Glycemic Control in Long Term Care: Considerations for more Appropriate Individualized Care.

by

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Authors Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Diabetes, specifically type 2 diabetes (T2DM), is a metabolic disease that is highly correlated with increasing age. Diabetes is prevalent in about a quarter of residents in LTC, where its management in elderly residents is complicated by the presence of multiple comorbidities, a high level of vulnerability and risk of death. Despite this, evidence for the benefit of tight blood glucose control in preventing cardiovascular and other geriatric outcomes in the frail elderly is inconclusive. Although many clinical practice guidelines (CPG) call for more relaxed blood glucose control in the frail elderly, evidence for relaxed blood glucose targets is mostly based on expert consensus, resulting in variable recommendations among different CPG's. Furthermore, the current literature suggests that blood glucose values are generally below the recommended lower threshold (an A1C <7.0%) in LTC residents. However, it is not conclusive as to whether lower A1C values are a reflection of the clinical characteristics of the frail elderly in LTC, or a result of stringent blood glucose control. Finally, research in Canada regarding the management of diabetes in LTC homes is greatly lacking.

This study conducted a mixed method design (convergent parallel design) in order to explore the current practices, processes, and opinions of blood glucose control in Ontario LTC homes. This study conducted a provincial survey exploring opinions of blood glucose control and treatment among LTC medical directors and attending physicians across Ontario. Alongside the survey, this study also conducted in-depth phone interviews with medical directors, attending physicians, and nurses of varying educational and managerial positions, in order to explore the experiences of managing blood glucose in LTC residents with diabetes.

The findings of this study illustrate the growing appreciation of less stringent blood glucose control in elderly LTC residents among LTC physicians and nurses. Frailty, a limited life

expectancy and dementia, are common factors that promote less stringent blood glucose control. However, there is still variance in what blood glucose targets physicians are willing to consider. Furthermore, there appears to be two approaches to managing hyperglycemia in LTC. Whereas some physicians are mainly concerned with preventing acute symptoms of hyperglycemia in LTC residents with a less stringent approach, other physicians are of the opinion that hyperglycemia is still related to multiple short term illnesses and complications in LTC residents, and are less willing to consider the more extreme opinions of less stringent control that exist. Barriers to optimal blood glucose control within LTC homes include the presence of dementia and managing a resident's diet, including unpredictable intake and poor diet choices by the resident or family. Physicians limited their consideration of sliding scale and complex insulin regimens in LTC residents when possible. However, attempts to reduce monitoring parameters was complicated by the presence of unstable blood glucose levels as a result of frailty, dementia, and variable diet intake. The study also identified the role for increased communication between health professionals within LTC and a need for continuing education, especially for the nursing staff, in order to facilitate optimal management.

Future research should explore the perceptions and experiences of other key professionals and individuals that are essential to informing the experiences of blood glucose control and overall diabetes management in LTC. Studies should also address the current practices of diabetes management in LTC residents, in order to highlight any potential differences between what physicians and nurses report versus actual practice. Finally, future studies should explore the effect of hyperglycemia on short term complications and geriatric outcomes, in order to better inform management that improves the quality of life of residents.

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List of Abbreviations

A1C- Glycated Hemoglobin

ADL- Activities of Daily Living

BG – Blood Glucose

CDA- Canadian Diabetes Association

CHD- Coronary Heart Disease

CHESS- Changes in Health, End-stage disease and Symptoms and Signs

CHF- Congestive Heart Failure

CKD- Chronic Kidney Disease

CPG- Clinical Practice Guidelines

DOC- Director of Care

FBG- Fasting Blood Glucose

LTC- Long term Care

MDS 2.0- Resident Assessment Instrument, Minimum Data set

MI- Myocardial Infarctions

PPBG- Post-Prandial Blood Glucose

PSW- Personal Support Worker

RCT- Randomized Control Trial

RN- Registered Nurse

RPN- Registered Practical Nurse

T2DM- Type 2 Diabetes Mellitus

CHAPTER 1- INTRODUCTION

Previously known as adult onset diabetes, Type 2 diabetes mellitus (T2DM) has a high incidence in mid to later life, and is strongly correlated with increasing age (PHAC, 2011). However, due to alarming rates of childhood obesity and sedentary lifestyles, the incidence of T2DM in children and young adults has risen drastically, resulting in a focus of public health efforts on treatment and prevention in these younger populations. Still, the prevalence of diabetes is highest in the elderly, a population that encompasses a high prevalence of individuals with complex needs challenged by frailty, comorbidity, and geriatric concerns such as dementia, polypharmacy, and incontinence. Despite this, evidence for appropriate management and care in this special population is scarce and inadequate. Although there are variations in definition, the elderly can be defined as individuals who are generally passed the age of 60. Many ultimately, develop a state of progressive frailty that ultimately culminates in the end of life, though the age of onset and rate of progression of frailty can be highly variable (Tessier & Meneilly, 2001). Frailty can be defined as a loss of physiological reserve in multiple domains that increases an individual's vulnerability to poor health outcomes when subject to stressors. Recently, there has been a growing shift in geriatric and diabetes research for a more individualized approach to blood glucose control in the elderly, with less stringent blood glucose targets in the frail elderly. In light of this, inquiry into the management of elderly diabetes has increased in aging populations, specifically in regards to concerns of overtreatment in the long-term care setting. However, research of this kind remains almost non-existent in Canada. The purpose of this study is to explore the current practices of blood glucose management in elderly long term care (LTC) residents, as well as the current opinions and decision process used among care providers to individualize care in this complex population.

CHAPTER 2- LITERATURE REVIEW

Epidemiology of Diabetes Mellitus.

According to the Canadian Chronic Disease Surveillance System (CCDSS, 2011), the prevalence of diabetes from 2008-2009 was 6.8% in Canada. Furthermore, the current risk of developing diabetes in Canada is projected at 8.9%, with about 1.9 million expected cases of diabetes between 2007 and 2017 (Manuel et al., 2010). The prevalence of diabetes is highest in adults within the age groups of 70-74 years, 75-79 years, and 80-84 years, with rates of 24.1%, 25.5%, and 25.2%, respectively (PHAC, 2011). Cumulative incidence of diabetes is also highest in this age range, with 20.0 cases per year (per 1000 individuals) in the 75-79 years age group, followed by 70-74 years and 65-69 years age groups with 20.3 and 19.5 cases per year (per 1000 individuals) respectively (PHAC, 2011). Hence, diabetes in older adults can be newly diagnosed or the result of long-standing diabetes. The rate of diabetes continues to rise in Ontario, increasing by 69% from 1995 to 2005 (Lipscome, & Hux, 2007). Diabetes prevalence in Ontario was 9.6% in 2011, with the highest prevalence (13.6%) in the Greater Toronto Area (Booth et al., 2012). The prevalence of diabetes in Ontario also increases with age, and is highest in the 75+ age group at 20.0% in men and 16.0% in women in 1999 (Hux & Tang, 2003).

Diabetes in LTC.

In Ontario, long-term Care (LTC) homes are regulated by the Ministry of Health and Long Term Care (MOHLTC). LTC homes (in some cases known as nursing homes or residential care facilities) refer to residences that generally provide residents with 24-hour monitoring, personal, and nursing care (MOHLTC, 2014). There are about 70,000 older adults who use LTC services in Ontario (Gruneir et al, 2010). Long-term care residents are predominantly elderly, with only 5.9% under the age of 65 years (Gruneir et al, 2010), and 71.1% of residents over the age of 85 years (Gruneir et al, 2010). Analysis of the Resident Assessment Instrument- Minimum

Data set (MDS 2.0) found that newly admitted LTC residents in Ontario are becoming increasingly frail (Bronskill et al, 2011). The MDS 2.0 is a validated health assessment tool that is used to collect comprehensive resident level data in multiple important health domains (Poss et al., 2008). The MDS Changes in Health, End-stage disease and Symptoms and Signs (CHESS) scale is an MDS scale that assesses changes in health, end stage disease, and signs and symptoms of medical problems (Hirdes et al., 2003). The CHESS scale ranges from zero (no instability in health) to five (highly unstable health), and has been shown to be a strong predictor of mortality ($p<0.0001$) independent of multiple factors (Hirdes et al, 2003). About 57% of newly admitted older adults to LTC have a composite CHESS score of two and above (Bronskill, 2011).

To the knowledge of this review, there are no published literature regarding the average life expectancy of LTC residents. However, studies on mortality for specific diseases within LTC populations report mortality rates from 25.7% to over 50% within the first year following admission (Allen et al., 2011; Gambassi et al., 2009). A study in Icelandic nursing homes found the median survival time for LTC residents from the time of admission to be 31 months (Hjaltadottir et al, 2011).

The prevalence of diabetes in LTC closely reflects that in the community, being prevalent in about a quarter of residents in the LTC setting. Using data from the Continuous Care Reporting System (CCRS) maintained by the Canadian Institute of Health Information (CIHI), Hirdes and colleagues (2011) found the prevalence of diabetes in Ontario LTC homes to be about 25%. However, this data does not differentiate between the prevalence of Type 1 diabetes (T1DM), a subset of diabetes where the body no longer can produce insulin, and T2DM. This is an important distinction, as considerations for blood glucose control would be different in this sub-population. Nonetheless, about 90-95% of diabetes diagnoses is attributable to T2DM, while

about 5-10% of diabetes cases reflect T1DM (PHAC, 2011). T1DM has an early onset in childhood, and typically arises in individuals under the age of 40 (PHAC, 2011). As such, the prevalence of T1DM in LTC is most likely less common than the general population, reflecting a small percentage of cases within LTC. Hence, the focus of this research is on T2DM.

Evidence for the Benefit of Blood Glucose Control in T2DM.

Cardiovascular disease is the principal complication occurring in patients with T2DM. Nephropathy, retinopathy, and neuropathy, which are cardiovascular complications affecting the microvasculature of the kidney, eye, and nerves, lead to significant morbidity in diabetes. Furthermore, macrovascular complications that lead to stroke, myocardial infarctions (MI), and coronary heart disease (CHD) are the leading cause of mortality in people with diabetes (UKPDS, 1998). Evidence for the pathophysiological effect of hyperglycemia on the cardiovascular system is extensive. However, epidemiological evidence of the impact of the control of hyperglycemia on cardiovascular outcomes has produced mixed results. Refer to Table 2 for a summary of all major randomized control trials (RCTs) assessing the impact of blood glucose control on cardiovascular outcomes. Not all of these RCTs address the population of older adults. However, these studies reflect the basis of the evidence for the benefit of blood glucose control in individuals with T2DM.

Measures of Blood Glucose. The three major blood glucose tests that are considered to guide blood glucose control in diabetics include fasting blood glucose (FBG), post-prandial blood glucose (PPBG), and A1C. FBG tests measures blood glucose in the absence of carbohydrate consumption, generally done with at least eight hours of fasting. PPBG tests are conducted after a meal, are generally higher than FBG in people with T2DM, and is indicative of the blunted response to insulin in people with T2DM. Random blood glucose tests are done

regardless of whether the subject has eaten or not. Random blood glucose tests can also be indicative of blood glucose control, since individuals without diabetes do not fluctuate greatly in blood glucose values. The Glycated hemoglobin test, also referred to as A1C, is a widely accepted and reliable blood glucose test that measures chronic hyperglycemia (Nathan DM et al, 2008). The rate of formation of glycated hemoglobin is directly correlated with the presence of blood glucose. Given the lifespan of hemoglobin to be 120 days, A1C tests assess the average concentration of blood glucose over the span of three months. Table 1 reflects the average blood glucose for different A1C values. This table was adapted from the A1C-Derived Average Glucose (ADAG) study, which correlated A1C values with average blood glucose measurements (Nathan et al., 2008).

Table 1. Correlation of A1C to Average Blood Glucose

A1C (%)	mmol/L
5	5.4 (4.2–6.7)
6	7.0 (5.5–8.5)
7	8.6 (6.8–10.3)
8	10.2 (8.1–12.1)
9	11.8 (9.4–13.9)
10	13.4 (10.7–15.7)
11	14.9 (12.0–17.5)
12	16.5 (13.3–19.3)

(95% Confidence Intervals),

Table 2. Major Clinical Trials on the Benefit of Blood Glucose Control

Study Name	Duration (yrs)	Population Characteristics	Intervention	Target Achieved	Outcome
UKPDS33	10	N=3867 Age: 25-65, median=54 New onset T2DM	Intensive control (FPG <6mmol/L) vs. conventional (Diet only)	Intensive: A1C 7.0% (6.2-8.2) Conventional : A1C 7.9% (6.9-8.8)	16% ↓ fatal and nonfatal MI (p = 0.052), 12% ↓ any diabetes-related endpoint (p=0.029) 25% ↓ microvascular disease (p=0.0099)
Kumamoto Study	6	N=110 with or without retinopathy	Multiple insulin injections vs. conventional insulin	Multiple insulin A1C: Conventional A1C:	Significant decrease in microvascular complications
ACCORD	3.5	N=10,251 Age= 40-79 with CVD or 55-79, Median=63, Median A1C 8.1%, T2DM for 10 yrs	Intensive (A1C<6.0) vs. Conventional (A1C 7-8)	Intensive: A1C 6.7% Conventional : A1C 7.5%	CVD HR 9.0 p=0.16 in standard group, HR 1.22 p=0.04 in intensive group. Study stopped due to deaths in intensive group.
ADVANCE	5	N=11,140 Age= 55+ (μ)=66.6 A1C (μ) of 7.51% T2DM with existing CVD DD (μ) = 8	Intensive (A1C<6.5) vs. Standard (A1C 7.0)	Intensive: A1C 6.49% Conventional : A1C 7.42%	No significant effect on macrovascular events. 10% reduction in microvascular events (p=0.01) mainly due to reduction in nephropathy. Increased hypoglycemia seen in intensive group.
VADT	5.6	N=1791 Age (μ) = 64.4 A1C (μ) = 9.4 DD (μ) = 11.5	Intensive (1.5% reduction in A1C) vs. Standard	Intensive: A1C 6.9% Conventional : A1C 8.4%	No significant reduction in any CVD endpoint

DD (Diabetes Duration), CVD (Cardiovascular Disease), MI (Myocardial Infarction), A1C (Glycated Hemoglobin), FPG (Fasting Plasma Glucose)

The United Kingdom Prospective Diabetes Study (UKPDS) was a large prospective cohort study conducted between 1977 and 1992 that evaluated the effect of blood glucose control on cardiovascular risk. The study enrolled 4209 patients with newly diagnosed T2DM that were randomized to either a standard blood glucose control group (diet modification) or an intensive blood glucose control group (using either insulin, sulphonylureas, or metformin). The study concluded that intensive blood glucose control leads to a significant reduction in microvascular complications of diabetes, specifically nephropathy, as well as macrovascular disease such as stroke and MI (UKPDS, 1998). The UKPDS study confirmed the hypothesis of smaller epidemiological studies, such as the Kumamoto study (Ohkubo et al, 1995), on the benefit of blood glucose control on cardiovascular complications, and underlines many national guidelines on the benefit of blood glucose control.

However, the results of recent RCTs have questioned the generalizability of the UKPDS results. The Action to Control Cardiovascular Disease in Diabetes (ACCORD, 2008) trial was an RCT designed to test the 5-year incidence of cardiovascular disease in people with diabetes, whose primary focus was on the development of non-fatal myocardial infarction (MI), non-fatal stroke, and heart failure (HF; ACCORD, 2008). The focus of the study was to assess the impact of intensive blood glucose control on the development of cardiovascular events in subjects with *existing cardiovascular disease or with cardiovascular risk factors*. Treatment groups included an intensive blood glucose control group (A1C <6.5) and a standard blood glucose control group (<7.5) using different blood glucose lowering agents. The results of the ACCORD study were unexpected, showing a small significant decrease in non-fatal MI, yet an increase in CVD mortality in the intensive group. The ACCORD trial was terminated after 3.5 years into the study for excessive death in the intensive group.

The Action in Diabetes and Vascular Disease Preterax and Diamicron Modified Release Controlled Evaluation (ADVANCE, 2008) collaborative group, conducted a five-year RCT on 11,010 patients with a mean age of 66 years and a history of or risk of major macro and micro-vascular complications. Results from the ADVANCE (2008) study found a 10% relative reduction in risk of combined cardiovascular outcomes (both micro and macrovascular events), mainly due to the development of nephropathy, but did not find a significant reduction in macrovascular events or CV death. Lastly, the Veteran Affairs Diabetes Trial (VADT, 2009) compared the effect of intensive glucose therapy vs. standard therapy on diabetes related outcomes over 5.6 year period. Participants' A1C after the follow-up was 8.4% in the standard therapy group and 6.9% in the intensive group. The results of the VADT (2009) trial did not find any significant reduction in macro- or micro-vascular complications in the intensive control group with the exception of an increase in albuminuria.

In comparing the reviewed studies, there are certain conclusions that must be addressed. Firstly, the UKPDS study included patients that did not have a history of a cardiovascular event, while patients enrolled in the other RCTs had a longer duration of diabetes and previous cardiovascular complications. Hence, it may be that the effectiveness of blood glucose control decreases with the severity of diabetes or the presence of macrovascular complications. Age is also a significant consideration; with less significant results observed in RCTs with higher mean ages (ACCORD, ADVANCE, and VADT). Secondly, the duration of the UKPDS was twice as long in comparison to the recent RCTs, which may indicate a delayed benefit of blood glucose control on cardiovascular risk. This effect of study duration was also seen in long prospective trials on Type 1 diabetes, such as the DCCT and EDIC study, which found a significant reduction in micro-vascular outcomes after a combined 11-year follow-up (NDIC, 2008). The

different cut off points for A1C levels in the intensive blood glucose control group also raises questions as to the appropriate level of blood glucose control. The ACCORD trial, which had the lowest A1C target of <6.5%, had the highest rate of mortality for any cause. However, it is still unclear what the underlying cause was for this increased mortality. Different explanations hypothesized include increased rates of hypoglycemia in the intensive group, undetected adverse drug events in the intensive control group, or an interaction between these factors and the clinical characteristics of the intensive group population (ACCORD, 2008). Lastly, acute post-prandial hyperglycemia has shown to have pathogenic consequences on cardiovascular outcomes separate from chronic hyperglycemia (Mannucci et al., 2012; Santilli et al., 2010). Given that A1C measures mean blood glucose values over three months, it may not accurately capture the acute fluctuations that have a significant effect on pathological cardiovascular developments (Avogaro, 2011; Mannucci et al., 2012; Wu, 2005). Finally, the relatively greater prevalence of comorbidities in the more recent trials may reflect greater underlying frailty of participants, though this remains hypothetical as frailty was not measured in these studies.

The findings from these RCTs represent the basis for evidence on the impact of blood glucose control on cardiovascular outcomes. Although these studies do not include elderly LTC residents within the study population, the inconclusive evidence for the benefit of specific blood glucose control targets from the ADVANCE, ACCORD, and VADT trial have large implications when weighing the appropriateness of tighter blood glucose control in the LTC population. These studies indicate a modest benefit of blood glucose control on microvascular outcomes. However, these studies suggest that there is no clear benefit of blood glucose control on macrovascular outcomes in older adults, or at least within a five year horizon. Hence, as an individual ages and has a reduced life expectancy, the potential benefits of more stringent blood

glucose control may be further attenuated. For instance, a decision analysis by Huang and colleagues (2008) found that intensive blood glucose control (7.0% vs. 7.9%) in patients with only a 5-year life expectancy gained at most 20-quality adjusted days in life expectancy, with reduced benefits in patients with increased comorbidity and disability. Such results put a larger emphasis on the control of hyperglycemia earlier in the onset of disease, but may call for less stringent control in later life. Overall, results from the ADVANCE, ACCORD and VADT trials have generated uncertainty regarding the benefits and risks of tight blood glucose control particularly among older and more medically complex patients. Ascertaining the potential benefits and risks of various levels of blood glucose control is further complicated among frail elderly LTC residents, where considerations related to blood glucose control must be weighed in light of their potential impact on vulnerable frail seniors and geriatric outcomes.

Considerations of Frailty

Frailty is a concept of great clinical relevance in older populations. Emerging consensus suggests that it is an essential consideration when assessing the management of diabetes in the elderly. Frailty can be defined as a loss of physiological reserve in multiple domains that increases an individual's vulnerability to poor health outcomes when subject to stressors. There are several definitions and models of frailty, all of which have the shared goal of accurately stratifying risk and predict adverse outcomes in sub-populations in order to meet their needs and deliver appropriate care.

Over the development of the 'frailty definition', two models have gained significant support. The first and most cited model, developed by Fried and colleagues (2001), defines frailty as having its own distinct clinical phenotype, and suggests a core set of clinical characteristics that, when combined to a specific threshold, identify frailty. These core

characteristics include shrinking, weakness, poor endurance and energy, slowness, and low physical activity level (Fried et al., 2001). For many, the terms disability, frailty, and comorbidity can be used interchangeably to refer to the extreme vulnerability seen in older adults. Yet, while these domains share a correlation in representing the vulnerable elderly, they do not encompass the entirety of the frail (Fried, 2004). Hence, the frailty phenotype is an attempt to distinguish the frail senior from those with high levels of comorbidity and dependency. The frailty phenotype model has been validated in clinical settings in the Cardiovascular Health Study (CHS) and has been shown to predict disability, institutionalization, and death independent of many confounding variables (Bandeen-Roche et al., 2006).

The deficit model of frailty, developed by Rockwood, Mitnitski and colleagues, conceptualizes frailty not as a distinct phenotype, but resulting from cumulative deficits in a variety of domains, and has been shown to predict mortality and institutionalization. The first form of this model, known as the Frailty Index developed by Mitnitski and colleagues (2002), is a comprehensive test that takes into account a list of 70 risk factors that provide relevant indications of the overall vulnerability of the individual. However, the Frailty Index is clinically time consuming, rendering it impractical (Rockwood et al., 2005). Following the Frailty Index is the Clinical Frailty Scale, which is a scale of clinical descriptors that attempt to stratify elderly individuals by degrees of vulnerability and risk of death and institutionalization (Rockwood et al., 2005). The clinical frailty scale was also validated in a 5-year prospective study in the CSHA study, and correlated highly with the Frailty Index (Pearson's coefficient 0.80, $p<0.01$) (Rockwood et al., 2005). Furthermore, a cohort study of frail older adults from the Cardiovascular Health Study found that the Cumulative Deficit Index was more accurate in predicting mortality in frail subjects than the frailty phenotype model (Kulminksi et al., 2008).

Nonetheless, the consideration of frailty is potentially indispensable in individualizing diabetes care in elderly LTC residents. Essentially, the key utility in frailty measurements, regardless of model, is estimating survival, which in turn is a vital factor in discerning the stringency of blood glucose control. Similarly, frailty may identify very frail residents that are at an increased risk of adverse effects of certain anti-hyperglycemic therapies, such as hypoglycemia and polypharmacy, which is also a key consideration in the care planning for LTC residents with diabetes.

Diabetes in older adults is highly correlated with frailty, and many studies have confirmed the presence of diabetes as a risk factor for the development of frailty (Lee et al., 2011; Walston et al., 2002). A simple explanation for this may be the presence of cardiovascular outcomes in older adults with diabetes. Clinical cardiovascular disease, such as heart failure, is associated with an increased risk of frailty, suggesting that frailty is a clinical manifestation of cardiovascular disease (Newman et al., 2001). Accordingly, the association of diabetes and frailty may rest on the extent of cardiovascular damage present in an individual. The San Antonio Longitudinal Study of Aging (SALSA) followed community-living older adults with diabetes for 36 months, acquiring A1C values at 6-month intervals in 119 older adults, age 71-79 years. The SALSA study found that a diagnosis of diabetes increased the risk of progressing to frailty by 40 % (HR 1.38 (CI 1.00–1.91) p= .05) overall, and 84% in older adults with diabetes and cardiovascular complications (HR 1.84 (CI 1.02–3.33) p= .04; Espinoza et al, 2012). Diabetes has also been shown to accelerate the aging process, predisposing individuals to frailty much earlier than individuals without diabetes (Hubbard et al., 2010). Other explanations for the association between diabetes and frailty include possible weight loss from pharmacotherapy, muscle weakness, slow gait speed, depression and cognitive decline (Atenzar et al., 2012). Older

adults with diabetes develop predisposing factors to frailty, including sarcopenia, increased fracture risk, as well as falls and delirium associated with the short term symptoms of extreme hyper and hypoglycemia (Morley, 2008). Recent studies have established a correlation between hyperglycemia and frailty status, independent of other cardiovascular diseases, diabetes, and other comorbidities, possibly suggesting a more direct link between hyperglycemia and the development of frailty (Blaum et al., 2009; Kalyani et al., 2011).

Furthermore, research suggests that the predictive ability of frailty on mortality is more pronounced in older adults with diabetes. A study by Cacciatore and colleagues (2012) found that older adults who were frail were at increased risk of mortality than subjects who were not frail (HR 1.58, $p<0.04$), and that this risk was increased by the presence of diabetes. With increasing frailty, mortality increased from 57.9-79.0 % in subjects without diabetes and 75.9-87.0% in subjects with diabetes (Cacciatore et al., 2012). Research from the Canadian Study of Health and Aging found that older adults with diabetes had shorter life expectancies than those without (43 vs. 65 months, $p < 0.005$), had more comorbidity and were 2.62 times more likely to develop diabetes complications in the presence of frailty (Hubbard et al., 2010). Again, it is possible that the increased mortality seen in frail older adults with diabetes may be due to the progression of cardiovascular complications. Classifying older adults with diabetes by comorbidity, Laiteerapong and colleagues (2012) found that older adults with six or more comorbid conditions had a five year mortality rate of 33%. Congestive heart failure and myocardial infarctions (which are major macrovascular complications of diabetes) were conditions that were most commonly associated with this classification, present in more than 90% of participants in this sub-group (Laiteerapong et al, 2012).

Diabetes and Other Geriatric Outcomes.

Diabetes is also associated with concerns specific to the geriatric syndrome, including malnutrition, incontinence, and cognitive impairment (Araki & Ito, 2009).

Functional decline. The relationship between blood glucose control and functional decline and disability has produced mixed results within the literature. In regards to disability, Kalyani and colleagues (2010) found that community-dwelling older adults with diabetes were two to three times more likely to develop disability than those without. Up to 84% of this was explained by comorbidities, obesity, and poor blood glucose control (A1C >8%), yet elevated A1C alone only accounted for up to 10% of excess odds seen in different measures (Kalyani et al., 2010). The San Antonio Longitudinal Study of Aging (SALSA) followed community-living older adults with diabetes for 36 months, acquiring A1C values at six month intervals in 119 older adults, ages 71-79. The study found that poor blood glucose control (A1C >7% vs. <7%) was modestly associated with worse lower extremity function (0.62 vs. 0.42, $p<0.05$; Wang & Hazuda, 2011). A secondary analysis of the Women's Health and Aging Study found that participants with a baseline A1C of 8% and above after about a nine year follow-up, were three times as likely to develop frailty and three to five times as likely to develop lower extremity limitations (difficulty walking, low gait speed, and low physical function) than those in lower categories (Kalyani et al., 2012). However, this study only retrospectively assessed A1C at baseline, and did not take into account fluctuations in A1C, or the participant's previous diabetes history, which limit the implications of blood glucose control on functional decline (Kalyani et al., 2012). Conversely, evidence suggests that higher A1C values are associated with less functional decline and death in older adults and those in LTC. An observational study by Yau and colleagues (2012) sought out to explore the relationship between A1C values and functional

decline (measured by ADL) within two years in community-dwelling nursing home eligible older adults. The study found that A1C values between 8.0%-8.9% were associated with less functional decline and death than participants with A1C of 7.0%-7.9% (p=0.006). Although the outcomes measured between the studies above are different, these studies may suggest that hyperglycemia is associated with different outcomes across the spectrum of older age. Hence, although it may be that hyperglycemia is associated with the development of frailty, factors associated with hyperglycemia, such as BMI, may serve as protective against further decline and death, which was what Yau and colleagues (2012) observed.

Falls and Fractures. Recent evidence suggests that the relationship between falls and blood glucose control follow a U-shaped trend, with the prevalence of falls being highest in residents with an A1C lower than 7.0% and higher than 9.0% (Davis et al., 2014). This finding is consistent with other studies that have found an increase in the risk of falls in older adults with diabetes with A1C's of 7.0% or under, regardless of frailty status (Nelson et al., 2007). A retrospective case-control analysis of older adults with diabetes admitted to a hospital for a hip fracture found that individuals with an A1C between 6.1% and 7% and those under 6% were two to three times as likely (OR 2.34, (95% CI 1.71–3.22), $p < .001$, and OR 3.01, (95% CI 2.01–4.51), $p < .001$ respectively) to have a hip fracture than individuals with an A1C above 8.0% (Puar et al., 2012).

Infections. In regards to infections in LTC, Chen et al found that a mean A1C of <7.0% versus >7.0% did not significantly protect against LTC acquired Pneumonia (2011). Davis and colleagues (2014) found in a retrospective chart review that the rate of infections was highest in LTC residents between the ages 75 to 84 years with an A1C of over 9.0%. However, in

comparing the rate of infection across different A1C and age groups, no trends or correlations were found (Davis et al., 2014).

A Review of Current Practice Guidelines

A clinical practice guideline can be defined as a "systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances" (Field & Lohr, 1990, p.38). Expert consensus refers to a rigorous process in which acknowledged experts in a field reach agreement regarding a recommendation of care when there is limited or inconclusive evidence available on a topic. Considering the paucity of evidence regarding blood glucose control in the frail elderly and those in LTC, guidelines have produced targets for the frail elderly mainly on the basis of expert consensus. However, in reviewing guidelines on blood glucose targets in the frail elderly, there are differences among guidelines as to the range of appropriate blood glucose values. Below is a review of commonly referenced guidelines established by different organizations that all recommend more liberal blood glucose targets for elderly LTC residents (Refer to Table 3 for Summary of Guidelines).

The purpose of this review was to explore differences in recommendations from different clinical practice guidelines. Guidelines reviewed include recommendations that address blood glucose management among older adults and includes considerations for long-term care/nursing home residents within the guideline. It is important to note that not all clinical practice guidelines follow the same standards of guideline development, resulting in potential differences in methodological quality across guidelines. This review did not appraise the methodological processes in which these guidelines were developed, which is an important consideration when comparing different guidelines. Nonetheless, this review does provide insight into any differences in expert consensus across published clinical practice guidelines. The search strategy

began with two national guidelines, the Canadian Diabetes Association (CDA, 2008; 2013) and the American Diabetes Association (ADA, 2015). The CDA 2008 and 2013 guidelines were both included as the latter was introduced shortly before the initiation of this study. In addition, a search strategy was conducted using SUMSearch, an online tool that can be used to search for evidence-based medicine and clinical practice guidelines across multiple online databases (including MEDLINE, DARE, and the national guidelines clearinghouse) and medical journals (Haase et al., 2007). SUMSearch has been shown to be more sensitive than google scholar in retrieving clinical practice guidelines as well as having a higher specificity, reducing the amount of time required to review search results (Haase et al., 2007). Refer to appendix A regarding the inclusion criteria for guidelines, the specific search terms used, and the final list of included guidelines. Overall, there were six guidelines identified from this search strategy.

Table 3: Summary of clinical practice guidelines

Association Name	**Considerations for less stringent blood glucose control**	**Less stringent target for the frail and complex elderly**
CANADA		
Canadian Diabetes Association (CDA 2013)	- Prevention of hypoglycemia in the frail elderly while avoiding symptomatic hyperglycemia - Reference to Clinical Frailty Scale	A1C <8.5%, FBG 5.0 mmol/L-12.0 mmol L
Diabetes Care Program of Nova Scotia (DCPNS, 2010)	- For frail elderly LTC residents with a high risk of hypoglycemia - This range acceptable if resident has no reversible symptoms such as polyuria or nocturia	No A1C target. Random BG 10 mmol/L-20 mmol/L
USA		
American Diabetes Association (ADA, 2015)	- Complex/intermediate health (multiple chronic illness or 2+ IADL impairments or milt-to-moderate cognitive impairment)	A1C <8.0%, FBG of 90 mg/dl-150mg/dl)
	- Very complex/poor health (LTC or end-stage chronic illness, or moderate-to-severe cognitive impairment or 2+ ADL dependencies)	A1c <8.5%, FBG of 100 mg/dl-180mg/dl)
American Medical Directors Association (AMDA, 2010)	- Follows 2003 AGS recommendation. - For institutionalized older adults with a life expectancy under 5 years - Where the risks of tight control may outweigh the benefits	A1C <8.0%
American Geriatrics Society (AGS, 2013)	- Older adults with multiple comorbidities, poor health, and a limited life expectancy	A1C 8.0%-9.0%
INTERNATIONAL		
International Diabetes Federation (IDF, 2014)	- Category 2: Functionally dependant Frail residents (recommends reference to Clinical Frailty Scale) Dementia (cognitive impairment, disorientation, personality changes)	A1C 7.0% to 8.0% Up to 8.5%
	- Category 3: End of life care	Minimize hypoglycemia and symptomatic hyperglycemia Consider appropriate withdrawal of therapy

Canadian Guidelines. In addition to the CDA guideline, the only other Canadian guideline that considers recommendations for less blood glucose control in LTC residents is the Diabetes Care Program of Nova Scotia guideline.

The 2008 CDA guideline provides pharmacological considerations in individuals with diabetes and heart failure or chronic kidney disease. For the elderly population, a target of <7.0% is recommended for healthy older adults, and a less stringent target is recommended for older adults with comorbidities, high functional dependency, and a limited life expectancy. However, the guideline does not provide a specific less stringent target. In an update to the 2008 CDA guidelines, the 2013 CDA guidelines suggest less stringent A1C targets between 7.1% and 8.5% in people with a limited life expectancy, a history of hypoglycemia and hypoglycemia unawareness, high functional dependency, multiple comorbidities, and extensive macrovascular disease. The 2013 CDA suggests that the Clinical Frailty Scale can serve as a decision aid in setting appropriate blood glucose control targets in individuals with diabetes (Meneilly et al, 2013).

The Diabetes Care Program of Nova Scotia (DCPNS) guidelines for diabetes care in LTC also dictate less stringent blood glucose control for residents of long-term care with advanced comorbidity, frailty, and limited life expectancy. Recommendations for blood glucose control were developed by the DCPNS diabetes in LTC committee. The committee states that given the absence of evidence-based guidelines for the LTC population, these guidelines were developed as being evidence informed (DCPNS, 2010). The DCPNS guidelines hold the most liberal position concerning blood glucose management in frail residents. The DCPNS guideline suggests blood glucose levels of 7.0-9.9 mmol/L in residents with reversible symptoms and complications, but warns of the risk hypoglycemia. For residents with non-reversible complications and an increased risk of hypoglycemia, blood glucose of 10.0-20.0 mmol/L is considered appropriate. According to the ADAG study, an average blood glucose of 10.0

mmol/L and ~15mmol/L is correlated with an A1C of about 8.0% and 11.0% respectively (Nathan et al., 2008).

United States. The 2015 update to the American Diabetes Association (ADA) diabetes guideline suggest a less stringent A1C target between 8.0% and 8.5% in patients with a severe history of hypoglycemia, limited life expectancy, and high treatment burden (2014). A1C targets in complex seniors with an intermediate life expectancy should range from 7.0% to 8.0%. The 2015 ADA update lists this recommendation as grade E, or based on expert consensus and clinical experience. The American Geriatrics Society (AGS, 2003) diabetes guideline includes the evaluation of geriatric syndromes, including polypharmacy, depression, cognitive impairment, incontinence, falls, and persistent pain, in the evaluation of the health of an older adult. An A1C target below 7.0% is recommended for healthy older adults with diabetes and minimal cardiovascular complications. For those who are frail, have a limited life expectancy and have higher risk of hypoglycemia, the AGS suggests a less stringent A1C target of 8%. The AGS 2013 diabetes guideline update has updated its recommendations for A1C targets to range from 7.0% to 9.0%. The guideline states that the majority of older adults should be between an A1C of 7.5% to 8.0%, whereas a target between 7% and 7.5% may be appropriate in healthy older adults. An A1C between 8% and 9% may be considered for older adults with multiple comorbidities and a limited life expectancy, and an A1C of under 6.5% is considered potentially harmful in older adults (AGS, 2013). The evidence for the target of 7%-8% is graded as level one (of three), and level two for targets between 8%-9% and the avoidance of targets below 6.5%. The American Medical Directors Association (AMDA) follows blood glucose control recommendations set out by the 2003 AGS guideline.

International. The new International Diabetes Federation (IDF, 2014) Guideline for managing type 2 diabetes in older people, categorizes different profiles of older adults and provides specific blood glucose control targets for each category. The first category represents functionally independent older adults, and recommends an A1C target range between 7.0% and 7.5%. Following this are functionally dependant older adults, with a recommended A1C target of 7.0% to 8.0%. However, for older adults who are frail or have dementia, targets can be individualized up to an A1C of 8.5%. The final category represents end of life care, with the goal of care being the avoidance of hypoglycemia and symptomatic hyperglycemia. Considerations should also be given in this situation to appropriate withdrawal of blood glucose therapy.

Current Practices in LTC

A literature review was conducted to review current practices of blood glucose control in LTC homes. This section of the literature reviews studies that evaluated blood glucose control in LTC and the prevalence of hypoglycemia in LTC, as well as the barriers to diabetes care in older adults and those in LTC. Following this, this section reviews available evidence on the management of diabetes in LTC homes in Canada.

Blood Glucose Control. Although reported blood glucose control rates vary greatly among LTC home studies, there does exist a theme of low A1C values among residents (Basso et al., 2012). A study of French LTC homes found that 32% of residents with diabetes had an A1C of less than or equal to 6.5% (Boulliet et al., 2010). Pham and colleagues (2003) found A1C values among residents in one French nursing home were <6.5% in 26%, 6.5%-8% in 27.4% and >8.0% in 20.5% of the residents. In the United Kingdom, Gadsby and colleagues (2011) found that the average A1C among 75 residents across 11 nursing homes to be 6.7%, with values

ranging from 4.9% to 12.3%. In a prospective cohort examining 583 older adults with diabetes from 95 Austrian nursing homes, the average A1C was 6.5% (± 0.9 $p<0.001$) (Dobnig et al., 2006). In Sweden, Sjoblom and colleagues found an average A1C of 6.5% (± 1.60) among 98 residents with diabetes in nursing homes; 48% of residents had an A1C <6.0% (Sbojlob et al., 2008). Other Swedish studies have reported an average A1C of 5.9% (± 1.1%) in community dwelling older adults, with hypoglycaemic events as a common occurrence (Lofgren et al., 2004). Basso and colleagues (2012) also confirmed a high prevalence of A1C values under stringent targets within three Italian nursing homes. The mean A1C in this study population was 6.5%, with residents 90 and older (n=20) having a mean A1C of 6.3% (± 0.9; Basso et al., 2012). Hypoglycemic events occurred in 31% of residents within a three month chart review (Basso et al., 2012).

In the United States, Meyers and colleagues (2007) reported a lower average A1C (6.7% ± 1.00 $p<0.001$) in nursing home adults over 65 years than in residents under 65 (7.4% ± 1.20 $p<0.001$). These results were found in conjunction with the fact that the provider perception on optimal management amongst nurses and physicians varied. Furthermore, there was no relationship in this study between A1C level and care providers' estimation of resident health status or life expectancy (Meyers et al., 2007). In a U.S academic nursing home, Joseph and colleagues (2008) studied 62 residents with diabetes without a terminal illness (LE of 6 months), and found that an A1C under 7.0% and 6.0% to be prevalent in 89% and 77% of residents respectively. Although the prevalence of hypoglycemia was not reported, this study stated that it achieved these targets without serious adverse effects from hypoglycemia (Joseph et al., 2008).

In 2011, Holt and colleagues found through a retrospective review of 11 U.S nursing homes, that 67% of residents had an A1C of less than 7.0%, while 94% of residents were under

the target of 8.0%. Among the residents with A1C data, Feldman and colleagues (2009) found 19% of LTC residents with diabetes had an A1C less than 6.0%, while 53% were <7.0%, and 88% were <8.0%. However, in the study by Feldman and colleagues (2009), a survey of LTC directors of care found that 46% of respondents did not report hypoglycemia in their residents within the previous 6 months of the study.

The frequency of A1C testing also varied between studies. Pham and colleagues (2003) found that 23% of residents with diabetes received three to four A1C tests a year, while another 26% were not tested at all. Although current guidelines call for A1C testing between two to four times per year for older adults in LTC, in practice, the frequency of A1C testing is reduced in patients with life limiting ailments and complex conditions. Recently, research has shown that residents with cognitive impairment and dementia receive less A1C testing than residents without cognitive impairment (Quinn et al., 2009; Thorpe et al., 2012). Glucose monitoring can also be excessive and unnecessary in nursing homes. Yarnall and colleagues (2012) reported regular glucose monitoring in 63% of elderly residents with diet-controlled diabetes or non-hypoglycaemic medication in care homes.

Overall, these results illustrate that LTC residents with diabetes often have A1C levels of 7% and below. Whether this is the result of overtreatment in LTC, clinical characteristics of LTC residents, or an artifact of study methodologies (most often cross-sectional) is unclear. The prevalence of hypoglycemia among LTC homes veries. Some studies have found that hypoglycemia is uncommon in LTC, and can be avoided despite achieving A1C targets 7% or below in LTC residents with diabetes (Feldman et al., 2008; Joseph et al., 2008). This is in contrast with other research that have reported rates of hypoglycemia to be from 15% to 41.9% in LTC residents (Chen et al., 2008; Davis et al., 2012; Pandya et al., 2013; Sjoblom, 2008;

Yarnall et al., 2012). It is not clear whether the variability in hypoglycemia rates reflects variances in the clinical characteristics (age, dementia, frailty) of different LTC homes or variances in blood glucose control and treatment.

Barriers and Care Provider Perceptions. Physician and nurse attitudes both form barriers to diabetes care. A survey of primary care providers attending continuing medical education programs found that physicians consider that diabetes requires more monitoring than other diseases as well as increased time and a more complex treatment algorithm in order to reach care goals (Larme & Pugh, 1998). Physicians also found previous guidelines on diabetes to be unclear (Drass et al., 1998; Larme & Pugh, 1998). Yet, there is evidence to suggest a gap between physician treatment goals and practice. Chin and colleagues (2008) found that patient life expectancy was the strongest consideration by primary care physicians in the community in setting care goals in patients, with almost 50% of physicians feeling that blood glucose treatment should be less intensive in patients with a life expectancy of five years or less. Furthermore, a survey of physicians and medical directors show blood glucose control is less stringent in LTC residents with cognitive impairment and functional dependence than those without (McNabney et al., 2005). However, the presence of relaxed physician expectations and prevalence of intensive treatment observed in the elderly, may indicate barriers to the implementation of these care goals (Huang et al., 2007). This hypothesis is also supported by generally poor adherence to clinical practice guidelines seen across LTC (Garcia & Brown, 2011). Nurses may also be a potential barrier to individualized diabetes care. Nursing staff may be more focused on providing routine care rather than individualized care for residents in LTC (Newhouse et al., 2012). Furthermore, due to the often limited presence of LTC physicians at the resident bedside, clinical decisions are often grounded on the experience of nurses. Examples of this have been seen in

antipsychotic prescribing in LTC residents, where physician prescribing is sometimes induced by demands from the nursing staff (Cornege-Blokland et al., 2012). Furthermore, increased antipsychotic prescribing is proportional to increased nursing and physician-aid visits, and is reduced with increased physician visits, which sheds light on the impact of different care provider roles on resident care (Hanlon et al, 2010). This finding also shows broader importance of effective inter-professional teams, where multiple health professionals are required to work together in managing complex LTC residents with multiple chronic diseases. With the physician further removed from the bedside, clinical decisions regarding the daily management of residents rely on input and observations from nursing and personal support staff. Previous research has reported the importance of communication and trust in frontline staff in providing optimal inter-professional chronic disease management (Heckman et al., 2014). The issue of trust in the judgment of frontline may be a barrier in the management of diabetes in LTC, where previous research has found that the level diabetes knowledge varies greatly among nurses in LTC (Smide & Nygren, 2013).

Canada's Standing

Despite the existing international debate over blood glucose management in LTC, research regarding current practices in Canada is greatly lacking. To the knowledge of this review, only two studies have explored diabetes management in Canadian LTC homes. At the time of the literature review, Clement and Leung (2009) were the only researchers that had a published assessment of current diabetes practices for older adults in Canadian LTC homes. In regards to blood glucose control, a survey of LTC facilities in British Columbia showed an average A1C of 6.5%, 82% of residents under ≤7% (Clement & Leung, 2009).

Barriers to individualized care were revealed by Clement and Leung (2009) through chart audits, surveys and interviews with the nursing and physician staff, and work observations. Through a pilot project in a 254-bed LTC facility in Toronto, Clement and Leung found that staff were overwhelmed by a resident to staff ratio, and that practices within the LTC facility were out-dated and did not conform to CDA guidelines. Furthermore, physicians lacked criteria for increasing insulin treatment and continued oral anti-hyperglycemic medication such as metformin despite very low creatinine clearance. The average A1C in the pilot project was 7.6%, with 33% of residents under ≤7.0%. The second study, conducted by Agarwal and colleagues (2014), conducted a cross-sectional survey across Southwestern Ontario nurses in LTC homes assessing nurse perceptions and comfort levels with managing diabetes in LTC. The study found registered practical nurses (RPNs) were more comfortable in administering insulin than registered nurses (RNs), which highlights the changes in the scope of practice of RNs within the LTC environment. This study also identified a need for increased nurse education and training in diabetes management in LTC residents.

Summary of Literature Review

Overall, the literature illustrates the existing lack of clarity in guidelines for individualized blood glucose control in older adults in LTC with diabetes. The implications from the findings in landmark clinical trials suggest that there is a limited benefit and potential harm of overly-stringent blood glucose control in individuals with a longer duration of micro- and macro- vascular complications, increased risk of hypoglycemia or limited life expectancy. Furthermore, diabetes is strongly correlated with the development of frailty. Although many clinical practice guidelines call for more relaxed glucose control in older adults who are frail, have an increased risk of hypoglycemia, a limited life expectancy, and other complications,

recommended targets are highly variable. The literature suggests that blood glucose control values are generally low in LTC residents, though the factors that underlie lower A1C values are not clear. The prevalence of hypoglycemic events in LTC homes with a lower average A1C varies across studies, which has led to conflicting about whether low A1C values can be achieved in LTC residents without the risk of hypoglycemia. Studies have suggested barriers to the management of chronic diseases in LTC, specifically the need for inter-professional collaboration between physicians and other front line staff in setting appropriate prescriptions and management in LTC residents. Finally, research in Canada regarding the management of diabetes in LTC homes is greatly lacking.

CHAPTER 3- STUDY RATIONALE AND QUESTIONS

Diabetes in Canada is growing in epidemic proportions. Currently there is a growing shift in clinical practice towards relaxed blood glucose control in the elderly and frail. However, there is minimal research in Canada regarding individualization of blood glucose management in long term care homes. As previous studies noted, there is variability across clinical practice guidelines regarding what range of blood glucose targets is considered appropriate, as well as a gap between perceptions of optimal individualized care and actual levels of control in residents. Hence, the focus of this study is to consider the decision-making process used by care providers to individualize care in elderly LTC residents.

Thus, the rationale of this study is to contribute to the literature of diabetes care in LTC in these two domains:

(1) What are the current processes and protocols in place for blood glucose management in Ontario LTC homes?

This study will assess the guidelines used, priorities of care, and goals of diabetes management established by medical directors and physicians in Ontario LTC homes. Furthermore, given most current guidelines advocate for individualized care, it is difficult to assess whether variability in glucose targets in the population is due to adherence to practice guidelines or suboptimal management. Hence, interviews among care providers will be used to address care processes established in LTC facilities in order to discern the source of variability in management.

(2) What are the experiences of physicians and nurses in managing blood glucose control for elderly frail residents of LTC facilities?

In-depth interviews will be used to explore the experiences of care providers in managing the blood glucose of residents of LTC homes. Understanding what care providers identify as barriers and facilitators to care is essential in implementing new diabetes care guidelines for the complex elderly in long-term care, and informing future research on optimal management in this complex population. In-depth interviews will be conducted among both physicians and nurses. This is done for multiple reasons. Firstly, as nurses are among frontline staff in LTC, their experience of diabetes management may be influenced by a variety of environmental factors that are not experienced by physicians. Furthermore, by exploring perspectives of both physicians and nurses, there may arise inter-professional themes that impact disease management in LTC, as previous research has outlined.

CHAPTER 4-METHODOLOGY

This chapter addresses the methodology utilized in addressing the study rationale. Justification is given for the use of a mixed methodology and an interpretive descriptive qualitative framework. The methodology for the development of the quantitative survey and

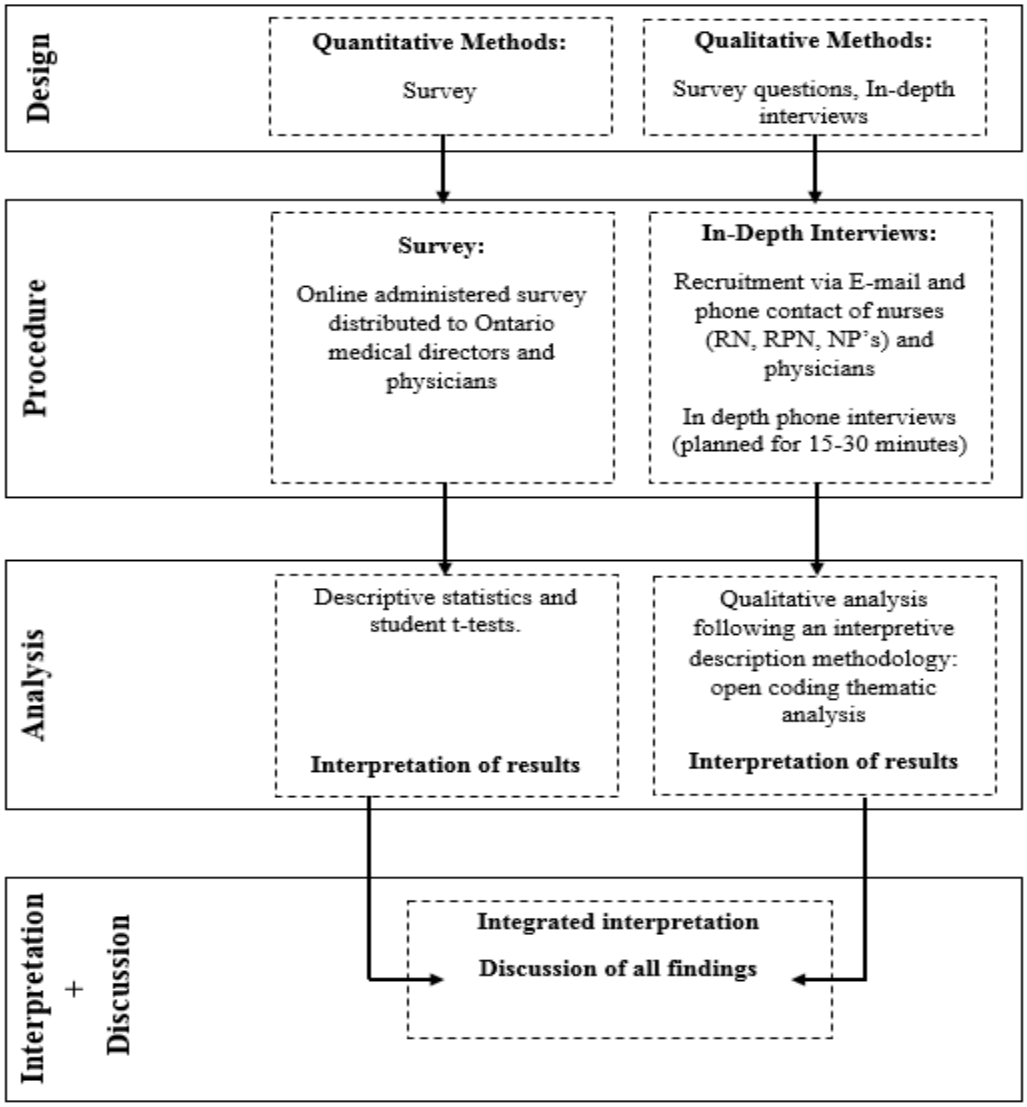
qualitative interview guide is also given. Sampling and recruitment, data collection, and data analysis strategies are discussed for both the quantitative and qualitative components of this study.

Study Design

In order to achieve the two objectives of this study, a mixed methods approach was necessary. The primary purpose of utilizing a mixed method design, specifically the convergent parallel design, is to provide a more comprehensive understanding of a research topic by building off the strengths of both qualitative and quantitative methodologies (Creswell, 2012). Within this methodology, both qualitative and quantitative methods are weighted equally, and serve to answer their own specific research question. The purpose of an overarching research question is to explain the type of mixed method design as well as provide a clear link between the study rationale and research questions (Teddie & Tashakkori, 2009). Within a convergent parallel design, the overarching research question should be a hybrid research question that incorporates both quantitative and qualitative research questions. Following this design, the overarching mixed method research study question is: What are the current practices, processes, and experiences of managing diabetes in elderly LTC residents with T2DM? This overarching mixed method research question encompasses the two questions within the study rationale. In the context of this study, quantitative data was collected to elucidate the current processes of diabetes management by survey completion of physicians. In addition to this, qualitative data that addresses the experiences of physicians and nurses in managing diabetes in the frail elderly was used to further explain current practices and opinions of diabetes management established in LTC residents. The qualitative element of the study further explained the findings of quantitative data, and was conducted concurrently with the quantitative methods. Both methods were given

equal weight during the integration phase. Refer to Figure 1 for an outline of the mixed method design. This figure was developed for the current study to adapt the basic methodology of a convergent parallel approach to the study design.

Figure 1. Outline of Convergent Parallel Design



Quantitative Methods

The quantitative portion of this study involved the development of the survey, the data collection with a specific research population as well as the quantitative data analysis. This

portion of the study addressed the research question: What are the current practices and processes to managing blood glucose control in LTC residents with T2DM?

Development of Survey. Survey items are meant to be descriptive of practices and opinions specific to diabetes management in long-term care. The literature review did not identify any surveys of diabetes management in LTC that were relevant to Canada. Hence the development of survey questions was derived from a number of sources. Firstly, eight items were included from previous research by Feldman and colleagues (2011), which surveyed diabetes management among directors of care across American nursing homes. The remaining items were developed to address gaps in the literature. Constructs that were developed for the survey include considerations of different blood glucose control treatments in LTC, considerations of blood glucose control in light of different life expectancies in LTC residents, and the importance of stringent blood glucose control in the presence of select comorbidities. The survey was distributed across 5 sections: (1) LTC policies in place (2) Blood Glucose Testing and Management, (3) Pharmacotherapy, (4) Prioritizing Care, (5) Potential Barriers to Care. Each section provided a comments box, allowing respondents to express comments specific to each section (Refer to Appendix B for Survey). Comments were analyzed separately following the study's qualitative analysis methodology.

The first section consisted of four questions concerning the policies of the respondent's facility and compliance to clinical practice guidelines. The response options were dichotomous, either yes or no. The respondents were provided space to comment or elaborate on their answer.

The second section consisted of nine questions focusing on blood glucose control. The first five questions in the second section were specific to blood glucose targets considered by physicians. The respondents indicated a higher and lower limit to their blood glucose targets

based on the parameters they operated within the resident's blood glucose control. For both questions there were 13 response options. For FBG and PPG levels, the options ranged from <4 mmol/L to 15+ mmol/L. For A1C values, the options ranged from < 4% to 15%+. The next question asked physicians to scale the importance of five measures for relaxing glycemic control on a five point Likert-type scale (1= Not at all, 2=Not very, 3=Neutral, 4=Somewhat, 5=Very). The five measures listed were Existing Diabetes Complications, Life Expectancy, Co-morbidity, Hypoglycemic Risk, and Quality of Life. The last four questions of this section were specific to management decisions based on life expectancy and the five response options consisted of a numerical range of years (<5yrs, <3yrs, <2yrs, <1yr, <6mths). Respondents also had the option of selecting "would not consider that range".

The third section had two questions specific to pharmacotherapy. The questions asked how often physicians would consider a series of pharmacological agents and therapies. The response options were on a five point Likert-type scale (5=Always, 4=Often, 3=Sometimes, 2=Rarely used, 1=Not considered in LTC).

The fourth section consisted of one question concerning the importance of blood glucose control when considering certain comorbidities. This question included a list of nine diseases that result in complications with diabetes or indicate diagnoses with a limited life expectancy (see Appendix B for a complete survey). The response options were on a five point Likert-type scale (1= Not at all important, 2=Not very important, 3=Neutral important, 4=Somewhat important, 5=Very important).

The fifth section focused on potential barriers and facilitators and entailed two open-ended questions and additional space was provided for general comments and concerns the

respondent had regarding the study. The two open-ended questions asked respondents to describe any barriers and any facilitators separately.

Neutral responses were considered in two questions (question 10 and question 16) in the survey. Firstly, following the pilot study (as discussed below) these two questions resulted in feedback from physician comments suggesting that they were unable to generalize these answers to all of their residents. As a bipolar construct, the omission of a neutral response in these questions may have forced physicians to respond in one direction when physicians truly held a neutral position (Krosnick & Fabrigar, 1997, p.147). Hence, interpretation of a neutral position in questions regarding individualization may indicate items where physicians would alter their attitude on blood glucose control given specific resident considerations.

The validity of the survey was evaluated using an expert panel and an independent pilot study. To assess face and content validity, an expert panel was developed in order to evaluate whether instruments accurately measured the construct. This assessment was between members of the thesis committee, as well as an external endocrinologist. A pilot study of the survey was run at the 35th annual Ontario Long-Term Care Physicians (OLTCP) conference. The survey collected responses of 17 medical directors and seven attending physicians who attended a workshop on diabetes management in long term care. The survey was administered prior to the workshop. The pilot project revealed questions that lacked clarity for some respondents as well as questions that would have a better impact on discussion if worded differently. Furthermore, one question assessing agreement with the 2008 CDA clinical practice guidelines was removed, due to the release of the 2013 CDA guidelines, which was released a few months prior to data collection. The revisions for the pilot study were considered in discussion with the original panel in order to develop a new survey.

In addition to the pilot survey, this study planned to include measures for a test-retest in order to improve the reliability (the consistency in results) of survey questions. However, there was not sufficient data to complete this process. Test-retest is a method used to assess the level of variability in a respondent's response to a specific measure over time. A common statistical analysis used to measure this reliability is the intraclass correlation coefficient (ICC), which among other applications, can be used to measure the similarity of observations with the same measurement process (Koch, 2006). Although different studies have different standards for acceptable reliability, a correlation of 0.7 within a test-retest is considered a common basic target (Walter, Eliaziw, & Donner, 1998). In order to test whether a test-retest reaches a reliability of 0.7 within 95% confidence intervals, Walter et al calculated a theoretical sample size of at least 18 participants. Given that the survey was sent to a general mailing list, and that identifiable information from the respondents was not collected, respondents were asked at the end of the survey if they were willing to take part in a test-retest to improve the reliability of the survey. If yes, respondents were required to provide their contact information in order for the researcher to follow up with them directly. Unfortunately, there were only seven respondents overall that agreed to take part in the test-retest. Given the difficulty in attaining a strong overall response rate for the survey, the inability of achieving a satisfactory reliability within acceptable confidence intervals (due to a limited sample size), and the constraints of time in completing the study, test-retest measures for the survey were abandoned. The implications of this are discussed within the limitations of this study.

Sample Population. The survey was intended for medical directors and physicians, as they are the individuals who direct medical care in LTC facilities. Medical directors have a leadership role in that they are responsible to stay updated with evidence based medicine and

practice (Rahim-Jamal, Bhaloo, & Quail, 2007). In addition to this, the directors are also involved in managing the medical staff (i.e. policy compliance, resident coverage, reviewing management reports) as well as the planning of resident care (Rahim-Jamal et al., 2007). Originally, this study only sought medical directors for the provincial survey. However, due to the low response rate, the request for only medical directors was removed from the survey inclusion criteria. Nonetheless, participants who identified as a medical director, and years of experience within the LTC, were collected within the survey. Student t-tests between the responses of medical directors and attending physicians was conducted in order to assess any significant differences in responses between both groups.

Data Collection. The survey was distributed electronically as an online survey through mailing lists of select organizations. There are multiple strengths in administering the survey online versus hard-copy postage, which were better suited with the design and available resources of this study. Relevant strengths of online surveys for this study include lower administration costs, faster response and timeliness, the ability to take advantage of existing online databases, and the ability to format questions with clear instructions and answering techniques (i.e. the use of drop down menus, rank order and scale questions, one response limitations) (Evans & Mathur, 2005). These advantages were well suited for the quantitative methodology of this study despite the limitations of using online surveys. Among the limitations of online surveys are that they present privacy and security issues, as emails are not very secure (Evans & Mathur, 2005). This study addressed this by not collecting identifiable information of survey respondents, as well as utilizing a Canadian-based online survey tool (Fluidsurveys). Furthermore, the impersonal nature of online surveys and the potential of being classified as

spam mail (even from trusted sources) may impede higher response rates (Evans & Mathur, 2005).

Distribution of the survey was originally implemented with the Ontario Long Term Care Association (OLTCA). The OLTCA has a formal application process, which facilitates distribution of research projects across all LTC facilities within Ontario. About 425 LTC facilities are registered with Ontario Long Term Care Association (OLTCA), representing about 68% of LTC facilities in Ontario. A promotional ad was included in the OLTCA newsletter, which is an electronically distributed newsletter to subscribers. However, response rate was low (three respondents) with the newsletter. Further efforts were made to distribute the survey across the Ontario Long Term Care Physicians (OLTCP) mailing list. The OLTCP is an association of Ontario LTC clinicians and medical directors, with the mission of supporting physicians through clinical and administrative education, peer support and advocacy for excellent care (OLTCP, 2015).The OLTCP membership mailing list provided the remaining survey respondents. There were 324 LTC physicians within the OLTCP member's mailing list. In addition to the original distribution of the survey within the OLTCP, two reminders where given in order to increase response rate.

Overall, there were 49 individuals that initiated the survey, resulting in a response rate of 15.1%. Within this group, ten respondents did not continue the survey past the first page (only collecting non-identifiable descriptive information of the respondent and their LTC facility) and were subsequently removed from further analysis. Hence, 39 respondents were included for further analysis. Within this sample size, 29 respondents completed every question within the survey, resulting in a completion rate of 59.1%. The remaining ten respondents did not respond to all questions, the majority (seven respondents) with missing data within section two of the

survey regarding blood glucose control parameters. These respondents were included within the sample size with justification given within the data analysis. Overall, 30 respondents identified as medical directors, with an additional 9 identifying as attending physicians. Responses were submitted between the dates of March 28, 2013 until November 27, 2013, the majority of responses (N=34) being completed within the month of October 2013.

Data Analysis. Results from the qualitative survey was analyzed using descriptive statistics. For all close-ended questions, results were presented in frequency and percentage (N, %). Student t-tests were conducted for each question in order to discern any significant differences in responses between medical directors and attending physicians. This study decided to include the ten responses that did not answer all questions for a number of reasons. Firstly, in regards to missing data, the pattern of missing responses, whether systematic or random, is often more important than the number of missing data. In this study, the majority of the ten survey respondents that had missing data did not fully answer questions pertaining to blood glucose targets in LTC. Three respondents commented on the reason for not responding to these questions, including being in the process of developing guidelines for diabetic residents, and difficulty in giving specific targets. Secondly, due to the relatively small sample size, removing entire surveys because of isolated unanswered questions would not be optimal. Therefore, this study utilized a pairwise deletion method, also known as available-case analysis, which is a technique that ensures all the available data for a specific variable is taken into account (Enders, 2010, p.40-41). Therefore, the results were estimated using all available data for each question. This technique is particularly valuable for minimizes any decrease in sample size and increase the power of the analysis of descriptive results. This is reported in the results section by providing the sample size of all available responses for each variable.

Qualitative Methods

The qualitative portion of this study addressed the research question: What are the experiences of physicians and nurses (as captured by the underlying processes of) managing type 2 diabetes in the elderly in the LTC setting?

The qualitative purpose of the mixed methods design is to understand the experience of blood glucose management in the LTC residents from the perspective of the physician and nursing staff, as they are the ones who execute the policies and practices of diabetes management established in LTC facilities. The goal of this qualitative question was to inform and interpret the current practices and processes explored in the quantitative survey. In devising a qualitative methodology, this study did not follow a grounded theory methodology, as the goal of the qualitative research question was not to develop a theory of LTC practice. One potential paradigm that this study originally pursued was phenomenology. Phenomenological research focuses on discovering the common meaning or "essence" attributed to lived experiences. In the context of this study, the phenomenon under inquiry would be the practice of blood glucose management and control in older adults in LTC. However, the methodological (i.e. bracketing) and philosophical underpinnings within a phenomenological framework aimed at achieving the true essence of experiences, proved to be beyond the scope and objective of the qualitative research question.

Moving a step further, this study employed an interpretive description paradigm for health research. Interpretive description is a non-categorical, inductive analytical methodology that follows an "applied qualitative research approach that would generate better understandings of complex experiential clinical phenomena" (Thorne, 2008, p. 26-27). Interpretive description moves beyond a qualitative descriptive design, which intends to examine and describe a

phenomena through a process of inductive reasoning. What is meant by interpretive description is to go beyond description, seeking "to discover associations, relationships, and patterns within the phenomena that has been described" (Thorne, 2008, p.50). Thorne outlines that the inherent assumption of interpretive description is that the discovery of relationships and phenomena in one case study, maybe prevalent in other cases as well, which ultimately brings the researcher closer to the general understandings of a phenomenon within its clinical context (2008). This approach is used when the prospective research "has (1) an actual purpose goal and (2) an understanding of what we do and don't know on the basis of the available empirical evidence." (2008, p.35). The ultimate goal of interpretive description is the acquisition of new knowledge in order to provide a contextual understanding to apply new evidence on clinical phenomena (Thorne, 2008). This philosophy fits well within the scope of our qualitative question, as well as our mixed methods design, given that the goal of the qualitative findings are to provide a contextual understanding of the underlying processes of diabetes management in LTC.

Development of Interview Guide. The purpose of the interview guide was to provide adequate coverage of the research topic. The interview guide was based on the qualitative research question. This question was further subdivided into two objectives: (1) To describe what physicians and nurses experience in managing diabetes in elderly LTC residents and (2) To describe what physicians and nurses experience to be the barriers and facilitators to the care of elderly LTC residents with diabetes. Questions were developed in order to direct discussion towards these two objectives, but were deliberately broad to allow for the development of new concepts and themes. (Refer to Appendix I and J for interview guide questions and probes). Separate from the interview questions are probes, which are items of information or questions, developed to redirect the interview discussion toward the original interview questions, in the

event that the discussion becomes off-topic. The development of the interview guide probes where a result of questions that arose during the literature review of the study, as well as preliminary findings from other interviews. Probing questions included the experience with setting appropriate blood glucose targets and monitoring parameters, the interviewees experience with other health professionals, the resident and family members, and the use of LTC assessment tools (i.e. MDS 2.0, scales to assess life expectancy) to aid in the management of residents.

Recruitment of nurses. Sampling of the research population was conducted across five cities in Southern Ontario (Waterloo, Cambridge, Burlington, Toronto, and Ottawa). A list of all LTC facilities within the region was created. The researcher contacted the director of nursing of LTC facilities to request enrollment of nursing staff in the study. Three directors of care (DOC) for nursing agreed to aid in the recruitment of nursing staff. A convenience sampling method was used, with the help of the DOC, in order to interview available nursing staff within each LTC home. From these three nursing homes a total of ten nurses, two RNs and eight RPNs were interviewed. In addition to the ten participants interviewed, two management level nursing staff from two additional nursing homes (one a DOC, the other an RN who was newly designated as an assistant to the DOC) agreed to be interviewed, resulting in a total sample 12 nurse interviewees.

Recruitment of Physicians. Recruitment of physicians was conducted through the Schlegel Villages LTC homes. The medical director of the Schlegel villages was asked to aid in the recruitment of participants. The participating medical director distributed the studies information letter to the electronic mailing address of 11 Schlegel physicians. Three physicians from the Schlegel mailing list agreed to participate in the in-depth interviews. In addition to this, the study was also advertised through separate mailing list compiled by the study's supervisor,

comprising of 8 LTC physicians. Two respondents agreed to participate in the interview from this mailing list, resulting five in-depth physician interviews overall.

Data Collection. A total of 12 nurse interviews and five physician interviews were conducted. Both nurse and physician interviews were conducted over the phone by the primary researcher. Interview length for the nurse interviewees ranged from 20 minutes to one hour and two minutes. Physician interviews ranged from 25 minutes to 59 minutes in length. All interviews were audio recorded and transcribed verbatim by the primary researcher. All identifying information was removed from the data transcription.

Data Analysis. There is as level of methodological flexibility in the analysis phase of interpretive description depending on the scope and context of the study. Thorne maintains that researchers can derive from other analytical methodological traditions, such as grounded theory or phenomenology. However, the goal is not to rigidly follow an analytical tradition from inception to conclusion, but to critically reflect on analytical methods that are appropriate to the context of the research question, in order to generate knowledge that is useful within the applied health context (Thorne, 2008). The stages of analysis in this study were iterative, beginning with the immersion of the researcher with the qualitative data, followed by categorization and interpretation.

Familiarization: One principle tenet of the interpretive descriptive methodology is that the construction of data occurs throughout the entire process of methodology. The first level of analysis requires sufficient "immersion" of the researcher within the data (Thorne, 2008). This immersion began at the stage of data transcription, in which the researcher transcribes all interviews verbatim. Following this, the researcher reads through all transcriptions without categorizing or coding any data. Potential associations and ideas are recorded within the

researchers audit trail (see section on "credibility and trustworthiness"). Following this, the researcher employs an open coding approach, similar to a grounded theory, attempting to only identify themes grounded within the data. However, interpretive description cautions against the use of the strict coding process found in a grounded theory methodology, since the development of labels too early in the analysis may limit the researchers in the interpretive analysis, as they may become attached to the preliminary coding manual (Thorne, 2008). Hence for this stage, texts were summarized very broadly into codes in order to maintain the descriptive elements of the data. Codes were generated in a step-wise fashion for each interview. As a new code was generated in one interview, previously coded data was reviewed for further analysis.

Categorization and Interpretation: Codes were grouped into larger categories of similar codes. Criteria for grouping codes included the use of similar key words, addressing matching phenomena, whether in agreement or contradictory, and codes that addressed core objectives of the study. Categories were then compared with the text in order to assess its validity, and either maintained the category, or reorganized the codes more meaningfully. This method was done iteratively throughout the analysis. Following this, the researcher developed over-arching themes in order to interpret the categories in a meaningful way. Following the first draft of interpretations, the results were reviewed by experts in their field, in this context the researchers' thesis committee, in order to assess the relevance and applicability of the findings to the context of the phenomena. Critiques were made regarding the lack of interpretation of the results, as well as the relevance of sub-themes to the original research question. Following this, the primary researcher returned to the data, and reflected on the meaning behind the similarities and differences regarding the descriptive results of the analysis. Finally, a refined analysis was

developed. Interpretation and discussion of the findings in the context of existing literature was completed in the discussion phase.

Credibility and Trustworthiness. Thorne outlines that credibility in interpretive description is first and foremost rooted in the "epistemological integrity" of the study, in which the research question is appropriate for the epistemological methodology, and that the interpretation of findings should follow the assumptions and logical reasoning implicit within such design (Thorne, 2008, p.223-224). Following this, interpretive description utilizes three major criteria of credibility, including (1) representative credibility, (2) analytical logic, and (3) interpretive authority. A clear description of each criteria is provided as well as methods in which each criteria were satisfied.

Representative Credibility. In order for an interpretive descriptive analysis to have representative credibility, the claims made within the interpretive findings of the study must reflect and be consistent with the method in which the data of the phenomenon under study was sampled (Thorne, 2008). Thorne outlines purposive sampling and triangulation of sources to be a method of achieving representation. In this study, qualitative data was collected from medical directors and attending physicians of LTC. To further triangulate findings that would better explain the research goal, this study purposively sampled nurses of different educational and managerial levels. In total, this study collected perspectives on the experience of diabetes management in LTC from medical directors, attending physicians, a director of nursing care, RNs of different managerial levels, and RPNs. Interviews included varying levels of engagement, with interview times ranging from 15 minutes to over one hour.

Analytical Logic. The second criteria of credibility requires the researcher to outline the analytical logic from which the interpretive conclusions were made. In this study, interpretive

findings were preceded by an account of the major descriptive findings (what were the experiences of the phenomenon, what were the common or varied occurrences). Interpretive claims were then provided with verbatim quotes in order that they may be grounded in the data (Thorne, 2008). Furthermore, the use of an audit trail is a key feature to strengthening the integrity and credibility of the study's conclusions. Audit trails provide a logistical map of how the researcher engaged with the data in order to reach the final interpretive findings. This study employed an audit trail in the form of handwritten note-taking within a notebook. The audit began during the data collection phase, in which the researcher recorded thoughts during the interview process, as well as during the interpretive analysis, with thoughts regarding potential categories and themes (i.e. review nurse interviews for sub-themes around staff consistency). Potential categories and themes were recorded and reorganized as the researcher re-engaged within the data. In addition to the audit trail, potential probes were recorded during the interview process of physicians and nurses and used across interviews in order to explore responses and seek further depth.

Interpretive Authority. Although an assumption of interpretive description is the inevitable interplay between the data and the perspective of the researcher, methods must exist to ensure that the researcher's interpretations demonstrate that they "reveal some truth external to his or her bias and experience" (Thorne, 2008, p.225). Hence, quality checkpoints must be in place throughout the analysis that check the researcher interpretations against his or her subjects (Hutchinson & Wilson, 1992; Schwandt, 1996 in Thorne, 2008). In order to achieve interpretive authority, this study utilized the process of reflexivity and expert checks.

Researcher reflexivity. An inherent assumption of interpretive description is the strong interaction between the researcher and the data through this process. As such, it is important to

explicitly recognize and acknowledge the framework in which the researcher views and influences data interpretation in order to strengthen the rigour of analysis and validity of findings. This is referred to as reflexivity.

Firstly, the perspective of the primary researcher was considered inexperienced, as the primary researcher was a graduate student in gerontology who did not have a clinical background or experience within the LTC environment. The experiences and biases of the primary researcher were rooted and an extensive literature review regarding the research subject as well as pilot research conducted regarding the research question. The researcher conducted an extensive literature review regarding diabetes management in LTC, including the current evidence base for appropriate blood glucose targets in older adults, the relationship between certain disease states and diabetes management, varying consensus recommendations of clinical practice guidelines, and the role of data sets such as the MDS RAI as a clinical prognostic tool in managing residents in LTC. Following the literature review, the researcher's attitude towards blood glucose management in the older adults in LTC favoured a less stringent management style. It was important to recognize this stance throughout the course of the research so that it would not influence the data collection process. Preliminary analysis of the quantitative survey data and early interviews of the data was conducted during data collection. Hence, many of the probing questions utilized within interviews were grounded both on findings from preliminary interviews, survey and understandings from the literature review.

Expert Checking versus Member Checking. Among the methods of establishing validity in the researchers interpretation is the use of respondent validation, or member checking. Although there is a lack of consensus regarding exactly what this technique involves, member checking usually refers checking the credibility of the researcher's interpretation of results with

the research respondents (Creswell, 2012). Although this technique is often seen as a measure of credibility, there are several limitations associated to it. First, the account produced by the researcher incorporates the findings from multiple respondents, which could be similar or different from any one respondent. Second, the research findings complied by the researcher is intended for a larger audience (i.e. practitioners, researchers) than any individual respondent. Furthermore, conducting member checking upon completion of the study can present challenges depending on the amount of time that has lapsed between the collection of data and the final results. Regarding this study, there was an extensive gap between the initial data collection from respondents and the final interpretations, which would limit the quality of member checks by interviewed respondents. Other prominent issues of member checking include the lack of access or availability of respondents, lack of memory of the details of respondents, changes in the respondent's situation and opinions, or respondents denying less attractive findings (Cohen & Crabtree, 2008). From the perspective of interpretive description, member checking is highly discouraged, as agreement or disagreement within member checks may either cause false confidence in findings or greatly impede the effective interpretive analysis (Thorne, 2008). An alternative to member checking better suited to validating interpretive authority within interpretive description is referred to as expert checking. This methodology requires that experts within the context of the phenomena under study check to see that interpretive findings are relevant to and reflective of the context. In this study, the expert checking was conducted in collaboration with the primary researcher's thesis supervisor and research committee. The research supervisor is considered an expert in the field of geriatrics and the management of specific chronic diseases within the LTC environment. A second committee member, is

considered an expert in diabetes management research, and has experience in diabetes research with nursing staff in the LTC environment.

Summary. Overall, this study employed a strategy of analysis that was both exhaustive and iterative. The researcher ensured steps to record the analytical steps followed in the interpretation of data, constant reflexivity was conducted on behalf of the research before and during data collection and analysis. Finally, the researcher audited his results with experts in the field in order increase the rigour of the interpretations validity, so as to better ensure that the final interpretations are reflective of the context in which the phenomena under study is explored.

CHAPTER 5-RESULTS

This chapter summarizes both the quantitative and qualitative results of this study. The primary objective of using a mixed method approach was to better understand the underlying processes involved in blood glucose management in LTC residents. The quantitative section focuses on the results of the physician surveys. These findings are organized into the four main categories of questions that were addressed in the survey. These included: (a) LTC policies for diabetes, (b) blood glucose parameters, (c) individualization of care, and (d) pharmacological agents. The results of each of these categories of survey questions are reviewed below and accompanied by graphs.

The qualitative section summarizes the results from the interviews conducted with the physicians and the nursing staff separately. The physician interviews revealed four main themes and their corresponding subthemes. These themes included: (a) variability in opinion, (b) considerations in individualized care of diabetes control and monitoring, (c) time spent on diabetes care in LTC, and (d) the role of other health professionals. The nurses' interviews

identified 3 broad themes, which were: (a) experiences with diabetes monitoring and control, (b) barriers and facilitators to care, and (c) education. Each of the themes and their corresponding subthemes are discussed.

Quantitative Results of Survey

Data Collection. There were a total of 39 surveys that were included in the studies final sample size. However, ten respondents did not respond to all questions within the survey. Percentages were calculated separately for each question. Overall, 30 respondents self-identified as medical directors, with an additional 9 self-identifying as attending physicians. Table 4 describes respondent characteristics. Responses were submitted between the dates of March 28, 2013 until November 27, 2013, the majority of responses (N=34) being completes within month of October, 2013. The majority of respondents reported that they had ten years of experience or more in the LTC environment. Overall, student t-test revealed that there were no significant differences between the findings of medical directors and attending physicians. Refer to Appendix L Student t-tests for major questions.

Table 4. Survey respondents characteristics		N
Role in LTC	Medical Director	27
	Medical Director and Attending Physician	3
	Attending Physician	9
Total responses		39
Years of experience	1 to 3 years	3
	4 to 9 years	6
	10 + years	30
Total responses		39
Sector type		
	Public	16
	Private (non-profit)	8
	Private (for-profit)	13
	No response	2
Total responses		39

LTC Policies for Diabetes.

The first section of the survey explored if there were any documented policies in place for diabetes management in the LTC home (Table 5). This set of questions only included medical directors (N=30), as one attending physician noted in the comments the difficulty in answering these questions since they attended multiple LTC homes. Overall, the majority of medical directors reported that they did have a policy in their LTC home for blood glucose monitoring and diet management for residents with diabetes. However, almost half of directors did not refer to a clinical practice guideline for diabetes in their facility.

Table 5. Policies in place in LTC

Question	Response Yes	Response No	Total
Does your facility have a documented policy in place for diabetes management?	19	10	29
Does your facility have a documented policy in place for glucose monitoring?	22	8	30
Does your facility have a documented policy in place for diet management in residents with diabetes?	26	4	30
Do you refer to a clinical practice guideline (CPG) at your facility?	16	14	30

Blood Glucose Parameters.

The purpose of these questions was to discern the blood glucose parameters (fasting, post-prandial, and A1C) within which medical directors and attending physicians controlled elderly LTC residents' blood glucose. Refer to Figures 1 to 7 for the survey results. Overall, ranges and targets for blood glucose parameters were varied among respondents. Figure 5 and 6 illustrate the A1C blood glucose targets and ranges that respondents felt were appropriate in

elderly LTC residents. A majority of physicians (66%) felt an A1C target of between 8% and 9% was appropriate in LTC residents. Furthermore, there is also variation in the ranges physicians manage a residents blood glucose. Some physicians would alter a resident's blood glucose control if their A1C values were between 7.5% and 8.5% while other physicians would operate within an A1C range between 6% and 10% (Figure 7). The most frequent lower limit (32%) for adjusting fasting blood glucose was 4mmol/L, which may be too low for LTC residents. However, all but three of the remaining physicians had lower limits above 4 mmol/L, indicating an avoidance of the risk of hypoglycemia. For post-prandial blood glucose, 15mmol/L was the most frequent upper limit selected by physicians. Yet, the use of post-prandial blood glucose tests was considered less in LTC than fasting blood glucose. Overall, these results show that a majority of physicians do aim for less stringent A1C targets in elderly LTC residents, yet there is still variation among these targets.

Figure 2. Fasting Blood Glucose Parameters

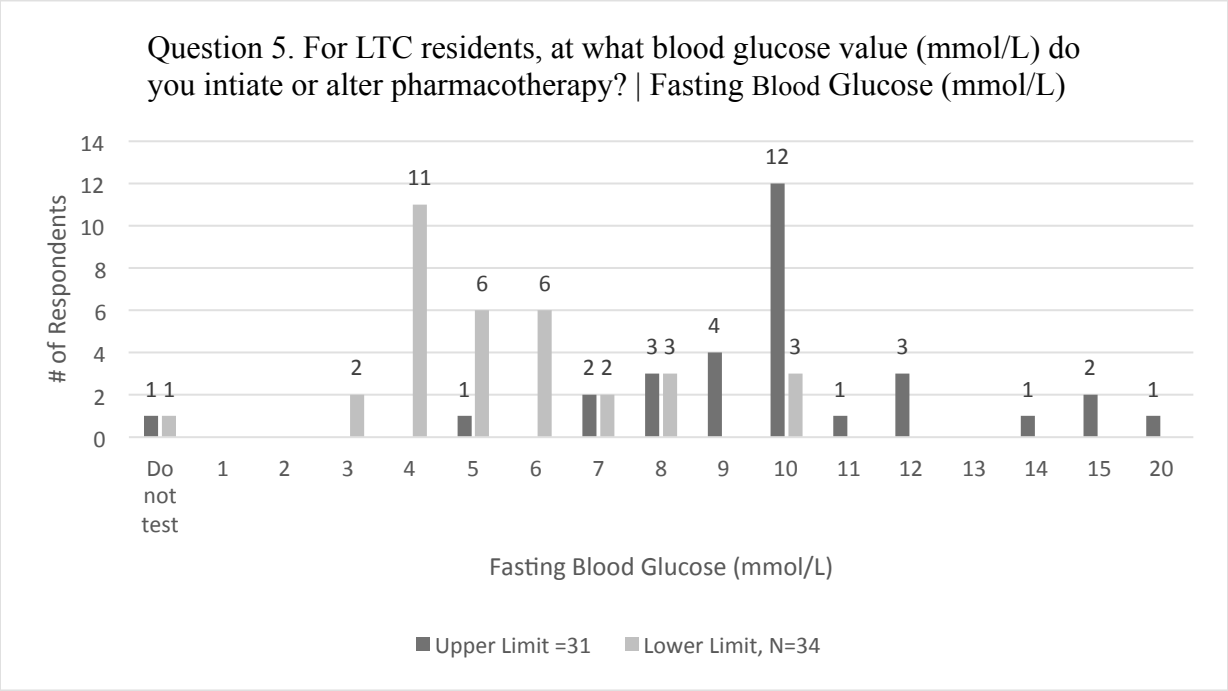


Figure 3. Post-Prandial Blood Glucose Parameters

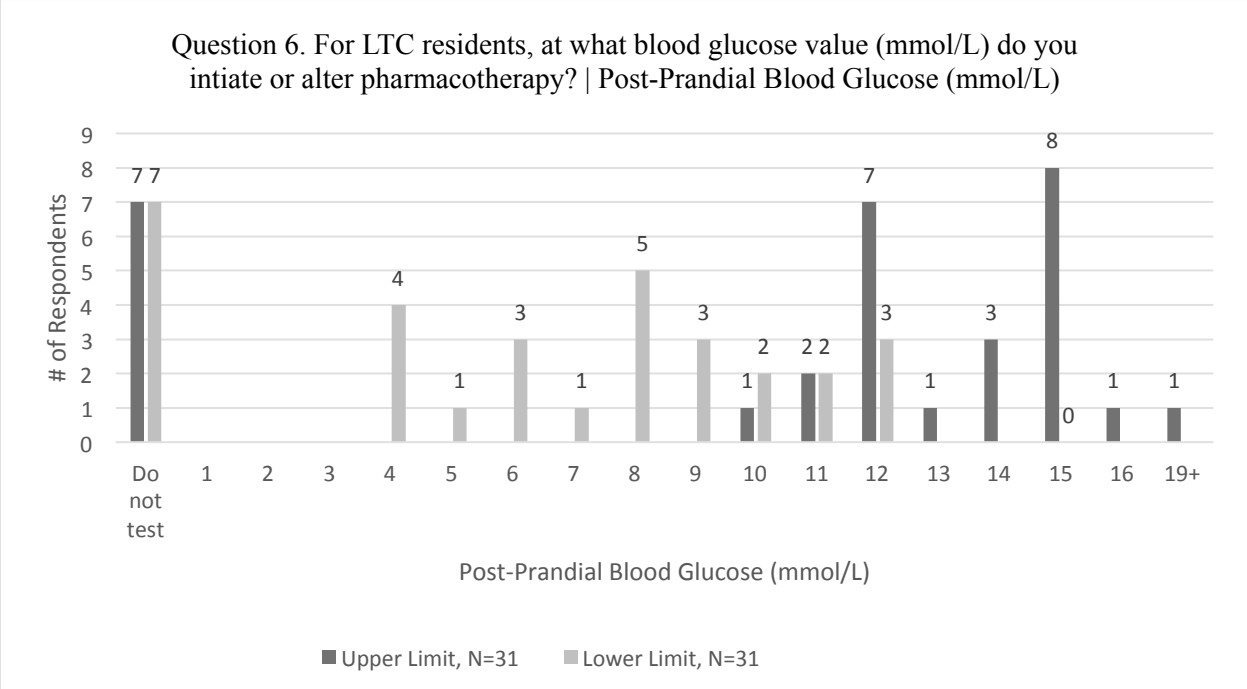


Figure 4. Fasting Blood Glucose Ranges for Each Respondent

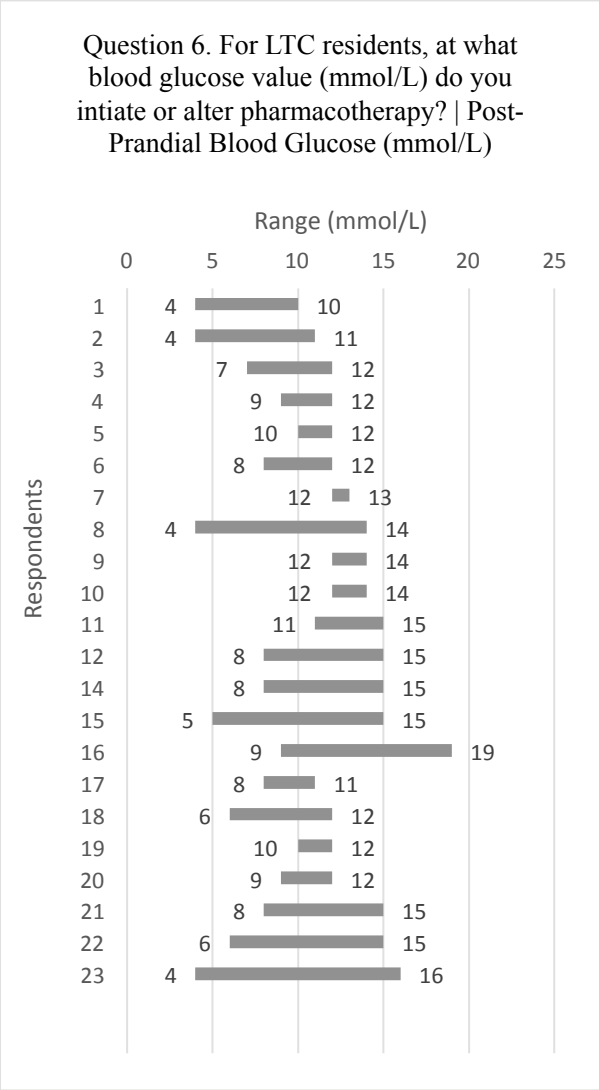


Figure 5. Post-Prandial Blood Glucose Ranges for Each Respondent

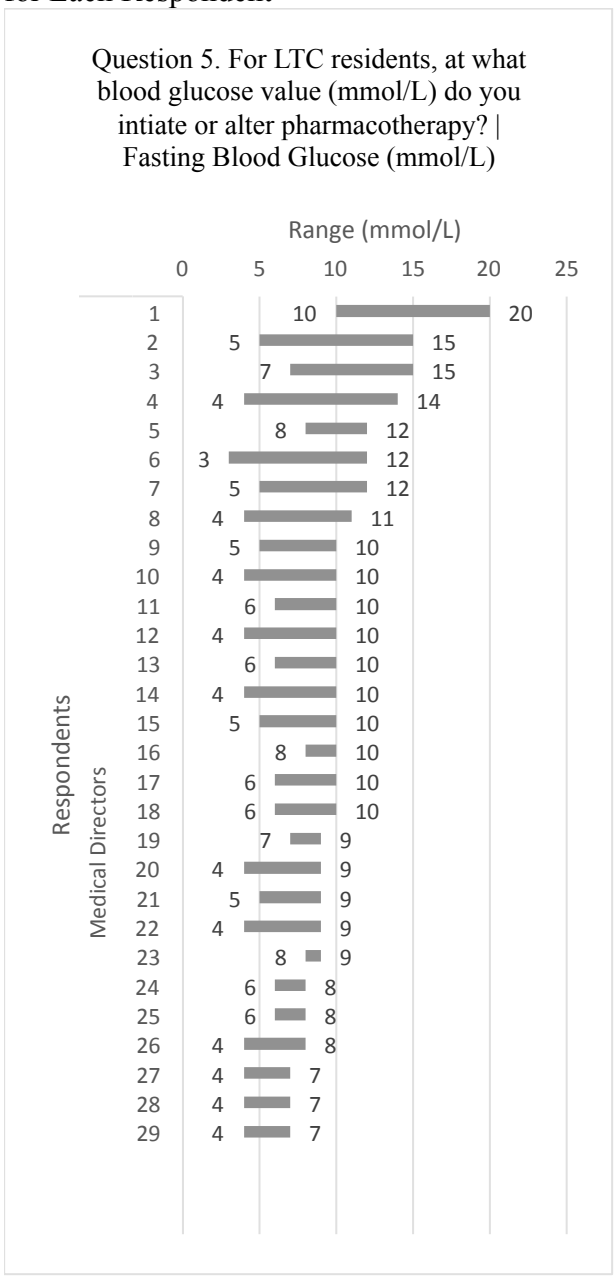


Figure 6. Appropriate A1C targets for LTC

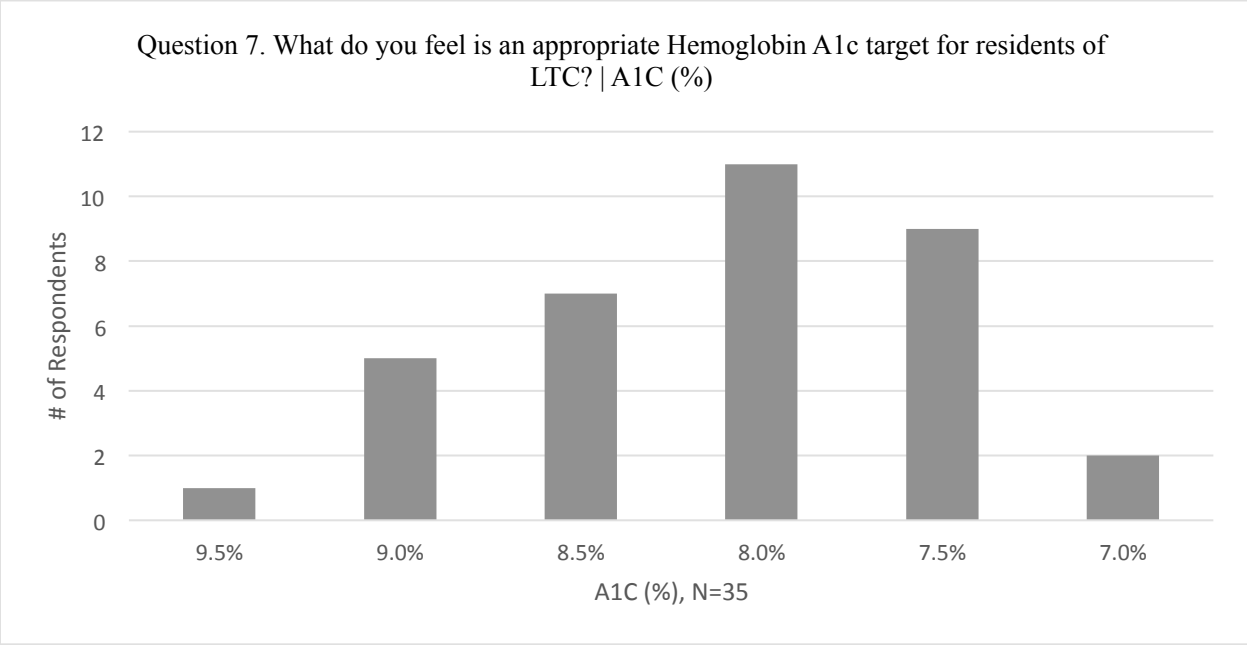


Figure 7. A1C parameters

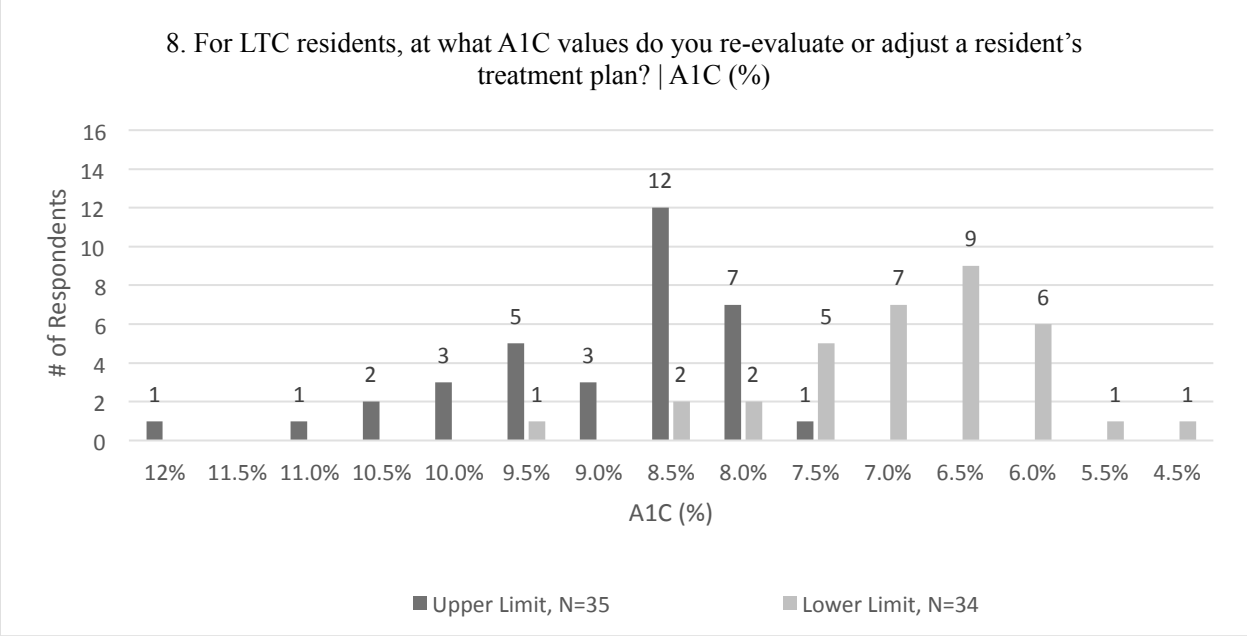
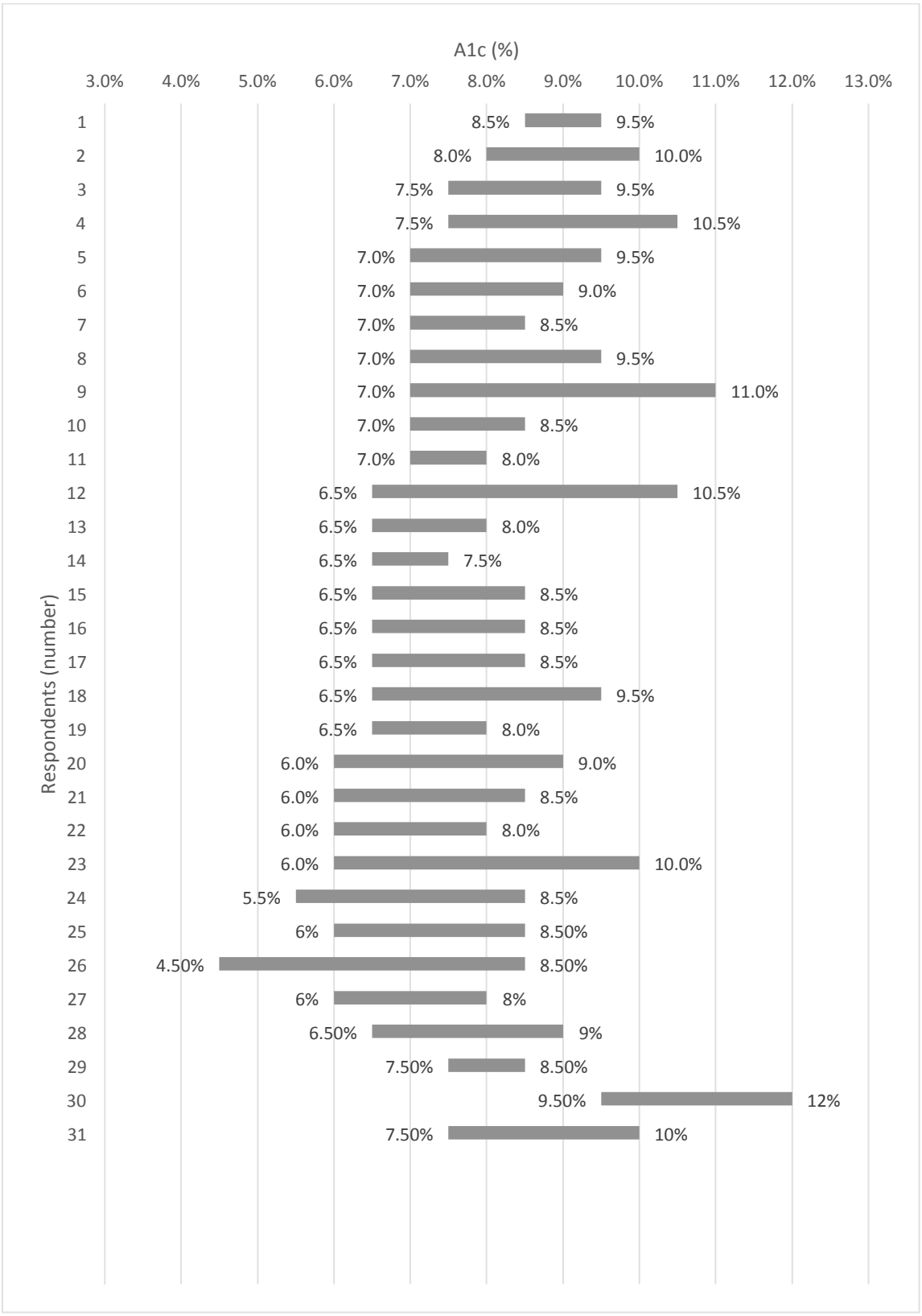


Figure 8. Ranges for A1C Parameters for Each Respondent



Individualization of Care.

This section of questions was devised to assess the importance of certain clinical characteristics as determinants of individualized diabetes control in LTC residents. Overall, the quality of life of residents and the risk of hypoglycemia were considered the most important by physicians when considering less stringent blood glucose control in LTC (Figure 8). This was closely followed by life expectancy. The importance of the presence of diabetes complications, was less definitive, producing mixed results. When ranked, hypoglycemic risk was the measure most often first in importance when considering less stringent diabetes management in LTC residents, followed by the residents quality of life, then life expectancy (Figure 9).

Determinant of Life Expectancy. Respondents were asked whether they would consider certain blood glucose targets (A1C and random blood glucose) at different estimates of life expectancy (Figure 10 & 11). Overall, physicians were willing to consider higher A1C thresholds in LTC residents with shorter life expectancies. Almost half of physicians (42%) were willing to consider an A1C target of 9% at a life expectancy of less than two years. Of the 11 respondents that felt an A1C of <8% was appropriate for LTC residents (Table 6), 8 were willing to consider an A1C of 9% in residents with a life expectancy of two years. However almost all physicians that felt an A1C of 9% was appropriate for LTC residents would consider that A1C in residents with a life expectancy of five years. A majority of physicians would consider a random blood glucose of 10mmol/L-14mmol/L in residents with a life expectancy of less than five years. Only six physicians would not consider random blood glucose values from 15mmol-20mmol, while the remaining physicians varied almost equally between a LE of under six months, one year, and two years. These results suggest that although limited life expectancy

is a determinant for considering less stringent diabetes control, physicians differed in opinion in regards the stage of a resident's life expectancy at which higher A1C and blood glucose values were considered. Most physicians were in agreement in considering blood glucose values between 10mmol/L and 14mmol/L, but there was increased variance in higher blood glucose ranges.

Presence of Comorbidities. Respondents were asked how important stringent blood glucose control (A1C of <7%) was in light of certain comorbidities. Respondents felt that stringent management was not important in the presence of cancer, frailty, and cognitive impairment. This opinion was seen more so in the presence of frailty, with 38.2% (N=13) of respondents feeling stringent management as not at all important in the presence of frailty and 32.3% (N=11) of respondents selecting it to be not very important. Congestive heart failure, chronic kidney disease, and kidney failure produced mixed responses, while also having the highest proportion of neutral responses, accounting for 35.1%, 37.8%, and 29.7% of responses respectively.

Figure 9. Determinants of less stringent glycemic control

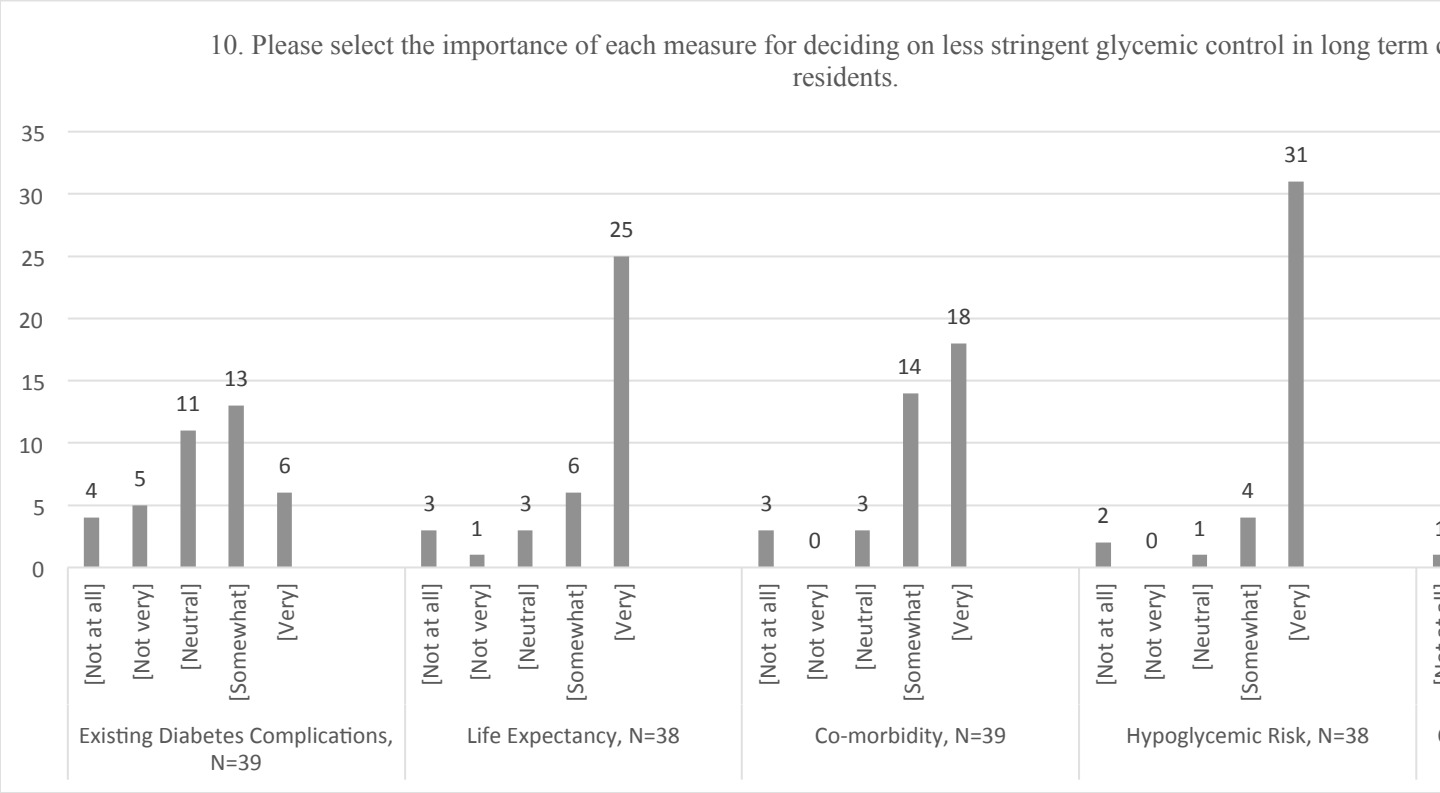


Figure 10. Determinants of less stringent glycemic control - ranked

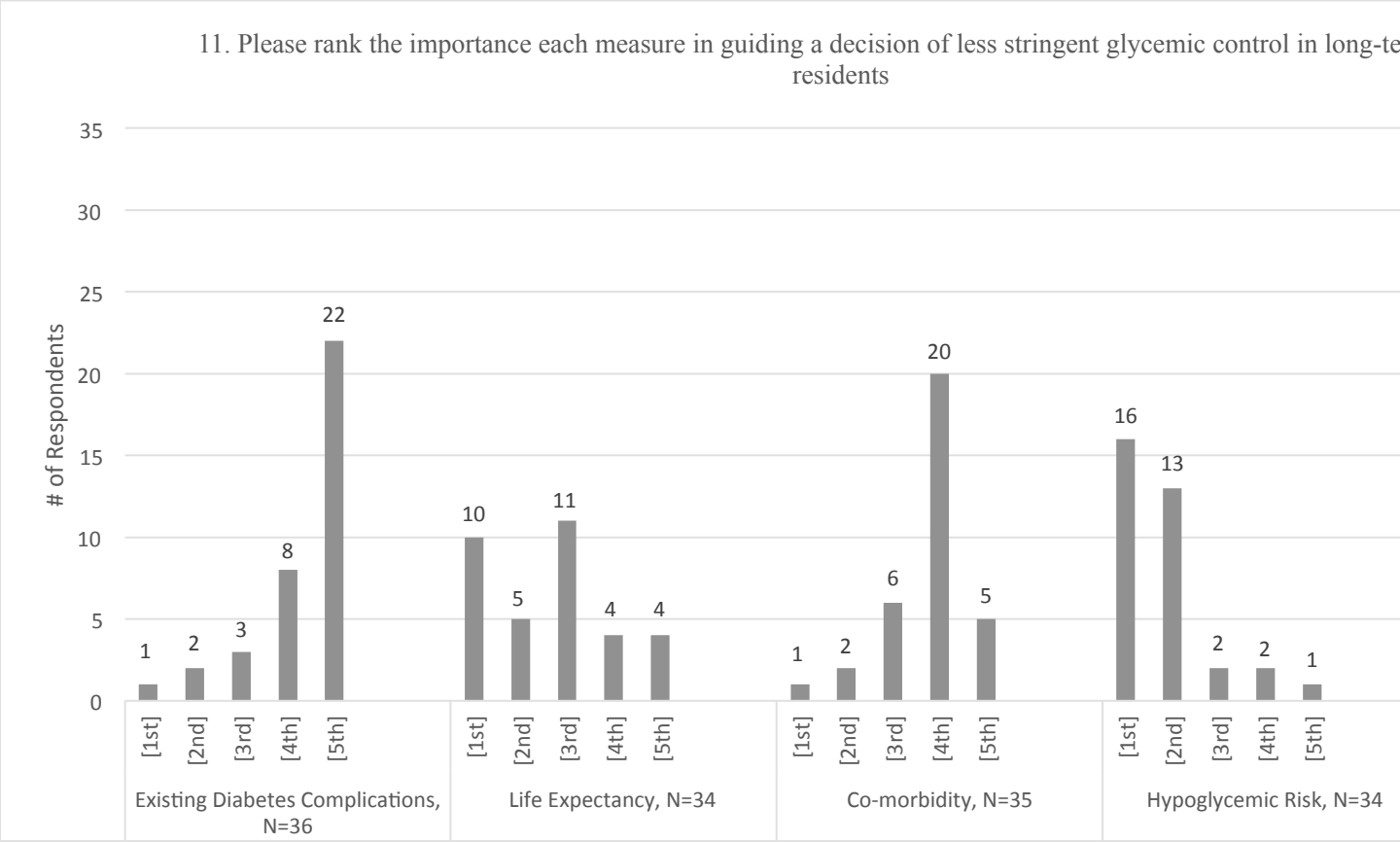


Figure 11. Determinant of Life Expectancy on A1C control

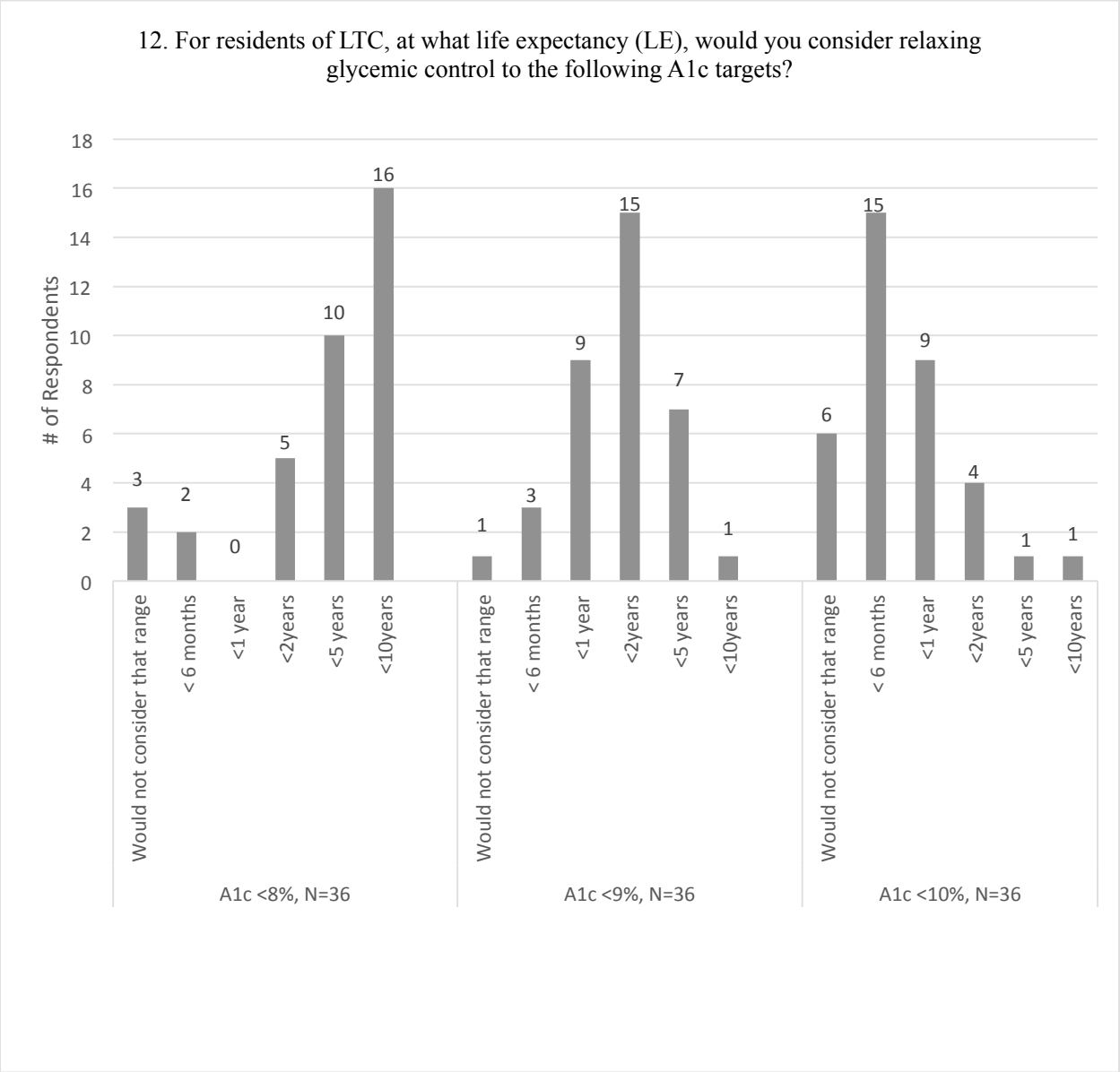


Figure 12. Determinant of Life expectancy on random blood glucose control

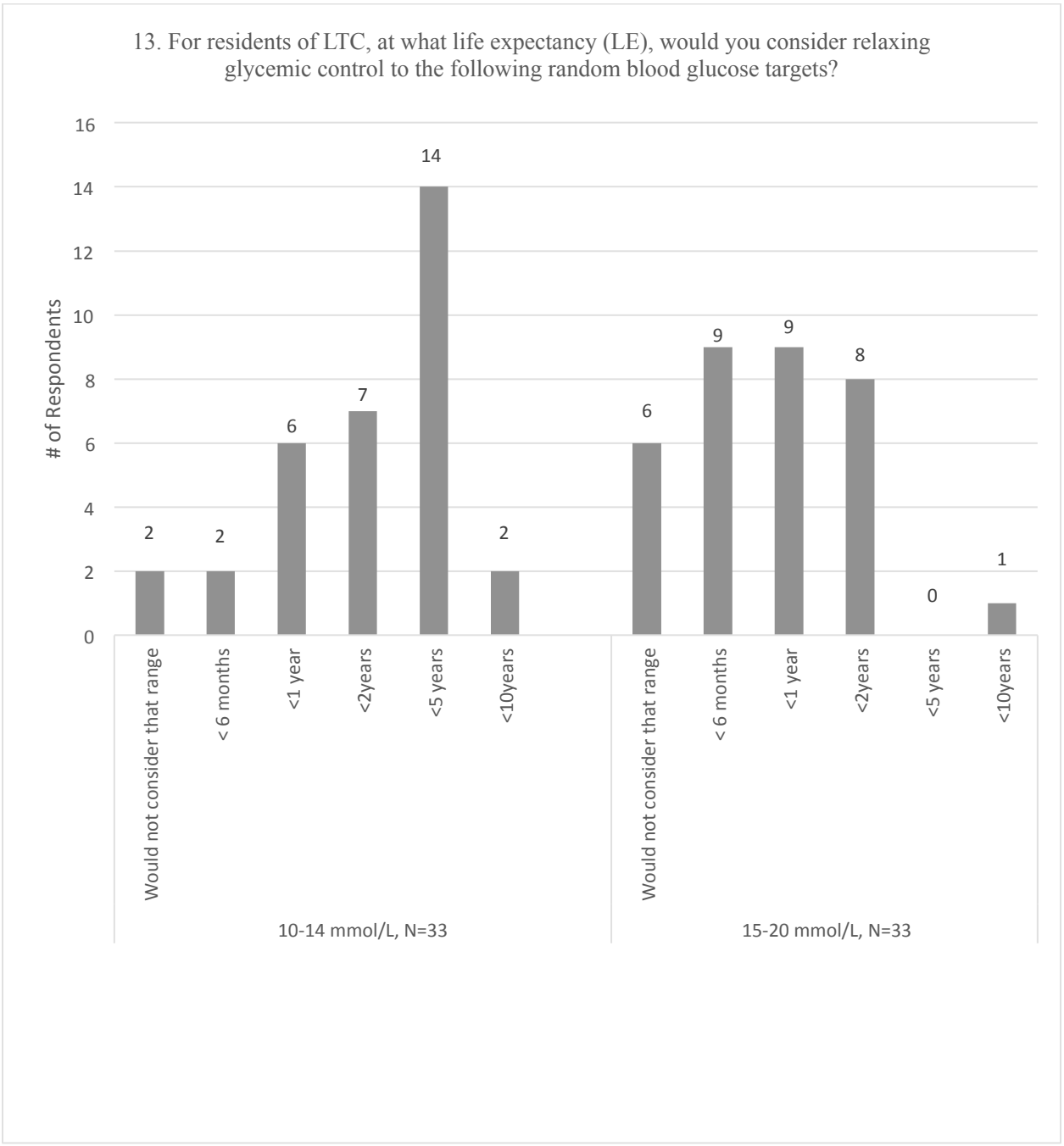
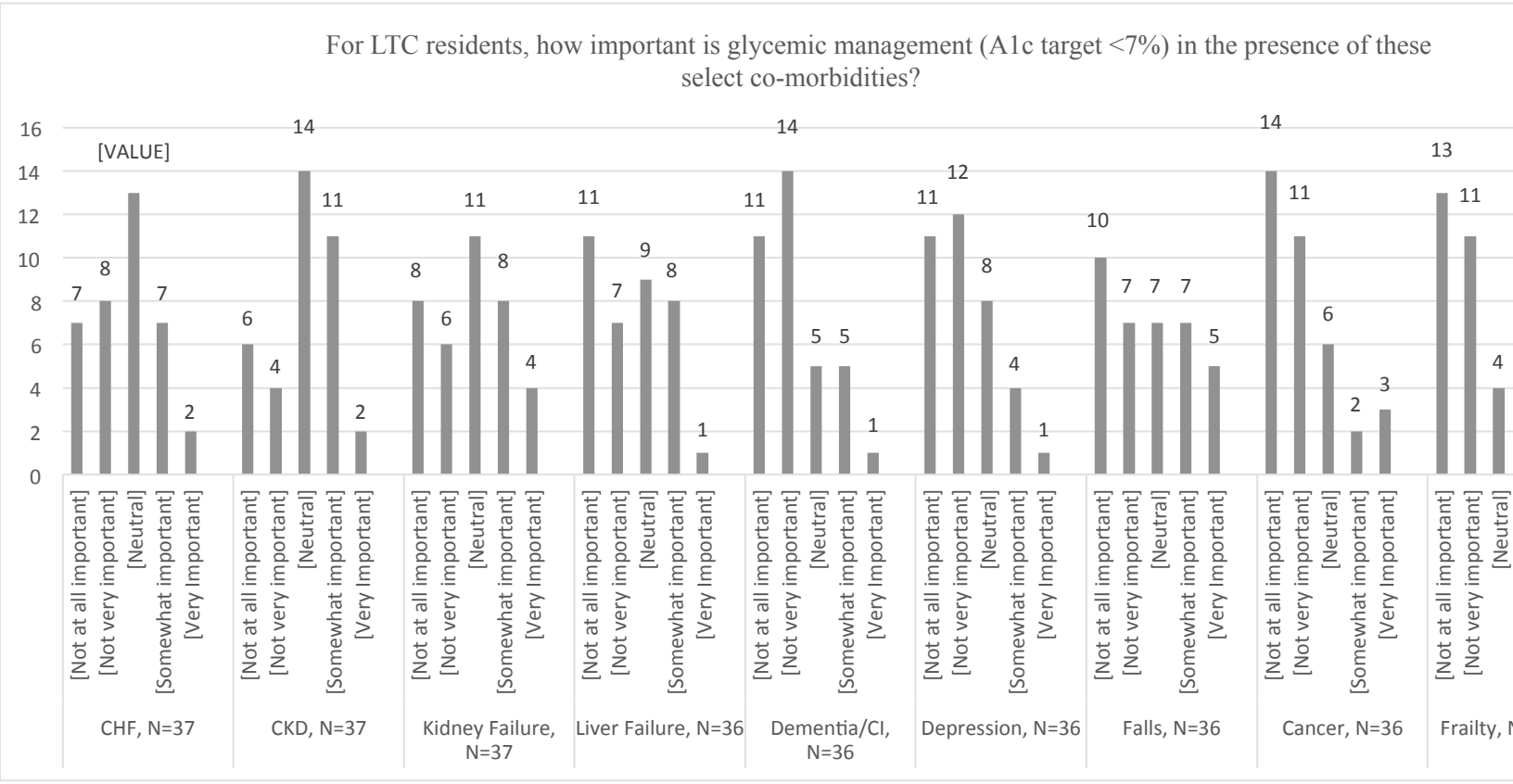


Table 6. Comparison between Question 7 and 12

#	7. What do you feel is an appropriate A1C target for residents of LTC?	12. For residents of LTC, at what life expectancy (LE), would you consider A1C <8%	12. For residents of LTC, at what life expectancy (LE), would you consider A1C <9%
1	7%	<10 years	<2years
2	7%	Would not consider	<1 year
3	7.5%	Would not consider	<2years
4	7.5%	Would not consider	< 6 months
5	7.5%	<10 years	<1 year
6	7.5%	<5 years	<2years
7	7.5%	<2years	< 6 months
8	7.5%	<2years	<1 year
9	7.5%	<2years	<2years
10	7.5%	< 6 months	Would not consider
11	7.5%	< 6 months	<2years
12	8.0%	<10 years	<2years
13	8.0%	<10 years	<2years
14	8.0%	<10 years	<2years
15	8.0%	<10 years	<2years
16	8.0%	<10 years	<1year
17	8.0%	<5 years	<2years
18	8.0%	<5 years	<2years
19	8.0%	<5 years	<2years
20	8.0%	<5 years	<2years
21	8.0%	<5 years	<1year
22	8.0%	<5 years	< 6 months
23	8.5%	<10 years	<10 years
24	8.5%	<10 years	<5 years
25	8.5%	<10 years	<5 years
26	8.5%	<5 years	<2years
27	8.5%	<5 years	<1 year
28	8.5%	<5 years	<1 year
29	8.5%	<2years	<2years
30	9.0%	<10 years	<5 years
31	9.0%	<10 years	<5 years
32	9.0%	<10 years	<5 years
33	9.0%	<10 years	<5 years
34	9.0%	<2years	<1 year
35	9.5%	<10 years	<5 years

Figure 13. Determinants of Comorbidities in Individualized Care



Abbreviations: CHF; Congestive Heart Failure, CKD; Chronic Kidney Disease, CI; Cognitive Impairment

Pharmacological agents.

This section of questions aimed to explore the use of certain diabetes medications within the LTC environment. The use of Metformin, Sulfonylureas such as Gliclazide, and insulin were the most common forms of pharmacotherapy in LTC homes (Figure 14). Physicians rarely used or did not consider the use of Glyburide, Thiazolinodines, and GP1-agonists, in LTC homes. The majority of physicians rarely considered sliding scale insulin regimens in LTC residents. Oral monotherapy and combination therapy were the first pharmacological considerations in LTC, with a higher proportion of respondents always considering oral monotherapy than a combination of oral therapies (Figure 15). Combination therapy of oral and insulin therapies were considered more often than insulin alone. Overall, the results from this section suggest that physician prescribing patterns for diabetes reflect current evidence for certain diabetes treatments that carry the risk of hypoglycemia or adverse effects with other comorbidities.

Figure 14. Consideration of Different Pharmacological Agents

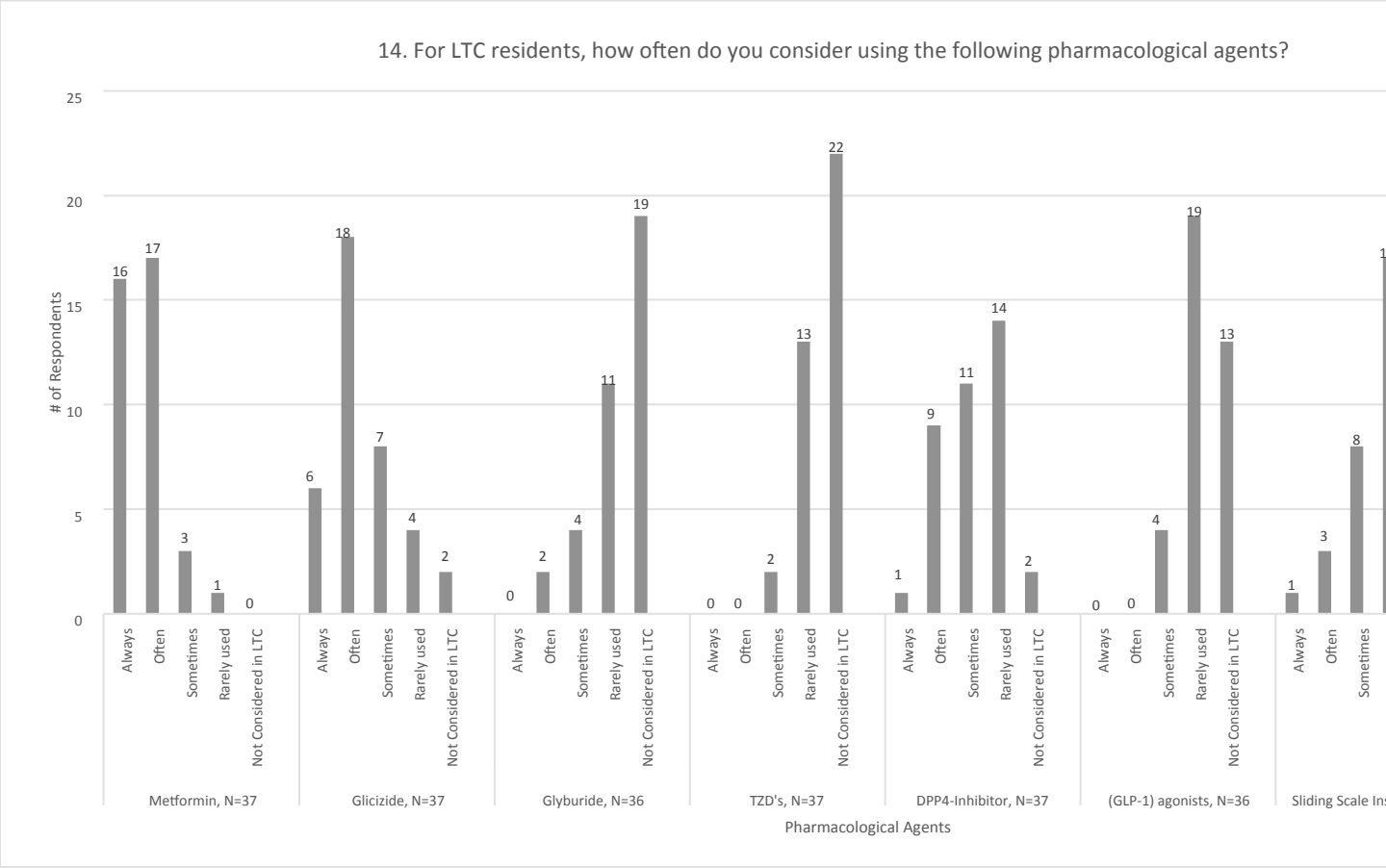
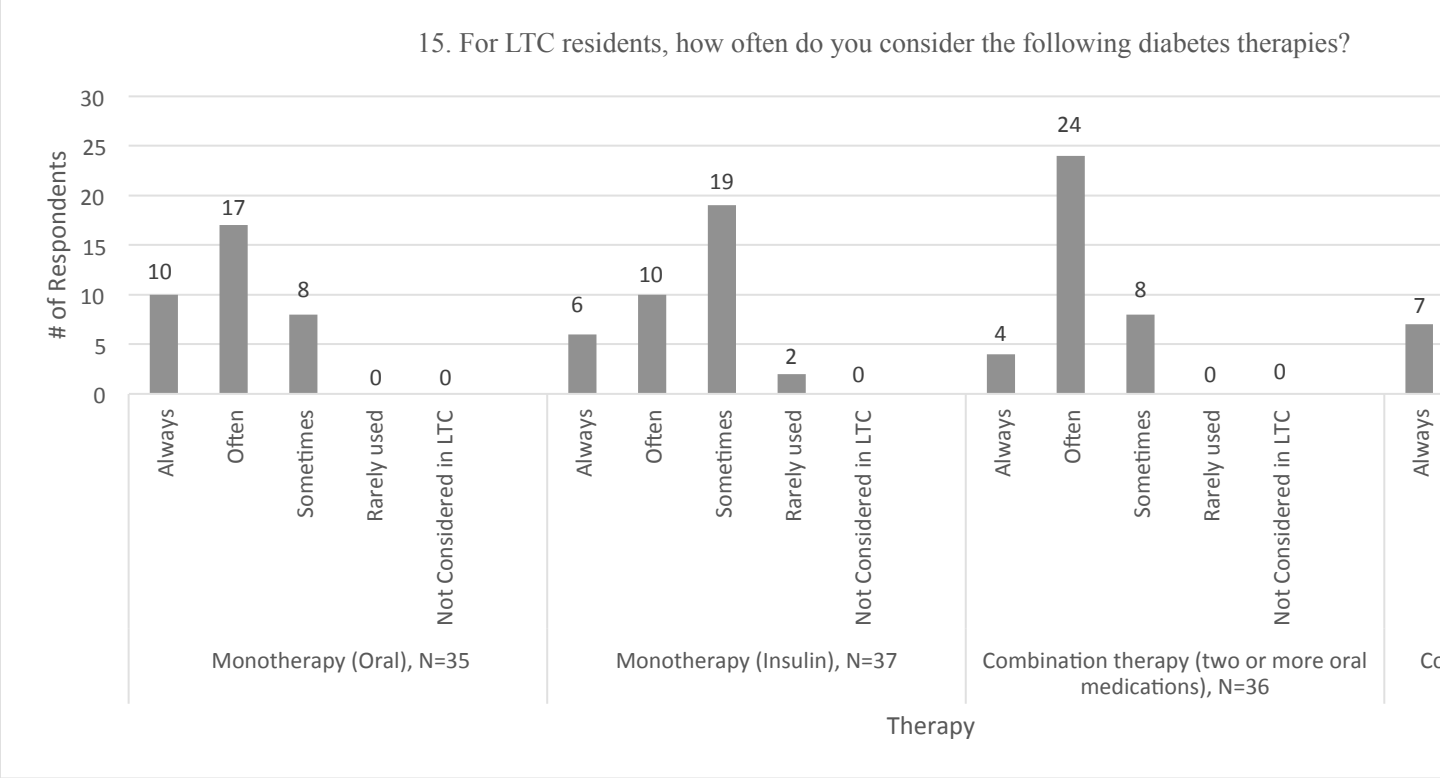


Figure 15. Consideration of Different Treatment Therapies



Qualitative Results of Survey

Data Collection. In total, 30 respondents commented in the open-ended questions on the barriers and facilitators to care. Responses varied from one word (i.e. "time") to multiple paragraphs (up to 120 words). Responses were coded and categorized thematically. All responses as well as their coding can be found in Appendix M.

Table 7: Thematic Analysis of Survey Comments Q.17

Barriers to Care	Frequency
Variable diet intake	6
Staff education and training	4
Family expectations	4
Poor diet choices	3
Over-testing by staff	2
Resistance to testing/treatment	2
Specialists recommendations inappropriate for LTC	1

Table 8: Thematic Analysis of Survey Comments Q18

Facilitators	Frequency
Adherence to treatment	4
Dietitian	4
Access to blood tests, charts	2

Qualitative Interviews with Physicians

Data Collection. Recruitment of physicians was conducted by email correspondence across Schlegel Village physicians. A total of 5 attending physicians agreed to participate in the physician phone interviews between October 23, 2013 and December 19, 2013. Among the physicians interviewed, four physicians were also the medical director for at least one facility. Interviews were conducted one-on-one over the phone, ranging between 25 to 59 minutes in length.

Table 9: Physician interview characteristics

Interviewee	Role in LTC	Specialization	Interview time
Physician 1	Attending	Family Medicine: CFPC Specialist	25:55
Physician 2	Attending + Medical Director	Family Medicine: CFPC Specialist	35:45
Physician 3	Attending + Medical Director	Family Medicine: CFPC Specialist	59:33
Physician 4	Attending + Medical Director	General Surgery: RCPSC Specialist	28:14
Physician 5	Attending + Medical Director	Non-Specialist	28:18

The interviews ranged from approximately 28 to 60 minutes. The interviewees were informed that the purpose of the study was to explore the experience of less stringent blood glucose management in elderly LTC residents from the perspective of the physician staff. The interviews were semi-structured based on three categories of open ended questions: 1) what key factors do you consider when individualizing glycemic control targets and treatment in LTC residents with diabetes? 2) What are the key challenges you face with long term care (LTC) residents with diabetes? 3) What changes in LTC processes would you like to see that would facilitate overall diabetes management? Is there anything that would help support diabetes care? Prompts were used to clarify information and probe for more details. Refer to Appendix I for full interview guide and potential prompts.

Upon interpretive analysis, the overall findings from the physician interviews identified four overarching themes that address physician experience of managing diabetes in LTC homes:

1) Variability in clinical experience and practice 2) Individualization of diabetes monitoring and control 3) Time spent on diabetes and 4) Inter-professional relationships.

Theme 1: Variability in clinical experience and practice

This theme addresses variability in physician's opinions and practices on several aspects of diabetes management in LTC homes. Physicians varied in: (1) their use of existing diabetes guidelines, (2) the diabetes control parameters they endorsed (e.g. blood glucose parameters and targets), (3) monitoring methods and practices (e.g. tests used, frequency of tests). There were differences among physicians in whether they saw value in existing diabetes guidelines for diabetes management in LTC homes. Physicians also differed in diabetes control parameters they used and found acceptable for their residents. All participating physicians expressed that they considered less stringent diabetes control when deemed appropriate for LTC residents. However, there was considerable variability in the extent to which physicians were willing to use less stringent blood glucose control targets. In addition to both the use of guidelines and acceptable control parameters, physicians also varied in the monitoring methods, such as the specific tests and measurements they used as well as the frequency to which the residents were monitored. Overall, the first theme of the physician interviews addresses the variability among physicians in the utility of diabetes guidelines, the appropriate blood glucose targets that are used, and the monitoring methods and practices (e.g. the use of blood glucose measurements) in LTC residents.

Utility of guidelines in reinforcing practice. Physicians varied in their reference to diabetes clinical practice guidelines (CPG's) for setting diabetes control in LTC. Most physicians stated that they were aware of 2013 CDA CPG. One physician mentioned he/she was in agreement with the Nova Scotia diabetes guideline. Regardless of the specific guideline

physicians endorsed, a common perception was that the guidelines applicability in LTC were generally broad and unspecific, resulting in physicians reference to guidelines as a means to confirm their inclinations to blood glucose control in LTC residents based on their personal clinical experience. For example:

I look at guidelines, they're just that, guidelines. They're not "though shalt". [...] You've got to milk and massage things according to [the] health and wishes of your residents. […] The guidelines are perhaps making me feel a little more at ease, that what I'm doing is [not] wrong, but I'm still comfortable doing it one way or another. - Physician 5

Physicians differed on their level of satisfaction concerning the quality of evidence behind recommendations within CPG's for blood glucose control in the LTC population. Whereas one physician felt the CDA consensus recommendations on blood glucose control was reflective of expert consensus and sensible for the LTC population, another physician voiced his distrust concerning the quality of evidence in guidelines for appropriate glucose targets in the LTC population and the frail elderly in general, which he/she felt left physicians to rely almost exclusively on their own clinical experience.

But I can, we all have to come to those decisions pretty much on our own, because there are no real good guidelines out there. […] Nothing really can tell us that we're doing the right thing, because if you look at those guidelines they're all expert consensus. […] and that's the danger of them. So it's kind of hard for us to decide you know whether we're doing the right thing or not. - Physician 3

Overall, the acceptance of different guideline recommendations for blood glucose control in LTC homes is varied. Physicians were in agreement with guidelines that reflected their clinical experience in LTC, however their utility was limited. Reasons for this include a lack of specificity in guidelines and concerns regarding the quality of evidence behind recommendations.

Variability of opinions on blood glucose monitoring parameters. Physicians expressed different preferences of blood glucose measurements (A1C, random and fasting blood glucose

tests) in informing glucose control and changes in diabetes therapy. One physician noted that he/she no longer assessed A1C in their residents, as he/she felt that it did not contribute to the day to day management of residents, whereas other physician participants preferred the A1C over capillary blood glucose (CBG) tests in judging the blood glucose control of LTC residents:

> And as far as the A1C's are concerned I don't really consider it too much, I stopped checking it in LTC in most of the patients. I'm not using it to make decisions. I'm looking at their random blood sugars and using that to guide the decision more than anything else. Also not aware that it really is connected to outcomes in that patient population at least.- Physician 2

> I don't think you can write off the hemoglobin A1C and say well, they're only gonna be here for a couple of years, it doesn't matter if their kidneys crop up for example, or eye. […] To me the hemoglobin A1C is far more valuable in telling me whether their diabetes is controlled or not.- Physician 3

Separate from the variability of blood glucose measurements, there were considerations of the frequency of blood glucose monitoring. The range of reported CPG monitoring for residents was four times a day (maximum) whereas the minimum level of monitoring reported was once weekly. The use of insulin, a combination of insulin types, and fluctuating blood glucose values where the primary reasons noted for increased monitoring. Most physicians limited monitoring residents' random blood glucose four times/day to residents with very unstable blood glucose control. This type of assessment was mainly done variable times a week in order to assess a pattern.

Variability of opinions on blood glucose targets. There was no consensus among the physicians interviewed as to what blood glucose values they considered too high for frail LTC residents. Concerning A1C's, the upper limit target ranges for frail LTC residents amongst physicians included <8 %,< 8.5%, and <9.5%, while three physicians reported aiming for <7% to 7.5% if possible. The one attending physician interviewed noted a general reluctance to tolerate higher A1C's, stating:

The A1C's for the most part I still aim for less than 7%, but like I say in some patients I will tolerate more like a 7.7% range. [..] You know, even for them [frail residents] I still (sigh), I guess reflexively don't love having above 8%, so I can't really say…If I have anybody over 8 on their A1C…I don't think so though, usually I get that gut reflex, it's not at target. - Physician 1

The upper limit for random blood glucose varied across physicians as well, where some physicians reported having an upper limit between 12-15mmol/l, while others would be willing to consider random blood glucose values of up to 20mmol/l if the resident's hyperglycemia was not symptomatic.

Right. I try to keep most of them under 15, […] Random blood sugar of under 15, at least most of the time so, I'd say some of them will be, maybe 10% to 25 % of the time over that, and that's acceptable so long that it doesn't seem to be causing any problems. – Physician 2

However, three of the interviewed physicians held a more conservative approach in deciding on less stringent blood glucose control, the clearest divergence being tolerating blood glucose above 15 mmol/l in residents.

One finding that reflected the different perspectives of blood glucose control in LTC residents was differences seen in physicians' experience with hypoglycemia in LTC. It appears physicians' opinions about blood glucose control were highly informed by their experience in and characteristics of their individual LTC home. One physician identified hypoglycemia as a prevalent concern in LTC, resulting in less stringent goals in most LTC residents. This experience was contradicted in another physician's experience, who found that although theoretically a risk, hypoglycemia was infrequent over the course of his/her LTC practice:

Again because I have a higher than average population of dementia patients I guess, I may be less aggressive. But then I'm looking at quality of life and I'm looking at, preventing you know hypoglycemia and falls and fractured hips because certainly we've seen those across the years.- Physician 5

But of course in the elderly you have to watch for hypoglycemia. Theoretically it is also an issue although I don't see it much in the nursing home. I've worked in nursing homes for […] 15 years now, and I haven't seen hypoglycemia, I don't know, in the last five years. – Physician 3

While the underlying rationale for less stringent blood glucose control was based on concerns of hypoglycemia and the perceived benefit of control, one physician felt that diabetes control in LTC residents should focus on methods of achieving blood glucose control without the risk hypoglycemia. The prevailing concern regarding glucose control parameters that were considered overly liberal was based on ethical considerations, as this level of control was seen akin to discontinuing treatment. As one physician notes:

> Again, we're into opinions here you know. And you know my answer to that would be that if you allow higher blood glucose levels because you're afraid of hypoglycemia, then the haemoglobin A1C's gonna go up, […] they're going to be more likely to get infections, pneumonias, inter-term illness, and if they do get an acute illness, they're going to be less likely to get through it. So my feeling is that you know that argument, really what you're doing is your saying you're going to stop treating this patient, you know.[…] And I think in LTC, we have to be very careful of that argument. -Physician 3

> Yeah, it's an ethical decision that I think that I'm not sure why you would need to do it.[…] So I think there is a risk to say somebody who is frail and elderly, well we can be really lax with them, because frankly what does it matter. And I don't think that is, that's a slippery slope that you want to be very careful of. - Physician 4

Only one physician commented on the lower limit of blood glucose control, being comfortable with frail residents with a random blood glucose of 7mmol/l or 8 mmol/l, while ordering less stringent management if it fell below 5mmol/l or 6 mmol/l.

> Most of them I find we have to worry about anything under 5 [mmol/l] or a 6 [mmol/l], and become less stringent there. Especially if they're variable intake and on anything other than metformin really it becomes worrisome. […]. It's hard to really be more concerned at 5[mmol/l] or 6 [mmol/l], certainly the 7 [mmol/l] or 8's [mmol] are usually safe for most of them. – Physician 2

Overall, physicians expressed an appreciation for less stringent blood glucose control in LTC resident. However, physicians varied in the extent to which they were willing to relax blood glucose control targets. This variance in opinion was rooted in their clinical experience regarding the benefits and risks of blood glucose control in LTC residents.

Conclusion for Theme 1. There is great variability among attending physicians regarding the parameters in which they manage blood glucose targets and monitoring practices in LTC residents. The lack of clear evidence regarding diabetes monitoring and control in LTC residents, and the variable conclusions of CPG's, results in physicians relying on their clinical experience in LTC residents, which has resulted in two levels of interpretation of less stringent blood glucose control. Whereas all physicians consider less stringent blood glucose control in LTC residents when appropriate, different experiences and opinions regarding the impact of blood glucose control on LTC residents appears to be a source of variability in clinical decision-making on diabetes control.

Theme 2: Considerations in the individualization of diabetes control and monitoring.

This theme describes the process of individualizing diabetes control and monitoring among LTC residents. There was clear agreement among physicians regarding factors involved in individualizing care, though the weight given to these factors differed across all physician interviews. A common starting point among all physicians was that ideal blood glucose control is the primary goal of care in LTC residents as long as it did not come at a significant risk to the resident. Physicians noted multiple determinants that underlined the processes of individualizing less stringent blood glucose control in LTC residents. For this reason, these determinants have been conceptualized as three primary consideration of blood glucose control: (1) life expectancy and frailty, (2) quality of life and (3) the resident and family preferences/care goals. These considerations are discussed below.

Life expectancy. Physicians stated that life expectancy was noted as a primary reason for less stringent diabetes control and monitoring. As one physician notes,

So, that's really what I'm looking at, if a person's life expectancy is you know maybe two years, I'm not going to be aggressive. If a person is 80 years old but otherwise healthy but might live another 10 [to] 15 years well I'll be more aggressive. - Physician 5

Two physicians expressed the difficulty in assessing life expectancy in LTC residents. However, in terms of measuring life expectancy, physicians were either not aware, or did not rely on any specific measures or tools to assess life expectancy, but rather relied on a clinical impression of gradual decline:

Yeah I don't think there is a real, if there's one out there I'm not aware of it, but you know a tool that could say, well you know if a person can do these things, and so they're more likely to live a certain amount of time. I think its more of a clinical impression that you get and certainly once we see some of these changes whether with falls or lower blood sugars, as the frailty level is increasing the expectation that more things are going to happen and that the life expectation is shorter. - Physician 2

Physicians were further probed about the use of other major information tools in LTC such as the Minimum Data Set (MDS) 2.0, and the utility of certain measures or scales in the clinical decision process of physicians in regards to diabetes management. All physicians interviewed did not feel that the MDS instrument had any impact in their clinical decision process for the diabetes management of residents. Reasons for this include unawareness of the MDS instrument, or that it has utility beyond administrative uses, where one attending physician states "I know it exists, but I have no idea what it is. It's a measurement that the administration does, but I don't know how it affects care"- Physician 1

And

As a physician, I hardly ever look at it… I know [I] should, but at the end of the day, there has been a gap between, you know most physicians look at the MDS RAI as you know [an] administrative nursing issue, we just do our thing and show up. And I'm one who says that needs to change. – Physician 4

When asked how life expectancy was assessed, the extent of a residents frailty and dementia, were prominent clinical characteristics of assessing life expectancy. Specifically, characteristics of frailty mentioned by physicians included variable nutritional intake, falls and

fall related complications, weight management, muscle loss (sarcopenia), immobility, a lack of independence (i.e. in ADL's), and exacerbated vulnerability to other medical conditions. One physician noted the correspondence between measures of frailty and overall decline, which was used by the physician to judge the resident's life expectancy.

> And so that would be determined by me, by their nutritional intake, their overall weight, I guess their risk of falls, so that's kind of how I judge it…Yeah because a lot of the markers for frailty that are used include signs of deterioration, so increased falls, decreased nutrition, weight loss, all those things. – Physician 1

All physicians noted the presence of dementia, and the level of its progression, as a clear determinant of limited life expectancy. This becomes very key in LTC homes where the prevalence of dementia is high, as one physician notes:

> Well, as I say 85% maybe even 90% of our residents have dementia of some form. […] If we can determine those at the beginning and have some sort of idea of the clinical examination, which type of dementia they have, then we can determine a little bit better the lifespan – Physician 3

Quality of Life. The maximization of a resident's quality of life was an important determinant in setting a resident's diabetes care plan. In regards to less stringent glucose control, physicians would make changes to reduce/ simplify diabetes medication and monitoring in residents to prevent negative impacts to quality of life for LTC residents that were considered frail.

> Yeah of course. But again if I have an 85 year old, you know moderately severe demented patient who's mini mental is 5 out of 30, whether they've had a heart attack or not, or congestive heart failure in the past or their eGFR is 40, I would still not [..] be super tight because to me it's more quality of life. – Physician 5

Polypharmacy and drug interactions were also considered a risk of stringent control in the care home, which two physicians actively attempted to reduce. Avoiding complex insulin regimens, specifically combinations of insulin, was a common goal for these two physicians.

Polypharmacy's a big issue, so, when I'm considering less stringent diabetes management, any opportunity to reduce the medications they're on, without a negative impact or certainly with a positive impact, would be a positive change to make. And, often diabetes management is consistent with that. – Physician 2

One physician stated that for residents on insulin, he/she always aimed to stabilize blood glucose control with the splitting of long acting insulin regimens while avoiding fast acting insulin in residents as much as possible. The benefit of this was that drug regimens were uncomplicated for nurses and for family members, giving family confidence in taking residents out, while also limiting the risk of hypoglycemia. Contrarily, another physician noted that almost all residents that required insulin were on a combination dose of insulin. Finally, almost all physicians stated that they considered the use of sliding scale regimens less often in LTC residents.

There was a difference of opinion among physician interviewees regarding the value of frailty as a promoter of less stringent glucose control. On the one hand, the vulnerability of frail resident's results in their limited life expectancy, which is considered a primary factor of individualizing care and is a cause for relaxed blood glucose control. Contrarily, some physicians felt the vulnerability of residents due to their frailty, resulted in management that was more cautious, but was not cause for less stringent control, given the physicians position that control of high blood glucose still had a positive impact on their quality of life. As one physician notes:

I don't ease off on diabetic management if that's what you mean. Again my impression is that if somebody has a high haemoglobin A1C, they're not going to be feeling well […] and they feel better if you can get it down. So frailty to me, I wouldn't, I'm not sure I would make that much difference in my management. I mean I would stop and be more careful of the changes of insulin, that's you know, how quickly or slowly I'm doing that. But I would still keep the same management I think. – Physician 3

An extension of the variability in practices of blood glucose targets seen in theme 1, while some physicians are only concerned of hyperglycemia in some LTC residents if it is symptomatic, other physicians are averse to allowing blood glucose targets to reach overtly high

levels, due to its perceived impact on a residents quality of life. The willingness to accept higher thresholds of hyperglycemia is based on the physician's impression of the impact of hyperglycemia to a resident's quality of when faced with a limited life expectancy. Physicians who see a lack of clinical benefit in tighter blood glucose control among residents with a limited life expectancy, are more willing to relax blood glucose control. Conversely, physicians who continue to see clinical benefit in tighter blood glucose control in LTC residents, still see potential in avoiding acute complications, and the perceived risk of hyperglycemic symptoms. Both approaches are intended to improve the resident's quality of life.

Resident and Family Care Preferences. Resident/family care goals were a primary consideration noted by all physicians in individualizing diabetes treatment and control among residents. One physician noted how estimations of life expectancy and frailty were secondary to the care goals of the resident and family:

It impacts a whole variety of things, but [..] it's much more what are the desires of the family [and] the long term outlook for that individual as opposed to they're frail and they're going to be around for 6 months. That doesn't impact it as much […] Frailty does impact to some extent, but it's not the driving force in terms of how aggressive or not aggressive I would manage their sugars – Physician 4

Overall, a common theme was the increased level of involvement of the family in setting the care plan for residents. Physicians mentioned accounts of family members that would make requests for either more stringent or relaxed control, which physicians valued highly in setting goals of care for that resident, as noted in this example:

…and try to get a better understanding in terms of, of what, if the patients are cognitively well, what their interests is, and how tightly they want to be monitored. And in some cases it's the POA's [power of attorneys]. I have a case right now that, of somebody who the POA's not interested in really tight control, because of previous history of behavioral issues when he was hypoglycemic. So she sort of determines "I don't want to run him that close because I know my

husband, sometimes he runs low and when he is low he's been awful. I'd rather him sit at 14 than 6". – Physician 4

The general observation from most physicians' perspective was that resident goals and family expectations were more inclined towards less stringent blood glucose control and monitoring, and that expectations of stringent blood glucose control were less likely. Adjusting towards the resident/family care goals would take priority if the medical and nursing staff could achieve the goals safely:

I mean and this depends, I had a lady who was dying for month[s], like 6 months, so, in her case she didn't want to be having CBG's [capillary blood glucose] all the time but, she was still receiving treatment, with insulin and pills so […] we were balancing our safety thresholds and how comfortable we feel as nurses and doctors, with patients goals of care in that case. So, I think I told her I'm ok with not monitoring if she's on pills but not so much if she's on insulin, and she was ok with that. – Physician 1

This however can also become a challenge for some physicians, in which resident/family wishes may conflict with what the physician feels is the more optimal care plan:

Well it can be, so I mean you could end up stuck. You could have somebody who is having some complications of either hypo or hyperglycemia or quite a range, and they're not willing to consider their intake as part of the problem, and they may not be able to because of cognitive issues, and family may want to support them in eating what they want, and yet they may have a peripheral neuropathy that could maybe get a little better with tighter control, or they refuse to have you check their sugars, and then you're worried they're either hyper or hypoglycemic and it's difficult to tell. So there are barriers to care that are part of the problems in dealing with management. – Physician 2

Although less likely, a few physicians did note cases where family expectations called for tighter control. One physician observed that this was generally a result of younger members of a resident's family with diabetes:

I find the vast majority of families, especially with dementia patients when you sort of talk about, you know quality of life, most of them don't want anything done anyways […] There are some families, and I find it families with younger diabetics, where I as a family to want glucometers done QID (four times a day), that's because the younger family member who's like 30, 40, […]

has been hammered to death by their endocrinologist […]. They don't take into account life expectancy. Those are the families I find are more strict. – Physician 5

When differences between physician goals and family preferences such as these arose, one physician mentioned the importance of communicating the limited benefit of stringent blood glucose control in frail LTC residents stating:

Well they're not conflicts it's just difference of opinion. I sort of say, yeah that's great you know […] tight control of your diabetes […] are key to prevent microvascular complications you know years down the road […] but, your mom, has advanced dementia and probably given her decline over the last year, may only last another year or two. […]We're not trying to prevent anything we're trying to keep her comfortable […] well then they usually come around. – Physician 5

Overall, family preferences was highly valued among physicians in deciding on the intensity of blood glucose control in LTC. For the most part, resident and family preferences were aligned with goals of care that allowed for relaxed blood glucose control in LTC residents. In less frequent situations where the family differed with the physician in what was considered optimal care, it was important for the physician to communicate the inappropriateness of stringent blood glucose control. However, in cases where physicians felt that residents would benefit from more stringent blood glucose control, physicians found it difficult to persuade resident/family who had preferences of relaxed blood glucose control and dietary behaviours.

Conclusion for Theme 2. Life expectancy, quality of life, and resident and family care goals were the primary considerations when individualizing diabetes management in LTC residents. Life expectancy was assessed through clinical judgement, mainly by the presence of frailty and dementia. Physicians' assessment of a resident's quality of life was rooted in the physician's opinion of the benefit of blood glucose control in residents with limited life expectancy. Physicians felt that resident and family care goals were generally consistent with less stringent blood glucose control and monitoring, and found that communicating the need for relaxed blood glucose control was not difficult. However, there were challenges in expressing

the need for stringent blood glucose control. Physicians noted the difficulty in assessing life expectancy in LTC residents, yet did not utilize any clinical tools in its assessment. Rather they relied on a clinical impression of decline.

Theme 3: Time spent on diabetes in LTC.

This theme addresses the perceived demands of diabetes management on LTC staff time. Some physicians recognized the time consuming nature of diabetes in the LTC environment, and in some cases, made adjustments to a resident's care plan to simplify the time spent by the nursing staff with residents. Physicians felt that progress in the appreciation of less stringent diabetes control from LTC staff has improved the burden of diabetes on staff time, although physicians did report instances where recommendations from other health professionals in the care plan of residents was considered stringent (see Theme 4 on Inter-professional Relationships)

Contrary to the challenges mentioned by physicians, two physicians commented on the benefit of the LTC setting due to the constant oversight of residents. One physician's impression was that due to the presence of constant oversight and monitoring by physicians, nurses, and LTC staff, dilemmas such as non-compliance of treatment regimens were prevented. This physician felt that this feature of consistent oversight in LTC, promoted better blood glucose control in LTC residents versus the community, stating:

> …when in fact almost all chronic illnesses in my experience are far better controlled in the nursing homes than in the community. Simply because we've got 24 hour monitoring, we've got dietetic oversight of their diet, and activity that is consistent day to day […] and we know that they are getting their medication. One of the problems in the community is that if you put someone on multiple insulin injections in the community, my experience in private practice is that you get multiple missing doses and when you get multiple missing doses the blood sugar goes up. – Physician 3

Physicians displayed varied levels of awareness of the demands diabetes management had on staff time. One physician did not feel that diabetes management had high demands on

physician time in LTC. However, when probed about the impact on nursing staff, there was a lack of awareness of the time demands diabetes had on nursing time, stating:

No because in the LTC I have the nurses doing a lot of the leg work, like I can pretty much make decisions with the information that I'm given. So, I don't find it that long actually. I would say that it's worse in the community when I'm trying to get the information from patients. […] I guess I don't really know, because I don't follow them [nurses] around. But I guess to collect that information they probably are running around poking people, writing it down and, giving them medications. But I think that goes along with everything else they do right? - Physician 1

Three physicians recognized the time consuming nature of diabetes in the LTC environment, and in some cases, made adjustments to a residents care plan in order to simplify and reduce the time nurses spent on treating and monitoring diabetes in LTC residents: "It takes more medications, more doses several times a day compared to the other conditions. So it's a significant part of their day, and that's another thing we try to simplify" (Physician 2).

Conversely, another physician felt that nursing staff time was consumed by a variety of conditions specific to the LTC environment, as opposed to diabetes management taking an inordinate amount of time. Hence, the availability of nursing time was presented as a barrier:

Timing of nursing staff. The nurses are always running ragged. Even if you wanted to check them more often it's extremely difficult to do it because they just don't have the time to do it…No, I think it's more of a general complaint if you want to call it, on a lot of nursing staff just don't quite get it and they're so run ragged with everything, not just diabetes, with wound care with behavioral modification and control, and patients with dementia, with family concerns, they're just run ragged with everything. So, it's not one thing taking over the other.- Physician 5

Some physicians attempted to reduce the time spent on diabetes in a variety of ways, including individualized targets for residents that required less stringent control and limiting the use of complex insulin regimens for as many residents as possible. One attending physician felt that in his experience, there has been a reduction in the time nurses spend monitoring residents, which was a result of the increased level of individualization of residents' diabetes treatment and monitoring in the LTC home.

If you're spending an inordinate amount of time to get only marginal benefits, then that's not appropriate. The treatment I would say, is much more individualized than it used to be. […] Well I can only talk about the way it is today and sort of where it's come [from]. It's gone away from them spending as much time, doing sugars all the time on people, to now doing it less frequently and a little bit more lax, so it frankly is probably consuming less of the nurses time today, than it was five years ago. – Physician 4

However, some physicians interviews did suggest instances with other LTC staff professionals that were overly concerned in certain areas of diabetes management (nurses monitoring blood glucose, dietitians enforcing diet plans, etc.) when physicians felt a less stringent approach was deemed appropriate (See theme 4).

Another reason physicians felt that the time spent on diabetes was appropriate was because of the nature of the LTC environment in treating chronic disease. One physician felt that diabetes should not be de-prioritized in the LTC home because of its prevalence**.** As such, the time spent on diabetes was a necessity because the goal of care was to stabilize chronic diseases.

Well I think all of these things are part of LTC because really what LTC, what we're talking about is chronic disease management. […] and you know I think one of the most worthwhile things I think that I can do in a nursing home is try to keep all of these conditions stable as possible so we don't have to transfer people to emergency, and I think that's all part of the constant management, constant monitoring we need to be doing. Yep. And one of, in fact as I say it's my definite impression that chronic illness is far better in the nursing home than in the community and I think it's for all of those reasons. – Physician 3

Conclusion for Theme 3. In summary, this theme addressed physicians' experience regarding the time spent on diabetes in LTC. Physicians expressed that the nature of the LTC environment as opposed to the community, entailed a high and consistent level of oversight of residents, which according to one physician's perspective resulted in better LTC resident outcomes such as blood glucose stability. However, not all physicians were aware of the demands of diabetes control and monitoring on the LTC staff. One physician was not aware of the impact their control and monitoring orders had on nursing staff, while other physicians did recognize the high demand of diabetes on staff time compared to other conditions, and made

attempts to reduce the nursing time spent on diabetes by simplifying treatment regimens. However, one physicians impression was that the constant monitoring and control of diabetes resulted in better outcomes in LTC residents, and that the demands of diabetes on nursing staff time was not a result of unnecessary management, but due to the sheer prevalence of diabetes in LTC.

Theme 4: Role of Inter-professional Relationships.

This theme addresses the level of collaboration and communication between the physician and other health professionals, specifically the nurses, pharmacists and dietitian. This theme did not find consistent findings of physicians' experiences with specific professions, rather it addresses the common facilitators and barriers found with other health professionals in LTC. Firstly, the level of collaboration between other allied health professionals varied among physicians. There were cases where physicians felt a sense of collaboration in diabetes management and there were also situations where physicians felt they were solely responsible. One physician felt that despite the presence of other health professionals in LTC, the responsibility of following all guideline endorsed measures was almost solely up to the physician, as opposed to the community environment, where a team of professionals work in order to follow through with measures in the effective prevention and management of diabetes. As one attending physician noted:

> And in the community I have a team right. So I have a diabetic nurse and dietitian who come in and are involved. I don't have that. So in nursing homes I guess it's a lot of my kind of peripheral neuropathy or diabetic nephropathy, A1C targets. That's kind of up to me, I don't really see anyone else being part of that team. – Physician 1

However, all of the other physicians did report a high level of collaboration with other health professionals, This theme did not find consistent observations from physicians among

different health professionals, as some physicians report shared care goals between health professionals, other physicians felt that some health professionals made recommendations that were considered stringent or unnecessary in residents where a less stringent approach was deemed appropriate by physicians. For instance, one physician reported the growing appreciation for less stringent diabetes management among allied health professionals, limiting disagreements in opinions:

A lot of the education has gone out that, the guidelines are changing, we don't need to regulate them as tight. […]. So as practice has changed I would say certainly [it's] different now than it was 13 years ago when I started, and there's less push back. –Physician 4

Conversely, there were differences in the opinions among different health professionals regarding the individualized approach of diabetes management for a resident. One physician reported how these opinions would sometimes result in "differences on what we should be doing" (physician 3) during med reviews. For instance, one physician described the pharmacists as "on board" in regards to being up to date in diabetes knowledge. This was in contrast with another physician, who in his experience felt that pharmacists lacked the LTC experience in allowing for less stringent treatment and control in LTC residents.

The pharmacist is often looking to blood monitoring and definitely our blood monitoring has gone up since they included the pharmacist in med reviews. And that in some ways is a good thing, but in some ways it is a bad thing too. Again we are doing more testing on people who just want to get on with their lives. […] So I think it's all part of experience you know. I think the pharmacist has academic experience, but very little clinical experience, and therefore is afraid of making you know changes that I would have no difficulty making. […]So those are the sort of conflicts we get. – Physician 3

For the nursing staff, physicians indicated a growing appreciation for less stringent diabetes control in avoiding hypoglycemia in the elderly; however, it is an appreciation that does not automatically translate into a change in practice.

Well I think there's appreciation for you know avoiding the problems we see with really tight control [..] and I think they appreciate that [..] less stringent control has a fit and their supporting of that. It takes some getting used to. Maybe not checking blood sugar as often is a transition we go through and one of the homes we do that, but generally speaking they have an appreciation. – Physician 2

When probed about how nurses transition to appreciating less stringent diabetes control and monitoring, one physician noted bedside education as an effective method of training the nursing staff towards a less stringent approach, stating "you know often you'll have it right there in front of you, you can show them that it's been stable for a month it's not hard to say you know why do we need to do this 4 times a day when it's the same everyday" (Physician 2). The need for continuing education for the nursing staff was emphasized. There was concern with one physician about the differences in nursing education levels, which presented a barrier in the physician's willingness to trust in the nurse's judgement:

I find the educational level of nurses, um, especially your RPNs coming [as] recent grads [are] very disparate between nursing homes. You have some nurses who are, you know, what I consider up to date from what I can understand. I have some nurses who don't understand the different kinds of insulin and yet they're giving it to patients which scares the heck out of me. – Physician 5

Two physicians felt that dietitians were an important asset in LTC in preventing malnutrition and variable diet intake, which was one of the leading barriers to diabetes management in the LTC home. As one physician notes, "They're key players in LTC decision-making, they're mostly trying to prevent decline. […] trying to keep intake up […] than addressing something like diabetes" (physician 2). However, in one physician's experience with LTC dietitians, he/she felt dietitians would be restrictive with dietary management practices in some residents that the physician felt may not have an impact in the care of residents that required less stringent diabetes management:

Dietitians are wanting to be much more picky with diets about allowing certain foods and things of this nature. I'm looking at this person you know, probably got another year to go why are we restricting them so badly and [with] diabetic diets, they should be on more of a regular diet and let them get what they want." […] they seem to be much more looking at a 25 year old diabetic and being incredibly tough and strict, and monitoring their calories and their proteins, and snacks versus you know some of the guidelines are suggesting, especially in the older patients with dementia, there really shouldn't be diabetic diets […] and yet they're still wanting to push and itemize absolutely everything. I think they're spending too much time on that. – Physician 5

Only two physicians commented on the relationship with other specialists for their residents. One physician felt that specialist access/advice was difficult to receive in LTC, due to the barriers of transportation and scheduling of the residents.

One of the negative things is that people can't get um, unable to easily get specialist help. Because it's difficult for them to get outside and a lot of specialists are not easily accessible, even if people can get around. Getting to a specialist appointment means getting a relative to come and pick them up, essentially it's a day of organization. So it is specialist advice in diabetes is a little more difficult to come by. – Physician 3

Another comment regarding specialists was their inclination to have a more stringent management style in their frail LTC residents.

Sometimes specialists, nephrologists. You have a patient with advanced dementia [and] they want to dialyze absolutely everybody and get everyone's blood sugar absolutely perfect even though they're only going to live for three months. They're very strict and very aggressive. – Physician 5

Conclusion for Theme 4. Physicians shared different experiences regarding other health professionals in managing diabetes in LTC. Overall, physicians noted a general appreciation of other allied health professionals regarding the benefit of less stringent diabetes management. However, some physicians held that there was a propensity for some nursing staff to be overly concerned with a resident's blood glucose, which manifested in the nursing staff checking a resident's blood glucose more often than the physician felt necessary. Another inter-professional challenge was the variance in the educational level of nurses, which limited the physicians trust in the nurse's judgment. An important finding was the role of the physician in educating nurses

as to the benefit of less stringent diabetes control and monitoring in LTC residents. Bedside education was seen as an effective and efficient method of achieving this. Although physicians reported a growing appreciation for less stringent management by other LTC health professionals, there were still instances where physicians felt other health professionals were still stringent in their monitoring and management practices. Finally, specialist's advice was difficult to facilitate (i.e. transportation), and was sometimes seen as too aggressive for elderly LTC residents.

Qualitative Interview with Nurses

Data Collection. There were twelve interviews that were conducted of nurse professionals ranging across five different LTC homes in different regions of Ontario. Nurses represented a variety of educational backgrounds and managerial levels. Eight interviewees represented direct resident care nursing staff, seven of which were registered practical nurses (RPNs) and one practical nurses (RN). Of the seven RPNs, two also served as coordinators within the LTC home. The role of coordinator served as an intermediary between management and front-line staff, which came with additional administrative and managerial duties. Finally, one interviewee was an RN that was consulting for LTC homes as opposed to being registered staff, while the last interviewee was a nursing director of care. Interviews length ranged from 20 minutes to 1 hour and 2 minutes.

Table 10: Nurses interview characteristics

Interviewee code name	Role in LTC	LTC home	Interview time
DONC	Nurse director of care (DOC)	1	20:44
NC	Nurse consultant	N/A	16:22
RN 1	RN 1 + assistant to DOC	2	18:28
RN 2	RN 2	3	15:13
RN 3	RN 3	4	25:19
RPN 1	RPN 1	3	19:12
RPN 2	RPN 2	3	21:02
RPN 3	RPN 3	3	31:47
RPN 4	RPN 4	4	18:33
RPN 5	RPN 5	4	20:14
RPN 6	RPN + Nurse coordinator 1	5	43:37
RPN 7	RPN + Nurse coordinator 2	5	1:02:53

Similar to the physician interviews, the nurse interviews were semi-structured and based on three broad categories of questions: (1) What is you experience with managing diabetes in LTC residents? (2) What are barriers to managing diabetes in LTC residents? and (3) What are the barriers to care? The findings of the nurse interviews identified 3 major themes: 1) experience with diabetes monitoring and control, 2) facilitators and barriers to care, and 3) education.

Theme 1: Experience with diabetes monitoring and control.

This theme describes the experience of nurses with respect to managing (i.e. providing treatment, monitoring blood glucose and diet, etc.) LTC resident's with diabetes. Sub themes

involved in this theme include: (1) individualized blood glucose targets, (2) nurses monitoring and treatment practices and (3) time spent on diabetes.

Individualized blood glucose targets. When asked about their experience with less stringent blood glucose control and monitoring, nurses generally deferred the decision process under the physician's scope of practice. "It's all with the physician's discretion. (RPN 6)." Hence, from the nursing staff's perspective, the physicians practice ultimately informed the level of intensity of blood glucose control and monitoring in residents. As one nurse notes "It really depends on the resident. There isn't anything that really guides that. It's the physicians practice. (NC)".

In terms of individualized care of residents, the nursing staff mentioned several key considerations in tailoring the management practices to the circumstances of the individual residents. When asked what value was considered too high for LTC residents with diabetes, nurses recognized the need for less stringent control in LTC residents. Nurses generally mentioned random blood glucose targets above 10 mmol/L to be too high. However, there was a wider understanding among nurses of achieving targets that were specific to each resident. Hence, the risks of hyperglycemia was less of a concern in some residents, given their individual characteristics. "In the past I have looked at a resident that was managed at 15 to 18 consistently, because that was what was appropriate for that person." (RPN 6).

Many nurses recognized a benefit in maintaining a resident's blood glucose higher, in order to prevent the risk of hypoglycemia. This was more evident in residents with other comorbidities and other risks (i.e. frailty, dementia)

I'd say 10 [mmol/l], and too low I'd say even if they're at about 4.5 [mmol/l] but I would say about 10 [mmol/l]. I know with our doctor anyways he'd always like to run a little higher, [...]

just so you have that bigger window. […] Like I said a high number you wouldn't react. So you have a 90 year old and dementia, if they are at 15 maybe it's because they got to 15 because they haven't eaten in three days and now they have eaten so you don't worry about that, so it is so unpredictable. And not to say that, they're less cognitive they don't matter. Just based on their lifestyle you don't want to shoot them up on insulin because you don't know if they are going to eat for the next day. That's why you run them higher, when they are more frail, more demented, you don't know how that day is going to go. - RPN 7

The main consideration of the nursing staff for accepting higher blood glucose targets was the stable dosing of insulin and the quality of life of the resident, which was assessed by whether the resident displayed any signs or symptoms of hyperglycemia. This was explained by the nursing consultant:

Typically in LTC, what we want to see is stable dosing of insulin, we don't want to see sliding scale with our diabetics. It's very difficult to manage in LTC […] You know by the time we get residents they're pretty elderly. They got a history of what worked for them in the past, […] how high it can be before there has to be any major intervention. – NC

This sentiment was echoed by the other RNs and RPNs, who generally were not concerned with higher levels of hyperglycemia if the resident was stable/did not have drastic fluctuations at that level and was comfortable.:

Well it depends on the resident, you know we have a resident who runs, you know her blood sugar could be anywhere from you know 10, to I've seen it at 12.[…] because [..] that's the range she usually runs in. If she went to like 18 or 19 I certainly, or even 15, I would inform the RN directly, and say that this is her result today. […] Yes. The numbers are also important but you have to take into account, if they're no signs and symptoms, and the resident has been running at a consistent, you know that's her norm so to say, you that she's not a regular 6.2, and all of a sudden she spikes to 16, well then yeah hello, something's obviously wrong. - RPN 4

In summary, nurses deferred the decision process regarding setting appropriate blood glucose control to physicians. For most nurses, there was a general understanding for the role of relaxed blood glucose targets in LTC residents. Nurses were comfortable with higher blood glucose readings as long as the resident was stable at this level.

Experience with Diabetes Monitoring. Monitoring practices varied across LTC homes, and were a result of physician orders and/or policies within the nursing home. Nurses indicated

monitoring schedules for residents with diabetes that ranged as frequent as four times a day, to as infrequent as once every quarterly assessment. Nurses noted multiple rationales behind these monitoring practices.

One general observation from the nurses, was that residents who were on insulin were monitored more frequently than residents on oral anti-hyperglycemic agents or diet-controlled diabetes. The implications of this varied across homes. One nurse noted a more simplified monitoring policy in her home based on resident medications: “Well we do their blood sugar on a regular basis. Anybody that is on insulin gets blood sugar done daily, twice a day. And anybody that is on an oral, we would do twice a week.” (RPN 2).

The second main factor that influenced glucose monitoring was a resident’s diet. Variable intake of food was a consistent factor that produced increased monitoring of residents blood sugar by the nursing staff. This resulted in nurses being more vigilant of resident’s symptoms and behaviours: “Some are monitored like 4 times a day if they’re very hard to control and their diet varies and that, or they don’t really follow a diet then they’re monitored like 4 times a day.”(RPN 1).

Related to variable intake was the presence of dementia. In addition to the caution required due to variable intake, there was an increased need to monitor residents with dementia more closely, because of the difficulty in ascertaining the resident’s symptoms: “Like they can’t tell you, I mean the floors I work on they are advanced dementia they can’t tell you if they are feeling funny. And that would be another reason we would do it four times a day because they can’t tell you how they feel.” (RPN 7).

Much like the experience with resident's blood glucose targets, nurses were more concerned with the stability of a blood glucose rather hyperglycemia. Although some residents might have relaxed blood glucose targets, monitoring practices was higher in residents due to their vulnerability to fluctuations in blood glucose.

I mean there's some residents you'll get you can check their blood sugar anytime of the day and it's usually around the same but then you get, just the more brittle diabetics that come in and, they're all over the place. […] whatever it may be and they're the ones that are put on four times a day just because they are so unpredictable and so brittle. – RPN 7

Nurses would report blood sugars and make requests for reduced monitoring when a resident's blood glucose was steady at a certain level.

Well basically it's because of intense fluctuations in their blood sugars, and often once we've seen it somewhat stable, like within a range, usually as long as it is between the range of above 4 and for some people below 15, um then we will tend to start to decrease it and maybe go to three times a week. As we start to see some stability we will request the doctor to allow us to decrease the frequency, with always the addendum I guess you could say that, if we are concerned we could check at any time. – RN 3

In addition to the monitoring routine, nurses stated that they would check resident's blood sugar outside of scheduled times if they noticed any signs and symptoms within the resident. Many of the nursing staff mentioned a LTC policy of checking a resident's blood glucose in case of a fall. Lethargy was a common symptom that warranted a random blood glucose check. One nurse encapsulated common reasons noted by other nurses for unscheduled glucometer checks, including

…when we're seeing delirium, maybe potential causes of delirium… If someone's had a fall, well check a blood sugar, any change in their cognition status, if any health condition is significant, if someone is all of a sudden very pale, diaphretic, unresponsive. And infections as well, certain medications, if someone's put on antibiotics, we will do more frequent blood glucose testing because that can alter… their blood sugars as well. – RPN 5

Overall, nurses understood the need for increased monitoring in residents that were unstable in their blood glucose, regardless of relaxed blood glucose goals. The need for increased

monitoring was seen in residents where the recognition of symptoms or hypoglycemia was difficult, and in residents who had unpredictable diet intake.

Time spent on diabetes in LTC. One of the goals of this research was to explore the experience of nurses in regards to the nursing time allotted to the care of diabetes management. The majority of nurses felt that diabetes did take a large amount of the nursing time allocated for residents with diabetes. However, nurses did not feel that this was a reflection of the residents' management, but because of the sheer prevalence of diabetes in LTC:

No I don't think they're managed too tightly, I think there are too many diabetics in a specific area…I'm just finding an increase in residents with diabetes. Yeah. The numbers are a lot higher than what they used to be, and insulin dependent though. – RPN 5

It's so prominent right now, it's so prominent. I mean there are so many diabetics; I have 12 out of 31 residents. So it is one of the primary diseases, prominent diseases that I have up there. – RPN 2

Nurses noted the monitoring of residents was the function that consumed the most time. In order to maintain the stability of a resident's diabetes, constant management, including glucometer measurements, and the monitoring of residents eating habits and symptoms/behaviours was required.

You mean to look after them? Well yes, but it's not a lot, you just have to be really due diligent, […] If you only got two or three it's not that bad, but if you're running with 8 on your floor, its very time consuming. Because you have to be constantly paying attention […] and your crew has to be alert and letting you know, that you know a couple of hours later they're acting funny, you better be getting down there and checking out what's going on. – RPN 3

Furthermore, the feeling among nurses of the necessity of diabetes management despite its time consuming nature was rooted in the understanding that instability would result in either further diabetes related complications, whether chronic (i.e. cardiovascular complications,

wound care) or acute (i.e. infections, symptomatic hyperglycemia and hypoglycemia) both of which would result in further medication and time management.

No because the diabetes could be triggering other issues, so it's got to be the one that's dealt with first. You know because diabetes can run into a whole litany of other problems if its not managed. So of course anything that crops up out of the ordinary first thing you do is you make sure that the diabetes is in order. - RPN 6

Yet, there were cases in which some of the interviewed nurses would notify the physician if he/she felt that the resident was stable, and did not require more intensive monitoring levels. Ultimately, the time spent on diabetes was considered a necessity by the nursing staff, as they felt it was part of providing care to residents with diabetes: "It's just another part of their plan of care. And it follows up on just as if anything else would be whether its toileting or washing it just becomes another part of the daily routine." - RPN 6

Overall, the blood glucose monitoring of residents was the task that consumed the most time for nurses. However, nurses felt that the treatment and monitoring prescribed for residents was completely necessary, and that reducing the level of monitoring and treatment would have adverse impacts on the resident.

Conclusion for Theme 1. Generally, nurses were comfortable with a range of blood glucose targets in their residents that would be considered elevated from intensive control targets seen in the general population. The main goal for nurses in achieving a blood glucose target was to maintain stability. Monitoring practices in residents varied, depending on a number of factors that the nurses considered, including insulin use, other comorbidities (specifically frailty and dementia), and dietary intake. Nurses felt that although diabetes required extra nursing time, many felt it was necessary, as part of the care plan and maintaining stability in the resident.

Theme 2: Barriers and Facilitators to Care. For nurses, barriers and facilitators to the effective management of diabetes in LTC residents were considered into two subthemes: (1) resident-based factors and (2) Inter-professional relationships

Resident characteristics. The resident-based characteristics that presented challenges for the nurses were: diet intake (i.e. either an increase or reduction intake), dietary choices (i.e. foods with high sugar content), issues of cognitive impairment (i.e. dementia related), and lack of compliance among resident (e.g. resisting or refusing medication). Many of the resident characteristics that were considered barriers to diabetes management resulted in relaxed glucose targets. However, there would still be an increase in monitoring practices, due to the need to recognize potential volatility in the resident's blood glucose. The most prominent characteristic noted by nurses as a major barrier to care was the resident's diet intake. Variable diet intake resulted in increased instability and made it more difficult to have a consistent diabetes care plan. Although overeating was mentioned as one of the dilemmas of variable intake, the majority of concern was towards resident's reduced intake/skipped meals.

Oh, it's difficult, lord […], I had one lady once who you know, you give them the insulin and then they don't eat. And here you know the blood sugars dropping, like a rock, and you got to give some glucagon, I had that happen once. - RPN 3

Separate from variable diet intake, poor diet choices in relation to diabetes was also a large barrier to optimal blood glucose management. This may be resident driven where the resident decides to purchase and acquire foods with high sugar content. In addition to this source, there was congruence with almost all the nurse interviews that family members were a main promoter of poor dietary choices.

Actually, you know what's one of our biggest problems? The family members. I would say that is the biggest one. I mean we can have everything under control here and they'll come in and give them like cookies and cakes all day. - RPN 7

A resident's diet was perceived as an avenue for family members to pursue means to increase the resident's quality of life. As one nurse put it:

There comes a point when they feel they put them in long term [care].., they're suffering under the guilt that they've done it, and they fell that well al least if they have a cookie, you know I mean it might raise their blood sugar but they feel that you know at least he's getting some enjoyment out of life, you know what I mean? – RPN 3

Nurses would attempt to counter poor diet choices by educating the family and resident about its impact on the resident's diabetes management. Ultimately, the response of the nursing staff was generally accommodating of poor diet choices by the family and resident due to the perspective that it was an integral part of the resident's quality of life.

I mean if you have someone 90 years old and their sugars are 20 but all they want to do is eat cupcakes all day what're you going to do? I mean what's better for them, you controlling their blood sugar or them living their lives. I mean, I would never want to be that age and someone tell me I can't eat what I want to eat.[…] Physicians, dietitians, you can only do so much. - RPN 7

As a result of this, nurses would not be overly concerned of increased blood glucose readings due to snacks as long as they knew the cause of that fluctuation.

Sometimes that, when family visits they'll bring treats and you know a blood sugar later in the evening might be more elevated than it should be, and we're not, sometimes the family doesn't always inform us that the resident has had those extra treats. But we're very lucky here that our families are very uh, if they don't understand about diabetes you know we can have a small chat with them and explain to them that if they do bring treats in that's great but we just have to know so that we're just not blindsided by a different blood glucose reading later in the day. – RPN 4

Cognitive impairment was also a major barrier to the general care of residents. For one, it was linked to variable diet intake, resulting in sporadic control. Second, different forms of cognitive impairment led to resident behaviours, which was already considered a large dilemma in the LTC environment. Nurses noted difficulty in dealing with behaviours when it came to diabetes as it led to poor adherence to monitoring schedules and the administration of medication.

With the residents, there could be if there is some behavioural issues, dementia cognitive impairment, that certainly could alter management for diabetes.[…]Oh absolutely, it could. Due to compliance, resisting, refusing, and then aggressive behaviour, their safety is at risk for the resident and for the staff trying to um develop or maintain diabetes management. – RPN 5

This dilemma generally led to solutions that were of a less stringent approach, as nurses felt that imposing management against resident's wishes would have a negative impact on the quality of life of the residents. This is illustrated in two resident cases where complications of dementia resulted in reduced management approach.

We have one resident with dementia that refused to allow you to give him his insulin. It just wasn't going to happen. So you know at that point we decide what do you do. Do you pursue trying to wrestle with the resident everyday, or you go to an oral hypoglycemic agent. Which he, this gentleman was cooperative in taking his medications so, you know its what's the more resident centered, you don't want 2 or 3 people holding someone to try to give him a shot of insulin. - RPN 6

When asked how that affected the resident's management, the nurse replied that it resulted in improved control due to improved compliance:

Actually it was a little bit better. It turned out better because he was getting it on a more consistent regular basis, where the insulin was hit and miss. So because it was more regularly managed, it actually had a positive result changing him from insulin to an oral agent. - RPN 7

Well with residents who are, who have dementia, who are resistive to it, who it really bothers, we have requested to have it be decreased as much as the doctor is comfortable with. We had one resident that wouldn't allow anyone to do his blood sugar except for one staff who could speak French to him. [..] So, in order to accommodate that we had him scaled back to having it done one time, once a week, and varying the time o basically […], he had his finger pricked 4 times in a month. Which worked fairly well […], for those infrequent times we were able to manage to convince him to allow us to do it. But generally with anyone who is demented we need to kind of be flexible on it. - RN 3

Inter-professional Relationships. The dynamics of the inter-professional relationships between various health professionals including the physician, nursing staff, and other professionals presented both barriers and facilitators in the management of diabetes in LTC. These relationships included nurse-physician interactions, and relationships with health professionals and personal support workers.

Nurse-Physician Relationship. As described in theme 1, nurses relied on the physician's orders (medication, monitoring, etc.) to help manage resident's diabetes. However, if there were discrepancies with what the nurses experienced from residents and what the physician ordered then it was up to the nursing staff to communicate that to the physician. Overall, the majority of nurses noted that physician orders reflected what the nurses experienced at the bedside and the expected diabetes care. This was commonly attributed to the trust in the physician's judgement and the receptiveness of the physician to the nurse's observations and/or concerns:

Like ultimately the doctor has the final say, but they are also very accepting to input from the nursing staff because they realize that these are the people that see the residents every day. - RPN 6

Sometimes you know, there's always, you know the doctor has a certain guideline that he wants to follow, and we have a very good relationship with our doctors that work here, so they're very open to listening and you know, we've had good rapport with our doctors where we've had input saying you know, the resident is very tired of […], being so closely monitored blood sugars and you know he has been stable or she's been stable and we can prove to the doctor that there is this stability. So then that you know it's all documented. – RPN 4

However, there were cases in which the nursing staff conflicted with the physician orders. One barrier to care was the holding of insulin by nurses, as one nurse stated where:

They have a certain amount of insulin and what not, and they, we have orders to give the insulin, but we don't have orders to hold insulin if it's [CBG] lower than a certain amount… However, our physician does get irate when we hold insulin without an order. But, I have held it in the past, because I just, I don't feel comfortable giving insulin, at a certain, when their blood sugar is too low. - RN 3

When this particular issue was probed in another LTC home, it was not identified as a barrier. This was facilitated by the availability of the physician and the presence of trust in the nurse's judgement.

When we ran into a situation like that the nurses have usually made the decision to either if they called the doctor and can't get a hold of the doctor they uh go ahead and hold it, because it's ultimately the nurse that's responsible for giving it. So if somebody's at a 3 you're not going to give them a fast acting insulin they'll bottom out. So it's good nursing practice and uh, there is

not really any serious conflicts with the doctor when that has taken place. He generally, they all generally support the decisions that have been made at the time. - RPN 6

Continuity of the nursing staff, specifically having regular staff, was mentioned as a facilitator in diabetes management as it allowed for a better understanding of how to individualize diabetes control for residents beyond blood glucose readings.

But I do see that where this is normal for this person. […] So I think sometimes we don't look at the whole picture. We're not looking at symptoms; we're not looking at lifestyles, other factors. […] No I think our staff is fairly good, they look at symptoms as well. Especially if you have regular staff providing medications and dealing with our diabetic residents, they get to know our residents and how to manage their diabetes. – RPN 5

Given the value of regular staff, high nurse turnover in LTC was identified as a barrier to resident care by the nurses. However, one nurse noted the presence and continuity of the physician as facilitator that mitigated the challenges of high nursing turnover. Since management was generally left up to the physician, nurses felt that the ability of the physician to understand the history of the resident and his/her receptiveness to nurse observations would result in optimal management, even in light of the high nurse turnover.

It's really the doctor you're dealing with and I'm just fortunate we have an excellent doctor who knows the residents. I've heard horror stories from other places, you know where doctors don't listen, doctors don't really come, they don't know the person. One of the things I find with this home is […] the nurses' turnover pretty quick here. […] But the physician we have had forever and from what I know our management has done very well. […] As long as we have those doctors who know their residents, its seems like everything kind of follows with that.[…] Because you can have the best nurses on board, everybody on board, but you have, your physician's rotten and they don't want to listen to you then it doesn't really matter. - RPN 7

Overall, the dynamics between the nurse and the physician can act as both a barrier and a facilitator in diabetes management. Harmonious relationships were often a result of adherence among nurses to the physician's orders as well as physicians responsive to the nurses' observations and bedside experiences. In other cases, these relationships were conflicting due to a lack of communication, trust and availability of the physician.

Allied Health Professionals. There are both dietitians and pharmacists who work closely with nurses in diabetes care. Both these health professionals can be a source of information for nurses as they are specialized in diet and medication management for the residents. These professionals are also considered a source of support for nurses in reasoning for a different course of action in the residents' care plan with the physician. The dietitian played a central role in the management of diabetes in residents in LTC. One LTC home had a policy in place that required the nurses to contact the dietitian for residents that had a hypoglycaemic event or were at risk of hypoglycemia. Many of the nursing staff worked collaboratively with dietitians in managing a resident's diabetes, and were considered specialists in the view of some nursing staff. This was also true for the pharmacists, who were used extensively as resources for information on diabetes medications.

> The pharmacist, our pharmacist is fabulous… Yeah she's, we're very lucky to have [..] a pharmacy consultant that comes out every week to basically go through our residents that are on RAI and any other questions that we have, she'll answer them right away and she's, she definitely facilitates care of not only our diabetic residents but all of them. – RN 3

> Oh they're very good, […] they'll speak with the residents about the diet, they'll reinforce [it] that way. The pharmacy, if we have any questions, they're right there, they're just a phone call away, and they will help us with any kind of questions that we have about the insulin, things like that. - RN 2

Both the pharmacist and dietitians make recommendations to the residents care plan, which from the nurse's experience, are valued by the physician.

> Yes, yeah they both do. And of course everything has to be OK'd by the doctor. Technically they can make a recommendation but the doctor has to OK it. Usually, whatever the dietitian or the pharmacist recommends the doctor goes along with it [because] they're specialists. - RPN 6

Occasionally, nursing staff use the input from dietitians and pharmacists to support or corroborate their concerns with physician orders.

Well probably and maybe pharmacists too, the pharmacists usually have some excellent recommendations and with insulin types and monitoring blood sugars and labs. So sometimes we see conflicts with the physician's decisions and the nursing and pharmacy. – RPN 5

When probed on how such conflicts where resolved, the pharmacists was a resource in supporting a certain observation or suggestion.

As long as we present, from the nursing background, as long as we present supporting evidence to our physicians, for reason to either change a medication or monitoring, then he's pretty receptive. – RPN 5

This quote by the nurse consultant illustrates the role of pharmacists, dietitians, and nurse practitioners, especially those specialized in diabetes care, as sources of support in the event of different positions in setting the diabetes care plan of residents. This specific example illustrate cases where the nursing staff feel that the level of monitoring is unnecessary:

There are some physicians that insist on [monitoring] 7 days a week and we really have to work with those physicians when you are dealing with a diabetic who has end-stage prognosis of death within the next six months. […] We have to work by physician orders. So there are some struggles; we work with our pharmacists to work with physicians whom we have a struggle when we're trying to move the physician into another mind set with the diabetic. We do have a couple of nurse practitioners in a couple of our homes that are very well versed in diabetes, and we have some pharmacists that are specialists with diabetes. So we draw upon their knowledge and skill sets to help. The other pharmacists can draw upon them. We have some dietitians that are skilled at diabetes, so our consulting dietitians have a group that they can consult with as well. – NC

Personal Support Workers. Personal support workers (PSWs) were mentioned in only three interviews, two of which were nurse coordinators for one LTC facility. The general experience with PSWs from these interviewees was their integral role in the effective management of residents. Recognizing any changes in the resident (i.e. appearance, behaviour) began with the PSW, which then if they were relayed to the nursing staff could be used to adjust the residents care plan:

Yeah they may notice that Mrs. X is all of a sudden drinking 3 or 4 glasses of water a shift more. We know that's a good trigger, so that would be a time, ok well let's start checking the blood sugar a little bit more often…It's like a domino effect. If one level picks up one thing it goes to the next and then its caught and it goes up to the doctor. - RPN 6

In addition to status changes, PSWs held valuable information regarding the resident's preferences and care goals, as one nurse noted that:

They know a lot more than any of us right now, because they're with them every day. They know the important things. You know we may know how much insulin to give them in the morning but they know what makes them happy. And when you're 90 years old that's all that matters. So that's where they are the most important. - RPN 7

As a result, these nurse coordinators took an active role in involving the PSW in the resident care plans:

…Even a year ago, they didn't even know they could touch the charts, that's something we're trying to tell them get into the charts, go through it, add what you want to it. Because they do know the residents the best. I mean for me to sit here and do a care plan for somebody I'll try my best, but I'm not with them every morning, they are. - RPN 7

Both nursing coordinators found that the sharing of information between all front-line staff was a facilitator to effective management of LTC residents, as it allowed all members of the care team to be informed of any changes in the resident, which would in turn result in more appropriate decision making and responses to poor blood glucose control. Examples of the benefit of this in diabetes management were awareness of a residents eating habits, as well as the recognition of irregular symptoms in residents that require follow up.

We have every shift here something that we call a huddle. Every shift, every floor, every day. Yeah it happens with the resident staff, the PSWs, the housekeeper, the manager, they're all in on it. It's using daily dialogue for the residents […] that daily we have a chance to talk about any resident presents a specific problem. We had a resident recently who spiked a blood sugar, but through having a team talking about it together they were able to find out that yes actually the staff member gave the wrong dessert. – RPN 6

Conclusion for Theme 2. Diet management of residents, whether it is unpredictable diet intake of resident or the consumption of unhealthy snacks, significantly hindered diabetes

control. This was addressed by the LTC staff by educating residents and families, however, diet choices made by the resident and family was seen as a variable outside of their control. As a result, the outcome of unpredictable diet intake generally resulted in increased blood glucose and symptom monitoring. Dementia was presented as a complicated barrier to diabetes care among nurses, as there is a tension between the need for both increased (due to variable intake, inability to communicate, etc.) and reduced blood glucose monitoring (due to aggressive behaviours, discomfort etc.). Ultimately, nurses felt that residents with dementia required highly individualized diabetes control and monitoring solutions. Furthermore, open communication between the physician and nursing staff was a finding that was central to ensuring that physician's orders for diabetes control and monitoring reflected what nurses experienced from residents. This openness included both the availability of the physician and their receptiveness to observations and concerns made by the nursing staff. The role of pharmacists and dietitians was highlighted as a facilitator for the nursing staff, and were utilized as important educational resources regarding the treatment of diabetes (by medication/diet). Finally, PSWs hold integral information regarding the preferences and care goals of the resident, making them integral to the care plan of residents. However, although there is a need to have PSWs further included in the care plan of residents, there is the concern among nurses regarding their already heavy workload in LTC duties. Ultimately, increased opportunities for communication between all members of front line staff improves the ability of the care team to appropriately react to unpredictable/unstable residents.

Theme 3: Education. When asked what would help facilitate diabetes management, more education was the prevailing response among RNs and RPNs. Recipients of more education

efforts noted by nurses included the nursing staff, residents and family members, and personal support workers.

I would say everyone, well mainly the nursing staff giving direct care. So we got our registered staff, we have our personal support workers. – RPN 5

For the nurses, interviewees specified education specific to the treatment and monitoring of LTC residents. Nurses noted difficulties in sorting through new insulin drugs and regimens, and appreciated resources and support in this area of education.

And then of course it was only a few years ago they came out with the Lantis, Solo Star and the Epidra. When that came out we had extensive training from the actual supplier that came in and showed the different skills and how it works, […] So I think that kind of information on a more consistent basis, maybe even getting the different manufacturers would be of a real benefit too. - RPN 6

Furthermore, nurses wanted more guidance on what to look for in resident's diabetes beyond their blood glucose readings. Given the higher threshold blood glucose control in elderly LTC residents, nurses wished to be better equipped in recognizing the signs and symptoms of diabetes specific to older adults in the LTC population.

Maybe more guidance on types on insulin, I know there are some many insulin's on the market…We like to also go by symptoms, if they are symptomatic, if they are not ok [and] have a high reading because maybe they always have a high reading with that particular resident. […] And I know they've changed that as well. So it would be nice to look at more resident specific, including symptoms. – RPN 5

Signs and symptoms, what to watch for, especially for the people on the floor, the frontline workers. - RPN 6

One LTC, which received previously diabetes management workshops, expressed the preference of workshop formats as much more helpful method of learning appropriate diabetes management and keeping up to date to management practices in LTC.

I would love to have train[ing] once a year just to refresh your memory. Lots of times, like if there is new insulin, or just stuff like that. Because the, there was this lady… the best I've ever had. […] they talk at a level you understand, it's not all big words, and you know […] runs through scenarios, if you're seeing this, then do that, and that would be helpful. - RPN 3

More support for education for nursing staff. More active education would be great because you have to remember our nursing staff we have a lot of RPNs, which they don't have the depth and knowledge that an RN would have. The RN was born in a supervisory capacity. - NC

Nurses also noted the need to educate family members regarding individualized diabetes management in order to improve adherence and understanding. Given the challenge of managing diet in LTC, nurses felt that they needed more support in informing family members regarding diet:

It's important to keep families up to date and, and I mean, provide them with that education. Because not everyone understands the way, medical conditions, the way you know we as health care professionals do, so it's important to include them in the individualized care of the resident. – RN 1

Actually, you know what one of our biggest problems [is], the family members. I would say that is the biggest one. I mean we can have everything under control here and they'll come in and give them like cookies and cakes all day. I guess I feel like if there's some more educational opportunities not only for the staff but for family as well. […] Yeah, I guess more, absolutely we need more help in that area. We need more help in all areas. - RPN 7

Conclusion for Theme 3. Nurses felt that increased education would greatly facilitate diabetes management in LTC homes. This included an understanding of diabetes related medication and an update on optimal diabetes management. Active education through workshops and formal educators was seen as the most beneficial. Within the LTC home, strategies to better educate residents and family members was seen as a possible solution to better compliance in care, specifically around a residents diet intake.

CHAPTER 6 – INTEGRATED RESULTS

This chapter focuses on the integration of both the quantitative and qualitative results. Both the quantitative and qualitative phases of this study were conducted concurrently. The results were analyzed independently for each section, this first level of data integration would be to cross reference the findings between the survey of medical directors and physicians. These findings will then be reviewed with the qualitative data of the nurses.

Three key highlights from the integration of the survey with the in-depth interviews include (1) the parameters for blood glucose control (2) the process of individualizing care, and (3) considerations of pharmacotherapy. Within these three topics, the in-depth interviews found concordance between the survey results and provided a better understanding of the processes of blood glucose control in LTC. Thematic analyses of both the physician and nurse interviews resulted mostly in concordance. However, there were some instances where the different perspectives of interviewees produced results that lacked concordance, which further illuminated the potential of other conclusions. Refer to table 11 for an integrated comparison between the findings of the survey and the in-depth interviews. Implications of integrated results are addressed in the discussion.

Table 11. Integrated analysis between physician qualitative findings and survey.

List of quantitative survey findings	List of Qualitative findings from in-depth interviews
-50% of medical directors did not refer to a clinical practice guideline (CPG) for diabetes management within LTC.	Concerns with CPG's for LTC residents are that their recommenda and have a limited evidence base. CPG's for diabetes in LTC useful in confirming clinical experienc
- Variance in opinion in blood glucose parameters and targets in LTC residents -A1C of 8% most common target, with variability in targets of 7.5%, 8.5%, 9.0%	Physician and nurse appreciation of less stringent blood glucose co Tighter goals were pursued by some physicians if possible Different opinions among physicians in the benefit of stringent blo
-Life expectancy, hypoglycemic risk, quality of life, and comorbidity all very important	Variance with physician experience with hypoglycemia in LTC. Quality of life most important consideration in individualization (i preferences) Unpredictable diet intake increased the level of blood glucose mon
-High blood glucose (10mmol/l -14mmol/l) and symptom management (parameters up to 15-20mmol/L range) considered in residents of varying life expectancy (<2 years to <6months)	Most physicians and nurses more concerned with stability of blood resident rather than level of hyperglycemia
-Variable importance of existing diabetes complications on blood glucose control	Individualization primarily based on life expectancy, residents qua resident/family preferences Some physicians recognized need to address preventable cardiovas
-Stringent blood glucose control not very important in presence of dementia or frailty	Dementia determinant of limited life expectancy Dementia results in barriers to administration of complex blood glu Dementia may result in increased monitoring Nurses struggled with dementia due to reasons of variable intake, b adherence to treatment and monitoring Poor communication in residents with dementia a reason for relaxe and increased blood glucose monitoring
-Insulin often considered in LTC residents -Sliding scale regimens rarely used/considered in LTC - Insulin monotherapy sometimes considered - Combination oral and insulin therapy used often -Thiazolidinedione rarely considered in LTC.	Sliding scale considered less in LTC Complex insulin regimens (short + long acting insulin) commonly while some physicians actively attempted to avoid complex multi- long acting insulins) if possible
	Majority of physicians reported collaboration with nurses, dietitian Pharmacists and dietitian viewed as key players in LTC manageme
	Physicians displayed varied levels of awareness of the demands of staff time. Yet, the demand of diabetes on staff time was seen as a management by nursing staff. Nurses, pharmacists, and dietitians were sometimes viewed as driv monitoring and diet restrictions by some physicians Nurses will check residents blood glucose outside of scheduled tim concern Pharmacists sometimes differ in recommendations with physician Specialist access for LTC residents was limited and seen by some aggressive blood glucose control

	Continuity and availability of physician mitigated challenges assoc turnover Open communication with physician key in facilitating appropriate Opportunities for information sharing greatly improves symptom r PSW key member in reporting status changes in LTC residents wit Pharmacists key information resource for nurses on diabetes treatm Key role for health professionals with expert diabetes knowledge a management in LTC	
	Need for increased education for nursing staff, family members, ar needed in areas such as (1) signs and symptoms of hyper and hypo residents (2) Differences between insulin types (3) Impact of diet. Leadership from physicians in bedside education and active educat (workshops) identified as facilitators	
	List of Qualitative findings from open ended survey questions	
	Barriers to care	Facilitat
	-Variable diet intake -Staff education and training -Family expectations -Poor resident diet choices -Over-testing by staff -Resistance to testing/treatment -Specialist recommendations inappropriate for LTC	-Adhere -Dietitia -Access

CHAPTER 7- DISCUSSION

The purpose of this study was to review the current practices and underlying processes of blood glucose control in elderly LTC residents, as well as the experiences of physicians and nurses in managing T2DM in elderly LTC residents. The study conducted a cross-sectional survey of attending physicians and medical directors across Ontario in order to explore the current practices and processes of blood glucose control in elderly LTC residents. In addition to this, in-depth interviews of physicians and nurses working in LTC homes was conducted in order to explore their experience of managing T2DM in LTC.

In terms of the research question concerning the current processes and protocols in place for blood glucose control, this study had several key findings. This study found that almost all physician respondents within the survey and in-depth interview consider less stringent blood glucose control in LTC residents, however, there is variance in what they consider to be less stringent. Almost half of surveyed physicians did not refer to a clinical practice guideline for diabetes management within LTC. Life expectancy, quality of life, and resident and family preferences were the overall key processes of individualizing blood glucose control in LTC residents, while the presence of dementia and the management of residents' diet were considered the predominant barriers to optimal management. This study also highlights the importance of inter-professional communication and collaboration within LTC, as well as a need for ongoing education for diabetes management in LTC.

Overall, three considerations have been made discussing the findings of this study. (1) What are the implications of the study results for health care professionals and researchers in managing blood glucose in LTC residents? (2) What are the strength and limitations of the study,

and what implications do they have on study findings? (3) What are implications of this study for further areas of research?

Limited Evidence of Blood Glucose Control LTC Residents

LTC residents represent a complex population with increasing levels of frailty and poor functional status, multiple comorbidities, and limited life expectancy. Although the need for less stringent blood glucose control within this population is recognized, there is limited evidence that explores the range of blood glucose control levels that lead to the best outcomes within this special population. Clinical practice guidelines that address this population have recommended less stringent blood glucose control targets based on expert consensus. However, some recommendations are more liberal than others. Although the majority of medical directors reported having internal LTC policies in place for blood glucose management, close to half did not refer to a specific clinical practice guideline. The respondents who explicitly endorsed a specific clinical practice guidelines, often endorsed the guideline that were more in line with their clinical experience. This may suggest variable standards of practice for blood glucose control and monitoring in Ontario LTC homes.

Goals of Blood Glucose Control in LTC Residents

The findings of this study illustrate a general appreciation for avoiding the hazards of stringent blood glucose control in LTC residents. This finding was triangulated in both the quantitative survey, with 62.9% of respondents selecting A1C targets of 8% or higher as being appropriate for LTC residents, and in the qualitative interviews of both physicians and nurses. Within the limitations of this study, these findings show a shift among physicians and nurses towards less stringent blood glucose control for elderly LTC residents. However, there was great

variance regarding what blood glucose targets physicians were willing to consider. The most considered A1C value among physicians was a target of 8% and under. Following this value, there was still a high level of variance between the A1C targets of 7.5%, 8.5%, and 9.0%. These results reflect the variance seen in targets set by various CPG guidelines regarding appropriate blood glucose targets in older adults and LTC residents. Given that current evidence of appropriate diabetes control in older adults and those in LTC are based on expert consensus, different CPG guidelines have concluded on relaxed A1C blood glucose targets ranging from <7.5% to <9%. From the in-depth interviews, there was divergence between what physicians felt were the ramifications of sustained hyperglycemia within their frail residents. Whereas some physicians were not concerned with hyperglycemia that was not symptomatic in frail residents with a limited life expectancy, other physicians still felt the importance of preventing hyperglycemia in frail residents, as they felt it was still related to adverse acute outcomes in that specific population.

One notable finding in this study was that 50% of surveyed physicians considered an A1C of 6.5% or under as the lower limit at which point physicians would re-evaluate a residents diabetes control, which may be too low a consideration in LTC residents. Many CPGs have suggested a more targeted A1C goal with a lower A1C limit of 7% (ADA, 2015; AGS, 2013; CDA, 2013; IDF, 2013). Although the risk of hypoglycemia was a chief consideration in deciding on blood glucose control for LTC resident with T2DM, interviewees in this study reported contrasting experiences with the incidence of hypoglycemia in LTC. This finding reflects the literature that has found variable prevalence of hypoglycemia in LTC homes. It is not clear whether the lack of hypoglycemia is due to variances in the clinical characteristics (age, dementia, frailty) across different LTC homes or variances in the management of blood glucose

control and treatment. However, it is important to note that hospitalizations due to diabetes are infrequent amongst LTC residents (Davis et al., 2014; Grunier et al, 2010). This may be due to the ability of treating cases of hypoglycemia within the LTC home. Hence, it may be more appropriate to assess the use of anti-hypoglycemic agents as an indicator of inappropriate blood glucose control in LTC residents rather than hospitalizations.

Individualization of Blood Glucose Control

Ultimately, physicians relied on their clinical experience and nursing assessments in considering a variety of resident factors in order to best individualize diabetes care for each resident. There was similarity amongst interviewed physicians in the individualization process used to select appropriate target for LTC residents. Life expectancy, quality of life, and the resident's family care goals were the primary considerations when individualizing diabetes care.

Among physicians, the presence of cognitive impairment and frailty were key indicators of a limited life expectancy, which was a key determinant of less stringent blood glucose control. This finding is confirmed in the literature, with research finding that physicians are less likely to treat residents with cognitive impairments and functional decline (McNabney et al., 2005). Life expectancy, was assessed through the physician's clinical impression of cognitive decline and increased frailty, rather than the use of any tools to assess life expectancy in their residents. However, there is growing evidence for multiple tools used in LTC for increasing the accuracy of life expectancy in LTC home residents. For instance, the MDS-CHESS scale has been shown to further predict mortality risk in LTC residents with cognitive impairment (Hirdes et al., 2014). This further level of differentiation within the LTC population may serve as a tool for better informed clinical decisions. Furthermore, explicit recognition of physical frailty is an important step to limiting the hazardous affects for intensive treatments and preventing further vulnerability

(Morley et al., 2013). Formal assessment and recognition of frailty through validated tools may aid in improving the quality and appropriateness of diabetes care in this complex population.

Resident care goals, and in many cases family care goals in resident that are cognitively impaired, are essential in optimizing the quality of life of residents. Outside of LTC homes, older patient preferences for the intensity of diabetes management are varied, indicating the importance of consulting patient preferences (Brown et al, 2008). From our qualitative analysis, physicians and nurses perceived that family preferences for residents were generally in agreement with reducing the intensity of diabetes control when deemed appropriate. Although infrequent, physicians noted experiences with families that had preferences of more intensive diabetes treatment regimens. In these cases, younger family members with diabetes, specialist recommendations, and newly admitted residents with a history of poor glycemic management in the community were factors which physicians perceived as influencing family preferences for more intensive diabetes control. All these factors can be mitigated by increased levels of communication and education with the resident and family in order to set appropriate expectations for diabetes control. Overall, resident families were not seen as barriers to the transition to less stringent management, which was explained by the physician's continuous level of involvement and communication with the family of the resident and the history of progressive adjustments to the residents care.

Barriers to Less Stringent Management

Given the appreciation of less stringent blood glucose control, this study highlighted barriers to the appropriate management in elderly LTC residents despite the appreciation of the health professional staff in providing relaxed blood glucose control and monitoring.

Blood glucose instability was seen as a determinant of increased monitoring in LTC residents, despite a less stringent approach to blood glucose control. Challenges of a resident's diet greatly complicated diabetes control from the perspective of the physician and nursing staff. The two primary challenges present with diet in LTC residents include 1) the variable intake of residents and 2) the consumption of foods/snacks that were considered poor diet choices in regards to blood glucose control. Previous literature has found under-nutrition to be correlated with cognitive and functional decline, and considered a significant predictor of one-year mortality in LTC residents (Torma et al., 2013). From the perspective of the physician's care plan development, reduced intake signified frailty and overall decline in residents, resulting in reduced diabetes treatment and control. A key challenge with variable intake was insulin administration, with many nurses concerned or reluctant in administering insulin in residents with unpredictable eating behaviours (i.e. loss of appetite, behavioural issues). Both physicians and nurses felt limited in their ability to maintain healthy eating habits among residents with diabetes. Food enjoyment is a significant predictor of nursing home satisfaction and quality of life (Burack et al., 2012). This was recognized by the interviewed physicians and nurses, who felt were unable to prevent poor eating habits driven by the resident and/or family, as it would potentially have a negative impact on the resident's quality of life.

The survey found that combination therapy of oral and insulin therapies were considered more often than insulin alone. This finding can be possibly explained by the need to reduce the risk of hypoglycemia in LTC, as combination therapies of oral and insulin therapies may result with a reduced risk of hypoglycemia, as opposed to stopping oral agents and administering insulin alone (UKPDS, 1998). Some physician's practice reflected the avoidance of complex insulin regimens in order to prevent administrative errors and inconsistent blood glucose control.

The Nova Scotia Diabetes Guidelines recommend that frail LTC residents should only be under the administration of basal insulin, and rapid acting insulin should be avoided (2010). Within this study, the majority of physicians did not consider, or rarely considered the use of sliding scale insulin regimens (SSI) in LTC. This result was also triangulated in the qualitative interviews, with physicians and nurses stating the infrequent use of SSI in LTC due to the resulting instability in a resident's blood glucose control. One study postulated that unawareness of the ineffectiveness of SSI's by physicians and nurses may be a reason for the inappropriate use of SSI regimens (Browning & Dumo, 2004). However, the findings of this study does not suggest that this is the case for LTC physician and nursing staff. Reasons for increased SSI use in LTC may be a continuation of prescriptions of SSI regimens done in a hospital setting or in the community.

Inter-professional Collaboration

Previous research has characterized LTC homes as complex adaptive systems, in which multiple systems and individuals interact in a non-linear way, resulting in processes that are dynamic rather than static (Anderson et al., 2003). Hence, optimal LTC management under this conceptual framework requires members of a system to "self-organize" or adjust together in order to adapt to unpredictable demands on a system (Anderson et al., 2003). The implications of such a model of care on blood glucose control in LTC is evident, where most residents require individualized care based on multiple factors that can become unstable or unpredictable due to certain barriers to care (e.g. frailty, dementia, diet). Therefore, management practices that improve the ability of teams to self-organize would ultimately result in better system outcomes. Nursing management practices such as open communication, participation in decision making,

relationship-oriented leadership and less formalization in professional roles were found to produce better resident outcomes (Anderson et al., 2003).

Among 5 indicators of communication quality (i.e. timeliness, accuracy, understanding, effectiveness, and openness), a study by Huang and Garret (2012) found that synchronous, or real-time communication methods within the LTC environment, was most effective in achieving all markers of communication quality in resident centered LTC facilities. The importance of synchronous communication in improving inter-professional collaboration is a finding highlighted in this study. One nursing home employed a 'huddle', or a daily group meeting before every shift between management, health care providers, and service providers, in order to provide an avenue for information sharing in regards to any resident specific or team specific concerns. The importance of including multiple perspectives here was perceived to elucidate information on LTC residents that was not always available to all staff members, which in turn resulted in decisions that more accurately accounted for patient preferences, acceptable causes for high blood glucose readings, and the recognition of symptoms of hypo and hyperglycemia.

One interesting finding was the varying level of awareness of physicians of the time involved in decisions blood glucose control and monitoring. Diabetes in LTC has been reported to take a significant amount of nursing time, a finding that was supported in this study. Whereas some physicians did consider this in their care plans, one attending physician was unaware of the impact of blood glucose control decisions on front-line practices. Inter-professional skills that foster relationship-oriented leadership are an important enabler of self-organization that has been shown to result in better resident outcomes in LTC (Anderson et al., 2003). This finding suggests a need for more inter-professional training of physicians that attend LTC homes.

The role of pharmacists varied across LTC home interviews, yet overall, pharmacists were important sources of information for the nursing staff. Availability of the pharmacist in the nursing home and openness of communication were characteristics attributed to resourceful pharmacists from the nurses' perspective. Nurses rely heavily on pharmacists for resources for medication administration, and previous research has called for improved access to pharmacists by the nursing staff (Kaasalainen et al., 2010). Among the physician interviews, physicians noted collaboration with the pharmacist in residents' medical reviews. These results highlight the potential role of pharmacist as champions in updated diabetes education and practices. However, institutional barriers, and barriers of professional scope, may inhibit the capacity for pharmacists to be involved. For instance, in house meetings have been noted as a barrier for pharmacists in Ontario LTC homes (MacDonald, Stodel, & Chambers, 2008). Hence, changes and considerations to the LTC model of care need to be addressed in order to support inter-professional practices that allow all LTC professionals to better adapt changes in resident care, which will ultimately lead to better outcomes in chronic disease management.

This study also found within nurse interviews that the availability of the physician for contact and the physician's openness to considerations of nurses (i.e. withholding insulin), was seen as a facilitator to better blood glucose control. However, from the physicians perspective, inconsistent education levels of the nursing staff was seen as a barrier by some physicians in trusting nurses with decisions of insulin.

Role for Education

Both physicians and nurses identified ongoing education as a key area of development that would better facilitate appropriate care for older adults with diabetes in LTC. Physicians noted variance in the educational level of the nursing staff, specifically in knowledge regarding

various types of insulin. High LTC nurse turnover, the influx of relatively knew nurses in LTC, and the changing environment for LTC diabetes management are clear reasons in making recurring opportunities for education important. This was supported amongst the interviewed nursing staff, who expressed a need for ongoing opportunities for diabetes education. This finding is also consistent with studies that have identified variable levels of diabetes knowledge among nurses working in LTC (Argawal et al., 2014; Smide & Nygren, 2013). Priorities in educational endeavours identified by nurses included recognizing the physiological manifestation of symptoms of hyper and hypoglycemia in elderly LTC residents, ongoing education on diabetes medications (i.e. understanding the differences and administration of various insulin's), and guidance in dealing with residents with dementia. The first two concerns have been documented in recent literature with physician and nurses regarding diabetes management in LTC (Argwal et al., 2014; Boyle et al., 2013).

This study also identified different methods and opportunities for education in LTC homes that were considered effective and appropriate from the experiences of physicians and nurses in LTC. Bedside education was reported by one physician, as an effective opportunity for physicians to provide resident specific diabetes education to other LTC staff. This is a positive finding, as previous literature have identified opportunities for bedside education as an enabling factor to effecting behaviour change in LTC (Stolee et al., 2005). Among the nursing homes interviewed, one home provided workshops for nurses for managing diabetes in LTC residents. Nurses from this home outlined the benefit of workshops as an effective education method, improving confidence in diabetes management in LTC. Adapting the workshop to the educational background of the nurses (whether RN, RPN, etc.) and offering the workshops within the LTC facility were factors that were reported to making these workshops effective, a

finding also supported in the literature (Stolee et al., 2005). Overall, consistent opportunities for education for the nursing staff are needed to maintain quality of diabetes knowledge, in order to better enable staff to optimize blood glucose control in elderly LTC residents.

Study Limitations

The findings of this study must be interpreted within the several limitations of this study. For the survey, the completion rate was 59.1%, which may indicate limitations of scope that prevented some physicians in answering fully. The scope of the survey was developed in order to understand the parameters of blood glucose control in older adults in LTC. Some physicians found it difficult to generalize their targets to the LTC population as it was seen as a highly diverse population with individualized needs. However, the questions devised within the survey regarding blood glucose targets were aimed to explore the parameters physicians were willing to consider. Hence, although some physicians felt that a goal of 7.5% was an appropriate A1C target for residents in LTC, it does not capture whether they were willing to consider higher targets in various residents. However, this study did capture the variations in targets physicians felt were appropriate in LTC residents. Also, with an overall sample size of 39 respondents, the results of the survey cannot be generalized, to Ontario LTC physicians. Furthermore, as the majority of survey responses were sampled from members of the OLTCP, there are potential limitations to be considered within this study population. The OLTCP works as a membership organization with the mission of supporting LTC clinicians with continuing education, advocacy, and peer support (OLTCP, 2015). Hence, it may be that responses from the OLTCP may be better informed by up to date LTC practice, which may not necessarily reflect opinions and practices of non-member physicians and directors in Ontario. This potential bias also extends with the over representation of medical directors to attending physicians.

Another limitation of the study was the inability to conduct a test-retest to establish reliability. Given that the survey responses did not collect respondent identifying information, the survey requested whether respondents would be willing to take part in a re-test of the survey, in order to test reliability of the responses given. The study was unable to conduct a test-retest given the small number (seven) of willing participants. As explained in the methodology, the minimum theoretical sample size required in order to test whether a measure has satisfactory reliability (ICC=0.7) within 95% confidence intervals is 18 participants (Walter et al., 1998). Hence, the survey results must be interpreted under the caution that survey respondents may not be consistent with their responses over time. The timing of the survey must also be considered in light of the findings. Since the survey was released a few months following the release of the 2013 CDA CPG for diabetes, it may be that some respondents wished to conform to the new guideline recommendations.

Question 16 of the survey, which collected information of the importance of stringent blood glucose control in light of select comorbidities should be interpreted with caution. The goal of that question was to review the need for stringent blood glucose control in comorbidities that were considered to limit a resident's life expectancy in LTC (i.e. frailty, congestive heart failure) or resulted in risks of stringent diabetes control (i.e. falls). One respondent commented that they selected stringent diabetes control in most of the presented comorbidities, since stringent blood glucose control would complicate conditions such as falls, frailty, dementia, etc. Hence, the final question appeared for some respondents to not be completely clear and still have some room of interpretation.

In addition to the surveys, the in-depth interviews must also be considered in light of certain limitations. The foremost assumption being that under an interpretive description methodology,

or any qualitative method, results are not intended to be generalized to the entire population. Rather, it is meant to bring us closer to the clinical context in which phenomena occur (Thorne, 2008). Hence, these results are not intended to be generalized to all LTC homes, rather they are meant to give insight as to what might be experienced across LTC homes. Secondly, given the focus of this study on a specific research population, primarily physicians and directors of LTC homes, there were some challenges in terms of a limited research sample. The nature of qualitative research reduces methodological issues posed by a small sample size. Although the interpretive description does not prescribe a specific sample size for qualitative interviews, it is important that the qualitative analysis reaches data saturation. The challenge, as a qualitative researcher, is to organize the themes and categories in a coherent professional narrative that maintains the complexity and the integrity of the ideas and their meaning conveyed by the participants. Although saturation was achieved on some aspects of our study (themes), inconsistencies in the themes could have been addressed and further clarified in additional interviews. Another limitation was the ambitious objective of this project. Recruitment of physicians were difficult to attain in this study, hence the sample size of five physicians mostly reflect constraints in time rather than data saturation.

Another potential bias to report were the differences between the study participants. For the physician interviews, the majority of respondents were attending physicians who were also medical directors in at least one LTC facility. Only one physician was only an attending physician from the community. It may be that the overall appreciation for less stringent blood glucose control was a result of this specific characteristic of study participants, and that interviews of attending physicians from the community may yield different results.

Furthermore, the results of this study reflect the reports of participants and not the actual practice of LTC homes. Hence, the results of this study cannot be used to assess what the actual practices of blood glucose control are in LTC homes.

Study Strengths

This study includes multiple strengths. Firstly, given the variance in guidelines in treating diabetes in elderly LTC residents, there is no research in Canada that explores the current perceptions of blood glucose control in LTC residents. This is the first study to address this paucity in the literature. This study developed a survey, which is the first of its kind, in order to address the current processes of blood glucose control in LTC residents. Furthermore, this study confirms multiple barriers to care within the LTC environment, some of which are not specific to diabetes, which must be addressed in order to achieve appropriate and optimal care in this complex population. Finally, this study provided an ambitious mixed methodology in order to provide a more in-depth understanding of blood glucose control in LTC. Many findings within this study have been triangulated from multiple sources and perspectives including medical directors, attending physicians, directors of care, registered nurses and registered practical nurses, providing insight from multiple perspectives and increasing reliability within the study.

Implications and Further Research

This study highlights the need for more research regarding blood glucose control in LTC in order to provide a higher standard of appropriate diabetes care in LTC residents. There are multiple implications from this study that can direct further research. Firstly, future researchers should follow up on the limitations within this study in order to better answer the current practices, processes and experiences of blood glucose control in LTC residents. Although this

study provides insights in regards to physician opinions and processes of blood glucose control, the study sample is small. Future studies in this area could assess a larger population of Ontario LTC physicians, and may extend beyond specific membership organizations such as the OLTCP in order to limit potential related biases. An extension of this, considerations should be given to adequately representing attending physicians of varying LTC experience, as they were under-reported within this study. Secondly, future studies should study other key individuals within the LTC environment that are essential to informing the experiences of blood glucose control and overall diabetes management within LTC. Key individuals highlighted within this research who play an important role in blood glucose management include PSWs, residents and family members, dietitians and pharmacists. PSWs were reported in this study as key players who held valuable information in observing status changes in residents, as well as information regarding resident preferences and care goals. Future research exploring the experiences of PSWs can improve our understanding of the manifestation of blood glucose control symptoms in LTC residents, as well as barriers and facilitators in order to inform how to best engage PSWs within the frontline of care. Pharmacists in LTC is another group that plays a key role in informing blood glucose control and monitoring in LTC. In-depth interviews and focus groups could be conducted in order to obtain beneficial information in understanding the perspectives of pharmacists in advising for blood glucose control and monitoring in LTC residents.

In addition to these implications future studies should also consider in substantiating evidence for blood glucose control in elderly LTC residents. The lack of randomized control trials establishing safe and appropriate blood glucose targets in elderly LTC residents has resulted in physicians mostly relying on their clinical experience of appropriate blood glucose targets, which vary between physicians. This greatly impedes in setting any standards of care for

diabetes control as well as better identifying the individualization process for appropriate blood glucose targets in this special population. This gap in research is of high priority, given this disease is highly prevalent in older adults, and is prevalent in approximately a quarter in LTC residents. Research regarding the benefit of blood glucose control should go beyond long-term complications, and focus on acute clinical outcomes that are relevant to the risks within the LTC environment, including infections, falls, hypoglycemia, symptomatic hyperglycemia, and other acute complications related to hyperglycemia, ultimately to inform management that optimizes the quality of life of residents. Research has been growing in this area with recent publications by Yau and colleagues (2012) and Davis and colleagues (2014). Attention should also be given to the appropriateness and effectiveness of simpler insulin regimens such as long acting basal insulin in achieving optimal diabetes control in elderly LTC residents, as complex insulin regimens can be time consuming in LTC, increase the risk of administration errors among nurses and the risk of hypoglycemia in LTC residents. Future studies may also address current practices of diabetes management in LTC residents, to assess discrepancies between what physicians and nurses report (as ideal care versus actual practice). Finally, future studies should address methods to mitigate barriers to the care of residents in LTC outlined in this study. Considerations include caring for residents with dementia, dealing with resident behaviours, variable diet intake, and poor diet choices by the resident/family, and in improving inter-professional communication and trust between physicians and nurses. Future studies should assess the role of physician leadership and inter-professional relationships on outcomes in residents with diabetes. An expert consensus ranking the ten most pressing research priorities for LTC identified by included research on caring for residents with dementia and behavioural symptoms, improving nutrition, polypharmacy and improving resident's quality of life (Morley et al., 2014). This is reassuring as

these priorities are consistent with the multiple findings regarding blood glucose control within this study.

Conclusion

This study explored the current practices of blood glucose control as reported by physicians in a cross-sectional survey, as well as in-depth interviews with physician and nursing staff in order to understand the experience of blood glucose control in residents with diabetes in LTC. This study has contributed to the knowledge base of diabetes management in LTC in many ways. The findings of this study suggest a growing appreciation among physician and nurses in considering less stringent blood glucose control in elderly LTC residents. However, there is great variability in what physicians are willing to consider. Differences in opinion in setting appropriate blood glucose control are mostly based on clinical experience. Future research needs to explore the impact of hyperglycemia on acute outcomes in LTC residents, as well as factors related to the development of hypoglycemia in LTC residents. This study identified cognitive impairment and unpredictable food intake as barriers to maintaining the blood glucose stability of LTC residents with diabetes. Continuing education is needed among all LTC staff, including physicians, nurses, pharmacists, dietitians, and PSWs in order to improve diabetes management in LTC. Leadership opportunities among the physician and nursing staff in guiding education at the bedside, engaging PSWs within the care plan of residents, as well as a role for other health professionals such as pharmacists, were identified as avenues to improve education.

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Appendix

Appendix A: Search Strategy

Inclusion Criteria	Clinical practice guideline on diabetes management Includes a less stringent blood glucose target Includes the elderly (65+ years) within target population
Exclusion Criteria	Does not consider the LTC/nursing home population
Date	2000-Present
Search Strategy	
National guidelines included: 2	Canadian Diabetes Association (CDA, 2013) American Diabetes Association (ADA, 2015)
SUMSearch Strategy	
Search terms: diabetes 'AND' 'older adults'	
Guideline Search Results: 37	
Guidelines Included:6	American Medical Directors Association (AMDA, 2010) American Geriatrics Society (AGS, 2013) Diabetes Care Program of Nova Scotia (DCPNS, 2010) Michigan Quality Improvement Consortium (MQIC, 2014) Veteran Affairs/Department of Defence (VA/DOD) (2010)
Guidelines Removed:2	-MQIC 2014 (target population 18-75 years of age) -VA/DOD 2010 (Intended for primary care. Does not address LTC population)
Final guidelines included: 6	

Appendix B: Survey Questions

Participant and Facility Information

Role in LTC

- Medical Director
- Director of Care
- Attending Physician
- Other, please specify...

Years of Experiance in LTC

Facility Location

City

Sector Type

- Public
- Private (non-profit)
- Private (for-profit)

Section 1. Guideline Use and Compliance

1. Does your facility have a documented policy in place for diabetes management?

- Yes
- No

2. Does your facility have a documented policy in place for glucose monitoring?

- Yes
- No

3. Does your facility have a documented policy in place for diet management in residents with diabetes?

- Yes
- No

4. Do you refer to a clinical practice guideline (CPG) at your facility?

- Yes
- No

If yes, Name of Guideline

Comments

Section 2. Blood Glucose Testing and Management

5. For LTC residents, at what blood glucose value (mmol/L) do you intiate or alter pharmacotherapy?

Please select an UPPER limit

Fasting Blood Glucose (mmol/L) ---

Post-Prandial Blood Glucose (mmol/L) ---

6. For LTC residents, at what blood glucose value (mmol/L) do you intiate or alter pharmacotherapy?

Please select a LOWER limit

Fasting Blood Glucose (mmol/L) ---

Post-Prandial Blood Glucose (mmol/L) ---

7. What do you feel is an appropriate Hemoglobin A1c target for residents of LTC?

HbA1c (%) ---

8. For LTC residents, at what HbA1c values do you re-evaluate or adjust a resident's treatment plan?

Please select an UPPER limit

A1c (%) ---

9. For LTC residents, at what HbA1c values do you re-evaluate or adjust a resident's treatment plan?

Please select a LOWER limit

A1c (%) ---

10. Please select the importance of each measure for deciding on less stringent glycemic control in long term care residents.

	Not at all important	Not very important	Neutral	Somewhat important	Very Important
Existing Diabetes Complications	☐	☐	☐	☐	☐
Life Expectancy	☐	☐	☐	☐	☐
Co-morbidity	☐	☐	☐	☐	☐
Hypoglycemic Risk	☐	☐	☐	☐	☐
Quality of Life	☐	☐	☐	☐	☐

11. Please rank the importance each measure in guiding a decision of less stringent glycemic control in long-term care residents

	1st	2nd	3rd	4th	5th
Existing Diabetes Complications	☐	☐	☐	☐	☐
Life Expectancy	☐	☐	☐	☐	☐
Co-morbidity	☐	☐	☐	☐	☐
Hypoglycemic Risk	☐	☐	☐	☐	☐
Quality of Life	☐	☐	☐	☐	☐

12. For residents of LTC, at what life expectancy (LE), would you consider relaxing glycemic control to the following A1c targets?

A1c < 8% ---

A1c < 9% ---

A1c < 10% ---

13. For residents of LTC, at what life expectancy (LE), would you consider relaxing glycemic control to the following random blood glucose targets?

10-14 mmol/L ---

15-20 mmol/L ---

Section 3. Pharmacotherapy

14. For LTC residents, how often do you consider using the following pharmacological agents?

	Always	Often	Sometimes	Rarely used	Not Considered in LTC
Metformin (i.e. Glucophage, Glumetza)	☐	☐	☐	☐	☐
Sulfonylureas: Glicizide	☐	☐	☐	☐	☐
Sulfonylureas: Glyburide	☐	☐	☐	☐	☐
Thiazolinodines (i.e. pioglitazone/Actos, Rosiglitazone/Avandia)	☐	☐	☐	☐	☐
DPP4-Inhibitor (i.e. Stagliptin/Januvia)	☐	☐	☐	☐	☐
Glucagon like peptide-1 (GLP-1) agonists	☐	☐	☐	☐	☐
Sliding Scale Insulin	☐	☐	☐	☐	☐
Insulin	☐	☐	☐	☐	☐

15. For LTC residents, how often do you consider the following diabetes therapies?

	Always	Often	Sometimes	Rarely used	Not Considered in LTC
Monotherapy (oral)	☐	☐	☐	☐	☐
Monotherapy (insulin)	☐	☐	☐	☐	☐
Combination therapy (two or more oral medications)	☐	☐	☐	☐	☐
Combination therapy (oral + insulin)	☐	☐	☐	☐	☐

Comments

Section 4. Prioritizing Care

16. For LTC residents, how important is glycemic management (A1c target <7%) in the presence of these select co-morbidities?

	Not at all important	Not very important	Neutral	Important	Very Important
Congestive Heart Failure	☐	☐	☐	☐	☐
Chronic Kidney Disease	☐	☐	☐	☐	☐
Kidney Failure	☐	☐	☐	☐	☐
Liver Failure	☐	☐	☐	☐	☐
Dementia/Cognitive Impairment	☐	☐	☐	☐	☐
Depression	☐	☐	☐	☐	☐
Falls	☐	☐	☐	☐	☐
Cancer	☐	☐	☐	☐	☐
Frailty*	☐	☐	☐	☐	☐

* Frailty: Moderate to severe frailty (help with bathing and dressing to complete dependancy for personal care) following the Clinical Frailty Scale by Rockwood et al.

Comments

Section 5. Potential Barriers and Facilitators to Care

17. Please describe any barriers that exist for glycemic management in long-term care residents with diabetes

18. Please describe any facilitators for optimal glycemic management in long-term care residents with diabetes

Other Comments:

Test-Retest

Would you like to be considered for a retest

- ○ Yes (please provide you email address below)
- ○ No

Email address

Appendix C: Email Recruitment for Surveys

SPHHS logo (web GIF)

Dear Sir or Madam

My name is Osman Osman, and I am a researcher at the School of Public Health and Health Systems at the University of Waterloo. I'm currently conducting research under the supervision of Dr. George Heckman on diabetes management of residents in long term care (LTC) facilities.

We are interested in the current practices and processes of less stringent glycemic management in the frail elderly in LTC facilities. This study is part of a larger research initiative, whereby we can develop and implement better guidelines/protocols for diabetes management that result in better compliance and care.

If you are interested in participating in this study, please follow the URL to complete a short survey. The survey contains 5 sections with a total of 20 items. Survey items are meant to be descriptive of practices and opinions specific to diabetes management in long-term care. The survey is estimated to last between 15-20 minutes. You may refuse to answer any specific questions.

Here is the link: *URL*

If after receiving this letter, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact me at 226-600-2691.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you in advance for your interest in this project.

Yours sincerely,

Osman Osman

Appendix D: Consent Letter for Surveys

Consent to Participate

Survey for Diabetes Management in Long Term Care

Purpose: To explain the current practices and processes to managing the frail elderly with Type 2 diabetes in the LTC setting?

Procedure: We are interested different management policies, elderly profiles, and barriers and facilitators to care frail long-term care residents with type 2 diabetes. The survey contains 5 sections with a total of 20 items. Survey items are meant to be descriptive of practices and opinions specific to diabetes management in long-term care. The survey is estimated to last between 10-20 minutes. You may refuse to answer any specific questions.

Confidentiality: All information will be kept confidential. Any reports of this research will not identify you or anyone whose name you mention.

Benefits/Risks: There are no direct benefits or risks to you in participating in this survey, except that you may appreciate being given the opportunity to express you views. In so doing, you will help improve the application of new clinical management guidelines to long-term care homes.

Appendix E: Feedback Letter for Survey

University of Waterloo

Date:

Dear ***(Name of Participant),***

I would like to thank you for your participation in this study. As a reminder, the purpose of this study is to identify the current processes and protocols in place in for glycemic management in Ontario long-term care homes.

The data collected form this survey will contribute to a better understanding of the current decision processes used to individualize diabetes care goals in long-term care (LTC) residents.

Please remember that any data pertaining to you as an individual participant will be kept confidential. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please provide your email address, and when the study is completed, I will send you the information. In the meantime, if you have any questions about the study, please do not hesitate to contact me by email or telephone as noted below. As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you

Osman Osman

University of Waterloo
School of Public Health and Health Systems

Tel: 226-600-2691

Email: o2osman@uwaterloo.ca

Appendix F: Recruitment Letter for Interviews

SPHHS logo (web GIF)

Dear Schlegel staff

My name is Osman Osman, and I am a researcher at the School of Public Health and Health Systems at the University of Waterloo. I'm currently conducting research under the supervision of Dr. George Heckman on diabetes management of residents in long term care (LTC) homes.

We are interested in the experience of less stringent glycemic management in the frail elderly from the perspective of the physician and nursing staff. The goal of our research is that it will serve as a knowledge translation piece, whereby we can develop and implement better protocols for diabetes management that result in better compliance and care.

You will be asked to comment on different management policies, elderly profiles, and barriers and facilitators to care. The interview will be conducted over the phone and will last about 30-45 minutes. You may refuse to answer any specific questions. The interview will be recorded on an audiotape so that we can analyze the group's responses and prepare a report. All information you provide will be considered confidential. The data collected through this study will be kept for a period of two years in a locked office at the University of Waterloo.

If you are interested in participating in this study, please provide us with a date and time we could reach you at o2osman@uwaterloo.ca

If after receiving this letter, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact the interview coordinator at 226-600-2691.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you in advance for your interest in this project.

Yours sincerely,

Osman Osman

Appendix G: Consent letter for Interviews

Consent to Participate

Interview for Diabetes Management in Long Term Care

Purpose: To explain the experiences of nurses managing type 2 diabetes in the frail elderly in the LTC setting.

Procedure: We are interested in the experience of less stringent glycemic management in the frail elderly from the perspective of the nursing staff, as you are the ones who execute the policies and practices of diabetes management established in long-term care facilities. You will be asked to comment on different management policies, elderly profiles, and barriers and facilitators to care. The interview will last about 30-45 minutes. You may refuse to answer any specific questions. The interview will be recorded on an audiotape so that we can analyze the group's responses and prepare a report.

Confidentiality: All information will be kept confidential. All identifying information will be removed from the written transcripts. Any reports of this research will not identify you or anyone whose name you mention.

Benefits/Risks: There are no direct benefits or risks to you in participating in this focus group, except that you may appreciate being given the opportunity to express you views. In so doing, you will help improve the application of new clinical management guidelines to long-term care homes.

I have read this statement and I agree to participate in this focus group. I understand that I am free to withdraw at any time without any consequence to me. I understand that I may contact the interview coordinator at (226) 600-2691 at any time if I have questions about the study.

Name:

Appendix H: Telephone Script

This is the interview script for the I = Interviewer, calling P = Potential Participant;

Introduction

I – Hello, my name is Osman Osman and I'm a researcher in the School of Public Health and Health Systems at the University of Waterloo. I'm currently conducting research on diabetes management of residents in long term care (LTC) homes.

If you are willing or interested, I would like to speak with you about our study at a time that is most convenient for you.

Would you be interested in participating in the study? Are you free to speak now? What would be the best time for me to contact you?

…. if participant asks for background Information

I - **Background Information**

We are interested in the experience of less stringent glycemic management in the frail elderly from the perspective of physicians and nursing staff. You will be asked to comment on different goals of care, elderly profiles, and barriers and facilitators to care. The interview will last about 30-45 minutes. You may refuse to answer any specific questions. The interview will be recorded on an audiotape so that we can analyze your responses and prepare a report.

Would you be interested in participating in the study?

….if participant is unsure about participating or busy

I – No problem. I have emailed you information about our study in advance. I can resend you the email if you'd like. You can read it over before you decide whether or not you'd like to take part. If you have any further questions do not hesitate to call us. Please contact us even if you decide not to take part in our study; our contact information is right at the bottom of the email.

…If participant is not interested in participating

I - Thank you very much for your time. Once again, if you have any questions or concerns please don't hesitate to contact our research office. Our contact information is at the bottom of the email we sent you in advance.

Take care.

…if participant is interested in participating

I – Thank-you for agreeing to participate in the study. What would be the best time to conduct the phone interview?

Interviewer to schedule follow-up with participant

I – Thank you very much for your time. Once again, if you have any questions or concerns please don't hesitate to contact our research office. You can refer to the email which has our contact information on it.

Take care.

Appendix I: Interview Guide for Physicians and Nurse Practitioners

Topic	**Management and individualizing care**
Question 1	What key factors do you consider when individualizing glycemic control targets and treatment in LTC residents with diabetes? What conditions affect how you set glycemic control?
Potential Prompts	Do you have guidelines to follow in the facility? What policies on diabetes management exist in your facility?
	What blood glucose value (FBG, PPG, A1C) do you feel is too high in frail older adults in long term care?
	Are there any conditions that affect how you set glycemic control?
	Life expectancy. How is that assessed?
	How do you monitor resident blood sugar? How do you decide on the scheduling of a residents blood sugar?
Topic	**Barriers to Care**
Question 2	What are the key challenges you face with long term care (LTC) residents with diabetes?
Potential Prompts	Does family expectations clash with individualized care (whether tight or less stringent)? How are conflicts with the family and resident care plan resolved?
	What expectations do front line nurses have regarding glycemic control? How does that impact your decisions on the care plan of the patients?
	Do the families shape these expectations?
	Do the nurses order additional blood sugar tests?
	How does the time spent on diabetes management impact the care of other conditions of residents in LTC? Do you feel diabetes management takes more time than it should? What conditions really matter in LTC? Do you feel the current amount of time allocated to diabetes management in LTC is appropriate?
Topic	**Facilitators to care**
Question 3	What changes in LTC processes would you like to see that would facilitate overall diabetes management? Is there anything that would help support diabetes care?
Potential Prompts	What changes would you like to see in clinical practice guidelines that would facilitate overall diabetes management?
	Are you aware that the MDS can help in the care plan of LTC residents?

Appendix J: Interview Guide for Nurses

Topic	**Management and individualizing care**
Question 1	What is your experience with managing diabetes in LTC residents?
Potential Prompts	Are there any conditions that affect how you provide diabetes care?
	How do you monitor resident blood glucose? Are you comfortable with how your patients are monitored?
	Do you test blood glucose when it is not scheduled?
	What blood glucose value (FBG, PPG, A1C) do you feel is too high in frail older adults in long term care?
	At what level is it important to call the physician?
	Do you have guidelines to follow in the facility? What policies on diabetes management exist in your facility?
Topic	**Barriers to Care**
Question 2	What are the key challenges you face with long term care (LTC) residents with diabetes?
Potential Prompts	Does family expectations clash with individualized care (whether tight or less stringent)? How are conflicts with the family and resident care plan resolved?
	How do physician expectations impact the care of your residents?
	How does the time spent on diabetes management impact the care of other conditions of residents in LTC? Do you feel diabetes management takes more time than it should?
Topic	**Facilitators to care**
Question 3	What changes in LTC processes would you like to see that would facilitate overall diabetes management? Is there anything that would help support diabetes care?
Potential Prompts	What changes would you like to see in clinical practice guidelines that would facilitate overall diabetes management?
	Are you aware that the MDS can help in the care plan of LTC residents?

Appendix K: Feedback Letter for Interviews

University of Waterloo

Date:

Dear ***(Name of Participant),***

I would like to thank you for your participation in this study interview,. As a reminder, the purpose of this study is to explain the experiences of physicians and nurses managing type 2 diabetes of the frail elderly in the LTC setting.

The data collected form this interview will contribute to a better understanding of the current decision processes used to individualize diabetes care goals in long-term care (LTC) residents.

Please remember that any data pertaining to you as an individual participant will be kept confidential. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please provide your email address, and when the study is completed, I will send you the information. In the meantime, if you have any questions about the study, please do not hesitate to contact me by email or telephone as noted below. As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you

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Appendix L: Quantitative Analysis

Fasting Blood Glucose (Upper Limit); Question 5a

t-Test: Two-Sample Assuming Unequal Variances

	Medical Directors	*Attending Physicians*
Mean	10.54167	9.666667
Variance	9.302536	0.266667
Observations	24	6
Hypothesized Mean Difference	0	
df	27	
t Stat	1.331193	
P(T<=t) one-tail	0.097129	
t Critical one-tail	1.703288	
P(T<=t) two-tail	0.194257	
t Critical two-tail	2.051831	

Accept null hypothesis: no difference between groups

Fasting Blood Glucose (Lower Limit); Question 6a

t-Test: Two-Sample Assuming Unequal Variances

	Medical Directors	*Attending Physicians*
Mean	5.56	6
Variance	3.59	5
Observations	25	7
Hypothesized Mean Difference	0	
df	9	
t Stat	-0.47505	
P(T<=t) one-tail	0.323034	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.646069	
t Critical two-tail	2.262157	

Accept null hypothesis: no difference between groups

Post-Prandial Blood Glucose (Upper Limit); Question 5b

t-Test: Two-Sample Assuming Unequal Variances

	Medical Directors	*Attending Physicians*
Mean	13.625	13.28571
Variance	4.65	3.904762
Observations	16	7
Hypothesized Mean Difference	0	
df	13	
t Stat	0.368343	
P(T<=t) one-tail	0.359273	
t Critical one-tail	1.770933	
P(T<=t) two-tail	0.718546	
t Critical two-tail	2.160369	

Accept null hypothesis: no difference between groups

Post-Prandial Blood Glucose (Lower Limit); Question 6b

t-Test: Two-Sample Assuming Unequal Variances

	Medical Directors	*Attending Physicians*
Mean	8.2	7.75
Variance	8.6	5.357143
Observations	15	8
Hypothesized Mean Difference	0	
df	18	
t Stat	0.403628	
P(T<=t) one-tail	0.345621	
t Critical one-tail	1.734064	
P(T<=t) two-tail	0.691241	
t Critical two-tail	2.100922	

Accept null hypothesis: no difference between groups

Appropriate A1C target; Question 7

t-Test: Two-Sample Assuming Unequal Variances

	Medical Directors	*Attending Physicians*
Mean	8.203704	7.75
Variance	0.331909	0.428571
Observations	27	8
Hypothesized Mean Difference	0	
df	10	
t Stat	1.767857	
P(T<=t) one-tail	0.053763	
t Critical one-tail	1.812461	
P(T<=t) two-tail	0.107526	
t Critical two-tail	2.228139	

Accept null hypothesis: no difference between groups

A1C Upper Limit; Question 8

t-Test: Two-Sample Assuming Unequal Variances

	Medical Directors	*Attending Physicians*
Mean	8.87037	9.3125
Variance	0.799858	1.709821
Observations	27	8
Hypothesized Mean Difference	0	
df	9	
t Stat	-0.89626	
P(T<=t) one-tail	0.196728	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.393457	
t Critical two-tail	2.262157	

Accept null hypothesis: no difference between groups

A1C Lower Limit; Question 9

t-Test: Two-Sample Assuming Unequal Variances

	Medical Directors	*Attending Physicians*
Mean	6.923077	6.6875
Variance	0.573846	2.209821
Observations	26	8
Hypothesized Mean Difference	0	
df	8	
t Stat	0.431327	
P(T<=t) one-tail	0.338809	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.677618	
t Critical two-tail	2.306004	

Accept null hypothesis: no difference between groups

Appendix M: Qualitative Analysis

Table 12: Qualitative analysis of Survey Comments Q.17

	17. Please describe any barriers for optimal glycemic management in long-term care residents with diabetes	
	Response	Codes
1.	Family expectations re Personal care Wish levels in severely demented or "terminal" residents	Family Expectations
2.	Quality of life, resident choice and dementia. Dementia is VERY important.	Dementia Resident choices
3.	No real " barriers" but several complicating factors eg inability of residents to cooperate with diet/ exercise, sometimes family cooperation is lacking (not very careful with offering snacks or communicating with staff), returning from hospital on complicated sliding scale insulin.	Variable diet intake Hospital regimens
4.	Resident resistance to testing, diet difficulties, lack of activity, multiple medications, renal failure (less choice of meds), staffing re multiple testing	Resistance to testing Med adherence Polypharmacy Comorbidity Over testing by staff
5.	Irregular eating refusal of testing risk of hypo won't take meds impaired quality of life	Variable diet intake Med adherence
6.	variable diets with family visits	Variable diet Family and diet
7.	It seems we need to continue to educate on the evidence re the danger of intensive treatment of Diabetes.	More education on danger of stringent control
8.	Feel that blood glucose strips are painful and are overused in the home, often at the RNs discretion without my advice. Also residents and their families do not seem concerned about DM and bring in sugary snacks often	Over-testing by RNs Family and diet
9.	being real with very frail elderly, realizing that long term goals do not apply and the risk is hypoglycemia	Communicating expectations with resident and family
10.	Variable diet.	Variable diet
11.	Difficulty with insulin titration due to limited staff and poorly educated staff. Often need DM inservices.	Staff education
12.	1. regular ophthalmologic assessments to assist with managing complications 2. Resident refusal of treatments	Regular speciailist
13.	Access to laboratory investigations in a timely manner	Poor access to laboratory investigations

14.	risk of hypoglycemia coverage for medications	
15.	time	Time constraints
16.	Families sometimes do not want insulin started	Family medication resistance /Family expectantoins
17.	POA, families and resident's wishes. Nursing time team effort	Family expectations
18.	"Factory food" (supplied by outside source, not cooked in house); Cognitive impairment = hard to teach people about things; lack of exercise – most LTC residents have mobility issues.	Poor diet choices in LTC
19.	Other doctors, specialists, family expectations, staff education	Staff education Family expectations
20.	Poor food quality. High glycemic index food.	Poor diet choices
21.	Diet complicates	Diet
22.	1. The large variety of diabetic routines that residents are admitted with, many of which are inappropriate and/or ineffective. Many people are admitted with A1C levels over 0.1 2. Inappropriately complicated, intensive and intrusive insulin routines instituted in the community or in hospital. 3. Diabetic specialists who have no idea of the philosophy of LTC and have never set foot in a nursing home. 4. Family members who have had a poor community experience with the resident (through poor compliance, poor management or poor monitoring) and who have come to believe that their relative's diabetes simply cannot be controlled, or can only be controlled on their current regimen. These family members are very afraid of change in the diabetic routine.	Admission with complicated regimens Hospital regimens Diabetes specialists not suited for LTC Family members afraid of changing diabetes regimens Family expectations
23.	Variety of pharmacotherapies and lack of familiarity with those products that are less often used. Expense. Recommendations by outside consultants that are not consistent; fragmentation of care.	lack of familiarity with variety of pharmacotherpy
24.	hypoglycemia limited ability to communicate distress variable appetites difficulty administering multidose insulin	Variable diet intake
25.	staff training and education	Staff education
26.	less monitored diet. More clinical nursing hands on requirements	

Table 13: Thematic Analysis of Survey Comments Q.18

18. Please describe any facilitators for optimal glycemic management in long-term care residents with diabetes	
Compliance	Adherence to treatment
Dietitian very helpful.	Dietitian facilitates control
Very little compliance issues, re reg meds, lab assessments, clear	Adherence to treatment

records of charting.	
nursing staff, dietitian etc.	Nursing staff and dietitian facilitate care
LTCPhyscians and MOHLTC should formally adopt a guideline similar to the Nova Scotia and Edmonton guidelines. It seems the evidence is clear.	Nova Scotia guidelines facilitate management
What is optimal glycemic control in a 93 year old? Certainly not a goal of an A1C of anything less than 8%	Less stringent management above 8%
Prevent acute illness.	Prevent acute illness
A good dietitian is important to optimize glycemic control.	Dietitian facilitates care
1. easy access to lab values for Hb A1C 2. nursing compliance with regular CBG monitoring	Access to A1C lab values Nurse compliance with CBG monitoring
24 hour nursing care, monitoring, dietitian on site	Dietitian facilitates care Constant monitoring
team approach - MD, NP, nursing, dietitian, pharmacist	Team collaboration
Easy to monitor blood glucose and meds in an institution. At home, you often really don't know how "compliant" the patient is.	Adherence to treatment
My biggest challenge is to introduce healthier food to the residents. Although the home has started preparing healthier meals on site, the biggest challenge is the low budget available for healthier food and its preparation. If the budget for food and medicine was coming from the same source, then the home would have been much more motivated to provide healthier meals and reduce the current high use of medications for chronic degenerative illnesses like diabetes, hypertension and vascular disease.	Low budget for healthier foods
1. Regular medication. We know that residents are receiving the medication prescribed. This is not so in the community. 2. Regular monitoring and supervision by staff. In a good facility physicians will not be unaware of fluctuations in blood glucose or clinical symptoms. 3. Regular diet. Again this beats the community hands down. We know that the residents have a good, consistent diet. 4. Exercise. Residents tend to get into a routine, with consistent activity fro day to day. All these things make it far easier to control diabetes in LTC than in the community and make it far less likely that untoward events will occur.	Adherence to treatment Regular diet
Familiarity with a smaller range of products. Tools to monitor BS.	
BS charting in an easy to read format - easy to follow and adjust meds diet is controlled by staff (mostly)	Access to blood glucose results
I link with a DEC RN who assists me in reviewing the glucometer logs and to create management strategies for the	Collaborate with DEC RN

patients in LTC.	
having staff lead/diabetes nurse clinician or NP	Staff leadership
rpn / np focused care	Nurse focused care is a facilitator

Table 14: Categorization and Thematic Analysis for In-Depth Physician Interviews

Categories	Theme	Over-arching Theme
Utility of guidelines	Limited utility of guidelines	Variability in Opinion
Methods of blood glucose monitoring	Variability of opinion in blood glucose monitoring tests and parameters.	
Blood glucose parameters	Variability of opinions on glycemic targets	
Ethical Considerations		
Life expectancy	Life expectancy	Considerations in the individualization of blood glucose control
Information tools (MDS RAI)		
Quality of life	Quality of life	
Diet		
Family/Resident preferences/expectations	Family/Resident preferences	
Diet		
Differences between community and LTC	Differences between community and LTC	Time spent on diabetes in LTC
Time spent on diabetes	Time spent on diabetes	
Current landscape of understanding		
Nurse-Physician relationship	Nurse-Physician relationship	Role of interprofessional relationships
Role of dietitians and pharmacists	Other health professionals	
Specialists		

Table 15: Coding manual for physicians

Summarized Text
Category: Utility Guidelines
Physician has reviewed the CDA 2013 guidelines. No in-house specific guidelines
Physician 2 uses Nova Scotia guidelines as a gestalt. The Nova scotia guidelines are not that specific
It's hard to assess management by numbers, the guidelines are broader when it comes to clinical practice. It's hard to be specific in a population that is very varied.
Doubt of guidelines based on consensus.
There is no real studies on the best routine for the geriatric population.
Distrust of guidelines based on expert consensus.
No real evidence, just opinions.
Distrust of expert consensus

Sometimes specialists don't buy in to guidelines
Guidelines only reinforces what my clinical experience tells me
Category: Blood Glucose Parameters
Random blood glucose is not assess very often. Usually changes management if fasting blood glucose is in the 9's 9 (too high).
Still aims for less than 7 on HBa1c, will tolerate under 8.
Does not feel comfortable leaving any resident (even frail) over Hba1c of 8.
Physician reluctant to allow uncontrolled Hba1c
Physician 2 tries to keep most residents under 15 (random)
Physician will occasionally allow blood glucose's higher than 15 as long as it is not symptomatic
Physician 2 does not consider a1c to make decisions. Does not see any connection with outcomes in the LTC population
5, or 6 calls for less stringent management. That threshold is higher with variable intake.
7-8 usually safe.
Hypoglycemia is not seen that much in LTC. HBa1c of less than 8 is acceptable, which is the case for the majority of residents. Hba1c of 6 is good if there is no risk of hypoglycemia
Short term, the HBa1c is not useful. But it does measure control between months and years, making it useful for chronic disease management.
Physician 3 may accept blood glucose up to 10-14
Nurses usually want to check blood glucose more often than physician 3 would. They are less comfortable with certain values. Nurses and physicians tend to micromanage things. Making changes to regimens that will result in negligible changes to blood glucose that physician 3 would feel comfortable ignoring. Hba1c is a better measure of CV damage than random blood glucose readings that are high. So if the HbA1c is controlled, a high RBG is tolerable.
Try to keep Hba1c between 7.5 and 9.5
Most residents fall within that range
The high range for residents with limited LE is symptomatic hyperglycemia (25 is too much).
BG values are not of great importance for those with limited LE. A BG of 20 is high, but if there are no symptoms then it may be tolerable.
Preventing hypoglycemia is first, symptomatic hyperglycemia is second. Hba1c of less than 8.5% is a goal for frail patients with dementia.
Specialists can be aggressive
Category: Methods of BG monitoring
Random BG is not assess very often. Usually changes management if fasting BG is in the 9 mmol/L range . Above 9mmol/L (too high).
Resident only checks BG when symptomatic for palliative residents
Nurses check BG before administering insulin
If residents are on oral, physician either orders daily BG, or a three day schedule
Nurses will inform physician of any acute changes in BG
Physician 1 is on call, 24/7
Physician 2 does not consider a1c to make decisions. Does not see any connection with outcomes in

the LTC population
Rarily is it QID. This is left for those who's BG shift quickly to Hypo or Hyper. For stable insulin dosed, its twice a week on a rotating Sched. Oral a couple times a week and less if they're well.
Family and residents mostly ok with more reduced, simplified diabetes management.
4x a day for uncontrolled in order to asses a pattern. If under control and on insulin, BG is done once a day at different times
Short term, the HBa1c is not useful. But it does measure control between months and years, making it useful for chronic disease management.
2-3x monitoring for residents with multiple insulin regimens
2-3x week for oral residents
For stable residents on insulin, its BID 3x a week
Fluctuations is a more important concern regarding stability than high values. Low BG's more important than Highs
Polices: glucagon policy, contact physician over 20 BG, minimum frequency of glucometer
Even for patients are on insulin, there is no need for a daily glucometer if there are no symptoms
Minimum weekly schedule with symptomatic assessment
Nurses will do BG check if they have symptoms that may indicate different
Category: Ethical considerations
There is still reasons to prevent hypoglycemia. Accepting higher BG values in order to avoid hypoglycemia is akin to stopping the treatment of diabetes, which can be a dangerous decision.
Very less stringent management is an ethical decision that is unnecessary
Distrust of expert consensus
In response to the slippery slope argument: guidelines are not rules. Less aggressive management may be appropriate given the goals of care of residents and family and the comfort of reduced management based on clinical judgement.
Category: Considerations for individualizing BG control
Some palliative residents do not even take diabetes medications
Dementia is a strong risk of life expectancy
For residents with newly diagnosed diabetes, family can be a pressure to reach stable BG's
Balancing safety thresholds with patient goals is key to individualization of care
Less stringent treatment is usually driven by the family for reasons fo QoL
Patient based, medication based, and nursing based factors to guide treatment. Polypharmacy a key consideration in diabetes. Dementia a strong factor in polypharmacy.
Will maintain tight control as long as it doesn't come at a real "cost"
Life expectancy key measure in assessing benefit of tight control. Focus shifts to QoL in residents with low LE
Reduced monitoring with side effects of weight loss and reduced intake.
Weight and intake = less stringent management. Tight management is usually trouble for CHF
Risk of hypoglycemia and falls = less stringent management
Dementia = side effects with medications, complications with glucocorticoids and metformin.
Average life expectancy across Ontario 2-3 years
Physicians do not use any clinical tools for life expectancy

There is a clinical impression of life expectancy around markers of frailty, dementia, dietary intake, and overall decline. But it is not that accurate
There is a general idea of life expectancy from clinical experience
Life expectancy is the first consideration of individualization in LTC
Simplified routines result in better QoL
Life expectancy is much harder to asses on admission
Type of dementia is a strong marker of life expectancy
Frailty does not factor in reducing diabetes management. Frailty factors in bieng weary of significant changes in insulin because of their vulnerability High BG does have short term implications
Age, comorbidity, previous history, cognition, goals of care, POA's, POA's may not be interested in tight control because of behavioral issues with hypoglycemia
Fluctuations is a more important concern regarding stability than high values. Low BG's more important than Highs
More harm than benefit in LTC population
Individualization assessed primarily by comorbidity, and age.
Time and resources are not spent if the benefit is seen as only marginal. Individualization in LTC population reaches across the spectrum.
Frailty= immobility, doesn't generally impact diabetes management
Primary forces that affect management is patient/family goals as opposed to their life expectancy/frailty
QoL and life expectancy strongest forces in choosing management. Dementia strong predictor of LE
Preventing hypoglycemia is first, symptomatic hyperglycemia is second. Hba1c of less than 8.5% is a goal for frail patients with dementia.
Life expectancy is a major factor in less stringent care Dementia and frailty= limited life expectancy
Even with the uncertainty in LE, an estimate of LE is enough to discuss care goals with the family and individualize to a less stringent approach.
Comorbidities are not a driving factor in comparison to their LE and QoL
Complications are not a driving force in tighter management If the residents is frail/dementia (limited LE).
Frailty, dementia, QoL> discuss with family> clinical judgement
Category: Life Expectancy
Dementia is a strong risk of life expectancy
Does not use scale to assess life expectancy. Instead a clinical observation of graduated decline.
Frailty and decline=life expectancy, use the same markers
Physicians do not use any clinical tools for life expectancy
There is a clinical impression of life expectancy around markers of frailty, dementia, dietary intake, and overall decline. But it is not that accurate
There is a general idea of life expectancy from clinical experience
Life expectancy is much harder to asses on admission
Type of dementia is a strong marker of life expectancy
QoL and life expectancy strongest forces in choosing management. Dementia strong predictor of LE

A combination of cognition and frailty (no specific index) is how LE is estimated.
Life expectancy is a major factor in less stringent care Dementia and frailty= limited life expectancy
Uncertainty in assessing life expectancy
Even with the uncertainty in LE, an estimate of LE is enough to discuss care goals with the family and individualize to a less stringent approach.
Category: Information tools (MDS RAI)
Physician completely unaware of MDS RAI MDS RAI is an administrative tool.
The MDS RAI is reviewed by the nurses who relay any red flags they see to the physician. The physician doesn't look for anything in the MDS RAI. Physician doesn't feel the MDS RAI is needed when each resident is evaluated on an individual basis.
The MDS RAI does not have strong enough specificity when it comes to vulnerability
Two types of vulnerability when it comes to disease: 1 severe disease, or multiple non-severe conditions. Both are vulnerable.
Physician 3 doesn't see the MDS RAI
LTC programs are more administrative than clinical. So physicians don't really use them in a clinical capacity.
Physician uses accumulated patient profile instead on MDS
Physicians do not look at the MDS RAI MDS RAI is thought of as an administrative tool
The MDS RAI is not useful in assessing QoL and is not an aid or replacement to the physicians clinical judgement.
Category: Diet
Physician concerned about elderly care homes without diabetic diets
Concerns of diet as a key to diabetes management
Controlling diet is a barrier to care. Most LTC homes have a liberal approach to diet.
Lots of barriers to LTC are cost driven. It's not feasible to switch to diets that both improve QoL and clinical outcomes when the cost is too high.
Sometimes its important to manage/control dietary intake for QoL and clinical purposes. However, it is hard to influence diet, as familys and residents take it as an important aspect of their quality if life.
Complicated regimens result in BG out of control for residents that leave the home. Not much control regarding diet.
Diet is a barrier in LTC that needs stronger address. PSW stretched thin means they can't have a larger role in managing diet = issue of delivary (dietitian develops plan). Family is a barrier to effective diet plans
You shouldn't control diet too much as its part of QoL Poor diet countered by insulin
Diet is major challenge. Challenges with intake, modifications, skipping meals. Nursing education regarding diabetes is varied, and limited for new graduates
Limited intake of food a risk for residents with dementia Family decision is the deciding factor

Category: Family and Resident Preferences/Expectations
For residents with newly diagnosed diabetes, family can be a pressure to reach stable BG's
For residents with newly diagnosed diabetes, family can be a pressure to reach stable BG's
Less stringent treatment is usually driven by the family for reasons fo QoL
Sometimes family and patient goals may focus more on quality of life when stringent treatment might be beneficial (barrier to care).
There is not much resistance from the family regarding diabetes treatement
Family and residents mostly ok with more reduced, simplified diabetes management.
Families and residents are more resistant to reducing complicated regimens B/C of the difficulty to control diabetes in the community Chronic disease in LTC is better controlled because of 24hr monitoring and oversight by health professionals There is less adherence to medications in the community, contributing to BG out of control. LTC has a high adherence to regimens, diets, etc which lead to better outcomes
Persuading the family about the difference in settings is difficult
Age, comorbidity, previous history, cognition, goals of care, POA's, POA's may not be interested in tight control because of behavioral issues with hypoglycemia
Families are more involved in the management process than previous years.
Family is usually not a barrier to any changes in diabetes management. An intimate discussion about whats best for the resident usually brings the family on board
Primary forces that affect management is patient/family goals as opposed to their life expectancy/frailty
Diet is a barrier in LTC that needs stronger address. PSW stretched thin means they cant have a larger role in managing diet = issue of delivary (dietitian develops plan). Family is a barrier to effective diet plans
LTC guilt causes family to provide lots of treats for family residents
Limited intake of food a risk for residents with dementia Family decision is the deciding factor
Most families do not want intensive chronic disease management with residents that frail, demented and have little life expectancy. There tends to be tighter management when a family member has diabetes and is younger.
Discussion with family members usually resolves differences in opinions regarding less stringent management
Category: Differences between Community and LTC
Less clinical formalities (flow sheets) in LTC. More responsibility on physician to make choices regarding the diabetes management of resident
There are benefits to diabetes management in LTC that are not found in the community
LTC setting has both advantages and drawbacks to management. Residents have less access to specialists Advice in diabetes from specialists is less accessible.
Hypoglycemia is not that prevalent because of increased monitoring by the staff. Regular nutrition is key to preventing hypoglycemia. If you can maintain activity and diet, than it is easier to keep someone controlled (less than 9)
Families and residents are more resistant to reducing complicated regimens B/C of the difficulty to control diabetes in the community

Chronic disease in LTC is better controlled because of 24hr monitoring and oversight by health professionals There is less adherence to medications in the community, contributing to BG out of control. LTC has a high adherence to regimens, diets, etc which lead to better outcomes
LTC management is better than in the community
Category: Time spent on diabetes
Information collected by nurses. Increased diabetes management does not take more time for physicians
Diabetes management is a necessary part of disease management that cannot be deprioritized.
The time spent of diabetes is reduced by simplifying dosing.
Diabetes should be prioritized because it affects a quarter of residents in LTC. Diabetes is managed better in LTC.
LTC is about chronic disease management. Chronic disease needs constant management and monitoring, this includes diabetes. There should be better ways to manage all chronic disease as opposed to prioritizing some and forgetting about the others
Time and resources are not spent if the benefit is seen as only marginal. Individualization in LTC population reaches across the spectrum.
Diabetes monitoring is consuming less time than it did 5 years ago.
Nurses are stretched thin, but management is appropriate and needed (no need to prioritize or de-priortitized)
Category: Nurses Barriers and Facilitators Interprofessional
Nurses will inform physician of any acute changes in BG
Physician 1 is on call, 24/7
More appreciation in staff from avoiding problems with tight control.
Bedside education effective in training staff in individualized care.
The MDS RAI is reviewed by the nurses who relay any red flags they see to the physician. The physician doesn't look for anything in the MDS RAI. Physician doesn't feel the MDS RAI is needed when each resident is evaluated on an individual basis.
Pharmacists tend to be more academic, with following guidelines and managing numbers. Health professionals do have differences, which tend to result in a comprise toward middle ground.
Nurses usually want to check BG more often than physician 3 would. They are less comfortable with certain values. Nurses and physicians tend to micromanage things. Making changes to regimens that will result in negligible changes to BG that physician 3 would feel comfortable ignoring. Hba1c is a better measure of CV damage than Random BG readings that are high. So if the HbA1c is controlled, a high RBG is tolerable.
Nurses and physicians tend to micromanage things
Nurses will do BG check if they have symptoms that may indicate different
Diet is major challenge. Challenges with intake, modifications, skipping meals. Nursing education regarding diabetes is varied, and limited for new graduates
Distrust of nurses with limited education regarding diabetes
Pharmacists are an assest. Nurses sometimes lack the education level to be comfortable with limited diabetes management.
Nurses are stretched thin, but management is appropriate and needed (no need to prioritize or de-

priortitized)
Category: Current Landscape of understanding by nursing staff
More appreciation in staff from avoiding problems with tight control.
Diabetes management has changed to allow for less stringent care.
A lot of education on diabetes has happened that puts a lot of different professionals on the same page.
Category: Nurse-physician relationship
More responsibility on physician to make choices regarding the diabetes management of resident
Nurses usually want to check BG more often than physician 3 would. They are less comfortable with certain values. Nurses and physicians tend to micromanage things. Making changes to regimens that will result in negligible changes to BG that physician 3 would feel comfortable ignoring. Hba1c is a better measure of CV damage than Random BG readings that are high. So if the HbA1c is controlled, a high RBG is tolerable.
Nurses and pharmacists tend to micromanage things
There is no issues with other health professionals. Its very much a collaborative model.
A lot of education on diabetes has happened that puts a lot of different professionals on the same page.
Category: Dietitians and pharmacists
Nurses and pharmacists tend to micromanage things
Pharmacists tend to be more academic, with following guidelines and managing numbers. Health professionals do have differences, which tend to result in a comprise toward middle ground.
Pharmacists are an assest. Nurses sometimes lack the education level to be comfortable with limited diabetes management.
Diet is a barrier in LTC that needs stronger address.
Dietitians and pharmacist key players in preventing decline rather than dealing with diseases specifically
PSW stretched thin means they can't have a larger role in managing diet = issue of delivary (dietitian develops plan). Family is a barrier to effective diet plans
Dietitians and other professional staff still trying to manage diabetes like they would in a younger population
Category: Specialists
Advice in diabetes from specialists is less accessible.
Residents have less access to specialists
Specialists can be aggressive
Usually the specialist decision supersedes the attending physician since the specialist has seen the resident longer
Sometimes specialists don't buy in to guidelines
Category: Treatment methodology
Physician 3 tries to standardize and simplify treatment in the home in order to make it easier to follow for nursing staff as well as to reduce medications.
Metformin > DPP4 (Sitaglipton or Linaglipton) > Insulin (NPH, not impressed with Lantis) DPP4 is just a gateway to insulin, its usually not effective on its own Long acting insulin can be volatile (either wearing off or lasting too soon in renal compromised

residents) Lantis split into 2 injections daily, which is less volatile. Residents with multiple insulin injections usually don't go out because of mistakes of administering the insulin.
Simplified routines result in better QoL
Complicated regimens result in BG out of control for residents that leave the home. Not much control regarding diet.
Split Lantis results into better control
There is value in getting multiple residents on the same routine = less medication errors, better monitoring
Residents are admitted on a variety of regimens.
2-3x monitoring for residents with multiple insulin regimens

Table 16: Categorization and Thematic Analysis for In-Depth Nurse Interviews

Categories	Theme	Over-arching Theme
Physician guides management	Individualized Blood Glucose Management	Experience with Managing Diabetes
Policies for Hyperglycemia and Hypoglycemia		
Nurse experience with managing residents		
Use of sliding scale		
Monitoring patterns	Nurse Experience Monitoring Diabetes Residents	
Unscheduled monitoring		
Diabetes is time consuming	Time Spent on Diabetes	
Routine Practice		
Barriers to care- resident characteristics	Barrier to care – Resident Characteristics	Barriers and Facilitators to Care Table 12: Thematic Analysis of Survey Comments
Barriers to care – Family and diet		
Nurse-physician relationship	Inter-professional relationships	
Pharmacist and Dietitian roles		
Role of PSW		
Flow of information	Communication as facilitator in LTC	
Education	The need for education	What LTC needs
Other LTC needs		

Table 17: Coding manual for Nurses

Summarized text
Category: Physician guides management
Management left up to physician
Physician will usually conduct a two week intensive monitoring for pattern assessment
Nurses have hypoglycemia protocol. Other than that, refer to physician
Management left up to physician
Emergency level is dependent on the physician
Treatment depends on physicians practice
Monitoring set by the physicians order and is based on residents stability
Monitoring varies and is dependent on physician order
Physician will usually conduct a two week intensive monitoring for pattern assessment
Category: Policies for hyperglycemia and hypoglycemia
Hypoglycemia policy: use glucagon below 2
Nurses have hypoglycemia protocol. Other than that, refer to physician
Most policies are how to deal with hypoglycemia
Contacting the physician with a resident BG above 25 is a protocol in one home
Above 25 warrants emergency
Nurse is able to manage resident under 25
Only above 25 warrants emergency
If BG is over 20, nurses call the physician and give resident insulin
Some residents have directives to call the physician if over 15
Nurses would report BG to the physician if it's consistently over 10.
Emergency level is dependent on the physician
20 is too high, 11-20 is manageable when QoL is the priority
Physician called with use of glucagon
Physician is called when BG is in late teens to 20's
Only call the physician at 20
However, nurses will call if there is anything suspicious
Over 12, call the RN.
High threshold for BG extends to about 20
Threshold varies for each resident
Above 25 warrants immediate contact of the physician
If BG is always at 9 then the nurse would notify a physician
Category: Nurse experience with managing residents
BG readings do not always match symptoms
Blood sugars worse after meals. Usually stable in the morning
Both hypo and hyperglycemia is a concern. However, Hyperglycemia a little over 7 is ok.
9 mmol/L is ok for nurses
If BG is always at 9 then the nurse would notify a physician
Nurse feels that there isn't specific markers that guide the intensity of diabetes treatment
The BG history of a resident important in devising a care plan
The BG history of a resident important in devising a care plan
Quality of life takes precedent over strict management in LTC

Focus changes to quality of life.
Less concern for what is considered as traditional hyperglycemia
Individualization includes comorbidities and preferences and care goals
There is concern of a BG over 10, however individualized care can go much higher
Nurses allowing of an increased glycemic management.
Over 10 calls for mild concern. Nurse will start looking for potential triggers
Bladder infection is a trigger for hyperglycemia
Family snacks is a trigger for hyperglycemia
Management done on a more case by case basis
Bladder infection common in increasing blood sugar
More consistent medication results in better management
Diabetes can trigger conditions in other diseases, so it must be completely addressed
Poor glycemic management results in other secondary symptoms other than
Diabetes is very common, checking the blood sugar is usually the first line of inquiry in residents that have a problem
Diabetes should only be deprioritized in a palliative setting.
Diabetes management in the nursing home is generally loose.
More worried about hypoglycemia
Blood glucose of 10 is too high
Blood glucose of 4.5 is getting too low.
Knowing your resident facilitates the individualization process
Dementia results in running residents slightly higher with increased monitoring.
Residents with diabetes are mostly obese
Nurse feels they perform well considering they are understaffed.
Increased monitoring and using glucagon negatively affects quality of life.
Resident wishes and quality of life are essential factors in deciding on care plan in residents in LTC
Increased monitoring and using glucagon negatively affects quality of life.
Resident wishes and quality of life are essential factors in deciding on care plan in residents in LTC
Residents will feel comfortable (no signs or symptoms) at different levels
Diet is first line of care. Staff attempt to prevent poor diet and snacks
Every resident is comfortable at different values
Every resident is comfortable at different values
Residents have different glucose parameters.
Higher BG is acceptable to nurses if there are no signs and symptoms
High threshold for BG extends to about 20
Threshold varies for each resident
Quality of life is the main consideration for nurses
Resident wishes is most important.
Diabetes management is really relaxed during palliative care
Life expectancy in the home is mostly under 5 years
LTC residents sometimes have higher blood glucose, which the physician is ok with.
BG above 10-12 is considered high
Resident wishes and quality of life are essential factors in deciding on care plan in residents in LTC
Threshold for hyperglycemia increases in end of life care.
Uncontrolled would be on a sliding scale

Nurse is comfortable for less stringent management if it results in better comfort and higher QoL.
Nurse prefers stringent management if the resident is comfortable that way.
Category: Use of Sliding scale
The use of sliding scale is reducing
Uncontrolled would be on a sliding scale
Sliding scale is reserved for the residents with very high BG (10-15)
RPN has difficulty dealing with sliding scale insulin
Sliding scale is avoided unless deemed necessary
Sliding scale makes diabetes management time consuming
Sliding scale avoided
The hospital is a barrier to care because they usually will administer a sliding scale.
Category: Understanding cause of fluctuations/ Seeking stability
Nurses are more concerned with knowing the cause of fluctuating sugars.
Multiple conditions can affect a residents blood glucose, nurses focus on discerning the source of fluctuations
Familiarity with residents aid in understanding fluctuations in patterns
Seeking BG stability is the main goal with diabetes.
Monitoring more frequent in those that are not stable
Symptom changes are monitored closely
Nurses mostly concern is the cause of BG fluctuation
Nurses will not increase worry about acute hyperglycemic if they know it was caused by resident snacking
Being over 20 is acceptable if the nurses know why
Category: Monitoring patterns
Individualized blood monitoring ranges from tri-annual evaluations to 4 times a day, mostly dependent on a residents blood glucose stability
Intense fluctuations in BG is a reason for intensive monitoring.
If a resident is stable within a range, then nurses will request reduced monitoring.
Diabetes can be monitored as low as monthly, although the diabetes is usually diet-controlled
The most relaxed level of monitoring for residents on insulin is weekly
Most residents on insulin are monitored QID, with some done three times a week.
Large proportion of diabetes residents are on QID
Seeking BG stability is the main goal with diabetes.
Monitoring more frequent in those that are not stable
Once a pattern is established, BG monitoring is reduced.
Any resident who has a fall received a BG measurement
BG usually go low during the night
Residents on insulin usually get their blood sugars done twice a day if they are on insulin, twice a week if on oral
BID for those on insulin
BG is assessed for pattern recognition in new residents
Some physicians may monitor to intensely and it is up to the other health professionals to reason with them
Pharmacist is diabetes educator and does regular checks on residents
Increased monitoring is justified with an increased risk of hypoglycemia

Monitoring set by the physicians order and is based on residents stability
Monitoring ranges from QID to 4x a week.
Monitoring varies from QID to once a month
QID is usually because of unstable blood sugars
Brittle/frailty results in increased monitoring
Frailty and dementia equates to less medication more monitoring.
Run them higher because of unpredictable diet.
Monitoring varies and is dependent on physician order
The physician will reduce monitoring with stability
Instability requires more monitoring
Residents who are not under control, have variable diet, are monitored QID.
Monitoring can go as low as twice a week
As low as 2x a day 2x a week. As high as QID
Irregular diet equates to increase monitoring.
Poor diet (high sugar) equates to increased monitoring
Nurse will withhold insulin if resident is not eating.
Brittle/uncontrolled residents are monitored more frequently
Category: Unscheduled monitoring
Non-scheduled BG monitoring usually happens during the night
Nurses conduct unscheduled BG monitoring in residents with diabetes with certain health conditions/ status changes
Any status changes or symptoms of dysglycemia warrant an unscheduled BG test by the nursing staff
If there are signs/symptoms, nurses will check BG when not ordered
Nurses will check BG if there are concerns of hypoglycemia
Blood glucose is tested outside of scheduling if residents shows signs/symptoms for dysglycemia
Cannot predict the need for unscheduled BG monitoring, dependent on resident stability.
Signs and symptoms of dysglycemia
Nurses will test blood sugar outside of scheduled time if the resident shows any signs and symptoms.
Category: Diabetes is time consuming
nursing homes with a lot of residents with diabetes, BG and insulin treatment takes a lot of time
Diabetes required constant management to keep resident stable, while other conditions are not as present
Diabetes increased in LTC
Need to increase education
Diabetes takes a lot of time
Nurse does not feel time spent of diabetes is unnecessary, just that the number of residents with diabetes increased, which makes time a barrier to care
Even for frail residents, nurses feel that diabetes management is still necessary
Nurse do not feel that diabetes takes more time than it should
Nurses feels diabetes takes more time because of its prevalence, not because of inefficient management
A high prevalence of diabetes results in routine practice
Sliding scale takes the most time

Hyperglycemia is a concern in cases of wound healing
Nurse feels that prioritizing care impedes on a holistic management approach
Diabetes management must be done and cannot be deprioritized
Diabetes is just another part of management
Time is not a real conflict in the care plan of residents, outside of isolated incidents
Diabetes can trigger conditions in other diseases, so it must be completely addressed.
Poor glycemic management results in other 2dary symptoms other than
Diabetes is very common, checking the blood sugar is usually the first line of inquiry in residents that have a problem.
Diabetes should only be deprioritized in a palliative setting.
Behaviours takes a lot of time.
Residents who are bottoming out and need glucagon take a lot of time
Doing blood sugar and insulin is easy, which allows it to go unnoticed as routine.
Behaviours take more time.
Nurses do not feel that they spend any unnecessary time with diabetes, or that it comprises other issues.
Ulcers a complication that takes up a lot of time.
Frail residents with diabetes take extra time.
Nurses do not feel that diabetes takes more time than it should.
Nurses work to make diabetes a routine management.
Monitoring takes a lot of time.
Diabetes management is something you cannot change.
Diabetes has to be managed or it will impact other conditions
The high prevalence of diabetes makes its management routine
Diabetes is time consuming, but the time is necessary
Category: Barriers to care - Resident Characteristics
Dementia and resistant residents are a barrier to diabetes treatment and monitoring
Dementia a barrier to treatment and monitoring
Nurses seek stability to reduce BG monitoring
Stability with residents dementia, medications, and risk of polypharmacy a reason to reduce medications and monitoring
Irregular eating habits of residents complicate insulin regimen
Behavioral issues/dementia alter management of diabetes
Compliance and aggressive behavior are the primary barriers to diabetes care in those with dementia
Residents do not see the importance of taking insulin consistently
Residents try to plan around their diabetes by not taking medication or adjusting their diet
Irregular eating habits are a barrier to effective diabetes management
Cognitive issues and diet are is a challenge in managing residents with diabetes
Variable intake makes treatment complicated. Generally results in managing a resident by diet alone.
Diabetes management is a concern during infectious outbreaks
Diet protocols in place manage diet with insulin intake
Nutrition is a barrier to intensive diabetes care
Dementia a barrier to glycemic management

Concession in diabetes management are made for residents with dementia
More consistent medication results in better management.
No cases of residents attached to medications in diabetes
Behaviors is a barrier to insulin administration
Behaviors is a barrier to insulin administration
Behaviors take up most of the time
Dementia is really difficult with diabetes
Category: Barriers and facilitators with family
Family is very receptive to medication or management
Family needs education on the importance of diabetes complications
Families do not object to nurses providing insulin
The family generally listens to the physician when treatment needs to be reduced
Family usually excepts health professionals judgment in regards to diabetes treatment
Family frequently bring in snacks to residents which is a cause of high blood glucose
The family suffers from "LTC admission guilt" which causes them to indulge their family residents with snacks without regard to BG
Families are not a source of conflict in regards to treatment plan
Family drives poor diet in residents
Residents are not self-managed so there is a clash in diet decisions
Diet conflict with the family is usually resolved in an on-going fashion with multiple health professionals
No clashes of expectations with the family
Family is a big source of poor diet choices in residents.
Educational opportunities for the family may improve diet control.
Sometimes family members may have diet concerns.
Family don't have issues with treatment
Families are usually on board with treatment.
One case of a resident who felt she was monitored too often.
Family members not compliant with diet. Families are more willing to give treats because of the increased monitoring of the LTC environment.
Category: Nurse-physician relationship
Nurses contact physician for medication review if they see consistent elevated BG at *certain times*
There are conflicts with the physician decisions and nurses/pharmacist recommendations
Physician usually receptive to nurse recommendations if presented with supporting evidence
Nurses follow the doctors order and look for patterns in BG.
BG results are given to the physician in order to review care plan
The physicians are very accessible and keep everyone grounded in what they can do for the residents
There is little clashes of expectations with the physician
Physician relies on nurse input because they are at the bedside.
24hr physician on call, nurses are not afraid of calling.
Nurses always have someone available to ask
Nurses will call physician if they think giving insulin will take the resident too low.
Trust between nurse and physician allows for the flow of information and eliminates barriers to teamwork.

Some physicians do not listen to the nursing staff, or do not know much about the resident
Nurses inform physician on changes in glycemic stability
Nurses report changes in diet and BG to physician
There is little clashes of expectations with the physician
Physician relies on nurse input because they are at the bedside.
When contact physician when they have concern about giving insulin, if physician unavailable, they will withhold it.
Physicians supportive of nurse decisions
Nurses do not have orders to hold insulin, which may be counterproductive in certain situations
Nurses holding insulin is a source of contention with the physician.
Category: Facilitator to care: Pharmacist and Dietitian role
Pharmacists and dietitians facilitators to care; help nurses with any questions; facilitate in explain care plan to resident
Pharmacy consultant is always involved in decisions made with insulin
The pharmacists and nurse practitioners are a key player in reasoning with problematic physician orders
Pharmacists are involved in making recommendations to the physician in regards to medication changes during the three month review.
The pharmacist is involved during the quarterly med reviews
Pharmacists are very involved in setting the care plan.
The pharmacist is involved during the quarterly med reviews
Usually the physician goes along with the pharmacist and dietitian recommendations because they are specialists.
BG under 4 is referred to the dietitian, whilst anything over 10 is referred to the physician. Everything else is under the judgement of the nurses
The physician relies on the dietitian for concerns of hypoglycemia
Dietitian is very involved in diabetes care plan
The dietitian is central to resident management. Very involved especially in the early stages of the diabetes (or if resident is diagnosed in the LTC).
Dietitian is involved and monitors blood sugars.
Nurses find that the dietitian is more involved than the pharmacist
Dementia compounds the challenges with diet
Dietitian monitors resident closely and follows a strict guideline
Some insulin's are difficult to administer (they require food first and require more vigilance)
The dietitian holds a lot of information on diabetes and is helpful to the nursing staff.
Nurses will refer to the dietitian to make diet changes in residents with dysglycemia
Category: Role of PSW
PSWs and nurses pick up on sings and symptoms
PSWs communicate to nurses which helps recognize triggers
Flow of information is effective moves from PSW to physician
PSWs are involved in the care plans of resident
Nurses rely heavily on the PSWs
Nurses do more medications and paperwork. Outside of that they are removed form the bedside
PSWs take on a lot of work with residents in the LTC environment
Not enough Indians too many chiefs

Nurse wants the PSWs more educated to be more involved, but doing less work (they are overworked).
PSWs do all the work. Nurses just hand out pills (and they don't change).
PSWs know what will improve the residents QoL which is important information in the care plan
Category: Flow of information
Huddle allows information sharing and teamwork
Communication allows staff to find triggers to dysglycemia, preventing improper medications,
Nurses pick up subtle changes in flow sheets on a weekly basis.
Nurse coordinator picks up changes on quarterly assessment.
Trust between nurse and physician allows for the flow of information and eliminates barriers to teamwork.
Consistency in staff allows form better flow of information
Bringing together all members of the LTC team in huddles has proven effective in Schlegel villages in finding signs and symptoms of residents
The physician is always in communication with the family in light of medication changes
Communication with family troubleshoots conflicts
Category: Variable Utility of MDS RAI
RAI serves as a reassessment point
Funding is based on the RAI MDS
MDS a strong tool to pick up a variety of clinical problems (depression, behaviors).
The RAI MDS shows important trends quarterly that would be missed on a day to day basis.
RAI is effective for those that can read it.
Not all health professionals use the RAI, but they follow recommendations for those that use the RAI
MDS rai effective in seeing trends on a quarterly basis vs day to day
The PSW holds a lot of the resident information that may be more benefcial to the care plan than the MDS RAI
There is a lack of trust in the data collected into the RAI
There is redundancy in the paperwork of the RAI that does not help nurses
Flow charts and PSWs capture all the data required to adjust the care plan.
The RAI is only a snapshot every three months, which means it is missing a lot fo the day to day changes that does not help in individualized care.
The RAI is done because it is a source of funding. But it doesn't help.
Differences in the opinion of the RAI
Neighbourhood coordinator works as quality control for wrongly entered information in the RAI, which is lost if everything is computerized.
Paperwork gets the last priority, which results in mistakes when its rushed
RPN nurse not sure the use of the MDS RAI in LTC
There is resistance to the RAI. Difficulty with the coding is a barrier
Paperwork is over-prioritized in LTC
Category: Education
Family more compliant with education
Ongoing education is needed for the families and residents in understanding diabetes
Nurses and support workers need more education on the complications of diabetes and its relation to other conditions

Changes in guidelines suggested include better explanation of insulins as well as symptoms of diabetes in older adults.
Yearly seminars really helpful in improving diabetes mangemnt
More education needed for RPN
Education as a facilitator
Education for the family and nursing staff
annual training for registered staff to facilitate care
Formal training more effective
Training including signs and symptoms for frontline workers
Education of the MDS rai lacking in LTC homes
More MDS rai training needed in schools
Simplifying diabetes management makes it easier for the nurses.
Nurses wish to have more information of the impacts of diabetes and its signs and symptoms
Category: Other LTC needs
Having more flexibility/autonomy in administering insulin would be a facilitator to better diabetes care
Continuity of care a facilitator to optimal individualized diabetes care.
PSWs have increased information input tasks
Nurse would like more nurses
Nurse feels more nurses would give them more time.
Nurse director feels only more nursing staff will help