Certain professions (clinical dietitians, pharmacists, and nurses) were more knowledgeable about vitamin D than compared to other professions. Knowledge of sun exposure, bone health, mental health, and muscle

function were common. The majority of participants (76.5%) reported in the survey that they know what vitamin D does in the human body, however, during the interview only a small number of participants could elaborate on the specific functions of vitamin D. Many comments were made regarding the lack of sun exposure in Canadian older adults. This is consistent with previous literature in which factors that inhibit cutaneous vitamin D synthesis are age and insufficient sunlight during the winter months at latitudes above 37°N and below 37°S (Holick, 2006). A need for nutrition education emerged from the focus group interviews. Several participants were unaware of the daily recommendations and dietary sources of vitamin D, as only 43.1% of participants reported in the survey that they knew the 2010 vitamin D recommendations for adults. In addition, participants indicated (68.6%) that consuming food is important to obtain an adequate supply of vitamin D for health despite not being aware that there are limited dietary sources available. Studies have concluded that vitamin D deficiency and insufficiency is common in LTC residents and older adults due to age-related metabolic changes, low sunlight exposure, and limited dietary sources of vitamin D (Sitter & Lengyel, 2011; Hamid et al., 2007; Holick, 2006). In the present study, only one participant was aware of age-related metabolic changes in which the skin has a decreased ability to synthesize vitamin D. Participants shared a common concern for the risk of vitamin D deficiency among residents however majority of participants did not have specific knowledge on the daily recommendations and food sources of vitamin D.

Lack of education on vitamin D was reported as a common concern. The need for education on vitamin D, not being aware of the research conducted on vitamin D, and the assorted availability of vitamin D products emerged from the focus group sessions.

There is limited education provided by the RHA for LTC staff on vitamin D in the form of evidence reviews and recommendations (Winnipeg Regional Health Authority, 2014, 2013). However, when these reviews are provided to the facilities it should be mandatory to be circulated and addressed in a monthly meeting to inform healthcare staff members. More education can also be provided in other formats such as symposiums, memos, advertising, and newspaper articles which may be a beneficial approach for awareness and prevention on vitamin D deficiency. In the Munir, Wright, & Carr (2007) study, an educational letter was provided to the primary care physicians in the LTC facility on the importance of vitamin D and calcium supplementation and resulted in an increase in vitamin D status assessment and an increase in the use of vitamin D supplementation. Education on vitamin D for physicians, LTC health professionals, residents, and family members is important and could decrease physician, family, and resident resistance, be made aware of the minimal cost of the supplement, and this would result in a decrease in the identified barriers. In the present study, only one participant mentioned attending a nutrition education session on vitamin D supplementation. A continuum of education symposiums should be provided by the RHA to LTC staff to provide adequate information on vitamin and mineral supplementation.

Participants addressed pill burden as a common concern in LTC facilities. Participants reported that by adding a vitamin D tablet supplement would increase the amount of pills residents were currently taking. The push to reduce the number of medications was addressed and vitamins and minerals were identified as one more pill. In a previous study, researchers found that the number of prescribed medications for LTC residents ranged from 4 to 24 with an average of 10.2 pills per day (Viveky et al., 2012).

The current literature and findings from the present study point to the need for reduction in the number of medications residents consume daily and assess other alternatives for vitamin supplementation such as weekly, bimonthly, or monthly to help reduce the concerns of polypharmacy.

Participants reported that in general LTC residents have poor dietary intake and poor vitamin D intake due to a number of factors. Findings from this study found that many residents suffer from co-morbid conditions such as decreased appetite and dysphagia. This is consistent with previous literature as studies have concluded that LTC residents often have chronic illnesses, specific complex care regimens, use of medications, dysphagia, and psychosocial factors that impair dietary intake making it common to develop nutritional problems (Sloane et al., 2008; Reimer & Keller, 2009). In addition, previous studies have found that 30% of LTC residents were malnourished, 63% were at risk for malnutrition, consumed inadequate dietary intakes, and therefore concluded that all residents require vitamin and mineral supplements (Wendland et al., 2003; Torma et al., 2012). Poor dietary intake remains a challenge as noted in this present study and remains a future problem therefore the use of supplementation to obtain adequate levels is important.

A tablet is the most common form of administration for vitamin D. Vitamin D is available in a liquid form but it is more costly. Some participants reported that the liquid form is covered under their drug formulary in their facility. Several participants indicated that many residents “about 60% of your LTC population” suffer from dysphagia therefore the liquid form would be an easier formulation for those particular residents. In several studies, researchers found that 30-60% of LTC residents suffer from dysphagia which

implicates difficulty chewing, swallowing, and passage of food (Kayser-Jones & Pengilly, 1999; Sloane et al., 2008; American Dietetic Association, 2005a). In the future, the liquid format of vitamin D should be reviewed and made available on all formularies associated with LTC for those residents who suffer from swallowing issues. A recent study from the Netherlands was conducted on providing vitamin D supplementation to LTC residents in the format of cholecalciferol capsules and cholecalciferol drops and there was a higher increase of serum levels with the capsules (Veleva, Chel, & Achterberg, 2014). This study suggests that the capsule format provided better bioavailability of vitamin D and therefore higher serum levels. Furthermore, the amount of vitamin D in a multivitamin and in a combination tablet with calcium is small ranging from 100-400 IU. Participants reported that the size of a multivitamin and a combination tablet with calcium and vitamin D is large and that it tastes awful when crushed. This is consistent with a previous study where findings reported that a multivitamin contains a minimum of 400 IU of vitamin D and that calcium and vitamin D preparations typically contain 200 IU of vitamin D<sub>3</sub> (Hamid et al., 2007). In the present study, participants mentioned avoiding the use of multivitamins and a combination tablet with calcium and vitamin D with a preference for a single vitamin D tablet.

Among participants in this study, they addressed concerns for the ability of residents to be able to make a choice about taking medications and supplements. In Bockock & Keller (2008) study, it was found that worsening of cognitive skills for daily decision making was one of the highest risk factors for malnutrition in LTC residents. In the present study, cognitive decline and dementia was reported as factors that contributed to decreased intake of medications, supplements, and food. Due to cognitive decline, it is

a challenge in a LTC facility to get permission from the resident as to whether or not they want to take or refuse medications. In spite of this, some residents have spokesmen for them on their behalf such as family members or loved ones who can assist in the decision making process. This can become a complex ethical issue with who makes a choice on behalf of the resident and their well-being.

The barriers that were identified by participants for providing vitamin D supplementation were the following: cost (healthcare cost, cost of laboratory tests for serum vitamin D levels, and cost of the supplement), the complexity of residents, resistance of supplement use by family and loved ones, polypharmacy, physician resistance, and limited knowledge and education on vitamin D. Cost was identified as a multifaceted barrier and staffing cost was included as a major barrier to the cost of the healthcare system. In a separate study, researchers found that staffing levels differed between lunch and supper mealtimes in LTC facilities resulting in differences in quality of care. Lunchtime provided extra staff, assistance, and more highly trained staff than compared to supertime where staff was limited (Reimer & Keller, 2009). In the present study, participants reported the need for extra staff due to the aging population increasing and becoming more complex. In addition, participants also identified the cost of medication along with cost of staffing. The cost of a vitamin D supplement is inexpensive especially when you compare it to the cost of a fracture, a finding that supports previous literature (Bischoff-Ferrari et al., 2006; Winnipeg Regional Health Authority, 2013). Physicians were identified as a major barrier at each facility due to two concerns which are polypharmacy and their opinions about the necessity for vitamin supplementation. In a separate study, researchers found that physicians in LTC limited

polypharmacy by reducing the number of total medications and discontinuing nonessential medications such as vitamins and minerals (Hamid et al., 2007). Similarly, in the present study, the addition of another pill and physicians' bias on vitamin and mineral supplementation were deemed common roadblocks among Winnipeg LTC facility staff.

A small number of participants were aware of the plethora of research that has been conducted on vitamin D supplementation. These participants exhibited a good understanding of past and current research on vitamin D and its importance to health. Improvement of muscle strength, cognitive function, and falls and fractures were most commonly reported. A RHA practice summary recommends 1,000 IU/day of vitamin D supplementation is necessary for bone health and non-bone disease prevention for children and adults (Winnipeg Regional Health Authority, 2013; Holick, 2007). In a previous study, it was found that there was a 72% reduction in falls for LTC residents with vitamin D supplementation of 800 IU/day compared to placebo and lower doses of vitamin D (Broe et al., 2007). In the present study, a few participants were aware of the vitamin D practice summary that had recently been published by a RHA. However, findings from this study indicate that more LTC staff should be up-to-date with literature and the current RHA recommendations which were developed through evidence-based medicine. Furthermore, only one facility developed evidence-based practice for vitamin D to almost all their residents. However, participants from this facility could not identify health-related changes (falls and fractures) and no vitamin D levels were done to compare before and after supplementation. Future acceptance of vitamin D in a facility should focus on pre and post vitamin D levels and develop criteria to evaluate improvement for

falls and fractures. This future approach should be established in a number of LTC facilities within the RHA to determine and compare if providing vitamin D is beneficial.

Implementing a policy within a LTC setting is a challenging task. Several participants reported that to have blanket supplementation policy in place there are a number of factors that need to be addressed. These factors that were identified happened to be themes that emerged from the data such as barriers, evidence-based practice, education, and choice of the physician. Findings from this study determined that all five LTC facilities do not have a policy in place for vitamin D supplementation. In a separate study, researchers reported that at the provincial level, there is no policy that enforces vitamin D supplementation in LTC facilities across Canada and recommendation for supplementation varies between each province (Canadian Agency for Drugs and Technologies in Health, 2010). Therefore there are multiple factors that have to come together first before a policy can be implemented at a LTC facility level.

This study has some limitations. First, the relatively small sample size (n=51) and use of qualitative data analysis implies that results are not representative of all LTC staff perceptions in all Manitoba LTC facilities. Secondly, the researchers faced several sampling issues including a lack of representation of physicians, participants were not randomly selected, participants who volunteered to participate may have more experience with vitamin D supplementation, and the majority of participants were nursing staff. Lastly, the use of focus groups to collect qualitative data resulted in some participants who were more vocal in identifying their perceptions than others.

Despite these limitations, the findings of the present study shed light on the perceptions and the many barriers that exist for providing vitamin D supplementation in LTC facilities. Further research needs to be continued in this area and find potential resolutions for the identified barriers as this may help to promote vitamin and mineral use in LTC. Similar to existing literature, findings from this study indicated that there was no policy for providing vitamin D supplementation in any of the 5 LTC facilities (Canadian Agency for Drugs and Technologies in Health, 2010). However, one facility did develop evidence-based practices for vitamin D supplementation to almost all residents. Future research should focus on developing practical strategies and approaches for consistency in supplementation within Manitoba LTC facilities. Knowledge on vitamin D varied among health professionals therefore there is a need for nutrition education on a continuum basis for Manitoba LTC staff.

## TAKE AWAY POINTS

- Knowledge on vitamin D varied among health professionals. Providing more education on vitamin and mineral supplementation is important for LTC staff and would be a practical strategy to increase awareness and encourage supplementation use.
- Participant perceptions were positive about providing vitamin D supplementation to LTC residents. This reinforced that LTC staff felt vitamin D is important for resident's health.
- Many barriers exist for providing vitamin D to LTC residents. The most common barriers are physician resistance, the complexity of residents, and cost (healthcare cost, cost of the supplement, and cost of laboratory tests for serum vitamin D levels). Since these barriers have been identified, future research should focus on potential resolutions to help promote vitamin and mineral use in LTC.
- No policy exists in all five LTC facilities for vitamin D supplementation. Individualized treatments could potentially be more appropriate and target only those residents who are vitamin D insufficient or deficient. This could be done by obtaining serum vitamin D levels of each resident prior to admission into a facility and only provide supplementation to those residents who are insufficient and/or deficient.
- There is a need to reduce the amount of medications that residents consume on a daily basis to help reduce the concerns of polypharmacy. Providing vitamin D supplementation weekly or monthly could be an alternative to help decrease pill burden.

## CHAPTER 5

### **Understanding the perceptions and barriers that exist for providing vitamin D supplementation in Long-Term Care Facilities**

#### INTRODUCTION

The aging population is increasing worldwide with 7.9% of older adults living in Canadian LTC facilities (Statistics Canada, 2012a). It is projected by 2056, that 27.2% of the Canadian population will be older adults (Statistics Canada, 2006).

Vitamin D is a fat-soluble vitamin that aids in calcium absorption and bone formation, which are essential in bone health (Insel et al., 2006; Holick et al., 2005; Bischoff-Ferrari et al., 2006). In older adults, vitamin D helps prevent bone loss and fractures (Bischoff-Ferrari et al., 2006; Demontiero et al., 2011). The primary source of vitamin D is sunlight exposure (solar UV-B radiation) followed by limited dietary sources which include fatty fish, eggs, and fortified milk and margarine (Holick, 2006; Health Canada, 2012). The limited number of foods that naturally contain vitamin D and those that are fortified make it almost impossible to meet vitamin D recommendations through food alone without recommending unrealistic daily consumption of these foods (Holick, 2007, 2006). The RDA for vitamin D is 600 IU/day for 51-70 years of age and 800 IU/day for those 70 years of age and older (Ross et al., 2011).

Factors that contribute to the high prevalence of vitamin D inadequacy are low sunlight exposure due to being institutionalized, limited dietary sources containing vitamin D, age-related physiological decrease of vitamin D synthesis, and poor dietary

intake (Holick, 2006; Demontiero et al., 2011). A previous study found that 83% of LTC residents in Winnipeg had insufficient levels of 25(OH)D regardless of the season (Sitter & Lengyel, 2011). Insufficient 25(OH)D leads to reduced ability to absorb calcium and phosphorus, leading to poor bone health, osteoporosis, and increased risk of bone fracture (Holick, 2007). In LTC residents, the incidence of vitamin D deficient levels (defined by  $< 30$  nmol/L) are as high as 76-79% (Hamid et al., 2007; Demontiero et al., 2011).

It is recommended that a vitamin D supplement be provided to all Winnipeg LTC residents (Winnipeg Regional Health Authority, 2013, 2008). A previous Canadian study found that nurses and PSW felt strongly towards providing vitamin D supplementation for their residents (Lau et al., 2010). In Canada, there is no policy at the provincial level implementing routine vitamin D supplementation in LTC facilities despite current recommendations (Canadian Agency for Drugs and Technologies in Health, 2010; Winnipeg Regional Health Authority, 2013).

## **PURPOSE**

The objectives of this study are: 1) to examine the perceptions of LTC health professionals, staff, and visitors (family and friends) regarding vitamin D supplementation in LTC facilities; and 2) to determine what barriers exist in providing vitamin D supplementation to all residents in LTC.

## METHODS

### *Setting, Sample, and Recruitment*

The sample consisted of participants (n=102) from five diverse LTC facilities within a RHA in Manitoba to examine perceptions and barriers regarding vitamin D supplementation in LTC. The sample consisted of LTC staff, health professionals, and visitors (family and friends) from each facility.

Recruitment posters, communication (emails and announcements), and reminders to staff and visitors via directors of care and/or clinical dietitians assisted in recruiting participants for the study. The inclusion criteria for the survey required that all participants must be 18 years of age and older and could not be a resident of the LTC facility.

### *Development of Tools*

The self-administered survey was two-pages in length and consisted of twelve questions of which four were demographic, seven perception, and one barrier question. Five perception questions contained dichotomous responses: 1 = yes and 2 = no and the two perception questions and one barrier question were classified into categories. The survey was designed by the principal investigator and the research supervisor, pilot tested for face validity by five health professionals and two non-health professionals, and minor modifications were made to content, format, and readability of the barrier question. These modifications helped to ensure that the barrier question was clear and easy to read for the study participants.

### ***Data Collection Procedure***

The date and time frame for data collection at each site was predetermined by the directors of care and/or clinical dietitians and was scheduled based on what was convenient for each facility. A booth with the principal investigator present was set-up near the cafeteria or at the front of each facility to recruit individuals to fill out the survey. The principal investigator was present for all data collection sessions to ensure the informed consents and surveys were complete and assisted in the clarification of any questions. The consent form and the survey were provided separately and put into two different envelopes to ensure anonymity. The consent forms were completed first, following the survey which took approximately five minutes to complete. The surveys were confidential and participants' information was only identified by numerical code. Participants were eligible for a draw for one of five \$50 gift certificates per site for a local grocery store, as a token of appreciation.

Ethics approval was obtained from the University of Manitoba Joint-Faculty Research Ethics Board and from each participating site prior to study commencement.

### ***Statistical Analysis***

The data was compiled and statistically analyzed using SPSS version #20.0 for Windows (SPSS Inc., Chicago, IL). Descriptive statistics (i.e., means, standard deviations, frequencies, and percentages) were used to examine all variables. Chi-square test was used to compare relationships between job title and survey responses. A  $p$ -value  $\leq 0.05$  was used to signify statistical differences between all comparisons.

## RESULTS

### *Participant Characteristics*

A total of 102 individuals participated in this study (Table 5.1). The average age was  $48.4 \pm 13.8$  years and they were predominately (87.3%) female. Eighty-five percent of participants were LTC health professionals and staff, and 14.7% were visitors (family or friend) of a LTC resident.

### *Perceptions*

Perceptions on vitamin D varied among participants (Table 5.2). Ninety percent of participants perceived that they knew what vitamin D does in the human body. However, only 41.2% knew the latest 2010 vitamin D recommendations for adults. The majority (86.3%) of participants perceived that all LTC residents should receive a vitamin D supplement and 92.2% thought that it would make a difference to the overall health of the residents. Significant differences were found between occupation (nursing-related staff and other participants) and their perceived knowledge of the latest 2010 vitamin D recommendations  $\chi^2 (1, n = 102) = 6.00, p = 0.014$ , and consuming a vitamin D supplement regularly  $\chi^2 (1, n = 102) = 4.22, p = 0.040$  (Table 5.3). Nursing staff had greater perceived knowledge of 2010 recommendations and less supplement use than compared to other participants.

### ***Barriers***

The two most common barriers to supplementation use in LTC were swallowing problems among residents (31.4%) and cost of the supplement to family, the resident, or the LTC facility (15.7%) (Table 5.2).

Table 5.1: Participant Characteristics

<b>Variables</b>	<b>Results % (n)</b>
<b>Age (years) (n=101)</b>	
Mean $\pm$ SD	48.4 $\pm$ 13.8
Range	22 – 89
<b>Gender (n=102)</b>	
Female	87.3 (89)
Male	12.7 (13)
<b>Job Title (n=102)</b>	
Nursing	45.1 (46)
Food Service	9.8 (10)
Recreation Therapist	8.8 (9)
Visitor: Friend	7.8 (8)
Administrator	6.9 (7)
Visitor: Family	6.9 (7)
Clinical Dietitian	3.9 (4)
Social Worker	2.9 (3)
Rehabilitation Aide	2.0 (2)
Nursing Clerk	1.0 (1)
Nutrition Clerk	1.0 (1)
Occupational Therapist	1.0 (1)
Physician	1.0 (1)
Physiotherapist	1.0 (1)
X-Ray Technologist	1.0 (1)
<b>Employee of Long-Term Care Facility (n=102)</b>	
Yes	85.3 (87)
No	14.7 (15)

Table 5.2: Participants' Responses to Perception and Barrier Questions

Survey Item (n=102)	Results (%)
Knowledge of the latest 2010 vitamin D recommendations for adults	
Yes	41.2
No	58.8
Knowledge of what vitamin D does in the human body	
Yes	90.2
No	9.8
Consumption of a vitamin D supplement regularly	
Yes	39.2
No	60.8
Importance of consuming food to get an adequate supply of vitamin D for your health	
Important	76.5
Not Important	23.5
Importance of all individuals over 18 years of age to take a vitamin D supplement regularly	
Important	54.9
Not Important	45.1
Should all residents in long-term care (LTC) facilities receive a vitamin D supplement	
Yes	86.3
No	13.7
Providing vitamin D supplementation in long-term care (LTC) facilities would make a difference to the overall health of the residents	
Yes	92.2
No	7.8
Number one concern for providing vitamin D supplementation to all residents in long-term care (LTC) facilities	
Swallowing problems of residents	31.4
Adding to the amount of medications the resident currently takes	22.5
Limited knowledge and education on vitamin D by LTC staff, residents, and/or families	13.7
Residents preferences towards taking pills	12.7
Who pays for the supplement (family, resident, or LTC facility)	10.8

(continued)

---

Physician preference to not prescribe vitamin D	5.9
None	2.0
Prevention of falls in the elderly	1.0
Number two concern for providing vitamin D supplementation to all residents in long-term care (LTC) facilities	
Who pays for the supplement (family, resident, or LTC facility)	15.7
Swallowing problems of residents	14.7
Adding to the amount of medications the resident currently takes	13.7
Limited knowledge and education on vitamin D by LTC staff, residents, and/or families	13.7
Residents preferences towards taking pills	13.7
Providing a supplement will not change the health status of the resident	10.8
Physician preference to not prescribe vitamin D	9.8
Delivery of the supplement by staff due to workload concerns	3.9
None	2.9
When there is no indication (added health benefits)	1.0

---

Table 5.3: Comparison of Nutrition Survey Responses between Nursing Staff (n=46) and Other Participants (n=56)

Survey Item (n=102)	Pearson chi-square	df	Significance
Knowledge of the latest 2010 vitamin D recommendations for adults	6.001	1	<b>0.014</b>
Knowledge of what vitamin D does in the human body	1.021	1	0.505*
Consumption of a vitamin D supplement regularly	4.218	1	<b>0.040</b>
Importance of consuming food to get an adequate supply of vitamin D for your health	0.732	1	0.392
Importance of all individuals over 18 years of age to take a vitamin D supplement regularly	0.487	1	0.485
Should all residents in long-term care (LTC) facilities receive a vitamin D supplement	0.157	1	0.691
Providing vitamin D supplementation in long-term care (LTC) facilities would make a difference to the overall health of the residents	3.135	1	0.136*

All bolded figures are significant at a  $p < 0.05$ .

\*Fisher's Exact Test used.

## DISCUSSION

### *Perceptions*

This study examined the perceptions of LTC staff, family, and friends regarding vitamin D supplementation to LTC residents, which is an underinvestigated area. The percentage of participants that felt all LTC residents should receive a vitamin D supplement was 86.3%. This is higher than rates reported in another Canadian study in which 68% of nurses and 44% of personal support workers strongly felt their patients should be prescribed vitamin D supplements (Lau et al., 2010). Findings from this study and the previous Canadian study are consistent with positive and strong perceptions of vitamin D supplementation. Participants in this study strongly felt (92.2%) that providing vitamin D supplementation to LTC residents would make a difference to their overall health. This is consistent with the RHA practice summary which recommends 1,000 IU/day of vitamin D supplementation as necessary for bone health and non-bone disease prevention for children and adults (Winnipeg Regional Health Authority, 2013; Holick, 2007). The findings from this study show that the majority of participants feel that it is important to consume food to get an adequate supply of vitamin D for health. Vitamin D is found in few dietary sources such as fatty fish, fish-liver oils, eggs, and fortified milk, margarine, rice or soy beverage, and some yogurt and orange juices (Winnipeg Regional Health Authority, 2013; Health Canada, 2012; Holick, 2006). Participants' perceptions indicated that consumption of vitamin D rich foods is important but in reality dietary sources of vitamin D are very limited.

### ***Barriers***

Multiple barriers exist for providing vitamin D supplementation in LTC facilities. The top five barriers reported in this study were the following: swallowing problems of residents, pill burden for residents, limited knowledge and education on vitamin D, residents preferences towards taking pills, and cost of the supplement. The cost of a vitamin D supplement was reported as a barrier; however, previous literature suggests that the cost is inexpensive especially when you compare it to the cost of a fracture (Bischoff-Ferrari et al., 2006; Winnipeg Regional Health Authority, 2013). Barriers of pill burden and physician preference to not prescribe vitamin D are findings that support previous literature (Adolphe et al., 2009; Hamid et al., 2007). The identified barriers from this study need to be addressed to find solutions and creative interventions in order to promote consistent vitamin supplementation use in LTC.

### ***Study Limitations***

Study limitations include a non-randomized sample, a small sample size, and distribution to only one geographic area. The small sample size implicates that these results are not representative of all LTC staff and visitors within all Manitoba LTC facilities. A larger sample and additional in-depth survey questions would permit further analyses and increase the strength of statistical tests. Participant recruitment was challenging as the majority of the sample were from nursing and there was lack of physicians represented.

### ***RELEVANCE TO PRACTICE***

This study has provided the first evidence that LTC staff and visitors perceive vitamin D supplementation as being important for LTC residents. Results identified there are multiple barriers that exist in LTC facilities regarding vitamin supplementation. The results suggest that further research is needed to develop resolutions to vitamin use, as well as minerals, to improve this population's vitamin D status. Providing vitamin D supplementation weekly or monthly and fortifying foods with vitamin D could be a potential solution to increase vitamin D intake.

## CHAPTER 6

### GENERAL DISCUSSION

The objectives of this study were (1) to examine the perceptions of LTC health professionals, staff, and visitors (family and friends) regarding vitamin D supplementation in LTC facilities and (2) to determine what barriers exist in providing vitamin D supplementation to all residents in LTC facilities. An exploratory mixed-methods design was used consisting of two phases to explore the perceptions and barriers from five diverse LTC facilities within a RHA in Manitoba. Phase 1 consisted of qualitative and quantitative methodology with 51 participants who were LTC staff and health professionals (Chapter 4). Phase 2 consisted of quantitative methods with 102 participants who were LTC staff, health professionals, and visitors (Chapter 5). Phase 1 results are presented in the first manuscript (Chapter 4) and phase 2 results are presented in the second manuscript (Chapter 5).

The first objective of the study was to examine the perceptions of LTC staff, family, and friends regarding vitamin D supplementation to LTC residents, which is an underinvestigated area. Phase 1 (Chapter 4) focused on LTC staff and their perceptions. Phase 2 (Chapter 5) examined LTC staff and visitor perceptions. The results from both phases found that perceptions were positive about providing vitamin D supplementation to residents. The percentage of participants that felt all LTC residents should receive a vitamin D supplement was 71.4% from phase 1 and 86.3% from phase 2, respectively. Participants strongly felt (81.6% from phase 1 and 92.2% from phase 2) that providing vitamin D supplementation to LTC residents would make a difference to their overall

health. Participants reported vitamin D supplementation is beneficial for residents due to decreased sunlight exposure, limited dietary sources of vitamin D, and poor dietary intake. Contrary to the positive perceptions, there were a few participants that viewed supplementation negatively. These participants considered that providing vitamin D was too late to be of any benefit for the residents and would therefore not change the outcome in the risk of falls and fractures. Overall, LTC staff, family members, and friends were positive and demonstrated strong perceptions about vitamin D supplementation indicating that they perceive vitamin D as being important for residents.

The second objective of this study was to determine what barriers exist for providing vitamin D supplementation to LTC residents. Findings from this study identified multiple barriers that exist for providing vitamin D in LTC. The most common barriers identified from both phases were the following: cost, the complexity of residents, polypharmacy, physician resistance, and limited knowledge and education on vitamin D. Other barriers that were identified were family and loved ones acceptance (phase 1), providing a supplement will not change the health status of the resident (phase 2), and staff workload constraints (phase 2). Cost was identified as a multifaceted barrier which included cost to the healthcare system, cost of laboratory tests for vitamin D levels, and cost of a vitamin D supplement. However, the cost of a vitamin D supplement is minimal and inexpensive especially when you compare it to the cost of a fracture (Bischoff-Ferrari et al., 2006; Winnipeg Regional Health Authority, 2013). Barriers of pill burden and physician bias to not prescribe vitamin D were found to be a common roadblock among Winnipeg LTC facilities. Findings from this study indicated that both phases identified the complexity of LTC residents are a major barrier in providing vitamin D due to

swallowing problems such as dysphagia and reluctance with taking medications. Participants from both phases identified the need for education on the importance of vitamin D. Providing an educational in-service to all LTC health professionals on a yearly basis and routine updates on vitamin D research and recommendations through memos and emails could play a critical role in improved awareness on vitamin D. An educational letter could also be provided to LTC physicians to try and reduce some of the identified barriers such as physician resistance toward the use of a vitamin D supplement and increase screening for vitamin D deficiency (Munir et al., 2007). Overall, the identified barriers need to be addressed in order to find potential resolutions to promote vitamin supplementation in LTC facilities.

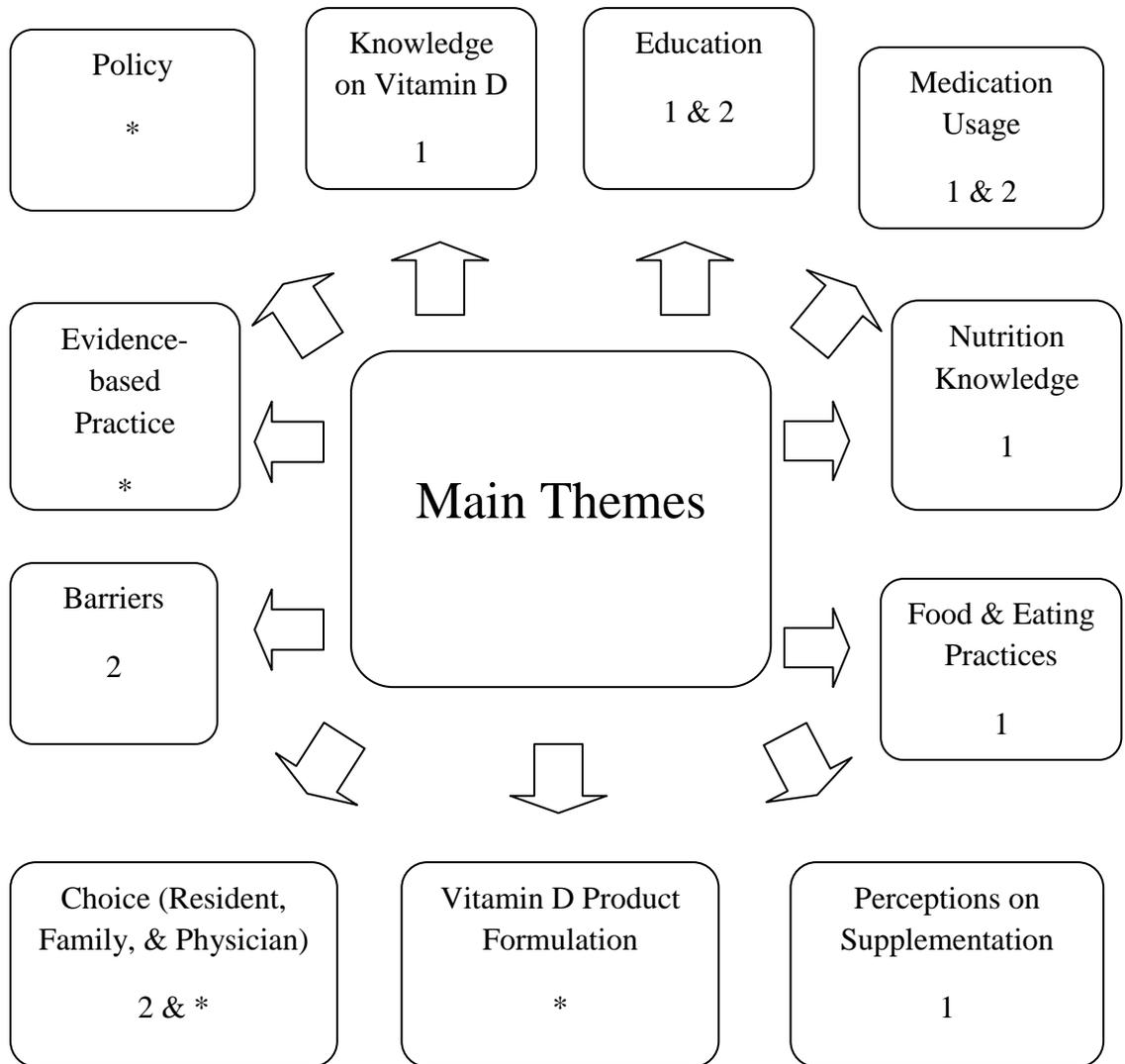
Knowledge, education, evidence-based practices, and policy are other themes that emerged from phase 1. Knowledge and education play an important role in the awareness and prevention of vitamin D deficiency and was identified as a common concern among LTC health professionals. A policy for vitamin D supplementation was considered too restrictive and evidence-based practices were identified as more favorable.

Knowledge emerged as one of the main themes from phase 1 of this study and was related to the perceptions of LTC health professionals and staff (Figure 6.1). Knowledge on vitamin D varied among health professionals and LTC facilities. Certain professions (clinical dietitians, pharmacists, and nurses) were more knowledgeable about vitamin D than compared to other professions. The majority of participants (76.5% from phase 1 and 90.2% from phase 2, respectively) reported that they know what vitamin D does in the human body. In spite of a high percentage of reported knowledge about vitamin D only a small number of participants during the focus group interviews could

elaborate on the specific functions of vitamin D. A few participants at two different focus group interview sessions thought that the session was an information session on vitamin D and were disappointed to find out it was a focus group interview and not an education session. It is important to note that for the participants who did not know the specifics on vitamin D, some had a basic understanding about vitamin D and its relationship to sun exposure, bone health, and muscle function. Several participants were unaware of the daily recommendations and dietary sources of vitamin D. In both surveys (phase 1 and 2), 43.1% and 41.2% of participants perceived that they know about the latest 2010 vitamin D recommendations for adults, however, several focus group participants demonstrated that they were in fact unaware of the current recommendations. It was noted that the clinical dietitians in the focus group interviews were knowledgeable about the specifics of vitamin D as this is their area of expertise. All LTC healthcare professionals vary in their role and responsibility with the resident and being able to identify medical problems associated with the possibility of vitamin D deficiency or insufficiency. It is important for these varying LTC health professionals to be knowledgeable about vitamin D and its implication to their profession. For example, a nurse is aware of whether the resident is taking their medications and is monitoring for falls and fractures, a pharmacist would be aware of the different types of vitamin D products available, coverage, and any drug interactions, a physiotherapist and occupational therapist would be aware of mobility issues, assess muscle integrity associated with muscle weakness, and activities of daily living, and a physician is responsible for prescribing vitamin D supplementation and obtaining serum levels to

screen for insufficiency or deficiency. Therefore, all health professionals in LTC have their specific role with vitamin D awareness and its impact on a LTC resident.

Figure 6.1: Main Themes Related to Study Objectives



1 = Perceptions of LTC health professionals and staff.

2 = Barriers that exist in providing vitamin D supplementation to LTC residents.

\* These themes are not related to study objectives, but emerged as a result and were discussed.

More information on vitamin D was an important issue that emerged from both phases (Figure 6.1). Limited knowledge and education on vitamin D was one of the top barriers reported by participants in both phases. During the focus group sessions, participants perceived the need for education on vitamin D and public awareness is essential. There was a general concern expressed with regard to not knowing about vitamin D and previous research conducted on the benefits of vitamin D and bone health for LTC residents. Education and knowledge play an important role by increasing awareness and therefore bettering the health of LTC residents.

Evidence-based practice and policy were two main themes that emerged from phase 1 but were not related to the study objectives (Figure 6.1). Participants discussed the importance of evidence-based practice for providing vitamin D supplementation to residents as opposed to a policy within their facility. Only one facility had developed evidence-based practices for vitamin D for almost all their residents. Participants from this facility addressed that no vitamin D levels were performed to compare pre and post supplementation and therefore could not identify health-related changes (falls and fractures) in their residents. Several participants reported that to implement a policy within a LTC setting would be a challenging task as there are a number of barriers and steps that need to be addressed such as education, physician resistance, and evidence-based practices. In addition, participants identified there was no policy for providing vitamin D supplementation in any of the 5 LTC facilities. In order for evidence-based practice to be accepted in LTC facilities pre and post vitamin D levels should be obtained in order to evaluate the benefit and outcome of vitamin D supplementation.

This study has some implications related to the health belief model. Participants who indicated that they consume a vitamin D supplement regularly (41.2% from phase 1 and 39.2% from phase 2, respectively) perceived they were susceptible (perceived susceptibility) to develop vitamin D deficiency (perceived threat) due to factors such as their age, personal symptoms, and physician recommendation (modifying factors). Due to this perceived threat, these participants are more likely to promote vitamin D supplementation (likelihood of action) for LTC residents because they themselves perceive supplementation as being important (individual perceptions) in the prevention of vitamin D deficiency. During the focus group sessions a few participants identified that they take a supplement regularly and therefore, felt supplementation was important for LTC residents. Lastly, the participants who were knowledgeable on vitamin D from previous education and awareness (cues to action) were aware of the seriousness (perceived threat) of vitamin D deficiency. Therefore, these participants were more motivated to promote supplementation (likelihood of behavior) to prevent deficiency and understood the benefits of vitamin D (perceived benefits) which outweigh the barriers that exist such as cost of the supplement and pill burden (perceived barriers).

Overall, this study was successful in examining perceptions and identifying barriers for providing vitamin D supplementation to LTC residents. In general, LTC staff and visitors perceive vitamin D as being important for residents overall health and well-being. However, there are many barriers that exist and need to be addressed. The top two barriers identified in phase 2 were the complexity of residents and cost of the supplement. Participants varied in their knowledge on vitamin D supplementation and therefore lack of education for some staff and visitors was evident. More education on

vitamin D should be provided to LTC health professionals and the community to increase knowledge and awareness on vitamin D. Evidence-based practices should be established to include screening for vitamin D deficiency and changes in the status of fractures and falls. It is important to note that the lack of education did not necessarily translate into non-acceptance of vitamin D supplementation as findings suggest that majority of participants were in support of supplementation. LTC health professionals and visitors can be on board for supplementation and it will still not happen because of existing barriers such as physician resistance and more education for the physicians and policy decision makers.

## **Limitations**

Some limitations of this study include a non-randomized sample, a small sample size for phase 2, and distribution to only one geographic area. The small sample size implicates that these results are not representative of all LTC staff and visitors within all Manitoba LTC facilities. A larger sample and additional in-depth survey questions would permit further analyses and increase the strength of statistical tests.

A limitation with the use of focus groups was that some participants were more vocal in identifying their perceptions than others. This limitation would suggest that certain participant's perceptions and important contributions were not voiced. The moderator ensured that during each focus group session all participants had contributed to the discussion within the first ten minutes to ensure everyone's voice was heard.

Lastly, the researchers faced several sampling issues such as a lack of representation of physicians and majority of both samples consisted of nursing staff. Recruitment of professional groups (physicians, registered dietitians, pharmacists) was a challenge in this study due to their busy schedules, unavailability, and low numbers at various facilities. In addition, participants who volunteered to participate may have a better understanding of the uses of vitamin D which may result in potential sampling bias. Selection bias is another potential limitation as directors of care and/or clinical dietitians assisted in the recruitment process during both phases and may have self-selected the most articulate participants to participate.

## **Implications of Findings**

Findings from this study have several implications. Nutrition education on a continuous basis should be mandatory for LTC health professionals and staff in regards to vitamin D and the importance it has on the overall health of residents. Education is important for all LTC health professionals due to their varying role and responsibility with the resident and being able to identify residents at risk for falls and possible vitamin D deficiency or insufficiency. This study found that some LTC staff reported their lack of knowledge on vitamin D and felt that this was one of the main barriers to supplementation within their facility. Providing nutrition education would increase awareness on vitamin D recommendations, dietary sources, and vitamin D products that are available for LTC. Awareness and prevention in the community for older adults is an important component prior to LTC admission. Southgate, Keller, & Reimer (2010) found that providing a nutrition education booklet and personalized letter with recommendations to older adults in the community were effective at changing nutrition knowledge and risk behavior. Clinical dietitians are health professionals that are specialized in the area of nutrition. A future implication could lead to dietitians providing continuous nutrition education sessions to older adults in the community on a proactive basis and also health professionals working in LTC.

In order to overcome the identified barriers from this study, solutions and creative interventions need to be developed and tested in LTC to promote vitamin and mineral supplementation use. This study found that a number of barriers exist for providing vitamin D supplementation in LTC. Possible solutions would include education for physicians, LTC staff, residents, and family members on the importance of vitamin D to

help increase acceptance and provide vitamin D biweekly or monthly to decrease the issue of pill burden. An all-day educational in-service could be provided once yearly to all LTC staff to include shift changes and provide information on vitamin D dietary sources, recommendations, vitamin D products, and current research. In addition, a once yearly education forum could also be provided to family members and visitors to aid in the awareness of vitamin D deficiency in the community at the various facilities. These solutions could be tested in different LTC facilities to determine if supplementation has improved resulting in a decrease in barriers.

Canadian LTC facilities need to focus on developing practical strategies and approaches for consistency in supplementation. Recommendations in Canada for vitamin D supplementation vary between each province and territory (Canadian Agency for Drugs and Technologies in Health, 2010). Findings from this study could be utilized to develop consistent evidence-based practices for uniform recommendations and guidelines for vitamin D diagnostic testing to determine if supplementation is required for residents.

Food fortification could be another alternative approach to increase vitamin D intake for LTC residents. Participants indicated that residents have poor vitamin D intake and do not consume enough food. Fortified foods that are available on the market are milk, margarine, yogurt, and some orange juices (Health Canada, 2012; Holick, 2006). It would be beneficial if the food industry could add vitamin D to more foods for example different juices and desserts. More specifically, fortified milk and margarine could be added to mashed potatoes and/or pureed vegetables in the LTC facility kitchen as these are generally well-liked items on the menu and could also be provided to residents suffering from swallowing problems. Fortified milk and egg can also be added to

custards and ice cream as another potential fortified food source. The fortification process is one way of bypassing the requirement of an oral tablet. Fortifying foods with vitamin D in LTC should be closely looked at as this would be a practical way to administer vitamin D for those residents with dysphagia that require supplementation.

### **Summary**

This is the first study to examine health professionals and visitor perceptions and identify what barriers exist for providing vitamin D supplementation, which has not been previously investigated. Barriers were identified to assist in the future development of practical guidelines to help promote appropriate supplement use in LTC. Nutrition education is an important component for overcoming the identified barriers. Continuing education is imperative for understanding the important role of vitamin and mineral supplementation.

## REFERENCES

- Adolphe, J. L., Whiting, S. J., & Dahl, W. J. (2009). Vitamin fortification of pureed foods: For long-term care residents. *Canadian Journal of Dietetic Practice and Research, 70*(3), 143-150.
- American Dietetic Association. (2000). Position of the American Dietetic Association: Nutrition, aging, and the continuum of care. *Journal of the American Dietetic Association, 100*(5), 580-595.
- American Dietetic Association. (2005a). Position of the American Dietetic Association: Liberalization of the diet prescription improves quality of life for older adults in long-term care. *Journal of the American Dietetic Association, 105*(12), 1955-1965.
- American Dietetic Association. (2005b). Position of the American Dietetic Association: Nutrition across the spectrum of aging. *Journal of the American Dietetic Association, 105*(4), 616-633.
- Arvanitakis, M., Beck, A., Coppens, P., De Man, F., Elia, M., Hebuterne, X., et al. (2008). Nutrition in care homes and home care: How to implement adequate strategies (report of the Brussels Forum (22-23 November 2007)). *Clinical Nutrition, 27*(4), 481-488.
- Bell, C. L., Tamura, B. K., Masaki, K. H., & Amella, E. J. (2013). Prevalence and measures of nutritional compromise among nursing home patients: Weight loss, low body mass index, malnutrition, and feeding dependency, a systematic review

of the literature. *Journal of American Medical Directors Association*, 14(2), 94-100.

Bischoff-Ferrari, H. A., Dawson-Hughes, B., Willett, W. C., Staehelin, H. B., Bazemore, M. G., Zee, R. Y., et al. (2004). Effect of vitamin D on falls: A meta-analysis. *Journal of the American Medical Association*, 291(16), 1999-2006.

Bischoff-Ferrari, H. A., Giovannucci, E., Willett, W. C., Dietrich, T., & Dawson-Hughes, B. (2006). Estimation of optimal serum concentrations of 25-hydroxyvitamin D for multiple health outcomes. *American Journal of Clinical Nutrition*, 84(1), 18-28.

Bocock, M. A., & Keller, H. H. (2008). Defining malnutrition risk for older home care clients. *Canadian Journal of Dietetic Practice and Research*, 69(4), 171-176.

Bostrom, A. M., Van Soest, D., Kolewaski, B., Milke, D. L., & Estabrooks, C. A. (2011). Nutrition status among residents living in veterans' long-term care facility in western Canada: A pilot study. *Journal of the American Medical Directors Association*, 12(3), 217-225.

Broe, K. E., Chen, T. C., Weinberg, J., Bischoff-Ferrari, H. A., Holick, M. F., & Kiel, D. P. (2007). A higher dose of vitamin D reduces the risk of falls in nursing home residents: A randomized, multiple-dose study. *Journal of the American Geriatrics Society*, 55(2), 234-239.

Brown, J. E. (2008). *Nutrition: Through the life cycle*. (Third Edition). Belmont, CA: Thomson Wadsworth.

- Calvo, M. S., Whiting, S. J., & Barton, C. N. (2004). Vitamin D fortification in the United States and Canada: Current status and data needs. *The American Journal of Clinical Nutrition*, 80(6), 1710S-1716S.
- Canadian Agency for Drugs and Technologies in Health. (2010). Vitamin D supplements for elderly patients in residential care: Policies and protocols [Environmental Scan]. *Canadian Agency for Drugs and Technologies in Health*, 12, 1-6. Retrieved December 2012, from <http://www.cadth.ca/products/environmental-scanning/environmental-scans/issue-12>
- Canadian Malnutrition Task Force. (2012) *What is malnutrition?* Retrieved December 2013, from <http://nutritioncareincanada.ca/>
- Canadian Union of Public Employees. (2009). *Residential long-term care in Canada: Our vision for better senior's care*. Retrieved February 2013, from <https://cupe.ca/sites/cupe/files/CUPE-long-term-care-seniors-care-vision.pdf>
- Center on Aging. (2010). *Profile of Manitoba's seniors*. Retrieved December 2012, from [http://umanitoba.ca/centres/aging/media/Profile\\_Manitoba\\_Senior\\_2010.pdf](http://umanitoba.ca/centres/aging/media/Profile_Manitoba_Senior_2010.pdf)
- Chandler, J. M., Zimmerman, S. I., Girman, C. J., Martin, A. R., Hawkes, W., Hebel, J. R., et al. (2000). Low bone mineral density and risk of fracture in white female nursing home residents. *Journal of the American Medical Association*, 284(8), 972-977.

- Chevalier, S., Saoud, F., Gray-Donald, K., Morais, J. A. (2008). The physical functional capacity of frail elderly persons undergoing ambulatory rehabilitation is related to their nutritional status. *Journal of Nutrition, Health & Aging*, 12(10), 721-726.
- Cranswick, K., & Dosman, D. (2008). *Eldercare: What we know today. Canadian social trends* (Statistics Canada, Catalogue no. 11-008-X). Retrieved December 2012, from <http://www.statcan.gc.ca/pub/11-008-x/2008002/article/10689-eng.htm>
- Creswell, J. W., & Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage Publications, Inc.
- Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches*. Thousand Oaks, CA: Sage Publications, Inc.
- Crogan, N. L., & Shultz, J. A. (2000). Nursing assistants' perceptions of barriers to nutrition care for residents in long-term care facilities. *Journal for Nurses in Staff Development*, 16(5), 216-221.
- Demontiero, O., Herrmann, M., Duque, G. (2011). Supplementation with vitamin D and calcium in long-term care residents. *Journal of the American Medical Directors Association*, 12(3), 190-194.
- Doupe, M., Fransoo, R., Chateau, D., Dik, N., Burchill, C., Soodeen, R., et al. (2011). *Population aging and the continuum of older adult care in Manitoba*. Winnipeg, MB: Manitoba Centre for Health Policy.
- Eriksen, E. F., & Glerup, H. (2002). Vitamin D deficiency and aging: Implications for general health and osteoporosis. *Biogerontology*, 3(1-2), 73-77.

- Gloth III, F. M., Tobin, J. D., Smith, C. E., & Meyer, J. N. (1996). Nutrient intakes in a frail homebound elderly population in the community vs a nursing home population. *Journal of the American Dietetic Association*, 96(6), 605-607.
- Hamid, Z., Riggs, A., Spencer, T., Redman, C., & Bodenner, D. (2007). Vitamin D deficiency in residents of academic long-term care facilities despite having been prescribed vitamin D. *Journal of the American Medical Association*, 8(2), 71-75.
- Health Canada. (2004). *Long-Term Facilities-Based Care*. Retrieved January 2013, from <http://www.hc-sc.gc.ca/hcs-sss/home-domicile/longdur/index-eng.php>
- Health Canada. (2010). *Dietary Reference Intakes*. Retrieved January 2013, from [http://www.hc-sc.gc.ca/fn-an/alt\\_formats/hpfb-dgpsa/pdf/nutrition/dri\\_tables-eng.pdf](http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/dri_tables-eng.pdf)
- Health Canada. (2012). *Vitamin D and calcium: Updated dietary reference intakes*. Retrieved January 2013, from <http://www.hc-sc.gc.ca/fn-an/nutrition/vitamin/vitamin-d-eng.php>
- Holick, M. F., Siris, E. S., Binkley, N., Beard, M. K., Khan, A., Katzer, J. T., et al. (2005). Prevalence of vitamin D inadequacy among postmenopausal North American women receiving osteoporosis therapy. *The Journal of Clinical Endocrinology & Metabolism*, 90(6), 3215-3224.
- Holick, M. F. (2006). High prevalence of vitamin D inadequacy and implications for health. *Mayo Clinic Proceedings*, 81(3), 353-373.

- Holick, M. F. (2007). Vitamin D Deficiency. *The New England Journal of Medicine*, 357(3), 266-281.
- Hollis, B. W. (2005). Circulating 25-hydroxyvitamin D levels indicative of vitamin D sufficiency: implications for establishing a new effective dietary intake recommendation for vitamin D. *Journal of Nutrition*, 135(2), 317-322.
- Hollis, B. W. (2011). Short-term and long-term consequences and concerns regarding valid assessment of vitamin D deficiency: Comparison of recent food supplementation and clinical guidance reports. *Current Opinion in Clinical Nutrition and Metabolic Care*, 14(6), 598-604.
- Hsieh, C., Novielli, K. D., Diamond, J. J., & Cheruva, D. (2001). Health beliefs and attitudes toward the prevention of osteoporosis in older women. *The Journal of the North American Menopause Society*, 8(5), 372-376.
- Insel, P., Turner, E. R., & Ross, D. (2006). *Discovering Nutrition*. (Second Edition). Sudbury, MA: Jones and Bartlett Publishers.
- Institute of Medicine. (2006). *Dietary reference intakes: The essential guide to nutrient requirements*. Washington, DC: The National Academies Press.
- Jensen, G. L., Mirtallo, J., Compher, C., Dhaliwal, R., Forbes, A., Grijalba, R. F., et al. (2010). Adult starvation and disease-related malnutrition: A proposal for etiology-based diagnosis in clinical practice setting from the International Consensus Guideline Committee. *Journal of Parental and Enteral Nutrition*, 34(2), 156-159.

- Johnson, R. M., Smiciklas-Wright, H., Soucy, I. M., and Rizzo, J. A. (1995). Nutrient intake of nursing-home residents receiving pureed foods or a regular diet. *Journal of American Geriatric Society*, 43(4), 344-348.
- Kamel, H. K. (2004). Underutilization of calcium and vitamin D supplements in an academic long-term care facility. *Journal of the American Medical Directors Association*, 5(2), 98-100.
- Kayser-Jones, J., & Pengilly, K. (1999). Dysphagia among nursing home residents. *Geriatric Nursing*, 20(2), 77-82.
- Kerr, J., Weitkunat, R., & Moretti, M. (2005). *ABC of behaviour change: A guide to successful disease prevention and health promotion*. Philadelphia: Elsevier.
- Krueger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research*. (Third Edition). Thousand Oaks, CA: Sage Publications, Inc.
- Larsen, E. R., Mosekilde, L., and Foldspang, A. (2004). Vitamin D and calcium supplementation prevents osteoporotic fractures in elderly community dwelling residents: A pragmatic population-based 3-year intervention study. *Journal of Bone and Mineral Research*, 19(3), 370-378.
- Larson, K. (2003). Fluid balance in the elderly: Assessment and intervention-important role in the community health and home care nursing. *Geriatric Nursing*, 24(5), 306-309.

- Lai, J. K. C., Lucas, R. M., Banks, E., Ponsonby, A. L., & Ausimmune Investigator Group. (2011). Variability in vitamin D assays impairs clinical assessment of vitamin D status. *Internal Medicine Journal*, 42(1), 43-50.
- Lau, A. N., Ioannidis, G., Potts, Y., Giangregorio, L. M., Van Der Horst, M. L., Adachi, J. D., et al. (2010). What are the beliefs, attitudes and practices of front-line staff in long-term care facilities related to osteoporosis awareness, management and fracture prevention? *BMC Geriatrics*, 10(73), 1-7.
- Lauque, S., Arnaud-Battandier, F., Mansourian, R., Guigoz, Y., Paintin, M., Nourhashemi, F., et al. (2000). Protein-energy oral supplementation in malnourished nursing-home residents. *Age and Ageing*, 29(1), 51-56.
- Lengyel, C. O., Whiting, S. J., & Zello, G. A. (2008). Nutrient inadequacies among elderly residents of long-term care facilities. *Canadian Journal of Dietetic Practice and Research*, 69(2), 82-88.
- Linton, A. D. (2007). *Matteson & McConnell's gerontological nursing: Concepts and practice*. St. Louis, MO: Saunders Elsevier.
- Lister, T. (2008). Should long-term care residents be supplemented with vitamin D? *Canadian Journal of Dietetic Practice and Research*, 69(1), 28-31.
- Lyles, K. W., Schenck, A. P., & Colón-Emeric, C. S. (2008). Hip and other osteoporotic fractures increase the risk of subsequent fractures in nursing home residents. *Osteoporosis International*, 19(8), 1225-1233.

- Manitoba Health. (2007-2008). *Annual Statistics 2007-2008: Manitoba Health & Healthy Living*. Retrieved February 2013, from <http://www.gov.mb.ca/health/annstats/as0708.pdf>
- Manitoba Health. (2010-2011). *Annual Statistics 2010-2011*. Retrieved February 2013, from <http://www.gov.mb.ca/health/annstats/as1011.pdf>
- McNaughton, S. A., Crawford, D., Ball, K., & Salmon, J. (2012). Understanding determinants of nutrition, physical activity and quality of life among older adults: The wellbeing, eating and exercise for a long life (WELL) study. *Health and Quality of Life Outcomes, 10*, 1-7.
- Millen, A., & Bodnar, L. (2008). Vitamin D assessment in population-based studies: A review of the issues. *The American Journal of Clinical Nutrition, 87*(4), 1102S-1105S.
- Morgan, D. (1997). *Focus groups as qualitative research*. (Second Edition). Retrieved from <http://dx.doi.org/10.4135/9781412984287>
- Munir, J., Wright, R. J., & Carr, D. B. (2007). A quality improvement study on calcium and vitamin D supplementation in long-term care. *Journal of American Medical Directors Association, 8*(3), e19-23.
- Nieuwenhuizen, W. F., Weenen, H., Rigby, P., & Hetherington, M. M. (2010). Older adults and patients in need of nutritional support: Review of current treatment options and factors influencing nutritional intake. *Clinical Nutrition, 29*(2), 160-169.

- Organisation for Economic Co-operation and Development. (2005). *Long-term care for older people*. Paris: OECD Publications.
- Pelletier, C. A. (2004). What do certified nurse assistants actually know about dysphagia and feeding nursing home residents? *American Journal of Speech-Language Pathology, 13*(2), 99-113.
- Plawecki, K., & Chapman-Novakofski, K. (2013). Effectiveness of community intervention in improving bone health behaviours in older adults. *Journal of Nutrition in Gerontology and Geriatrics, 32*(2), 145-160.
- Reimer, H. D., & Keller, H. H. (2009). Mealtimes in nursing homes: Striving for person-centered care. *Journal of Nutrition for the Elderly, 28*(4), 327-347.
- Ritchie, C. S., & Bales, C. W. (2009). *Handbook of clinical nutrition and aging*. Totowa, NJ: Humana Press.
- Ross, C. A., Manson, J. E., Abrams, S. A., Aloia, J. F., Brannon, P. M., Clinton, S. K., et al. (2011). The 2011 report on dietary reference intakes for calcium and vitamin D from the Institute of Medicine: What clinicians need to know. *Journal of Clinical Endocrinology and Metabolism, 96*(1), 53-58.
- Saxon, S. V., Etten, M. J., & Perkins, E. A. (2010). *A guide for the helping professionals: Physical change & aging*. New York: Springer Publishing Company.
- Sahyoun, N. R. (2004). Tooth and mouth problems and nutrition among older people. *Generations, 28*(3), 18-21.
- Silverman, D. (2004). *Qualitative research: Theory, method and practice*. (Second Edition). London: SAGE Publications Ltd.

- Simmons, S. F., & Schnelle, J. F. (2006). Feeding assistance needs of long-stay nursing home residents and staff time to provide care. *Journal of the American Geriatrics Society*, 54(6), 919-924.
- Sitter, M., & Lengyel, C. (2011). Nutritional status and eating habits of older Manitobans after relocating to a personal care home. *Canadian Journal of Dietetic Practice and Research*, 72(2), e134-e139.
- Sloane, P. D., Ivey, J., Helton, M., Barrick, A. L., & Cerna, A. (2008). Nutritional issues in long-term care. *Journal of American Medical Directors Association*, 9, 476-485.
- Southgate, K. M., Keller, H. H., & Reimer, H. D. (2010). Determining knowledge and behaviour change after nutrition screening among older adults. *Canadian Journal of Dietetic Practice and Research*, 71(3), 128-133.
- Statistics Canada. (2006). *A Portrait of Seniors in Canada* (Catalogue no. 89-519-XIE). Retrieved January 2013, from <http://www.statcan.gc.ca/pub/89-519-x/89-519-x2006001-eng.pdf>
- Statistics Canada. (2009/2010). *Residential Care Facilities* (Catalogue no. 83-237-X). Retrieved January 2013, from <http://www.statcan.gc.ca/pub/83-237-x/83-237-x2012001-eng.pdf>
- Statistics Canada. (2012a). *Living arrangements of seniors: 2011 Census of Population* (Catalogue no. 98-312-X2011003). Retrieved January 2013, from [http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-312-x/98-312-x2011003\\_4-eng.pdf](http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-312-x/98-312-x2011003_4-eng.pdf)

Statistics Canada. (2012b). *Canada's population estimates: Age and sex, July 1, 2012*.

Retrieved January 2013, from <http://www.statcan.gc.ca/daily-quotidien/120927/dq120927b-eng.htm>

Tang, B. M., Eslick, G. D., Nowson, C., Smith, C., & Bensoussan, A. (2007). Use of calcium or calcium in combination with vitamin D supplementation to prevent fractures and bone loss in people aged 50 years and older: A meta-analysis. *Lancet*, 370(9588), 657-666.

Torma, J., Winblad, U., Cederholm, T., & Saletti, A. (2012). Does undernutrition still prevail among nursing home residents? *Clinical Nutrition*, 32(4), 562-568.

Veleva, B. I., Chel, V. G., & Achterberg, W. P. (2014). Efficacy of daily 800 IU vitamin D supplementation in reaching vitamin D sufficiency in nursing home residents: Cross-sectional patient file study. *BMC Geriatrics*, 14, 1-7.

Viveky, N., Toffelmire, L., Thorpe, L., Billinsky, J., Alcorn, J., Hadjistavropoulos, T., et al. (2012). Use of vitamin and mineral supplements in long-term care home residents. *Applied Physiology, Nutrition and Metabolism*, 37(1), 100-105.

Wendland, B. E., Greenwood, C. E., Weinberg, I., & Young, K. W. H. (2003). Malnutrition in institutionalized seniors: The iatrogenic component. *Journal of the American Geriatrics Society*, 51(1), 85-90.

Winnipeg Regional Health Authority. (2008). Adult diet criteria for menu database: Nutrition & food services. Retrieved January 2013, from

<http://www.wrha.mb.ca/extranet/nutrition/files/Manuals-WRHAAdultDietCriteriaforMenuDatabase.pdf>

Winnipeg Regional Health Authority. (2013). Vitamin D supplementation recommendation for healthy children and adults: Practice issue evidence summary.

Winnipeg Regional Health Authority. (2014). Vitamin D supplementation: Evidence review & recommendations for LTC.

**APPENDIX A: Recruitment Poster for Focus Groups**

# Participants Needed for a University of Manitoba Research Study

**We are seeking opinions about vitamin D supplementation in long-term care facilities (LTC).**

You are eligible to participate if you meet the following criteria:

- 18 years of age and older
- Employees of the LTC facility: administrators, physicians, nursing, food service, and other allied health professionals
- Available for a 30 minute focus group interview

**Drinks and snacks will be provided during the group interview, as a token of appreciation.**

Please come by **XXXX Room** to join as a participant:

DAY XXXX

TIME XXXX

For more information, contact:

Name: XXX

E-mail: XXX

Phone: XXX



UNIVERSITY  
OF MANITOBA



## **APPENDIX B: Nutrition Survey for Focus Groups**



# Nutrition Survey for Focus Groups

ID #: \_\_\_\_\_

Please respond to the following questions. Use a check (✓) where appropriate.

1. Age \_\_\_\_\_

2. Female \_\_\_\_\_ Male \_\_\_\_\_

3. Describe yourself. Select **ONLY ONE CATEGORY** that best describes you today.

- |                     |                             |       |
|---------------------|-----------------------------|-------|
| Administrator _____ | Allied Health:              |       |
| Physician _____     | Clinical Dietitian          | _____ |
| Nursing:            | Occupational Therapist      | _____ |
| RN _____            | Pharmacist                  | _____ |
| RPN _____           | Physiotherapist             | _____ |
| LPN _____           | Recreation Therapist        | _____ |
| HCA _____           | Respiratory Therapist       | _____ |
| Food Service:       | Social Worker               | _____ |
| FSA _____           | Speech-Language Pathologist | _____ |
| Cook _____          | Other: (Give Title)         | _____ |
|                     | _____                       |       |

4. Years of Employment at Facility: \_\_\_\_\_

5. EFT: \_\_\_\_\_

6. Do you know about the latest 2010 vitamin D recommendations for adults?

Yes \_\_\_\_\_ No \_\_\_\_\_

7. Do you know what vitamin D does in the human body?

Yes \_\_\_\_\_ No \_\_\_\_\_

8. Do you take a vitamin D supplement regularly? Yes \_\_\_\_\_ No \_\_\_\_\_

**9.** How important is consuming food to get an adequate supply of vitamin D for your health? (Circle one number)

1

2

3

4

5

Not important

Somewhat important

Very important

**10.** Do you feel it is important that all individuals over 18 years of age take a vitamin D supplement regularly? (Circle one number)

1

2

3

4

5

Not important

Somewhat important

Very important

**11.** Do you feel that all residents in long-term care (LTC) facilities should receive a vitamin D supplement?

Yes \_\_\_\_\_

No \_\_\_\_\_

**12.** Do you think vitamin D supplementation in long-term care (LTC) facilities would make a difference to the overall health of the residents?

Yes \_\_\_\_\_

No \_\_\_\_\_

## **APPENDIX C: Moderator's Guide for Focus Groups**

# Moderator's Guide

## 1) Introduction of Moderator and Group: (1 minute)

Hello and welcome. My name is XXX and I am a Master's student at the University of Manitoba. The note taker today is \_\_\_\_\_. Today, I will be your moderator and guide you through this focus group discussion. I would like to thank you for volunteering your time and coming today. Snacks and drinks have been provided as a token of appreciation.

## 1) Overview of Study: (2 minutes)

The purpose of this focus group discussion is to talk about the perceptions of vitamin D supplementation among older adults residing in LTC facilities. I will be asking a few in-depth questions and I hope to obtain your opinions on these issues. As provided in the consent form that you signed, this session will take no longer than 30 minutes to complete. I am mindful of time, so I will facilitate this process so we are done by \_\_\_\_\_. The session will be audio tape recorded to facilitate data collection. Please feel free to share your opinions and thoughts about the questions with us. Results will not be reported by individuals' names nor will any names be associated with the results. Participants will be identified by a random number only during the transcription of the audio tapes. All data will be kept strictly confidential by the researcher. You are free to withdraw from the study at any time, and/or refrain from answering any questions you prefer to omit, without prejudice or consequence.

## 2) Group Guidelines: (2 minutes)

A few things to remember:

- a) There are no right or wrong answers to any of the questions I will ask you. Please feel free to share your opinions and thoughts.
- b) Since this is a group, it is important that we respect each other's comments.
- c) Since this session is being audio taped. Please state your name before speaking, speak in turn and as loudly as possible.
- d) Please state your name before speaking to help in record keeping and note taking.
- e) If you have a thought while someone is speaking, feel free to use the pen and paper provided to write it down and present your idea(s) during the session.
- f) Participation is restricted to the invited focus group participants, moderator and note taker whom are seated around this table.

## 3) Ice Breaker: (5 minutes)

To begin, I would like to go around the table for introductions. Please state your first name and your favorite sport or animal.

**4) Focus Group Discussion: (20 minutes)**

We will now begin with the questions.

The definition of vitamin D supplementation for this discussion means providing vitamin D to LTC residents above and beyond what food they consume to meet their nutritional needs.

*Question 1:* Tell me about vitamin D and its importance to health?

Probe: What about vitamin D in relation to the health of LTC residents?

*Question 2:* What would be some possible outcomes if vitamin D supplementation was given orally to all LTC residents? Please give some examples.

Probe: Positive or negative. Please expand.

*Question 3:* What are the barriers that may exist for the administration of vitamin D supplementation to all residents?

Probe: Is there anything in your profession that might prevent from getting a vitamin D supplement?

*Question 4:* What would have to happen at your facility for supplementation to occur for all residents?

Probe: Policies and procedures in LTC facility

*Question 5:* What do you feel would be the most suitable form and/or type for providing vitamin D supplementation for all residents in LTC?

Probes: Individual dose of vitamin D or as part of a multivitamin?

: Given to all residents or those that have been identified through screening?

**5) Closing Remarks: (1 minute)**

We have come to the end of our focus group discussion. Does anyone have any additional comments? I want to thank-you for your participation. All of your opinions and comments are very valuable.

A special thank you to

---

(NAME, TITLE at LTC FACILITY) for helping to organize this session.

Finally, I would like to acknowledge funding from the University of Manitoba.

**APPENDIX D: Informed Consent Form for Focus Groups**



**Faculty of Human Ecology**

**Human Nutritional Sciences**

418 Human Ecology Bldg.  
Winnipeg, Manitoba  
Canada R3T 2N2  
Phone: (204) 474-6051  
Fax: (204) 474-7593

## **INFORMED CONSENT FORM**

**Research Project Title:** Perceptions of Vitamin D Supplementation in Long-Term Care Facilities (LTC)

**Principal Investigator:** Amy Ludwig

**Research Supervisor:** Dr. Christina Lengyel

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. Please take the time to read this consent form carefully and understand any accompanying information provided. If you would like more detail about something mentioned here, or any additional information not included here, please feel free to ask or contact Amy Ludwig by phone at (204) 474-6051 or by email at XXX.

The purpose of the study is to seek opinions about vitamin D supplementation in long-term care facilities (LTC). The objectives of this study are:

- 1) To examine the perceptions of health professionals and staff regarding vitamin D supplementation in long-term care (LTC) facilities.
- 2) To determine what barriers exist in providing vitamin D supplementation to all residents in long-term care facilities (LTC). It is important to understand whether vitamin D supplementation is an important issue and if barriers to implementation exist so that an appropriate process can be determined.

The study involves the following:

- 1) *Focus Group Interviews:* Five to ten participants will be involved in an informal group discussion, assessing perceptions regarding the need for and barriers of vitamin D supplementation among older adults in LTC. A moderator (the Principal Investigator) will ask open-ended questions. Each focus group will take approximately 30 minutes to complete. All focus group sessions will be digitally audiotaped. The focus group interviews will be confidential and participants' information will only be identified by numerical code.
- 2) *Nutrition Survey for Focus Groups:* An anonymous survey will be completed prior to conducting the Focus Group session.

During each session, drinks and snacks will be provided as a token of appreciation. To receive a summary of the results from the focus groups complete the section at the end of this consent form.

No names will be associated with data collected and reporting will be done on a total group basis only. Data related to personal information and results obtained will be kept in a locked cabinet in a locked room for 5 years or until data are published whichever comes first. All digital audiotapes, surveys, and information of a personal nature will be destroyed after the time has expired.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Joint-Faculty Research Board of Ethical Review at the University of Manitoba. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122. A copy of this consent form has been given to you to keep for your records and reference.

---

Participant's Signature Date

---

Researcher and/or Delegate's Signature Date

**FOR A COPY OF THE STUDY RESULTS PLEASE COMPLETE THE FOLLOWING:**

---

Name (Please Print)

Preferred Mailing Address (check one of the following):

E-mail

Regular Post

---

E-mail Address

---

Street

---

City/Town

---

Postal Code

**APPENDIX E: Recruitment Poster for Nutrition Survey**

 **Participants Needed for a**   
**University of Manitoba Research  
Study!**

We are seeking opinions about vitamin D supplementation in long-term care facilities (LTC).

You are eligible to participate if you meet the following criteria:

- 18 years of age and older
- Cannot be resident of the LTC facility
- Cannot be employees of maintenance, custodial, and security of the LTC facility
- Can fill out a brief 5 minute survey

After completion of the survey, participants will be entered into a draw for one of five \$50 gift certificates for a local grocery store, as a token of appreciation.

Please come by our booth by the cafeteria to fill out a survey:

DAY XXXX

TIME XXXX

For more information, contact:

Name: XXX

E-mail: XXX

Phone: XXX



UNIVERSITY  
OF MANITOBA



**APPENDIX F: Nutrition Survey**



# Nutrition Survey

ID #: \_\_\_\_\_

Please respond to the following questions. Use a check (✓) where appropriate.

1. Age \_\_\_\_\_
2. Female \_\_\_\_\_ Male \_\_\_\_\_
3. Describe yourself. Select **ONLY ONE CATEGORY** that best describes you today.

- |                     |                                   |
|---------------------|-----------------------------------|
| Administrator _____ | Allied Health: _____              |
| Physician _____     | Clinical Dietitian _____          |
| Nursing: _____      | Occupational Therapist _____      |
| RN _____            | Pharmacist _____                  |
| RPN _____           | Physiotherapist _____             |
| LPN _____           | Recreation Therapist _____        |
| HCA _____           | Respiratory Therapist _____       |
| Food Service: _____ | Social Worker _____               |
| FSA _____           | Speech-Language Pathologist _____ |
| Cook _____          | Other: (Give Title) _____         |
| Visitor: _____      | _____                             |
| Family _____        |                                   |
| Friend _____        |                                   |

4. Are you employed here?      Yes \_\_\_\_\_      No \_\_\_\_\_
5. Do you know about the latest 2010 vitamin D recommendations for adults?  
     Yes \_\_\_\_\_      No \_\_\_\_\_
6. Do you know what vitamin D does in the human body?  
     Yes \_\_\_\_\_      No \_\_\_\_\_
7. Do you take a vitamin D supplement regularly?      Yes \_\_\_\_\_      No \_\_\_\_\_
8. How important is consuming food to get an adequate supply of vitamin D for your health? (Circle one number)

1                      2                      3                      4                      5

Not important                      Somewhat important                      Very important

9. Do you feel it is important that all individuals over 18 years of age take a vitamin D supplement regularly? (Circle one number)

1

2

3

4

5

Not important

Somewhat important

Very important

10. Do you feel that all residents in long-term care (LTC) facilities should receive a vitamin D supplement?

Yes \_\_\_\_\_ No \_\_\_\_\_

11. Do you think vitamin D supplementation in long-term care (LTC) facilities would make a difference to the overall health of the residents?

Yes \_\_\_\_\_ No \_\_\_\_\_

12. Indicate your top 2 concerns about vitamin D supplementation to all residents in long-term care (LTC) facilities. Use **#1** and **#2** to indicate your top **TWO** concerns using the items below.

\_\_\_\_\_ Swallowing problems of residents

\_\_\_\_\_ Residents preferences towards taking pills

\_\_\_\_\_ Adding to the amount of medications the resident currently takes

\_\_\_\_\_ Who pays for the supplement (family, resident, or LTC facility)

\_\_\_\_\_ Limited knowledge and education on vitamin D by LTC staff, residents, and/or families

\_\_\_\_\_ Delivery of the supplement by staff due to workload concerns

\_\_\_\_\_ Physician preference to not prescribe vitamin D

\_\_\_\_\_ Providing a supplement will not change the health status of the resident

\_\_\_\_\_ Other (Please describe): \_\_\_\_\_

\_\_\_\_\_ None

Thank you for your time!

**APPENDIX G: Informed Consent Form for Survey**



**Faculty of Human Ecology**  
**Human Nutritional Sciences**  
**INFORMED CONSENT FORM**

418 Human Ecology Bldg.  
Winnipeg, Manitoba  
Canada R3T 2N2  
Phone: (204) 474-6051  
Fax: (204) 474-7593

**Research Project Title:** Perceptions of Vitamin D Supplementation in Long-Term Care Facilities (LTC)

**Principal Investigator:** Amy Ludwig

**Research Supervisor:** Dr. Christina Lengyel

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. Please take the time to read this consent form carefully and understand any accompanying information provided.

If you would like more detail about something mentioned here, or any additional information not included here, please feel free to ask or contact Amy Ludwig by phone at (204) 474-6051 or by email at XXX.

The purpose of the study is to seek opinions about vitamin D supplementation in long-term care facilities (LTC). The objectives of this study are:

- 1) To examine the perceptions of health professionals, staff, and family members regarding vitamin D supplementation in long-term care (LTC) facilities.
- 2) To determine what barriers exist in providing vitamin D supplementation to all residents in long-term care facilities (LTC). It is important to understand whether vitamin D supplementation is an important issue and if barriers to implementation exist so that an appropriate process can be determined.

The study involves the following:

- 1) *Nutrition Survey:* Participants will be administered a nutrition survey. It will take approximately 5 minutes to complete.

After completion of the survey, participants will be entered into a draw for one of five \$50 gift certificates for a local grocery store, as a token of appreciation. To receive a summary of the results from the survey complete the section at the end of this consent form.

No names will be associated with data collected and reporting will be done on a total group basis only. Data related to personal information and results obtained will be kept in a locked cabinet in a locked room for 5 years or until data are published whichever comes first. All data and information of a personal nature will be shredded after the time has expired.

No names will be associated with data collected and reporting will be done on a total group basis only. Data related to personal information and results obtained will be kept in a locked cabinet in a locked room for 5 years or until data are published whichever comes first. All digital audiotapes, surveys, and information of a personal nature will be destroyed after the time has expired.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Joint-Faculty Research Board of Ethical Review at the University of Manitoba. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122. A copy of this consent form has been given to you to keep for your records and reference.

---

Participant's Signature Date

---

Researcher and/or Delegate's Signature Date

**FOR A COPY OF THE STUDY RESULTS PLEASE COMPLETE THE FOLLOWING:**

---

Name (Please Print)

Preferred Mailing Address (check one of the following):

E-mail

Regular Post

---

E-mail Address

---

Street

---

City/Town

---

Postal Code