

Physical Activity Supports Provided by Health Care Providers to Patients with Type 2  
Diabetes

by

Jill Amber Hnatiuk

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Department of Kinesiology and Recreation Management

University of Manitoba

Winnipeg, Manitoba, Canada

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### **Abstract**

*Background:* Physical activity (PA) is an important component of type 2 diabetes management, yet the amount and type of PA support provided by different types of health care providers (HCPs) is largely unknown. *Purpose:* This study identified differences in the amount and type of PA supports provided by HCPs, and determined whether HCPs use the Canadian Diabetes Association (CDA) PA guidelines or Canada's Physical Activity Guide (CPAG) in practice. *Methods:* Eight of 14 Winnipeg Regional Health Authority primary care clinics specializing in diabetes education agreed to participate in the study. In-person interviews were conducted with health care providers (n=48) and patients with type 2 diabetes (n=26). HCPs were given a total PA support score based on scores in three subcategories behaviour change support (BC), assessment/prescription support (AP) and information/referral/community resources support (IRCR), as reported by HCPs themselves and patients. *Results:* There was no difference in PA support between the 3 HCP types, but there was a significant difference between HCP report and patient report of PA support. Just over one half of HCPs report using the CDA guidelines unprompted or prompted. *Conclusions:* HCPs recognize the importance of PA in type 2 diabetes management, but implementing strategies to increase certain types of PA support and facilitate understanding between HCPs and patients would allow for optimal PA counseling in primary care.

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## **Chapter 1: Introduction**

Type 2 diabetes mellitus is a chronic disease which affects nearly 246 million people around the world (Wild et al., 2004). The prevalence is expected to double by the year 2050 (Narayan et al., 2006) given the aging population and the increased adoption of unhealthy lifestyle choices, specifically with regard to diet and exercise. In Manitoba, approximately 6.4% of people have been diagnosed with the disease, translating into a total of approximately 76,608 citizens (Manitoba Health and Healthy Living (MHHL), 2008). Type 2 diabetes is increasing in every age group and is now apparent in children and young adults, ultimately impacting the overall health status of generations in the years to come (MHHL, 2008). The large number of cases in Manitoba by 2016 is projected to result in provincial health care system costs of \$295,300,000 (Ohinmaa et al., 2004) and substantial premature mortality (Wei et al., 2000).

Physical activity is an effective method to both prevent type 2 diabetes in those at greatest risk (Knowler et al., 2002; Pan et al., 1997; Tuomilento et al., 2001) and manage the disease for those already diagnosed (Boule et al., 2001). Physical activity reduces glycosolated hemoglobin (HbA1c) levels, increases insulin sensitivity, improves body composition and improves lipid profiles (Gordon et al., 2009). The changes in HbA1c, insulin sensitivity and lipid profiles can occur independent of changes in body mass, suggesting the biological mechanisms that take place during physical activity are uniquely impacting health status (Boule et al., 2001).

There is a substantial amount of literature documenting the efficacy of physical activity interventions to prevent or manage type 2 diabetes. This evidence suggests that physical

activity should be considered a responsibility of the health care system in order fulfill the mandate of providing complete care to a diagnosed patient, or to one who is at risk.

However, many barriers (including lack of time, lack of education and training, and safety concerns) often arise for health care professionals and the support is not always delivered most effectively in practice (Buchholz and Purath, 2007; Douglas et al., 2006; Gornall et al., 2008; Harris et al., 2004; McKenna et al., 1998; Parker et al., 2010; Schmid et al., 2009)

The Canadian Diabetes Association (CDA) has recognized the role of physical activity in the health care system and has recommended aerobic and resistance exercise as part of their 2008 Clinical Practice Guidelines for health care professionals. The guidelines are intended to be used as recommendations for practice based on the best knowledge to date in the field. Canada's Physical Activity Guide (CPAG) is also recommended for utilization in the health care system as it is a quick, understandable resource that people with type 2 diabetes can easily refer to.

Sixty-nine percent of people with type 2 diabetes do not follow any exercise guidelines and are considered not active enough to achieve health benefits (Nelson et al., 2002).

While most know they should get more activity, very few actually change behaviour and engage in physical activity after diagnosis (Searle and Ready, 1991). Thus, it seems there is a huge gap between what people know about physical activity and the lifestyle choices that they make (Searle and Ready, 1991). Becoming regularly physically active is a major change in behaviour and requires multi-level support in order to sustain long-term change.

At the moment there is no evidence to determine the extent to which physical activity support is delivered in the health care setting in Manitoba, specifically within team-based clinics designed to treat people with type 2 diabetes. No published studies have examined the types of support the health care system provides to assist people in becoming more physically active. Without support for people to become physically active, it is less likely that the behaviour change will occur and be sustained. Thus, for the health care system to be effective in managing type 2 diabetes through lifestyle change it is essential there is support available to achieve the desired outcome. Given the evidence-based recommendations of the CDA, it is important to determine whether or not the health care system in Manitoba is following these guidelines in practice.

### **Statement of Purpose**

The primary purpose of this study is to determine the amount of physical activity support currently delivered to people with type 2 diabetes by health care providers in Winnipeg, Manitoba.

The specific objectives are as follows:

- 1) To identify differences in the amount and type of physical activity supports provided by physicians, nurses and other health care providers to patients with type 2 diabetes;
- 2) To determine the proportion of health care providers who are able to identify and describe the CDA physical activity guidelines and CPAG when prompted and unprompted;

- 3) To determine whether health care providers use the CDA physical activity guidelines;
- 4) To determine whether health care provider report of the amount and type of physical activity support provided is the same as patient report of the amount and type of health care provider physical activity support received.

### **Hypotheses**

- 1) Because health care providers do not have extensive, formal training in physical activity counseling there will be no difference in the amount and type of physical activity supports reported between physicians, nurses and other health care providers
- 2) The CDA guidelines and CPAG will be identified and described by health care providers and patients more often when prompted vs. unprompted
- 3) Based on previous literature indicating the small percentage of health care providers correctly using guidelines, over 60% of health care providers will not use the CDA physical activity guidelines
- 4) Health care providers will over-report or patients will under-report the amount and type of physical activity supports when compared to patient report of the amount and type of health care provider physical activity supports

### **Study Delimitations**

1. This study was conducted in clinics aimed at delivering diabetes education. Thus, people receiving treatment in other settings may not have a similar experience.
2. The study was done in the fall of 2009 in Winnipeg, a mid-sized Canadian city.

**Assumptions**

1. The health care providers in each category (physician, nurse, other) will be representative of the particular profession.
2. The patients will be representative of diagnosed patients with type 2 diabetes.
3. The questionnaires will accurately assess physical activity support in diabetes education clinics.

**Definitions**

Aerobic exercise: Any activity that uses large muscle groups, can be maintained continuously, and is rhythmic in nature (American College of Sports Medicine (ACSM), 2006).

Allied health care provider: personnel who have specific connections with the art and science of health care and are recognized as members of the health team in the national health system (World Health Organization (WHO), 2006).

Blood glucose: the amount of glucose in the blood (CDA, 2005).

Body composition: the percentage of body weight that is composed of lean tissue and adipose tissue (Sherwood, 2007).

Chronic disease: a non-communicable disease that is has a gradual onset and is of long duration (CDA, 2005).

Direct cost: the total cost of medical expenditures associated with treating people with Type 2 diabetes (Dall et al., 2008).

Exercise: a type of physical activity which is planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness (ACSM, 2006).

Glycemic control: the ability of a person with Type 2 diabetes to control his/her blood sugar (Davis and Green, 2007).

Glycosylated hemoglobin (HbA1c): a measure of the blood glucose levels over the past 120 days (CDA, 2005).

Health care provider: all people engaged in actions whose primary intent is to enhance health (WHO, 2006).

High-density lipoprotein cholesterol (HDL-C): a lipoprotein which contains the most protein and the least cholesterol and serves to remove cholesterol from the cells and transporting it to the liver for partial elimination from the body (Sherwood, 2007).

Indirect cost: The total costs associated with Type 2 diabetes resulting from lost productivity (Dall et al., 2008).

Low-density lipoprotein cholesterol (LDL-C): a lipoprotein which contains the less protein and more cholesterol and transports cholesterol to the cells for disposal (Sherwood, 2007).

Macrovascular complication: a disease of the large blood vessels which can occur when a person has had diabetes for a long time (CDA, 2005).

Microvascular complication: a disease of the small blood vessels that can occur when a person has had diabetes for a long time (CDA, 2005).

Physical activity: any bodily movement that is produced by the contraction of skeletal muscle and that substantially increase energy expenditure (ACSM, 2006).

Physical activity supports: Any information, discussion or assessment delivered to patients by their health care provider which promotes, facilitates or enables an increase in daily physical activity level.

Primary care: the element within primary health care which focuses on health care services, including health promotion, illness and injury prevention, and the diagnosis and



treatment of illness and injury (Health Canada, available from <http://www.hc-sc.gc.ca/hcs-sss/prim/about-apropos-eng.php>).

Primary health care: an approach to health and a spectrum of services beyond the traditional health care system. It includes all services that play a part in health, such as income, housing, education, and environment (Health Canada, available from <http://www.hc-sc.gc.ca/hcs-sss/prim/about-apropos-eng.php>).

Resistance exercise: exercise performed against an external force or load (ACSM, 2008).

## **Chapter 2: Literature Review**

This literature review will begin with a brief overview of research pertaining to the prevention and management of type 2 diabetes through acute and chronic exercise, as well as a description of the 2009 guidelines for physical activity in Canada. The main focus will be on the current status of physical activity delivery in the Canadian health care system.

### **Type 2 Diabetes Mellitus**

#### ***Definition***

Type 2 diabetes mellitus is a metabolic disorder that is characterized by the presence of hyperglycemia due to either defective insulin secretion, defective insulin action, or both (Canadian Diabetes Association (CDA), 2008). The severity of the disease can range from predominantly insulin resistance at the target cell (relative insulin deficiency) to predominantly impaired insulin secretion with insulin resistance as well (CDA, 2008).

Type 2 diabetes differs from Type 1 diabetes in that it does not occur as a result of autoimmune beta cell destruction in the pancreas and ketoacidosis seldom occurs (Dall et al., 2008). Type 2 diabetes is the most common type affecting approximately 90-95% of people with the disease (Dall et al., 2008).

#### ***Diagnosis***

A clinical diagnosis of diabetes mellitus can be determined in one of three ways: a) fasting blood glucose (FBG) level of greater than or equal to 7.0 mM/L, b) casual blood glucose (CBG) level of greater than or equal to 11.0 mM/L with symptoms of diabetes or c) 2 hour oral glucose tolerance test (OGTT) of greater than or equal to 11.0 mM/L (Table 1). The 2 hour OGTT is the best predictor of glucose control (Avignon,

Radauceanu & Monnier, 1997) but is less available for utilization in clinical practice than the FBG. Thus, the given blood glucose concentrations of the FBG and CBG have been set to correlate most closely with the 2 hour OGTT. Diagnosis must be confirmed with a second test on a subsequent day if first test results are significant (Dall et al., 2008).

**Table 1: Clinical Diagnosis of Diabetes Mellitus**

	FBG (mmol/L)	CBG (mmol/L)	2 hr OGTT (mmol/L)
Healthy	4.0-6.0	<11.0	5.0-8.0
Type 2 Diabetes	>7.0	> 11.0	>11.0

### ***Prevalence***

Type 2 diabetes is reaching epidemic proportions in both developed and developing countries around the world (International Diabetes Federation (IDF), 2008).

Approximately 246 million people worldwide currently have the disease and this number is expected to rise to 366 million in 2030 (Wild et al., 2004). By 2050, the prevalence is predicted to double in a span of less than 50 years (Narayan et al., 2006). In Canada alone, approximately 2 million people have diabetes and many more remain currently undiagnosed (Public Health Agency of Canada (PHAC), 2008). This number represents about 5.5% of the Canadian population, making type 2 diabetes one of the fastest growing chronic diseases in Canada (Health Canada, 2006).

Several factors contribute to the rapid increase in prevalence of type 2 diabetes. First, declining fertility rates and increasing longevity have resulted in a demographic shift towards a greater proportion of the population over the age of 65 (Division of Aging and Seniors, 2002). The prevalence of type 2 diabetes is remarkably increased with age due

to decreased insulin function, thus the expected increase in prevalence is greatest for the 65+ age category (Narayan et al., 2006). Second, an inactive lifestyle and a high caloric diet filled with refined sugar and fat have contributed to the increase in both type 2 diabetes and obesity (a major risk factor for type 2 diabetes). The change in environment, specifically increased urbanization and technological advancements, has contributed to an increased sedentary lifestyle among people worldwide; approximately 52% of Canadian adults are not active enough to achieve health benefits (Canadian Fitness and Lifestyle Research Institute (CFLRI), 2008). Insufficient physical activity increases one's risk for getting type 2 diabetes, however the weight gain resulting from prolonged inactivity is more detrimental (Hwang et al., 2007). Being overweight will increase one's risk of type 2 diabetes by 10-fold, while being obese will increase one's risk by 40-fold to 60-fold, when compared to individuals with an optimal body mass index (BMI) (Hwang et al., 2007). Furthermore, it has been reported that for every 5 kg of weight gained by a person of healthy body mass, there is a 4.5% increased risk of getting type 2 diabetes (Ford et al., 1997). This risk is further increased if the individual also has other risk factors for the disease (eg. family history, elevated lipid levels) (Health Canada, 2006).

### ***Complications***

People with type 2 diabetes are at risk for both microvascular complications and macrovascular complications as a result of elevated blood glucose concentrations (Morello, 2007; Sheetz and King, 2002). Microvascular complications from chronic hyperglycemia are a result of vascular damage and vascular leakage which affects many tissues of the body, specifically the eyes (retinopathy), the nervous system (neuropathy),

and the kidneys (nephropathy) (Sheetz and King, 2002). Macrovascular complications lead to more serious life-threatening conditions including heart disease and stroke (LeRoith and Rayfield, 2007). While much of the pathophysiology is beyond the scope of this literature review, the central issues surrounding these particular conditions are discussed below.

### *Retinopathy*

Diabetic retinopathy is the leading cause of blindness in Canada and other developed countries (CDA, 2005). Nearly 2 million people in Canada are estimated to have some form of diabetic retinopathy (CDA, 2005) and this number is expected to triple from 2005-2050, putting a huge demand on health care services (Saaddine et al., 2008). It has been suggested that 40.3% of patients with type 2 diabetes have diabetic retinopathy, 8.2% of which is considered vision-threatening (Eye Diseases Prevalence Research Group, 2004). Diabetic retinopathy occurs through complex physiological processes involving altered blood flow to the retina. Over time the physiological changes can result in retinal hemorrhage or retinal detachment, ultimately leading to blindness (Sheetz and King, 2002). Several studies have found that improving glycemic control can drastically reduce one's chance of developing diabetic retinopathy over 1 year (Pettitt et al., 2005), 4 years (Vaag, 2006) and 10 years (UK Prospective Diabetes Study Research Group (UKPDSRG), 1998). The risk reduction ranged from 25% (UKPDSRG, 1998) to 58% (Vaag, 2006). Additionally, the patients who do develop diabetic retinopathy are typically those with poorer glycemic control (Henricsson et al., 2003).

### *Neuropathy*

Diabetic neuropathy is the second multi-faceted complication by which hyperglycemia affects the regular functioning of neurons (Sullivan and Feldman, 2005). It affects all neurons in the peripheral nervous system, including autonomic, sensory and motor neurons (Duby et al., 2004). Every nerve fibre in the body is at risk for damage, though the loss of sensation is most common (Sheetz and King, 2002). Glucose enters nerve cells via a concentration gradient, making it particularly sensitive to acute and chronic hyperglycemia (Sullivan and Feldman, 2005). Hyperglycemia will impair blood flow to the periphery and damage the peripheral nervous system. The microvasculature which depends on neural regulation will be negatively affected, further reducing the already minimized blood flow (Duby et al., 2004). Even slight nerve damage will impair sensation over time, so much that the patient may not feel injury to the distal parts of the body (Sheetz and King, 2002). Therefore, when there is external damage to the periphery (specifically the foot) healing will be impaired and/or prolonged with the decreased blood flow (Sheetz and King, 2002). This vicious circle will repeat itself until glycemic control is achieved (Duby et al., 2004). Thus, with glycemic control, risk for diabetic neuropathy can be reduced (Vaag, 2006; DCCT, 1993) or managed (Duby et al., 2004; DCCT, 1993) effectively.

### *Nephropathy*

Diabetic nephropathy is the leading cause of kidney failure (American Diabetes Association (ADA), 2009). It occurs from changes in glomerular filtration rate (hyperfiltration) as evidenced by microalbuminuria (Sheetz and King, 2002). When hyperglycemia persists, proteinuria (via decreased glomerular filtration) will result, ultimately leading to end-stage renal failure (Sheetz and King, 2002). Improved

glycemic control has been found to reduce one's risk for developing nephropathy by anywhere from 21% (ADVANCE, 2008) to 61% (Vaag, 2006). It can also slow microalbuminuria (Levin et al., 2000) and thus can reduce one's risk for developing renal failure (UKPDSRG, 1998).

### *Cardiovascular Disease*

Macrovascular complications such as cardiovascular disease (CVD) and stroke account for up to 80% of deaths for people with type 2 diabetes, making it the most common cause of death amongst this population (ADA, 2009). Adults with type 2 diabetes have CVD and stroke-related death rates which are two to four times higher than adults without type 2 diabetes (ADA, 2009). In fact, for people with type 2 diabetes, the risk of having a myocardial infarction (MI) is the same as a person without type 2 diabetes who has previously had an MI (Haffner et al., 1998). A study by Haffner and colleagues (1998) found that the incidence of MIs for people without type 2 diabetes and no previous MI was 3.5%, while the incidence of MI for people with no previous MI but had type 2 diabetes was 20.2%. Being obese further exaggerates a patient with type 2 diabetes's risk for CVD up to 80% for women and 90% for men (Fox et al., 2008). Two studies have found no reduction in macrovascular complications with glycemic control (ADVANCE Collaborative Group (ACG) 2008; UKPDSRG, 1998), but nonetheless have shown that tight blood pressure control among patients with type 2 diabetes can significantly reduce the risk for CVD and stroke-related deaths (ACG, 2008; UKPDSRG, 1998).

### ***Economic Burden***

The ADA reported spending an estimated \$174 billion on type 2 diabetes care in 2007 in the USA alone, making up 20% of its total health care costs (Dall et al., 2008). Canada and Europe have reported similar proportions of their total health care costs amounting to \$15.6 billion (CDA, 2005) and €29 billion (8 countries) (Jonsson, 2002) respectively.

These estimates are based on a one year analysis of type 2 diabetes costs, yet many individuals with type 2 diabetes live for many years after diagnosis (Leal et al., 2008).

The average 10-year cost of treating one person with type 2 diabetes was reported to be \$38,006 (Johnson, Poher and Majumdar, 2006). To put this number in perspective, the health care costs are 2.3 times higher per person for people with type 2 diabetes than for those without type 2 diabetes (Dall et al., 2008). The total cost of type 2 diabetes can be broken down into two sections: direct costs and indirect costs.

### ***Direct Costs***

Direct costs make up the majority of health care system costs from type 2 diabetes. They consist of medical costs such as hospital care visits, physician office visits, emergency room visits, nursing home facility stays, home health visits, other health care provider visits and prescription drug and medical supply use (Dall et al., 2008). People with type 2 diabetes use more of these services than those without type 2 diabetes, whether or not they experience diabetes-related complications (Dall et al., 2008). Drug therapy (Morsanutto et al., 2006) and hospitalizations (Jonsson, 2002) have been cited as the greatest percentage use of direct medical costs for type 2 diabetes.

The presence of type 2 diabetes complications and co-morbidities is a major factor that increases the direct health care costs per patient (Jonsson, 2002). Patients with two or



more complications use substantially more resources and money than patients with 0 or 1 complication (Morsanutto et al., 2006). For example, a 10 kg/m<sup>2</sup> increase in BMI, treatment with oral antidiabetic or antihypertensive agents, diabetic kidney disease, cerebrovascular disease and peripheral vascular disease each increase health care cost per patient by 10-30% (Brandle et al., 2003). An estimated \$123,310 of type 2 diabetes costs were directly attributed to physical inactivity in the mid 1990's (Katzmarzyk et al., 2000).

### *Indirect Costs*

Indirect costs are defined as costs that occur as a result of lost productivity from type 2 diabetes (Dall et al., 2008). They affect the Gross Domestic Product of the country and impair the ability of the individual to do volunteer work and provide in his/her household (Dall et al., 2008). People with type 2 diabetes have greater (1.8 times) health-related days absent from work, reduced on the job performance (14 more days of lost productivity), reduced participation in the labour force, reduced earning capacity from permanent disability and lost productivity from premature mortality than people without type 2 diabetes (Dall et al., 2008). Specifically in Manitoba, people with Type 2 diabetes who have associated complications were twice as likely to not be in the labour force, and received 58% more social support than non-diabetic individuals (Kraut et al., 2001).

Several studies have shown that lifestyle intervention can reduce the direct and indirect costs of type 2 diabetes. Wolf and colleagues (2007) found that lifestyle counseling, saved up to \$8,046 per person per year, while Herman and colleagues (2005) found lifestyle modification was more cost-effective than either metformin or placebo treatments. With exercise alone, the cost of medications can decrease anywhere from \$196 to \$579 per year, depending on the intensity and duration of exercise (Di Loreto et

al., 2005). Furthermore, the probability of lost workdays and disability days are decreased by 64.3% and 87.2% respectively with improved physical activity and nutrition (Wolf et al., 2009). Major diabetes complications cost more than early stage complications and thus it is best to implement lifestyle changes as early as possible (O'Brien et al., 2003).

A 2008 study by Plotnikoff assessed the relationship between health-related behaviours and health-care utilization in patients with type 2 diabetes. The authors found that physical activity level was negatively associated with health care utilization; those who did not meet the physical activity guidelines had greater use of health care resources and accumulated higher health-care costs.

## **Exercise and Type 2 diabetes**

### ***Prevention***

Three influential randomized controlled trials (RCTs) have demonstrated the significance of a lifestyle intervention (physical activity and diet) on the incidence of type 2 diabetes in groups of individuals with impaired glucose tolerance (IGT) (Table 2). These studies were the first to demonstrate the effectiveness of physical activity in preventing type 2 diabetes using a well-designed RCT with a large sample size. The Diabetes Prevention Program was conducted over approximately 3 years, and determined that the incidence of type 2 diabetes was reduced by 58% with lifestyle modification, while the incidence of type 2 diabetes in the metformin group was reduced by only 31% (both compared to controls) (Knowler et al., 2002). The Finnish Diabetes Prevention Study found very similar results as there was a 58% reduced risk of developing type 2 diabetes at the end of the intervention (Tuomilento et al., 2001). More importantly, at follow-up 7 years later,

there was still a 43% reduction in relative risk among those in the intervention group suggesting that the benefits of improved lifestyle are still seen after discontinuing the program intervention (Lindstrom et al., 2006). The only large RCT to individually examine the effect of exercise only, diet only or exercise + diet was the ‘Da Qing IGT and diabetes study’ conducted over 6 years in China (Pan et al., 1997). This study found a reduction in the incidence of type 2 diabetes after the 6 years was 47% in the exercise only group, 33% in the diet only group and 38% in the exercise + diet group (Pan et al., 1997). This study exemplifies the importance of a physical activity intervention for reducing type 2 diabetes risk.

A 2007 meta-analysis supported the findings of these RCTs, as the authors concluded there was a 30% reduced risk of type 2 diabetes for people who engaged in moderate-intensity activity, as compared to sedentary counterparts. These results occurred partially independent of body weight (Jeon et al., 2007).

**Table 2: RCTs demonstrating the reduced incidence of type 2 diabetes with lifestyle change**

Source	Intervention	Findings
Knowler et al., 2002	Lifestyle vs. metformin vs. control	58% reduced risk of type 2 diabetes
Tuomilento et al., 2001	Lifestyle vs. control	58% reduced risk of type 2 diabetes
Pan et al., 1997	Diet vs. exercise vs. diet + exercise	38% reduced risk in diet + exercise 47% reduced risk in exercise only group

### ***Management***

For individuals who already have type 2 diabetes, regular physical activity is equally important. Research has consistently shown that improvements in health can be acquired in as little as four weeks (Ishii et al., 1998; Tokmakidis et al., 2004), and a new study has revealed that improvements can occur within 7 days of vigorous exercise (Kirwin et al., 2009). While the biological mechanisms underlying the outward changes in health status are still largely unknown, the impact of chronic aerobic and resistance exercise on glycemic control, lipid profiles, insulin sensitivity and body composition suggest that exercise should be part of the treatment for people with type 2 diabetes (Boule et al., 2001).

### ***Biological Mechanisms Underlying Changes in Health Status***

The mechanisms underlying the effectiveness of exercise in the treatment and management of type 2 diabetes are numerous and complex. An extensive review by Treserras and Balady (2009) identifies the major biological processes which contribute to the improvements in health status, though the reviewers acknowledge that the mechanisms are still not fully understood. With aerobic exercise increases in capillary density, GLUT-4 content, protein kinase B content and glycogen synthase activity are increased and there is a shift from low-oxidative muscle fibres to more oxidative muscle fibres and an increase in oxidative and non-oxidative enzymes (Treserras and Balady, 2009). With resistance training, similar findings have been reported with regard to GLUT-4 content (Dela et al., 1994; Holten et al., 2004; Tabata et al., 1999), protein kinase B content (Holten et al., 2004), glycogen synthase activity (Holten et al., 2004), though this type of exercise has been studied less extensively.

Increased capillary density and oxidative enzymes, and the shifting of less oxidative fibres to more oxidative fibres enhance the metabolism of lipids in the body as greater fat oxidation will occur (Tresierras and Balady, 2009). Oxidative fibres are also more insulin sensitive and thus whole body insulin sensitivity is increased (Tresierras and Balady, 2009). Glycogen synthase and protein kinase B regulate muscle glycogen storage (Henriksen and Dokken, 2006). Glycogen synthase is an enzyme which helps in the formation of glucose to be stored in skeletal muscle, and protein kinase B is part of the signaling pathway regulating glycogen synthase (Henriksen and Dokken, 2006). Thus, increasing either of these enzymes will increase glucose uptake (Henriksen and Dokken, 2006).

GLUT-4 is one of several types of glucose transporters in the human body, mainly dispersed within skeletal muscle. Following an acute bout of exercise, GLUT-4 translocates to the cell surface to take up glucose from the blood through insulin-dependent and insulin-independent pathways (Colberg, 2006; Henriksen, 2002; Sigal et al., 2004). These two mechanisms of uptake are not the same and can occur independently of one another (Henriksen, 2002). The exact mechanism of the insulin-dependent pathway is not fully understood, however it causes the tissues to become more sensitive to insulin action following exercise. Insulin-independent improvements occur as a result of contracting skeletal muscle, which mediates GLUT-4 translocation (Henriksen, 2002). Because the main issue with type 2 diabetes is the inefficient response to insulin, exercise provides an attractive alternative to translocate GLUT-4 to the cell surface and thus facilitate glucose uptake (Henriksen, 2002). This remains effective even in a diabetic

state because GLUT-4 content is similar in people of the same activity level with and without type 2 diabetes (Lund et al., 1993).

It has not been conclusively determined how long the insulin-dependent and insulin-independent effects last once exercise is stopped (Cauza et al., 2006; Gordon et al., 2009). Plasma glucose concentration is improved up to 24 hours after exercise (Fenicchia et al., 2004; MacDonald et al., 2006) but not at 60-72 hours post-exercise (Fenicchia et al., 2004). This suggests that exercise should be undertaken on a regular basis to acquire the health benefits (Gordon et al., 2009).

### ***Clinical Changes in Health Status***

#### ***Glycemic Control***

Glycemic control is an indicator of how well an individual can manage his/her blood glucose over time (Davis and Green, 2007). It is ideally measured by determining glycosolated hemoglobin (HbA1c) as HbA1c remains in the blood for 8-12 weeks (Davis and Green, 2007) but a FBG test or an OGTT test can serve as a surrogate measure of HbA1c. Most studies (Arora et al., 2009; Bastiaens et al., 2009; Castaneda et al., 2002; Cauza et al., 2005; Christos et al., 2009; Di Loreto et al., 2005; Dunstan et al., 2002; Goldhaber-Fiebert et al., 2003; Hansen et al., 2009; Honkola et al., 1997; Lambers et al., 2008; Maiorana et al., 2002; Sigal et al., 2007; Tokmakidis et al., 2004), though not all (Ishii et al., 1998; Cuff et al., 2003; Baynard et al., 2005; Vancea et al., 2009) have shown a decrease in HbA1c levels with exercise. A meta-analysis supports the former findings as HbA1c levels were reduced in exercise vs. controls (Boule et al., 2001).

Aerobic exercise has typically been advocated as the preferred type of exercise for people with type 2 diabetes, and has been shown to decrease HbA1c levels in the exercising

group by  $1.45 \pm 0.9$  over 8 weeks (Arora et al., 2009) and  $1.8 \pm 2.3\%$  over 3 months while HbA1c levels of the control group remained relatively constant (Goldhaber-Fiebert et al., 2003). The more MET hours of physical activity per week that one engages in, the greater the improvement in HbA1c level (Di Loreto et al., 2005). Similarly, aerobic training has shown decreased FBG levels over a similar time period (Vancea et al., 2009). It is important to note that matched for energy cost, low-moderate intensity exercise can be as effective as moderate-high intensity exercise in lowering HbA1c (Hansen et al., 2009). However, because aerobic exercise must be sustained for a period of time, it can be difficult to tolerate for people with type 2 diabetes who have been previously sedentary (Casteneda et al., 2002; Hills et al., 2009). Thus, researchers have begun to focus on resistance exercise as either an alternative to aerobic exercise or to be used in combination with aerobic exercise achieve further benefits. As described above, there are different physiological adaptations with aerobic and resistance exercise and a combination of the two may result in the benefits of both (Hills et al., 2009; Maiorana et al., 2002).

Resistance exercise has been shown to decrease HbA1c levels in a number of different populations (Castaneda et al., 2002; Cauza et al., 2005; Dunstan et al., 2002; Honkola et al., 1997), making it very generalizable to all individuals with type 2 diabetes.

Furthermore, the reductions in HbA1c levels with resistance exercise have occurred independent of age, sex, baseline HbA1c levels, waist circumference (Dunstan et al., 2002), duration of diabetes, changes in medications (Casteneda et al., 2002; Dunstan et al., 2002), insulin use or additional spontaneous activity (Casteneda et al., 2002). Circuit resistance exercise alone has shown a reduction in HbA1c levels of 0.5% compared to

controls (Honkola et al., 1997). A 0.5% reduction in HbA1c level should not be ignored for its possible significance. A 1% reduction in HbA1c levels has been shown to reduce the risk of microvascular complications and myocardial infarction by 37% and 14% respectively (Stratton et al., 2000).

A combination of aerobic and resistance exercise is currently viewed as the most effective way to reduce HbA1c levels (Hills et al., 2009; Sigal et al., 2007). After 4 weeks of resistance and aerobic exercise HbA1c level was reduced by from 7.7  $\pm$  1.7 (baseline) to 7.1  $\pm$  1.3 in women with type 2 diabetes and this value was reduced further to 6.9  $\pm$  1.0 after 4 months (Tokmakidis et al., 2004). These values are very similar to the absolute decrease in HbA1c exhibited by Mairona and colleagues (2002) (8.5  $\pm$  0.4  $\rightarrow$  7.9  $\pm$  0.3) and Sigal and colleagues (2007) (decrease of 0.59) over similar periods of time. Recent studies by Christos et al., (2009), Glans et al., (2009), and Lambers et al., 2008 also supported the effectiveness of combination training. A 2001 meta-analysis indicated that there was a 0.66 reduction in HbA1c levels with exercise compared to controls, enough to significantly reduce complications of type 2 diabetes (Boule et al., 2001). The most pronounced decrease in HbA1c levels is found in individuals with the highest baseline HbA1c levels (Sigal et al., 2007). In this population, aerobic or resistance training alone may be enough to elicit the same benefits as those seen through combination training in patients with lower baseline HbA1c levels (Sigal et al., 2007). Paradoxically, as baseline HbA1c levels decrease, greater stimulation is needed to further reduce glycolated hemoglobin and thus a combination of aerobic and resistance exercise may be necessary (Sigal et al., 2007). Using FBG as an indicator of glycemic control,



Maiorana and colleagues (2002) found a decrease from 12.0  $\pm$  0.5 to 9.8  $\pm$  0.5 mM/L using aerobic and resistance exercise.

Combined aerobic and resistance training improves glycemic control in individuals with type 2 diabetes, even if they have been taking insulin for extended periods of time (De Feyter et al., 2007). Such research is promising as it shows the benefits of exercise can be achieved by those with varying severities of type 2 diabetes. When aerobic and resistance training is discontinued however, HbA1c levels begin to rise back to baseline and potentially even higher, suggesting that regular activity is needed to maintain the significant health benefits (Cauza et al., 2006; Maiorana et al., 2002).

Only 4 studies have found insignificant changes in HbA1c levels. Two involved aerobic exercise only (Baynard et al., 2005; Vancea et al., 2009), one involved resistance exercise only (Ishii et al., 1998) and one combined aerobic and resistance exercise (Cuff et al., 2003). Some of the explanations for these insignificant findings included a) insufficient duration (Vancea et al., 2009) b) low intensity c) insufficient energy expenditure d) participants already had good glycemic control and d) measurement of glycemic control (OGTT) taken too long after the exercise session (Baynard et al., 2005).

### *Insulin Sensitivity*

While not all studies have found improved HbA1c levels with exercise, nearly all have found short-term improvements in blood glucose concentration. Resistance exercise improves insulin sensitivity by 46.3% (Ibanez et al., 2005) and 48% (Ishii et al., 1998). This can be inferred from a decrease in blood glucose with no change in insulin secretion (Dunstan et al., 1998; Fenicchia et al., 2004). Most of the studies were relatively short in duration (approximately 4-6 weeks), indicating that improvements can be seen quite

quickly (Fenicchia et al., 2004). Aerobic and resistance exercise also reduce insulin sensitivity more than aerobic exercise alone (Cuff et al., 2003). A 38% improvement is seen after 16 weeks without any changes in BMI (Tokmakidis et al., 2004). These dramatic improvements in blood glucose independent of changes in body weight exemplify the influence of exercise alone. Only one study found no difference in insulin sensitivity in the resistance training plus weight loss group compared to the group characterized by weight loss alone (Dunstan et al., 2002).

### *Lipid Profiles*

Improvements in lipid profiles enhance the overall health status of people with type 2 diabetes. The typical lipids measured in exercise intervention studies are total cholesterol, low-density lipoprotein-cholesterol (LDL-C), high-density lipoprotein-cholesterol (HDL-C) and triglycerides. Total cholesterol is a combination of LDL-C, HDL-C and very low density lipoprotein-cholesterol (VLDL-C). Research has found that total cholesterol can be reduced by 12% (Honkola et al., 1997) to approximately 14% (Cauza et al., 2006) with resistance training and combined aerobic and resistance training respectively in populations with type 2 diabetes. Equally important, this reduction occurred in comparison to the control group which experienced an increase in total cholesterol over the study period (Cauza et al., 2006). Thus, exercise not only serves to reduce total cholesterol but it prevents it from increasing further above baseline as well.

LDL-C serves to transport cholesterol from the liver to the peripheral tissues and then deposits the cholesterol at these sites (Sherwood, 2007). Alternatively, HDL-C transports cholesterol from the peripheral tissues to the liver to be metabolized, reducing buildup in the arteries (Sherwood, 2007). For this reason it is known as “healthy cholesterol” and its

existence is encouraged in people with type 2 diabetes. Both of these cholesterol levels can be altered with exercise as previous studies have shown a decrease in LDL-C of 14% (Honkola et al., 1997) and 16.7% (Cauza et al., 2006) and an increase in HDL-C (Mathieu et al., 2008).

Triglycerides are the major form of lipid in the body. They have been found to be reduced by 24.6% throughout a resistance and aerobic training program (Cauza et al., 2006) and by 22% and 20% with resistance training alone (Honkola et al., 1997; Arora et al., 2009). Much more research needs to be conducted on lipid profiles however, as the evidence is inconclusive. Several studies have found no change in lipid profiles despite improvements in other type 2 diabetes-related conditions (Dunstan et al., 2002; Maiorana et al., 2002; Sigal et al., 2007). This could potentially be a result of a greater amount of fat loss needed before lipid profiles are improved (Dunstan et al., 2002).

### *Body Composition*

Changes in body composition frequently occur with increased physical activity. These include a decrease in fat mass, an increase in muscle mass and an increase in strength. Improvements in body composition can improve insulin sensitivity and reduce the risk of developing other chronic diseases.

A decrease in fat mass can occur when one begins to exercise on a regular basis (Cuff et al., 2003; Ibanez et al., 2005; Mathieu et al., 2008; Vancea et al., 2009). Studies ranging from 10 weeks (Mathieu et al., 2008) to 20 weeks (Vancea et al., 2009) show decreased body fat. Intra-abdominal adipose tissue, a strong indicator for insulin resistance, decreased in both older men (Ibanez et al., 2005) and post-menopausal women (Cuff et al., 2003). A reduction in waist circumference was also evident (Mathieu et al., 2008;

Payne et al., 2008). The variety of populations studied for fat mass loss suggests that exercise can reduce fat mass in almost all groups of people. Furthermore, exercise has been shown to prevent weight gain as evidenced from those in the control groups who had an increase in fat mass over time. This prevents the individual's type 2 diabetes from worsening with additional fat mass (Honkola et al., 1997).

Whole body lean muscle mass increases with aerobic exercise (Cuff et al., 2003), resistance exercise (Brooks et al., 2007; Dunstan et al., 2002) or both (Cuff et al., 2003; Maiorana et al., 2002), though lean muscle mass gain is most prevalent when resistance exercise is integrated into the program (Cuff et al., 2003). Hypertrophy is evident after resistance training, and this has significant effects for people with type 2 diabetes (Brooks et al., 2007). Skeletal muscle accounts for up to 40% of body weight and is the main site of glucose uptake (Cauza et al., 2005; Henriksen, 2002). If, through exercise, muscle mass is increased, there will subsequently be an increase in glucose disposal (Cauza et al., 2005). This in turn, will remove glucose from the blood, decreasing HbA1c levels over time (Cauza et al., 2005). The pronounced association between muscle cross-sectional area and glycemic control further supports the importance of resistance exercise for type 2 diabetes (Cauza et al., 2005; Cuff et al., 2003).

Improvements in muscle strength may or may not be a result of muscle hypertrophy. Initially, strength gains are neuromuscular in nature, as the individual becomes more effective at recruiting muscle fibres (McDonaugh & Davies, 1984). The strength gains, which are seen in a relatively short period of time following regular resistance training, can have important functional implications for older adults with type 2 diabetes. Strength gains of up to 31.4% (upper body) and 39.7% (lower body) have been found after several

months of resistance exercise (Tokmakidis et al., 2004) with others showing slightly lesser improvements over very similar periods of time (De Feyter et al., 2007; Ibanez et al., 2005; Tokmakidis et al., 2004). It is important to note that strength gains can be maintained with a structured home-based resistance training program following an initial structured community-based program (Dunstan et al., 2005).

#### *Additional Benefits*

There are additional benefits associated with regular exercise, including reduced mortality and reduced medication use. Higher mortality rates are found in men with type 2 diabetes who have low fitness and are physically inactive (Wei et al., 2000). Those who are inactive or who have low fitness are 1.7 times and 2.1 times, respectively, more likely to die prematurely of all causes than those who are active or who have high fitness (Wei et al., 2000). This is true even after adjusting for age, baseline CVD, fasting blood glucose, high cholesterol, overweight, current smoking, high blood pressure, alcohol consumption and parental history of CVD (Wei et al., 2000).

The need for diabetic medications is also reduced with exercise (Brooks et al., 2007). With improved glycemic control a decrease in medication use of 30% was detected in the intervention group compared to controls (Brooks et al., 2007). This could be a result of the program alone or a combination of the program and additional leisure time physical activity associated with increased structured exercise (Brooks et al., 2007). Reduced medication use has important implications for both the individual and the health care system. The benefits of exercise in the management of type 2 diabetes are summarized in Table 3.

**Table 3: Studies illustrating the effectiveness of physical activity for type 2 diabetes management**

Source	Intervention	Findings
Boule et al., 2001	Aerobic & RT	Decreased HbA1c
Brooks et al., 2007	RT vs. control	Increased insulin sensitivity; improved muscle quality
Castaneda et al., 2002	RT vs. control	Decreased HbA1c; SBP; trunk fat mass; increased lean mass
Cauza et al., 2005	Aerobic vs. RT	Resistance: decreased HbA1c, LDL, triglycerides; increased insulin sensitivity Aerobic: no change
Cuff et al., 2003	Aerobic vs. Aerobic + RT	Increased glucose disposal, insulin sensitivity in both; more pronounced in A+R group
Dunstan et al., 2002	RT + weight loss vs. weight loss only	Decreased HbA1c both groups but more for R+WL; lean body mass increased RT
Eriksson et al., 1997	RT vs. controls	Decreased HbA1c
Fenicchia et al., 2004	RT vs. controls	No change in FBG, OGTT
Honkola et al., 1997	RT vs. controls	Decreased HbA1c, LDL, total cholesterol, triglycerides
Ibanez et al., 2005	RT	Increased insulin sensitivity; decreased abdominal fat
Ishii et al., 1998	RT vs. controls	Increased insulin sensitivity
Maiorana et al., 2002	Aerobic + RT vs. controls	Decreased HbA1c, FBG; increased lean body mass, strength
Sigal et al., 2004	Aerobic vs. RT vs. both	Aerobic + RT most effective in decreasing HbA1c
Tokmakidis et al., 2004	Aerobic + RT	Decreased HbA1c, FBG; Increased insulin sensitivity
Vancea et al., 2008	Aerobic vs. controls	No change in HbA1c

RT= resistance training

## **The Health Care System in Canada**

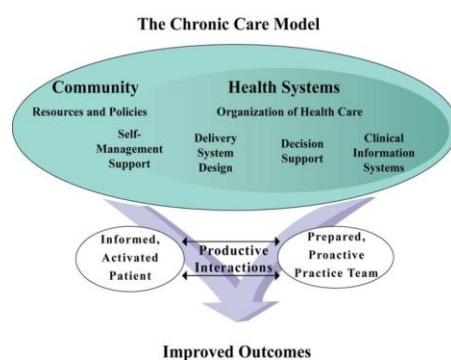
### ***The Health Care System and Chronic Disease Care***

Chronic disease management is typically framed under the Chronic Care Model (CCM)

(Figure 1), which the WRHA has recently adopted. This framework was developed based

on previous research, suggestions from practice and recommendations from evaluations of the existing interventions in the United States, and has since expanded to other countries such as the United Kingdom, Australia, New Zealand and Canada. The CCM was developed in order to reshape the delivery system to meet the needs of patients with chronic diseases (Wagner et al., 1998). Traditionally, primary care has focused on providing services to people with acute issues. Thus, it is a system built on short appointments, diagnosis and treatment of signs and symptoms, reliance on laboratory investigations and prescriptions and patient-oriented follow-up (Wagner et al., 1998), and does not support the needs of patients with chronic disease. The goal of the CCM is to deliver chronic disease care for patients by implementing practice changes to: increase provider expertise and skill, educate and support patients, utilize team-based and planned care delivery and use registry-based information systems. The model is supported by six pillars including a) Organization of Health Care; b) Delivery System Design; c) Decision Support; d) Clinical Information Systems; e) Self-Management Support; and f) The Community.

**Figure 1: The Chronic Care Model**



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### *Organization of Health Care*

Chronic disease care must be a priority of the provider organization for successful, long-term improvements. Without the support of the organization, and correspondingly its purchasers and insurers, self-management support, delivery system design, decision support and clinical information systems will not thrive. Purchasers and insurers must support and encourage a quality approach to chronic disease care, in order to reduce expense and promote sustainability of the model (Bodenheimer et al., 2002a; Wagner et al., 2001a).

The majority of payment for Canadian physicians is based on a fee-for-service system, in which the physician is paid based on the quantity of services he/she performs for patients. The fee-for-service system has been scrutinized in recent years however, as evidence suggests that it promotes a focus on quantity over quality and decreases preventative care, health promotion and collaboration. Thus there has been a shift to alternative remuneration methods (physician salaries and blended models) in order to improve health service delivery. Currently in Manitoba, salaries are offered to many rural physicians while blended models are offered more frequently in urban clinics if any alternative model is used at all (Wranik and Durier-Copp, 2009). The Physician Integrated Network (PIN) (described in the ‘delivery system design’ section) acknowledges the need to adapt the funding for chronic disease management and is attempting to implement additional remuneration methods for physicians (Manitoba Health, 2009).

### *Delivery System Design*

One of the major changes implemented with the CCM is the restructuring of practice in the health care setting to team-based care, in which the physician delegates the desired



treatment and utilizes other health professionals' expertise for treatment in their respective areas. When subsequent visits are planned at the first session, health care providers are able to ensure that follow-ups occur in an effective, appropriate manner (Bodenheimer et al., 2002a; Wagner et al., 2001a).

Recently, Manitoba Health has put forward a new approach called the Physician-Integrated Network in an attempt to improve the delivery of primary care to the citizens of Manitoba. One of the key features of the PIN is the integration of non-physician health care providers into primary care practice in order to increase the range of services delivered to and provide a comprehensive care plan for patients, as well as to decrease workloads and increase job satisfaction among health care providers. The interdisciplinary teams will allow health care providers to provide a variety of services in their area of expertise, but will also facilitate collaborative teamwork in order to increase the quality of care for patients. The three demonstration sites employed at the beginning of this project have recently finished the two project phases and an additional 65 primary care physicians are currently being recruited for further project expansion (Manitoba Health, 2009).

#### *Decision Support*

It is essential that health care providers and patients interaction occurs on a regular basis, ideally through simple reminders integrated into daily practice. The information delivered during the visit should incorporate evidence-based guidelines for care and be presented in such a way that the patient fully understands. This means that the physician must remain up to date on the most current information in the field through traditional continuing medical education and newer models of health care provider education.

Furthermore, the methods of interaction should not be limited to face-to-face contacts but instead should be available through a telephone call. A referral would not be necessary as specialist expertise would be readily available (Bodenheimer et al., 2002a; Wagner et al., 2001a).

### *Clinical Information Systems*

The three main roles of Clinical Information Systems are as follows: a) registries for improved patient care b) reminder system to assist primary care teams to follow practice guidelines and c) to provide feedback to determine how the patient is managing his or her disease. Registries are a list of all patients with a chronic disease under the care of a physician or an organization. Information from laboratory tests and examinations are put into the system throughout treatment. This allows health care provider to see the patients' progress and requests that reminders pop up if particular tests or examinations are not performed at the scheduled time (Bodenheimer et al., 2002a; Wagner et al., 2001a).

### *Self-Management Support*

When a person is diagnosed with a chronic disease, it becomes of utmost importance that the individual has the confidence and skills to manage the disease. In the past, treatments focused on increasing patient knowledge of the disease and the available treatments but this did not transfer into a change of behaviour. By involving the patients' families and teaching the appropriate management skills, health improvements are evident. The health care provider's role in self-management is to provide support for the patient. This should include an assessing the patient's current self-management skills, setting goals to improve the disease, identifying potential barriers to self-management, developing strategies to

overcome these barriers and providing tools to make the self-management possible (eg. glucometers) (Bodenheimer et al., 2002a; Wagner et al., 2001a).

### *The Community*

It is essential that chronic care organizations are linked with resources in the patients' communities. Because the health care system operates as part of the larger community, programs and resources help to support the ongoing care that is provided by the health care system. Community resources are extremely useful in situations where there are limited resources in the clinic itself. By developing community partnerships, current gaps in the system can be filled at no additional expense to the system (Bodenheimer et al., 2002a; Wagner et al., 2001a).

A recent review article by Coleman and colleagues summarizes the ability of health care organizations to introduce the CCM in practice. They examine the impact of this system redesign on clinical care and health outcomes in order to determine if this model is realistic in practice. The authors determined that practices structured according to the CCM improve quality of care and patient outcomes for people with chronic disease (Coleman et al., 2009).

### ***Chronic Care Model and Type 2 Diabetes***

Type 2 diabetes is an example of a chronic disease which has effectively utilized the CCM in practice. Several studies have examined how the implementation of the CCM or some of its components impact type 2 diabetes patient outcomes. Utilizing the CCM in primary care results in decreased HbA1c levels (Nutting et al., 2007; Parchman et al., 2007; Piatt et al., 2006; Siminerio et al., 2005; Solberg et al., 2006; Wagner et al., 2001b), decreased total cholesterol (Piatt et al., 2006), decreased LDL cholesterol

(Solberg et al., 2006), decreased disability days (Wagner et al., 2001b) and increased HDL cholesterol (Siminerio et al., 2005; Piatt et al., 2006) as compared to standard care. In one study, the inverse relationship between the extent of CCM and HbA1c was highest for those who had not adhered to exercise for the past 6 months, suggesting the model's importance for those who, on their own, are not ready to make lifestyle changes (Parchman et al., 2007). Patients also reported greater knowledge of diabetes and greater empowerment towards managing the disease (Piatt et al., 2006; Siminerio et al., 2005). Though these are not direct clinical outcomes they can facilitate improvements in health (Piatt et al., 2006).

With regard to health care delivery (process measurements), patients receiving care consistent with the CCM are more likely to report receiving preventative procedures and having a microalbuminuria test (Wagner et al., 2001). A review by Bodenheimer and colleagues (2002b) found that 82% of studies involving the CCM for diabetes improved at least 1 process (i.e., measurement of HbA1c, serum lipid levels, etc) or outcome (i.e., HbA1c levels, end organ complications, etc.) measure. No particular pillar was found to be the most effective but most of these studies included a self-management component (Bodenheimer et al., 2002b). Another study has indicated the delivery system design and community resources are associated with improved health (Parchman et al., 2009).

### ***Physical Activity Delivery in the Health Care System***

Approximately 69% of people with type 2 diabetes do not engage in enough physical activity (Nelson et al., 2002). Nearly 31% report engaging in no regular physical activity, and another 38% report engaging in less than the recommended amount (Nelson et al., 2002). Furthermore, few participate in an organized exercise program (7.7%), though

most (84%) believe they should get more exercise (Searle and Ready, 1991). The importance of physical activity on health status for people with type 2 diabetes is extremely well-documented and thus physical activity is now viewed as essential to any treatment plan. Despite the enormous impact physical activity has on health status of people with type 2 diabetes, one study concluded that physical activity is only discussed in 18% of visits while nutrition is discussed twice as often (Peek et al., 2008).

#### *Current Health Care Provider Counseling*

Physicians have traditionally been the main resource for physical activity information as they are viewed as a credible source of health information and regularly see patients throughout the year (Bull et al., 1997). More recently however, nurses and allied health professionals (e.g., dietitians, occupational therapists, mental health workers) are becoming a valued source of credible health information within the health care system (Gornall et al., 2008). The 7-A's model is advocated as an appropriate health care provider counseling model, which involves strategic steps to Address, Ask, Advise, Agree, Assess, Assist and Arrange physical activity behaviours (Fortier et al., 2007). Most health care providers ask about the patients' current physical activity level (Buchholz and Purath, 2007; Harris et al., 2004; Petrella et al., 2007) but the assistance is reduced significantly after this questioning. Less than 67% of health care providers advised on physical activity (Buccholz and Purath, 2007), and this is mainly via verbal counseling rather than written prescription (Petrella et al., 2007). Only 17% (Buccholz and Purath, 2007) to 25% (Petrella et al., 2007) actually assessed fitness and 10.9% referred to another person for a fitness assessment.

Looking in depth at the conversations between health care providers and patients with type 2 diabetes, Pokisparta and colleagues (2006) found that the conversations had minimal feedback for the patients and that health care providers did not discuss how to implement physical activity behaviours into the patients' lives. Furthermore, the delivery of physical activity information and content varied extensively by health care providers and could not be considered to follow a structured theoretical basis (Gornall et al., 2008). Physical activity was even warned against in several cases, whether the advice was to avoid it altogether, or to take safety precautions (Hirvensalo et al., 2005).

Patients are frequently asked about exercise counseling delivered by their health care provider, but often the patient responses do not correspond to those the health care provider has reported (Sinclair et al., 2008; Glasgow et al., 2001). In one study, 28% of patients reported receiving advice from their health care provider, and only 11% reported actually creating an exercise plan (Glasgow et al., 2001). In a similar study, 42% report often or always receiving advice from their health care provider (Sinclair et al., 2008).

The differences in percentages between these two studies may be due to the year the studies were conducted, the study design or the location, among others. Regardless, patients' responses imply significantly less counseling is available than what health care providers confirm (67%). This indicates that perhaps the socially-desirable response of providing adequate physical activity counseling makes the health care provider exaggerate their responses when asked, or that patients under-report the amount of support that they receive.

### *Barriers to Providing Physical Activity Counseling*

Several barriers exist for health care provider to give the physical activity counseling needed for behaviour change. One of the main concerns cited is a lack of time (Buchholz and Purath, 2007; Harris et al., 2004; McKenna et al., 1998; Parker et al., 2009; Schmid et al., 2009). Although physicians see the primary care system and their role in primary prevention as important (Schmid et al., 2009), they do not believe that using appointments for behaviour change counseling would be appropriate (Harris et al., 2004) and they feel that their time could be better spent addressing more important concerns (Buchholz and Purath, 2007).

A second, even more important barrier is the lack of education and training health care providers have with regard to physical activity counseling and prescription (Buchholz and Purath, 2007; Douglas et al., 2006; Gornall et al., 2008; McKenna et al., 1998). It has been found that the main source of physical activity information is the mass media for 27% of current health care providers and 48% of future health care providers (Parker et al., 2009). Furthermore, deans and directors of American medical schools feel that their graduates are confident in conducting a physical exam to approve the start of an exercise program, however only 10% feel they are fully capable of designing an exercise program (Connaughton et al., 2001). Studies in the United States and abroad have shown that only 13.4% of medical students know the public health guidelines for physical activity (Foster et al., 2002) and this proportion declines slightly as graduates enter practice (Douglas et al., 2006). With an already full curriculum and funding issues, physical activity program design would be a difficult topic to undertake (Connaughton et al., 2001). Looking at the education of allied health care provider, 61% of nurses said

physical activity counseling was not part of their formal education though some did receive information from conferences and workshops after graduation (Buchholz and Purath, 2007). Furthermore, 90% of health care providers do not have access to or regularly consult with physical activity experts (Parker et al., 2009). From the results of this research it is not surprising that physicians and allied health care provider report a lack of knowledge and a need for a physical activity specialist to work as part of the team (Gornall et al., 2008). For those who do believe they have an adequate understanding, physical activity knowledge is often overestimated (Parker et al., 2009) and the guidelines cited are frequently incorrect (Douglas et al., 2006). In Canada, 83% of physicians are aware of Canada's physical activity guide, but approximately 69% have not heard of the PACE program, the STEP exercise prescription and the Go for Green prescription (all programs targeting physician physical activity counseling), despite counseling many patients with type 2 diabetes who could benefit greatly from this sort of advice (Harris et al., 2004).

Health care providers often refrain from providing exercise counseling due to safety concerns (Gornall et al., 2008). People with type 2 diabetes have an acute reduction in blood glucose when they begin to exercise which must be monitored to ensure hypoglycemia does not ensue (Nguyen et al., 2008). However, with regular exercise, blood glucose becomes more stable and this drop is less dramatic (Nguyen et al. 2008). People with type 2 diabetes often also have other health concerns or associated complications which can increase risks during exercise, depending on the exercise intensity (Gornall et al., 2008). Thus, it is important that people providing physical



activity counseling have a clear understanding of the potential harms associated with exercise and identify ways to minimize the risks (Hayes and Kriska, 2008).

Other reasons for not providing physical activity counseling which were cited by health care providers include a lack of commitment or interest from the patient and limited access to community-based resources (Buchholz and Purath, 2007; Harris et al., 2004; McKenna et al., 1998).

#### *Access to Physical Activity Resources in the Community*

Physical activity resource guides are tools for physicians and allied health care providers which summarize physical activity information and the resources available in the community. The purpose of the resource guides is to a) provide access to information that is not readily available b) identify specific activity recommendations and c) remind health care provider to discuss the physical activity services available in the patient's community when an individual comes in to his/her office (Seligman et al., 2009).

Unfortunately, the task of keeping the resource guides up to date is difficult and information quickly becomes outdated (Seligman et al., 2009). Seligman and colleagues (2009) found that only three out of 20 health care providers had useful physical activity resource guides and often the health care providers had no idea about the services they referred their patients to. Health care providers noted that the guides were useful if they practice in a different area than they live, but determined that the resource guides cannot be relied upon entirely on their own but rather be used as a tool in conjunction with face-to-face counseling (Seligman et al., 2009).

Certified diabetes educators in Canada seem to have slightly more access to resources than traditional health care providers, with 38% reporting access to at least one type of

external physical activity resource (Gornall et al., 2008). This resource still only serves less than 4 in 10 people, and exemplifies an extremely essential missing link to the community and a need for more community partnerships, facilities, equipment and information in languages other than English (Gornall et al., 2008). Clinics with resource identification tools and linking strategies are 80% more likely to have patients who report exercising regularly (Balasubramanian et al., 2008).

### ***Physical Activity Counseling Effectiveness***

Most studies have found that physical activity counseling is effective in increasing physical activity levels (Armit et al., 2008; Dutton et al., 2008; Grandes et al., 2009; Halbert et al., 2000; Hardcastle et al., 2008; Jimmy and Martin, 2005; Kirk et al., 2004; Lindahl et al., 2009). Those that were not successful in increasing physical activity level were very brief (one-time counseling session with minimal reinforcement (Norris et al., 2000). Realistically, most people are willing to attend three to five counseling sessions over a 6-month period which will give them a guideline for intensity, duration, time and type of physical activity and a better understanding of the risks and benefits (Hardcastle et al., 2008). However, the more sessions one attends, the better their resulting health status (Hardcastle et al., 2008). Physical activity counseling is more effective in people with type 2 diabetes than those without type 2 diabetes based on both subjective recall of physical activity patterns and objective accelerometer data (Kirk et al., 2004). This could be explained because primary health care provider advice motivates people to increase physical activity level more often as a treatment option rather than a preventative measure (Horne et al., 2010).

Physician or allied health care provider counseling alone is more effective if it follows a brief negotiation design where health care providers discuss barriers to physical activity, encourage the patient to think about the importance of physical activity in his/her life rather than just giving verbal advice (Hillsdon et al., 2002). Furthermore, some of the most successful lifestyle change programs included regular ongoing support to patients, and utilized several health care providers in care (Bastiaens et al., 2009; Pinto et al., 2005). Due to the numerous barriers associated with health care provider counseling as previously mentioned, novel research has investigated brief advice from a health care provider followed by a longer counseling session with a physical activity specialist (Armit et al., 2008; Halbert et al., 2000; Hardcastle et al., 2008; Jimmy and Martin, 2005). This interprofessional collaboration addresses the current limitations of the health care system: a lot of people can be reached outside the time constraints of a single appointment in primary care (Balasubramanian et al., 2008). Improvements in physical activity were seen after 2 weeks (33% of participants) and after 14 weeks (67% of people) (Jimmy and Martin, 2005). Improvements have been maintained at 1 year (Halbert et al., 2000; Lindahl et al., 2009) despite no changes in other health behaviours (Lindahl et al., 2009). The increase in activity through counseling has a clinically relevant impact on health status of people with type 2 diabetes (Hardcastle et al., 2008). A review by Tulloch and colleagues (2006) concluded that either allied health care providers (ideally an individual with an exercise background) or combined providers (physician and allied health care provider) produce the most impressive physical activity counseling results over time. This type of counseling is likely effective due to the type, length and intensity of counseling that the allied health care provider can offer (Tulloch et

al., 2006). They can tailor the physical activity program to the person's stage of change, personal characteristics, realities and includes a follow-up all increase activity levels (Eakin et al., 2000; Kirk et al., 2004; Rose et al., 2007; Weidinger et al., 2008). Also, they can provide a written program which involves community resources in their area to improve adherence (Eakin et al., 2000; Swinburn et al., 1998; Weidinger et al., 2008) and use of other physical activity tools (eg. pedometer) to contribute to greater physical activity levels (Armit et al., 2008).

When physical activity counseling is found to be ineffective it is often attributed to the short amount of time allotted to counseling or to the overwhelming burden of trying to change two or more health behaviours at once (Keyserling et al., 2008). It seems the most effective method of counseling is in-person, as telephone counseling does not increase physical activity among patients with chronic diseases such as type 2 diabetes (Eakin et al., 2009).

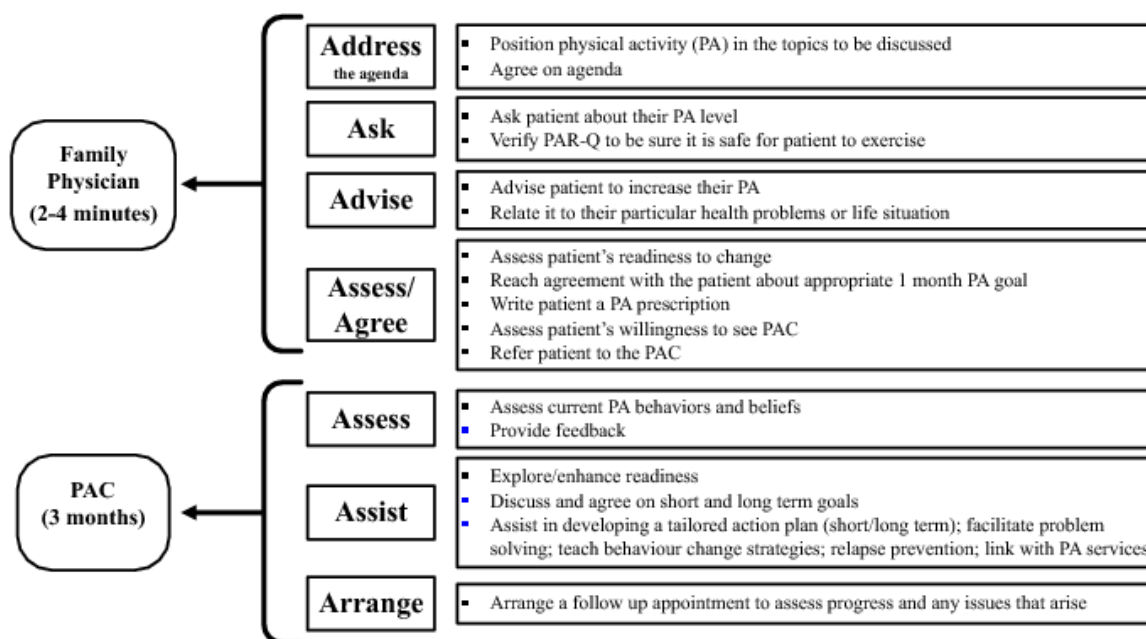
Recently, a new project called the "Physical Activity Counseling (PAC)" trial is looking to incorporate a physical activity specialist directly into the primary care team (Fortier et al., 2007). This project utilizes the 7As model, however breaks it into two sections so that it delivers the most appropriate care by the most appropriate provider (Figure 2) (Fortier et al., 2007). The first 4As (Address, Ask, Advise & Assess/Agree) are undertaken by the patient's regular health care provider, while the last 3As (Assess, Assist, Arrange) are completed by a physical activity specialist. This model utilizes a less costly allied health care provider for the most intensive, lengthy part of treatment and takes advantage of the physical activity specialist's skills, knowledge and experience in exercise program design and safety. It is important to note that the physical activity

counselor works alongside the rest of the primary care team in this model and is not a separate service to which the health care provider refers the patient (Fortier et al., 2007).

### *Patient perspective on physical activity counseling*

A recent study examined the patient perspective on physical activity counseling. When asked the most important health behaviour change that patients would like to make “right now”, 28% reported increasing their physical activity level. Of those 28% who ranked PA as the most important change, 15% indicated that they would need or want support to make the change, and health care providers were listed as a desired source to facilitate such a change (Leijon et al., 2010).

**Figure 2: The 7-A’s model for interdisciplinary shared care (Fortier et al., 2007)**



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**Physical Activity Guidelines**

Physical activity guidelines serve to identify the best evidence available from current research in Canada and around the world. Guidelines are developed by a team of professionals in the area (medical doctors, researchers, allied health care providers, health system employees, etc) to summarize the best information to date. This information can then be used to guide practice, at the discretion of the health care provider. It is hoped that the guidelines will be a tool to help deliver the best possible care to patients in Canada. The main physical activity guidelines in Canada for people with type 2 diabetes are Canada's Physical Activity Guide (CPAG) and the 2008 Canadian Diabetes Association (CDA) Clinical Practice Guidelines.

***Canada's Physical Activity Guide***

In 1998, The Public Health Agency of Canada developed Canada's Physical Activity Guide for healthy, active living. The recommendations made in this guide are a result of evidence-based research regarding the amount of physical activity required for health benefits. The goals of the CPAG are to promote regular physical activity to the general adult population and describe ways to implement more activity into one's life. The physical activity guidelines have recently been under review using an internationally-recognized rigorous approach. The results from this study will be used to inform potential changes to CPAG in future years (Tremblay et al., 2010), however as it exists today, the CPAG recommends endurance exercise four to seven days per week, flexibility exercise four to seven days per week and strength training two to four days per week. It recommends at least 60 minutes of light effort activity or 30 to 60 minutes of moderate effort activity or 20 to 30 minutes of vigorous effort activity. Additional guides have also been developed for special population groups (e.g., children, youth, older adults) to better

suit their needs (Health Canada, 1998). New physical activity recommendations have recently been released, advising adults to accumulate 150 minutes of moderate intensity physical activity per week, consisting mainly of aerobic activity, but also including bone and muscle strengthening activities two to four days per week and flexibility exercises four to seven days per week (Canadian Society for Exercise Physiology (CSEP) & Participaction, 2010).

Several concerns have been raised about the usefulness of the CPAG for the general public, however. A 2009 study by Ready and colleagues found that 70% of Manitoba adults actually met the minimum CPAG recommendations, despite the increasing prevalence of type 2 diabetes and other chronic diseases in the province. This suggests that perhaps the guidelines are set too low when all daily activity is included, not just leisure time activity (Ready et al., 2009). Furthermore, citizen awareness of CPAG is also very low (Spence et al., 2002). One study found that only 5.2% of Canadian adults had unprompted recall of the CPAG (Bauman et al., 2005). A similar 2007 study reported that this percentage had since dropped to 3.9% and that unprompted recall of the guidelines was also associated with being more active (Cameron et al., 2007). Thus, the usefulness of the CPAG as a public health strategy alone may be limited (Cameron et al., 2007; Spence et al., 2002). For the guidelines to reach the public effectively, Cameron and colleagues (2007) suggest that partnerships should be developed with the health care system to deliver the message.

### ***Canadian Diabetes Association Clinical Practice Guidelines***

In 2008 the Canadian Diabetes Association compiled comprehensive, evidence-based recommendations to assist health care professionals when treating patients with type 2

diabetes. The CDA guidelines are designed to provide optimal care in the prevention, screening, treatment and management of type 2 diabetes and as such can serve as a tool to evaluate current delivery practices within the health care system. The CDA proposes that diabetes care should be a collaborative undertaking and thus should utilize a diabetes health care team. They describe the ideal diabetes health care team to be multi and interdisciplinary, having extensive connections within the community. These qualities of the diabetes health care team, along with family support and patient self-management, yield the best long-term care for individuals with type 2 diabetes.

Physical activity is a component of the 2008 CDA guidelines and the recommendations for weekly activity are described below:

- 1) People with diabetes should accumulate a minimum of 150 minutes of moderate- to vigorous-intensity aerobic exercise each week, spread over at least 3 days of the week, with no more than 2 consecutive days without exercise
- 2) People with diabetes should also be encouraged to perform resistance exercise 3 times per week in addition to aerobic exercise. Initial instruction and periodic supervision by an exercise specialist are recommended.
- 3) An exercise ECG stress test should be considered for previously sedentary individuals with diabetes at high risk for cardiovascular disease who wish to undertake exercise more vigorous than brisk walking.



### **Chapter 3: Methods**

#### **Introduction**

The methods section will be presented in 6 subsections: ethics approval, research design, sampling, data collection, instruments and statistical analyses.

#### **Ethics Approval**

This study was reviewed by the Education/Nursing Research Ethics Board (ENREB) of the University of Manitoba and was given access approval by the Winnipeg Regional Health Authority (WRHA). Before agreeing to participate, informed consent was obtained from each Team Manager (for clinic data) (Appendix A), health care provider (Appendix B) and patient (Appendix C). All informed consent forms included a study description, potential risks and benefits, assurance of anonymity and confidentiality and responsibilities of the subject. The clinics, health care providers and patients were given an identification number following completion of the questionnaire to keep all information confidential. Thus neither the clinics, nor the subjects were identified when the data was stored or the results were reported- only the primary investigator, Jill Hnatiuk and her advisor, Dr. Elizabeth Ready had access to the identifying information. Paper data will be kept for three years in a locked filing cabinet in room 308 Max Bell Centre at the University of Manitoba. Computer files will also be kept for three years on a computer which will only be accessed by the primary investigator and her advisor. All results were presented as grouped data only. The results have been provided to each clinic for the patients and health care provider to see when they visit their respective clinics. The Team Managers have been notified by telephone that the results are available, and a written notice has been posted in each clinic to inform the health care

providers and patients and to let them know how to access them. All data will be securely destroyed after 3 years.

### **Research Design**

This study utilized a cross-sectional design, and was conducted over four months; from October 2009 to January 2010. There were three parts to this project. In Part A, the team managers from each of the 8 primary care clinics specializing in diabetes education were interviewed in-person to gather information about the operations of that particular clinic. In Part B, health care providers from the 8 clinics were interviewed in-person to determine the extent of physical activity supports normally provided to a patient with type 2 diabetes. A case study was used to describe the patient to which the health care provider would have to provide his/her services. This was done so that the health care provider could base his/her responses on one type of patient only. Without standardization, responses could vary substantially as a result of the different approaches used with different patients. The patient described in the survey was one who would benefit greatly from increased physical activity and would require minimal safety considerations. Three categories of health care providers were included in the study: a) physician b) nurse and c) other (including dietitians, occupational therapists, social workers, counselors/community workers, pharmacists and medical assistants). Physical activity supports were divided into three areas (Behaviour Change, Assessment/Prescription, Information/Referrals/Community Resources). In Part C, patients were interviewed to determine the extent of agreement between physical activity supports as reported by the health care providers, and perceived by the patients.

## Sampling

### *Clinics*

The team manager of each clinic was initially contacted by the WRHA Chronic Disease Specialist who introduced the investigator and provided a brief letter that very generally outlined the potential research project (Appendix D). The researcher followed up with either a phone call or an email in February or March of 2009 to determine if each clinic was willing to participate in the research study.

**Table 4: Total sample of health care providers in the clinics participating in the study**

<b>Clinic</b>	<b>Number and Type of HCP</b>
Clinic A	3 nurses 4 other HCPs
Clinic B	2 nurses 3 other HCPs
Clinic C	1 physician 3 nurses 3 other HCPs
Clinic D	4 physicians 7 nurses 4 other HCPs
Clinic E	2 nurses 4 physicians
Clinic F	1 nurse 1 other HCPs
Clinic G	3 physicians 5 nurses 4 other HCPs
Clinic H	3 physicians 3 nurses 2 other HCPs

### *Health Care Providers*

A potential pool of 62 health care providers was reported to be working in the eight clinics at the time the study was conducted (15 physicians, 26 nurses and 21 other health

care providers). All of the health care providers in the consenting clinics who regularly provide services to people with type 2 diabetes were approached to participate by the primary investigator or by another health care provider in the clinic. Health care providers were required to meet the following inclusion criteria: identify with only one of the following professions, a) physician; b) registered nurse or nurse practitioner or c) other health care provider (including dietitians, occupational therapists, social workers, counselors/community workers, pharmacists and medical assistants), counsel patients with type 2 diabetes and have worked in a primary health care clinic for 3 months or longer.

### ***Patients***

Patients were required to meet the following inclusion criteria: be of middle age (30 to 65 years), have no other health condition which would prevent him/her from engaging in exercise, have attended the clinic for at least 1 month and identify the clinic as his/her main primary care site. These inclusion criteria describe the ideal candidate to receive physical activity support from their health care provider and match the standardized patient in the health care provider interview.

## **Data Collection**

### ***Part A: Clinics***

An in-person interview was conducted with the team manager from each clinic to obtain information about the operations of the respective clinics. An informed consent form was filled out prior to beginning the interview, at which point the team managers had the opportunity to ask questions about the research. The interview took approximately five to 10 minutes to complete (Appendix E).

***Part B: Health Care Providers***

After receiving permission from the team managers to conduct the study in their clinics, interviews with health care providers were set up by either the team managers themselves or an employee as designated by the team managers. Written informed consent was given prior to beginning the interview. The questions asked during the interview determined the physical activity support provided by the health care provider to the standardized patient with type 2 diabetes and collected demographic data, including the number of certified diabetes educators. All interviews took approximately 15 to 20 minutes to complete, depending on the details provided by the health care provider (Appendix F).

***Part C: Patients***

After obtaining permission from each team manager to interview patients at their clinics, interview times were arranged by an employee of the health care clinic who was aware of the patient inclusion criteria (either a health care provider who had contact with many patients with type 2 diabetes or an office administrator). This individual informed the patients that there was a study being conducted that had absolutely no connection to the clinic itself. They were told that it involved a 20- minute interview about the types of physical activity support available from health care providers, as well as some demographic data. If the patient agreed to see the researcher to find out more information about the study, the patients were directed into a side room of the clinic or were scheduled for an interview appointment at a later date. The researcher then explained the study details and obtained informed consent from each subject. The interview took approximately 20 minutes to complete, again depending on the amount of detail provided (Appendix G). There was not the same number of patients selected from each clinic as

some clinics have fewer patients with type 2 diabetes, and a greater percentage of no-shows, than others.

## **Instruments**

### ***Interview Development***

The team manager, health care provider and patient interviews used in this study were all developed by the primary investigator, and are based on the 7A's model (Fortier et al., 2007) and the Physical Activity Exit Interview (Sciamanna et al., 2004). The questions were revised to answer the research questions specific to this study as there is currently no validated questionnaire or interview to answer these research questions. The interview has been reviewed by researchers specializing in survey design. The CPAG guidelines were utilized as one of the physical activity recommendations in this study as the revised guidelines came out in spring 2010 and thus were not available at the time the study was conducted.

### ***Clinic Interview***

The clinic interview was a series of open-ended and closed-ended questions posed to the team manager in order to describe the operations of the clinics. The data collected from these surveys was used to provide descriptive data about the results from the health care provider and patient portion of the project.

### ***Health Care Provider Interview***

The scoring for the health care provider interview is outlined in Appendix H and aims to answer the specific objectives in Chapter One. The first part of the health care provider interview involved open-ended questions. Any information that the health care provider provided from these questions was categorized as unprompted responses. The remaining

questions were prompted and mainly closed-ended, to which the health care provider responded ‘yes’ or ‘no’. The bolded questions in the health care provider interview scoring are all considered a physical activity “support”. The physical activity supports score was determined by the number of physical activity supports in each of the three areas: Behaviour Change (BC), Assessment/Prescription (AP), and Information/Referral/Community Resources (IRCR). For each physical activity support the health care provider identified or described unprompted, the health care provider was given a score of 1 in the unprompted data section. For each physical activity support the health care provider responds ‘no’, he/she was given a score of 0 in the unprompted section. The same pattern was utilized for the prompted responses, but instead with data recorded in the prompted data section. Total physical activity score was determined by combining the number of supports in each of the three areas (BC, AP, IRCR).

The proportion of health care providers who could identify and describe the CDA guidelines and the CPAG guidelines when unprompted and prompted was determined by counting the number of health care providers who identified or described the guidelines during the open-ended, unprompted portion of the interview and by the number who identified and described the guidelines during the prompted portion. The proportion of health care providers who use the CDA guidelines or the CPAG guidelines in practice was determined by the number of health care providers who respond ‘yes’ to the respective question identified in the health care provider interview scoring. The remaining questions provided descriptive data about the demographics of the health care providers by counting the number of health care providers who fell into each response category for the desired questions. The health care provider interview questions were

asked in an order that did not bias him/her for successive questions by providing physical activity information with earlier questions.

### ***Patient Interview***

The scoring for the patient questionnaire is outlined in Appendix I. It followed a very similar format to the health care provider questionnaire, in that the number of physical activity supports in each area were counted (yes=1, no=0), and then were added together to give a total physical activity support score. It also determined the proportion of patients who could identify and describe the physical activity guidelines, unprompted and prompted. The proportion of patients whose health care providers have used the CDA guidelines were determined by the number of patients who respond 'yes' to the respective question identified in the patient interview scoring. Again, the remaining questions provided descriptive demographic data by counting the number of patients which fall into each response categories.

Patient physical activity level was assessed by asking the patient the number of times he or she did light, moderate and vigorous physical activity and the total time spent in each type of activity in the past week. The intensity of activity was described in terms of an increase in heart rate and breathing rate and two examples of each type of activity were given (such as leisurely walking or gardening for light activity). All daily physical activity was considered for this study, not only leisure time activity. When determining which patients met the physical activity guidelines, both the frequency of the activity and length of time of the activity had to meet the guideline standards. Furthermore, if an individual did some vigorous activity but did not meet the guideline through vigorous activity, the time spent doing vigorous activity was added to the moderate activity



category to determine whether the individual would meet the guidelines through at least moderate activity. The same approach was utilized for moderate activity (in terms of adding it to the light + category).

### **Statistical Analyses**

Data was analyzed with SPSS version 16.0. The independent variables were the type of health care provider (physician, nurse, other) and the type of responders (health care provider vs. patient). The dependent variables were the number of physical activity supports in each of the three categories (BC, AP, IRCR) and the total number of physical activity supports. The data were analyzed using a Kruskal-Wallis test to compare physical activity supports (unprompted and prompted) between health care providers, and a Mann-Whitney U test to determine physical activity support response consistency between responders (health care provider and patients), as data did not follow a normal distribution when tested using a Shapiro-Wilk test for normality ( $p < 0.01$ ). Data was also analyzed initially using an ANOVA and t-test (Appendix K), and the same findings were discovered. Demographic variables for health care providers included sex, location of training and years of practice (total, and at that particular clinic). Demographic variables for patients included sex, education level, marital status, employment status and time since last visit to a health care provider.

## **Chapter 4- Results**

This section will be presented in four subsections: clinic characteristics, demographic characteristics, health care provider physical activity support, and health care provider and patient physical activity support response consistency.

### **Clinic Characteristics**

The sample included a total of 8 team-based, primary care clinics specializing in diabetes education in the city of Winnipeg, Manitoba, Canada. All 14 of the team-based clinics specifically focused on diabetes education in the city of Winnipeg were invited to participate in the study but four declined participation due to other responsibilities (mainly the H1N1 pandemic, especially amongst those who served mainly Aboriginal populations) and two did not respond to repeated telephone messages.

Consistent with the inclusion criteria, when describing the clinic's mandate all team managers identified their clinics as WRHA team-based primary care clinics with an emphasis on diabetes education. Most team managers mentioned community capacity building as a priority or described the ties that they had to the community. Some clinics indicated that they served specific populations, including "at risk" individuals and older adults while others elaborated on their focus on the determinants of health and providing holistic care aimed at improving or maintaining all aspects of one's health. Nearly all clinics reported that they followed the WRHA chronic disease model/framework when providing care to patients, however some clinics elaborated further by stating that they have also integrated the behaviour change model or self-management education components to their practice. All clinics identified that they used the WRHA diabetes flow sheet (Appendix J) as the common care plan for people with type 2 diabetes. Three

clinics indicated a written record of physical activity support is documented in this diabetes flow sheet, while four others stated that the patient's chart is more commonly used.

Responses as to whether or not physical activity support was provided to patients by all members of the clinic varied. Six clinics indicated that physical activity support was provided by all members of the healthcare team, but two specified the types of professionals who were involved in physical activity care (only these health care provider types were interviewed at the respective clinics). Table 5 summarizes the types of health care providers interviewed at each clinic.

**Table 5: Health care providers interviewed in each of the clinics**

<b>Clinic</b>	<b>Number and Type of HCP</b>
Clinic A	3 nurses 2 other HCPs
Clinic B	1 nurse 2 other HCPs
Clinic C	2 physicians 3 nurses 3 other HCPs
Clinic D	4 physicians 6 nurses 4 other HCPs
Clinic E	4 physicians 2 nurses
Clinic F	1 nurse 1 other HCP
Clinic G	3 physicians 3 other HCP
Clinic H	3 physicians 2 nurses

## **Demographic Characteristics**

### ***Health Care Provider Characteristics***

A total of 48 health care providers were interviewed (15 physicians, 18 nurses and 15 other health care providers including dietitians, occupational therapists, pharmacists, counselors/community workers, social workers and medical assistants); 83.4% were female and 16.6% were male. A total response rate of 77.4% was achieved, though the response rate between each type of health care provider type varied (100% physicians, 69.2% nurses, 71.4% other health care providers). The majority of health care providers completed their education and training in Manitoba with less than 20% reporting education from either another province or another country. Overall 18.8% indicated that they were certified diabetes educators, which are health professionals who have taken extra training which provides them with a sound knowledge base in diabetes care and management. Seventy-eight percent of certified diabetes educators were nurses and the remaining 22% were dietitians. Sixty-three percent of clinics had at least one certified diabetes educator, working in the clinic. The mean years of total practice was 13.8 +/- 10.02, and the mean years of practice in the current clinic were 7.2 +/- 6.94. Table 6 outlines the characteristics of the physicians, nurses and other health care providers.

**Table 6: Characteristics of the various health care provider types**

	<b>Physician (n=15)</b>	<b>Nurse (n=18)</b>	<b>Other HCP (n=15)</b>
<b>Female</b>	10 (66.7%)	18 (100%)	14 (93.3%)
<b>Education location</b>			
Manitoba	8 (53%)	18 (100%)	14 (93.3%)
Other province	4 (26.7%)	0 (0%)	1 (6.7%)
Other country	3 (20%)	0 (0%)	0 (0%)
<b>Certified Diabetes Educator</b>	0%	38%	13%
<b>Years practice</b>			
Total	12.7 +/- 9.3	29.0 +/- 10.8	10.4 +/- 9.0
Current clinic	7.9 +/- 7.1	8.2 +/- 8.4	5.3 +/- 4.5

***Patient Characteristics***

A total of twenty-six patients with type 2 diabetes were interviewed with a response rate of 50%. Patient data collection was discontinued after 26 people were interviewed as recruiting more patients to be interviewed would have extended the study well beyond its time frame. Thus to reduce the amount of health care resources utilized, a power test was completed which indicated that 26 people was a large enough sample size to conclude a significant difference between health care provider report and patient report of physical activity support. Table 7 describes the patient characteristics of the sample.

**Table 7: Patient characteristics**

Number of patients (n= 26)	
<b>Male</b>	13 (50%)
<b>Education level</b>	
Professional/ Graduate School	1 (4%)
Finished post-secondary	8 (32%)
Some post-secondary	6 (24%)
Finished high school	4 (16.7%)
Less than high school	6 (24%)
<b>Employment status</b>	
Working full-time	10 (38.5%)
Working part-time	2 (7.7%)
Working in the home	0 (0%)
Unemployed	4 (15.4%)
Retired	8 (30.8%)
Other (long-term disability)	2 (7.7%)
<b>Marital status</b>	

Married/common law	12 (46.1%)
Divorced/separated	2 (7.7%)
Single	8 (30.8%)
Widowed	4 (15.4%)

**Time since last visit to health care provider**

Less than 1 month	18 (69.2%)
1-6 months ago	6 (23.1%)
7-12 months ago	0 (0%)
More than a year ago	2 (7.7%)

Physical activity level was assessed by the frequency and duration of vigorous activity, moderate activity and light activity in the previous week. The total average duration of total physical activity was 438.2 (+/- 323.6) minutes per week. Most of the activity that the patients reported doing was aerobic (sustained, rhythmic activities) in nature (95.8%), however 25% of patients reported including strength (activities performed against resistance) in their routine, and none reported including a flexibility component. Table 8 outlines the percentage of patients who reported doing any form of vigorous, light or moderate activity in the past week as well as the average frequency and duration of the various activity levels for the patient group. See Appendix L for the individual patient physical activity levels in the past week.

**Table 8: Average physical activity level of the patient group in the past week**

	<b>Vigorous</b>	<b>Moderate</b>	<b>Light</b>
<b>% reporting activity</b>	16%	40%	100%
<b>Average frequency (times per week)</b>	3.0 +/- 1.8	4.2 +/- 2.0	6.1 +/- 1.7
<b>Average duration (minutes per week)</b>	150 +/- 112.3	258.5 +/- 209.0	310 +/-203.9

Using the reported frequency and duration of physical activity in the past week, patients were classified as to whether or not they met the CPAG physical activity guidelines with vigorous activity, vigorous and/or moderate activity, or vigorous and/or moderate and/or light activity and the CDA guidelines with vigorous and/or moderate activity. Table 9 outlines the number of individuals who met the CPAG and CDA guidelines with the aforementioned forms of physical activity.



**Table 9: Patients who meet the physical activity guidelines (one patient did not answer)**

	# of patients (n=25)	% of patients
<b>MET CPAG VIG</b>	2	8%
<b>MET CPAG MOD +</b>	3	12%
<b>MET CPAG LIGHT +</b>	11	44%
<b>TOTAL</b>	16	64%
<b>MET CDA (MOD + VIG)</b>	6	24%

Patients were asked at the end of the interview, whether or not their physical activity level had changed since being diagnosed with type 2 diabetes. Approximately 61% said that their physical activity level had changed, with 69% of them reporting that it had increased. When asked unprompted what influenced his/her positive behaviour change, the most common reason was because of fear after being diagnosed with the condition (40%) or because it made him/her feel better (20%). Other reasons included the influence of the clinic and/or the health care provider, having more energy/eating better, and going on an upcoming vacation. When patients were prompted about possible reasons for increasing physical activity level, 75% of patients indicated that the clinic influenced behaviour change, 75% indicated a health care provider influenced behaviour change, 62.5% indicated that family/friends influenced behaviour change and 25% indicated that community programs/resources influenced behaviour change. No one

indicated that the CDA guidelines or CPAG guidelines were an influence in increasing physical activity level. The unprompted responses for why physical activity level had decreased (31%) included less energy/not feeling well, family responsibilities and recent surgery. No prompted questions were asked as to why physical activity had decreased.

### **Health Care Provider Physical Activity Support**

Health care provider physical activity support in the 3 subsections (BC, AP, IRCR) and the use of the CPAG and CDA guidelines were analyzed unprompted and prompted.

### ***Physical Activity Support Score***

Both unprompted and prompted there was no significant difference in the amount and type of physical activity support in each of the 3 subgroups, or in total, between physicians, nurses and other health care providers. The percentage of health care providers who indicated that they provide the physical activity support for each prompted question is outlined in Table 14. The number of years of practice was not correlated with the number of physical activity supports provided.

### ***Physical Activity Support Score Details***

Nearly all (89.6%) health care providers kept a written record of the conversations they had with their patients about physical activity, most of whom used a chart to record such details. A diabetes flow sheet and other forms of records were also utilized by 40.9% and 29.5% of health care providers respectively. These “other” forms of records were documents unique to the clinics themselves, typically developed in order to satisfy the specific needs of their clinic.

When asked about what types of written materials addressing physical activity health care providers distribute to their patients with type 2 diabetes, 72% of those who distribute

written materials reported distributing either CPAG or CDA material, 28% reported distributing WRHA materials, 20% reported distributing information from the internet, 12% reported distributing materials unique to the clinic, and 20% reported distributing “other” materials.

The 10.4% of health care providers who refer to an exercise professional typically referred to either a personal trainer or exercise physiologist, though it was not elaborated as to whether these individuals were certified or had a university degree.

### ***CPAG/CDA Guidelines***

Table 10 and Table 11 outline the percentage of health care providers and certified diabetes educators (a subgroup of health care provider group) who report identifying, describing and using the CPAG and CDA guidelines in practice, both unprompted and prompted. For both sets of guidelines more health care providers could identify the guidelines when prompted rather than unprompted. Furthermore, very few health care providers could describe the guidelines at a level considered “mostly correct”. Note that the percentages listed in the “describe” and “use” section of the table were only asked to those who reported identifying the respective guidelines.

**Table 10: Health care providers (HCPs) and certified diabetes educators (CDEs)  
identification, description and use of the guidelines unprompted.**

	<b>% of HCPs (total n=48)</b>	<b>% of CDE's (n=9)</b>
Identify CPAG	12%	11.1%
Describe CPAG	0%	0%
-Mostly correct	50%	0%
-Partially correct	50%	100%
-Mostly incorrect	0%	0%
-Don't know		
Use CPAG	12%	11.1%
Identify CDA	17%	55.6%
Describe CDA	0%	0%
Mostly correct	50%	40%
-Partially correct	37.5%	40%
-Mostly incorrect	12.5%	20%
-Don't know		
Use CDA	14.5%	44.4%

**Table 11: Health care providers (HCPs) and certified diabetes educators (CDEs)  
identification, description and use of the guidelines prompted.**

	<b>% of HCPs (total n=48)</b>	<b>% of CDE's (n=9)</b>
Identify CPAG	88%	100%
Describe CPAG	5.4%	0%
-Mostly correct	40.5%	25%
-Partially correct	18.9%	25%
-Mostly incorrect	35.1%	50%
-Don't know		
Use CPAG	43.2%	50%
Identify CDA	68%	75%
Describe CDA	0%	0%
Mostly correct	40.7%	100%
-Partially correct	22.2%	0%
-Mostly incorrect	37%	0%
-Don't know		
Use CDA	52%	100%

Tables 12 & 13 illustrate the percentage of each type of health care provider who indicated that they used the CPAG and CDA guidelines unprompted and prompted. Other health care providers use the CPAG guidelines the most unprompted + prompted, whereas nurses report using the CDA guidelines unprompted + prompted the most.

**Table 12: Health care provider type and use of the CPAG guidelines when unprompted and prompted**

	Unprompted	Prompted	Unprompted + Prompted
<b>Physicians</b>	13.3%	41.7%	55.0%
<b>Nurses</b>	16.7%	21.4%	38.1%
<b>Other HCPs</b>	6.7%	72.7%	79.4%

**Table 13: Health care provider type and use of the CDA guidelines when unprompted and prompted**

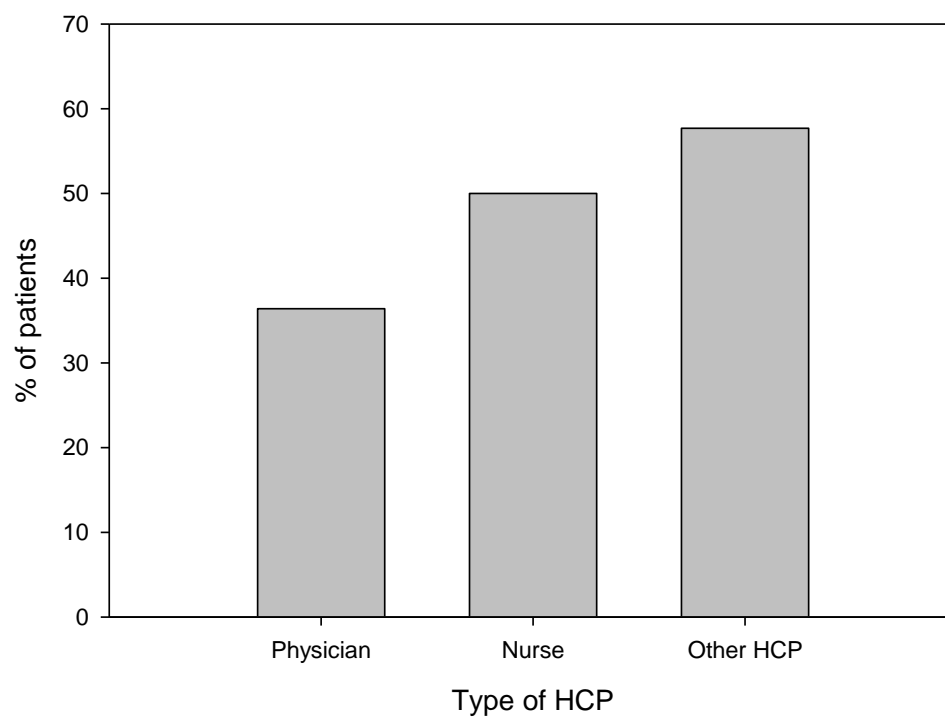
	Unprompted	Prompted	Unprompted + Prompted
<b>Physicians</b>	6.7%	45.5%	52.2%
<b>Nurses</b>	16.7%	70.0%	86.7%
<b>Other HCPs</b>	20.0%	33.3%	53.3%

## **Health Care Provider/Patient Response Consistency**

### ***Physical Activity Support Score***

Most patients (88.5%) indicated that physical activity was part of their diabetes management plan, however the percentage was less than that of the health care providers who reported incorporating it (97.9%). Thirty-six percent of patients reported that a physician had provided the physical activity support, 50% reported nurses and 58% reported other health care providers (Figure 3). Of those who indicated that other health care provider delivered physical activity support, 93.3% said that a dietitian was involved, 20% said a pharmacist was involved and 6.7% said that a counselor was involved. Both unprompted and prompted, patients reported that significantly less total physical activity support was delivered than health care providers reported providing ( $p < 0.001$ , 2-tailed), however the distribution of the physical activity support (prompted) was similar. Table 14 outlines the response consistency for each prompted question between health care providers and patients. In all but one question, a greater percentage of health care providers reported providing the support than the percentage of patients reported receiving the support. Patient gender did not influence the amount or type of physical activity support delivered by health care providers to people with type 2 diabetes.

**Figure 3: Percentage of patients who report physical activity support from the three HCP types**



**Table 14: Health care provider and patient physical activity response consistency**

<b>Physical Activity Supports</b>	<b>% of HCPs providing the PA support (n=48)</b>	<b>% of CDEs providing the PA support (n=9)</b>	<b>% of patients reporting receiving the PA support (n=25)</b>
Ask about current PA level	97.9%	100%	88.5%
Ask about readiness to become active	83.3%	100%	46.2%
Talk about how motivated the patient is to exercise	87.5%	100%	46.2%
Talk about the things that might prevent the patient from becoming active	100%	100%	65.4%
Discuss the connection between PA and the patient's diabetes	93.8%	100%	96.2%
Help the patient to set PA goals	68.8%	88.9%	50%
Talk about people close to the patient who could help support his/her decision to become active	85.4%	88.9%	46.2%
Distribute written materials about PA	54.2%	100%	38.5%
Give the patient a general exercise plan	50%	55.6%	15.4%
Conduct a baseline fitness assessment	0%	0%	0%
Develop a written specific exercise plan	31.25%	44.4%	3.8%
Refer the patient to a fitness professional	10.4%	11.1%	0%
Discuss PA resources available in the patient's community	87.5%	100%	38.5%
Refer the patient to a PA program offered in the community	54.2%	66.7%	0%
Ask the patient to schedule a follow-up visit to discuss PA levels	85.4%	100%	73.1%

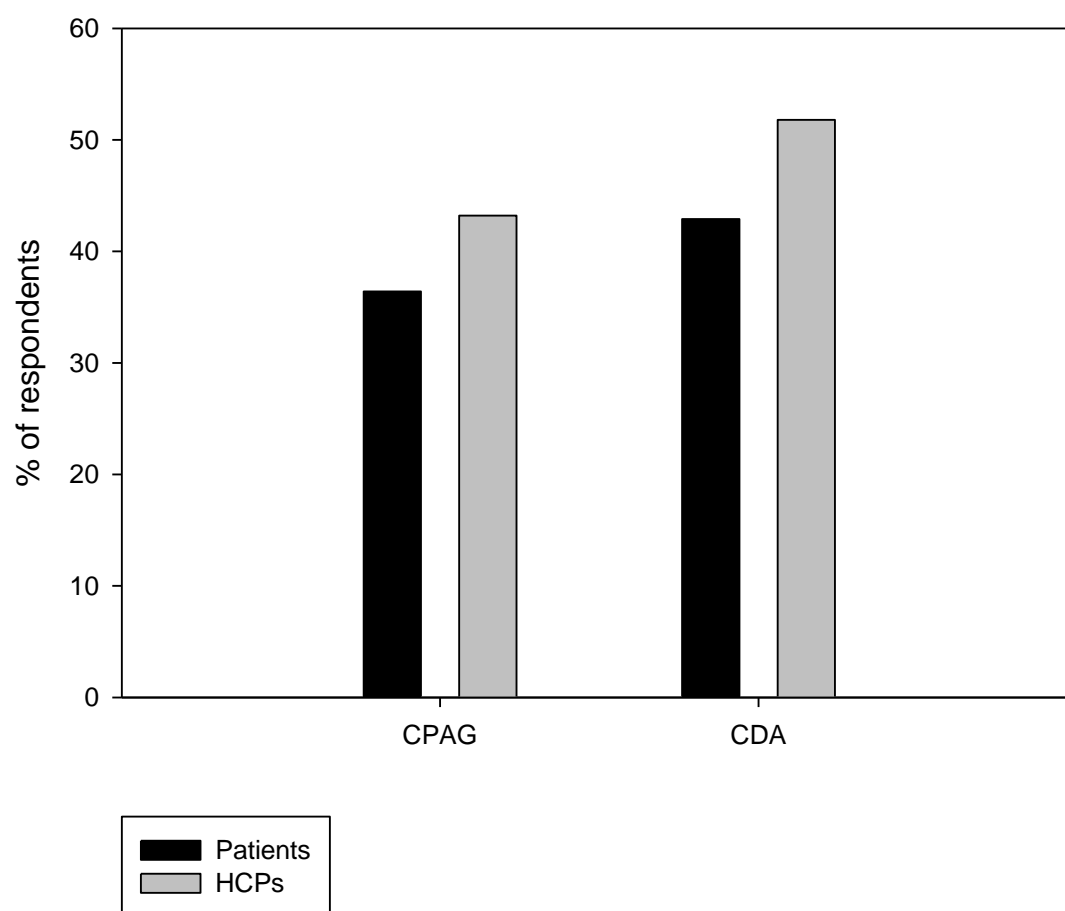


***CPAG/CDA Guidelines***

When prompted about physical activity guidelines, 42.3% of patients indicated that they were aware of the CPAG guidelines, but when asked to describe what they entailed 54.5% answered “don’t know”. Another 18.2% described them partially correct and 27.3% described them mostly incorrect. Thirty-six percent of patients indicated that their health care provider had told them about the guidelines. When prompted about the CDA guidelines 26.9% of patients were aware of them. Although they were aware, most patients (85.7%) answered “don’t know” when asked to describe the guidelines. The remaining patients (14.3%) answered partially correct.

Almost half (42.9%) of patients who were aware of the CDA guidelines indicated that their health care provider had relayed this information. Nearly all patients who reported that their health care provider used either the CPAG guidelines or the CDA guidelines in practice had seen a nurse and a dietitian for diabetes care. Figure 4 outlines the consistency between health care provider and patient use of the physical activity guidelines.

**Figure 4: Respondents' reports of the use of physical activity guidelines by HCPs**



## **Chapter 5- Discussion**

The purpose of this study was to identify differences in the amount and type of physical activity support provided by physicians, nurses and other health care providers, determine the proportion of health care providers who are able to identify the CDA physical activity guidelines and CPAG guidelines when prompted and unprompted, determine whether health care providers use the CDA physical activity guidelines, and determine whether health care provider report of the amount and type of physical activity support provided is the same as patients report of the amount and type of health care provider physical activity support received. The hypotheses in this study were supported as we found that there was no difference in the amount and type of physical activity support between health care providers. Eighty-six percent and 48% of health care providers did not use the CDA guidelines unprompted and prompted, and prompted awareness and description of guidelines occurred more often than unprompted. Health care provider report of physical activity support was significantly greater than patient report of physical activity support.

### **Sample Characteristics**

#### ***Health Care Provider Characteristics***

In our study, there were not an equal number of professionals from each clinic; however this simply reflects the diversity and reality of the health care providers in team-based clinics in Winnipeg. Most health care providers were female (83.4%), which echoes the typical make-up of health care providers in Canada (Canadian Institutes for Health Information (CIHI), 2005). Women make up approximately 47% of the labour force in Canada, but over 80% of the labour force in healthcare, specifically in traditionally

female-dominated areas such as nursing and occupational therapy. Furthermore, the traditionally male-dominated health professions such as medicine and pharmacy have also seen an increase in female participation in recent years (CIHI, 2008).

Our results showed that the number of years of practice in the current clinic was similar among all types of health care providers; however, the total years of practice were different. Nurses had been practicing much longer than physicians or other health care providers, which may be explained by the fact that almost half of registered nurses in Canada are between the ages of 45 and 54 (CIHI, 2005). While our data corresponds with national data which suggests that nurses are older than the many other health care providers (eg. dietitians, occupational therapists, pharmacists), it does not agree with the data which reveals that physicians are, on average, older than nurses (CIHI, 2005). One of the reasons that the physicians were younger than the nurses in our study could be due to the Province of Manitoba's recent physician recruitment and retention investment (Province of Manitoba, 2009). The \$2.1 million plan is aimed at attracting new graduates to and keeping new graduates in Manitoba, and thus many of the young physicians are now practicing in primary care clinics in Winnipeg as a result of this strategy.

From the total sample, 18.8% identified as a certified diabetes educator. This finding is not surprising as most of the clinics also provide care to patients without type 2 diabetes (and wouldn't necessarily require a certified diabetes educator). Furthermore, in order to become a certified diabetes educator it requires one be a member of a regulatory body in Canada as a health professional, have 800 hours of experience with diabetes education within a 3-year period and pass a final examination (Canadian Diabetes Education Certification Board (CDECB), 2007). This requirement may not be of interest for some

health care providers and may also be difficult for others who are interested to achieve, given their already demanding workloads or may not be possible if the profession does not have a regulatory body. These factors, among others, could influence the number of certified diabetes educators working in Manitoba.

### ***Patient Characteristics***

One-half of the 26 patients interviewed were female. In Manitoba, there is a greater prevalence of type 2 diabetes among males (MHHL, 2008), however females have been found to agree to requests for interviews slightly more often than males (Cameron et al., 2007). Most patients had at least some post-secondary education (60%), however 24% had finished less than high school. The unemployment status of individuals with type 2 diabetes (15.4%) was also higher than the provincial average of 4.2% in Manitoba (Statistics Canada, 2009). Type 2 diabetes disproportionately affects those with a lower socio-economic status (Rabi et al., 2006), thus it was not surprising that nearly 1 in 4 people had not finished high school and that the unemployment status of our study population was higher than the provincial average. Most patients (69%) had seen their health care provider within the last month, likely because many interviews were conducted after patients' scheduled appointments so as not to disrupt the clinic practice.

Self-reported weekly physical activity level for patients with type 2 diabetes initially appeared as well above the CDA guidelines and the CPAG guidelines with, on average, patients reporting 438.2 minutes of activity per week. However, when vigorous, moderate and light activity were examined in relation to the guidelines for each individual, the results show that approximately one-fifth of individuals meet the CPAG guidelines through vigorous or vigorous + moderate activity and approximately one-

quarter meet the CDA guidelines (also moderate to vigorous activity). Thus, it appears that the overall mean physical activity level is skewed by a few select individuals who do a lot of activity. Interesting to note however, is that 64% of individuals met the CPAG guidelines with at least light activity, which is similar to other self-report studies which also included both occupational and leisure time physical activity in their analysis (Ready et al., 2009). Had we used the new physical activity recommendations for Canadians (CSEP and Participaction, 2010) which do not include light activity, we would have seen a much smaller proportion of people meeting the guidelines.

There are several reasons as to why nearly two in three people met the CPAG guidelines amongst a population with type 2 diabetes. First, it been found that people tend to over-report physical activity level with self-report surveys, suggesting that actual physical activity levels are actually much lower than reported in surveys. In 2007, Troiano and colleagues found that accelerometer data of a national sample did not correlate to self-report measures of physical activity level. Using objective data, less than 5% of adults met the recommended 30 minutes of activity per day (Troiano et al., 2007), much lower than ours and other researcher's findings. Furthermore, adults tend to overestimate the intensity of exercise (Duncan et al., 2001), thus perhaps some of the responses in the moderate and vigorous category may be misclassified.

Second, it is also possible that the population who agreed to be interviewed for this research project were the same individuals who were already doing some physical activity in their occupations, leisure time, or both. Some of the individuals who were found to have met the guidelines could have been the same individuals who reported that they had recently changed their physical activity level after being diagnosed, and perhaps

the benefits of activity were not yet apparent. Furthermore, because less than half of individuals reported doing moderate physical activity and only 16% reported doing vigorous physical activity, the light activity that most participants reported doing may have been too light to see much of a health benefit if the individual was already used to doing this intensity of activity before diagnosis. While light activity is beneficial for an individual who is completely sedentary, moderate exercise would be preferred for those whose bodies have adapted to light activity.

Lastly, it has recently been suggested that perhaps the CPAG guidelines are set too low, given that they include light daily activities (Ready et al., 2009). A 2009 study by Ready and colleagues incorporated all activities of daily living (not just leisure time activity) and found that 70% of individuals were in fact meeting the CPAG guidelines in one way or another, despite growing obesity and type 2 diabetes rates in Manitoba. While the current study found that the majority of people met the guidelines through light activity, Ready et al., (2009) found that the main way to meet the CPAG guidelines was through moderate activity, which perhaps suggests a difference in activity choices between those with type 2 diabetes and those without. While recent research has shown that health benefits are the same for low to moderate exercise as compared to moderate to vigorous exercise when matched for energy expenditure (Hansen et al., 2009), other research reports greater health benefits from more intense exercise. The major reliance on light physical activity to meet the guidelines also explains why a much smaller percentage of individuals met the CDA guidelines, as they only consider moderate to vigorous physical activity. The new physical activity guidelines for Canadians (CSEP and Participaction,

2010) eliminate this discrepancy and would likely show much similar results when compared to the CDA guidelines.

Forty-two percent of individuals said that their physical activity level had increased, 19% said that it decreased, and 39% said that it remained the same after being diagnosed with type 2 diabetes. For those who had increased physical activity level, almost half reported that it was mainly due to fear of being diagnosed with the condition. It is not surprising then, that health care providers are often most successful in increasing physical activity among patients when it is for treatment or management purposes rather than prevention (Horne et al., 2010). Encouragingly, 20% of people said that they increased their physical activity level because it made them feel better, which will likely help maintain a regular physical activity program over time since the individuals would be doing it out of pleasure rather than necessity. When asked about the influence of the health care provider and clinic on physical activity level, 75% indicated that it positively influenced their physical activity level. This finding demonstrates the influence and value of health care providers in helping to change health behaviours, and verifies Leijon and colleagues' (2010) finding that health care providers are a desired source of support. None of the patients indicated that the CPAG or CDA guidelines were an influence in increasing physical activity level, perhaps due to the fact that awareness of guidelines is not related to current physical activity level (Green and Boyle, 2001).

### **Health Care Provider Physical Activity Support**

#### ***Physical Activity Support Score***

Overall, it appears that health care providers understand the importance of physical activity in managing type 2 diabetes based on the current physical activity support



delivered. However, there are gaps that could be addressed to facilitate an optimal environment for physical activity counseling in primary care.

Both unprompted and prompted, we found that there was no significant difference in physical activity support between physicians, nurses and other health care providers. It is very possible that the health care providers face similar challenges and barriers with respect to time, and education and training, and thus end up providing similar types of support. Each health care provider will have multiple tasks to address with the patient in the allotted time slot for an appointment. Thus, physical activity may not be the main priority for most health care providers, and their physical activity support habits end up to be quite similar. Furthermore, because there is no one with a physical activity background working in the clinics, no difference in total or sub-group (BC/AP/IRCR) physical activity support makes sense as there is no formal training and minimal 'extra' training required once the health care provider is working in the clinic which would distinguish one health care provider type from another. As well, the influence of the mass media could partially explain the similarity of health care provider support. Just under one-third of health care providers report getting their physical activity information through the mass media (Parker et al., 2010) and thus these external influences could contribute to similar counseling practices.

Our study examined the amount of support using three subcategories for a total physical activity support score. However, the questions used to determine this score could also be fit into the 7-A's model of support (Fortier et al., 2007). In this situation we would find that most of the support that the health care providers give is in terms of asking, advising,

or giving a brief assessment, while the types of support that are delivered by fewer health care providers include assisting the patient in becoming active.

When looking at each question measuring support individually rather than as a group (BC/AP/IRCR), it is apparent that not all supports are delivered equally. The supports that were reported to be delivered by more than 70% of health care providers could be categorized as tasks that could be done relatively quickly and require less specific knowledge about physical activity and physical activity resources in the community. For example, giving an individual a general exercise plan or a specific exercise plan, or conducting a baseline fitness assessment requires extensive time on behalf of the health care provider as well as a knowledge base of physical activity prescription which he/she has likely not specifically been trained to do. As well, referring the patient to a physical activity program or specific fitness professional in the community would require a link with other physical activity professionals and to community resources, specifically low-cost, convenient opportunities for many patients with type 2 diabetes. A common barrier to providing physical activity counseling cited in the literature is health care provider's limited access to community resources (Harris et al., 2004), as 90% of health care providers do not have access to or consult with physical activity experts (Parker et al., 2010). In our study, most health care providers seemed to be aware of possible programs available in the community (87.5%), but much fewer (54.2%) actually referred patients to a specific program and one in 10 referred to a fitness professional. Furthermore, only 18.8% of health care providers identified as certified diabetes educators. Previous research has shown that certified diabetes educators have slightly more access to physical activity resources in the community for people with type 2 diabetes (Gornall et al., 2008).

Thus, with only one in five of our sample being certified diabetes educators, perhaps the percentage of health care providers utilizing referrals was reflected by the makeup of our sample.

Previous research has reported similar percentages of health care provider physical activity support. Three recent studies indicated that most health care providers ask about physical activity level (Buchholz and Purath, 2007; Harris et al., 2004; Petrella et al., 2007), similar to our finding of just over nine out of 10. Petrella and colleagues (2007) found that 10.9% of health care providers referred to an exercise professional for a fitness assessment and from 9% to 20% (depending on the location) provide a written prescription. Consistent with our study, this specific prescription was utilized less than a general prescription (Petrella et al., 2007) likely because health care providers are more confident in providing general advice versus specific advice (Bull et al., 1997). Approximately one-half (54.2%) of health care providers in our study distributed written materials for patients to take home, a percentage which closely matched Petrella and colleagues' findings (54%). While no health care providers in our study conducted a fitness assessment themselves, 17% (Buccholz and Purath, 2008) to 25% (Petrella et al., 2007) reported doing so in previous studies, although the type of fitness assessment was often a body composition assessment rather than a cardiovascular, strength or flexibility test (Buccholz and Purath, 2008).

### ***CPAG/CDA Guidelines***

It was not surprising that many (76% and 38%) more health care providers identified the CPAG and CDA guidelines when prompted versus unprompted. It is interesting however, that when unprompted more health care providers identified and used the CDA

guidelines than the CPAG guidelines, where as when prompted a greater percentage of health care providers were able to identify the CPAG guidelines (vs. CDA guidelines), yet more health care providers still reported that they actually use the CDA guidelines in practice. It seems as though, if health care providers are to follow any guidelines for physical activity, they will follow the CDA guidelines which seem most appropriate for the population the health care provider is counseling. The large proportion (88%) of individuals who report being aware of the CPAG guidelines when prompted can likely be explained by the influence of the CPAG in the mass media. Our data suggests that while health care providers are very aware of the CPAG guidelines they choose not to utilize them in practice as much as the CDA guidelines.

Very few health care providers (5.4%) could describe the CPAG guidelines at a level considered “mostly correct” and none of the health care providers could describe the CDA guidelines at a level considered “mostly correct” (unprompted and prompted). This was consistent with Douglas and colleagues findings in which they concluded that guidelines cited by health care providers are often incorrect. Interestingly, the 5.4% of health care providers who did describe the CPAG guidelines “mostly correct” did so after prompting. Intuitively, one would think that if the health care provider reported using the guidelines unprompted, he/she would have a better idea of what those guidelines were versus someone who recalled that they used the guidelines after prompting, however this was not the case in our study. Approximately half of the individuals who indicated that they were aware of the guidelines unprompted could describe them “partially correct”, and 40% of health care providers who indicated that they were aware of the guidelines when prompted could describe them “partially correct”. While it is encouraging that part

of the message is getting out, particularly if the individual the health care provider is counseling is previously sedentary, a gap still exists for the other 50 to 60% of health care providers who stated the guidelines at a level “mostly incorrect” or “don’t know”. It is important to note that although health care providers do not know these specific guidelines it does not indicate that they do not possess knowledge of physical activity in a practical sense.

For all health care provider types, reported use of the CPAG and CDA guidelines when prompted was greater than when unprompted. This is similar to previous studies who have found a similar percentage (~4-5%) of Canadian adults have unprompted recall of the CPAG guidelines (Bauman et al., 2005; Cameron et al., 2007). Nurses reported the greatest use of the CPAG guidelines when unprompted but other health care providers reported greatest use of the CPAG guidelines when prompted. The opposite was then true when looking at the CDA guidelines. Unprompted, other health care providers reported the greatest use of the guidelines while nurses reported the greatest use when prompted. Perhaps the most important way to determine which health care providers are using the guidelines is to look at the combined total of unprompted and prompted responses. In doing this, we find that other health care providers are most likely to use the CPAG guidelines while nurses are more likely to use the CDA guidelines. Because our other health care provider category consisted of a variety of professionals, perhaps that particular group utilized the CPAG guidelines more than the CDA guidelines as a result of their diverse backgrounds. Furthermore, our results showed that certified diabetes educators were more likely to use the CDA guidelines rather than the CPAG guidelines (likely due to their certified diabetes educator training). Because most of the

CDEs identified as nurses, it is reasonable to expect that nurses report a higher percentage of CDA guideline use.

### **Health Care Provider/Patient Response Consistency**

#### ***Physical Activity Support Score***

Overall, significantly less physical activity support was reported by patients than was reported by health care providers, although the discrepancy varied depending on the question. Previous studies conducted in the last few years show a discrepancy in the amount of support reported by health care providers and patients (Buchholz and Purath, 2008; Glasgow et al., 2001; Sinclair et al., 2008), and from the studies it is difficult to determine whether it is health care provider over-report of the amount of support, patient under-report of health care provider support, or both. Because the distribution of support for each question was similar (i.e., giving the patient an exercise plan was reported less often by both health care providers and patients than asking about readiness to become active), we can be confident that the types of support that are reported by both health care providers and patients are likely occurring more often than other types of support which are reported to occur less often. Thus the areas of support which are stated least often represent some gaps in the current system which should be focused on to improve the quality of care to patients with type 2 diabetes.

When asked which type(s) of health care provider patients received physical activity support from, most reported an “other health care provider”, followed by a nurse and then a physician. This utilization of other health care providers and nurses as the source of physical activity information depicts the trend towards the use of nurses and allied professionals for health information. Most of the time (93.3%) when an “other health

care provider” was reported as the source of physical activity information, it was a dietician who was involved (Gornall et al., 2008).

### ***CPAG/CDA Guidelines***

When prompted, almost one-half (42.3%) of patients with type 2 diabetes noted that they were aware of the CPAG guidelines. This percentage is much higher than that found by Spence and colleagues (20.7%) in 2002, but similar to Cameron and colleagues findings of 37% in 2007, although both studies were conducted on the general public rather than patients with type 2 diabetes. Thus, it appears there has been increased exposure of the CPAG in recent years as our finding matches much more closely to the 2007 data than the 2002 data. It has also been well-established that those who are aware of the CPAG guidelines tend to be female and to have a higher education (Spence et al., 2002; Cameron et al., 2007). Interestingly, our sample consisted of an equal number of males and females and had 25% with less than a high school education. However, because over 50% of our sample had some post-secondary education or greater, and the study was conducted in a city with fewer than 1 million residents (both of which also influence CPAG awareness) (Cameron et al., 2007), some of those influences may have been mitigated. Over one half of individuals who indicated that they were aware of the CPAG guidelines did not attempt to describe what they were, and the remaining people described them partially correct or incorrect. While it is not surprising that patients would recall less of the guidelines than health care providers, it is important to note that the difference in description may partially be explained by the fact that only 36% of people with type 2 diabetes reported hearing about the guidelines from their health care

provider. In other words, it is difficult to compare the responses when only one-third of people would have actually received the information from their health care provider.

Approximately 27% of patients with type 2 diabetes reported that they were aware of the CDA guidelines when prompted. Although these individuals reported being aware of them, 86% didn't attempt to describe the guidelines, despite nearly one-half reporting that their health care provider told them about the guidelines. This finding suggests that perhaps although the patients heard the health care provider mention the CDA guidelines, he or she could not remember the message associated with the guidelines since it is unlikely the patient would have come in contact with the CDA guidelines outside of the healthcare setting. With nearly all of the patients who reported that their health care provider had used the CPAG or CDA guidelines indicating that they had seen a nurse or a dietitian for diabetes care, our earlier finding from HCP data which indicated that nurses and other health care providers most frequently utilize the guidelines in practice is verified. Furthermore, because the distribution of patient report and health care provider report follows a similar pattern (health care providers reported delivering support most often on the same questions that patients reported receiving support most often), we can be confident that the CDA guidelines are utilized and or recalled more easily in the health care setting with patients with type 2 diabetes.



### **Limitations**

There are several limitations associated with this study. First, only eight out of a possible 14 team-based primary care clinics providing diabetes education in Winnipeg agreed to participate. While we were only able to recruit eight clinics to participate mainly due to the H1N1 pandemic, it is possible that the clinics who agreed to participate may provide different physical activity support than the ones who did not. As well, these clinics only serve a very small number of people with diabetes in Winnipeg. Second, the health care providers and patients were asked to volunteer for the study; therefore there is a possibility of biased results. Third, the same number of patients was not selected from each clinic; therefore there may be overrepresentation or underrepresentation from any one of the clinics. Furthermore, the patients' responses were not directly matched with health care provider's responses that the patient reported seeing, but rather were treated as grouped data. Thus there could be unexplained error when approaching the study in this fashion. Fourth, all data was collected using self-report measures. It would be interesting to conduct a study where direct observation measured the amount of support delivered to patients to determine if it was different from the self-report measures. Fifth, the length of time since diagnosis with type 2 diabetes was not accounted for. It would be interesting to see if patients who have been more recently diagnosed receive more or less support than those diagnosed several years ago. Last, the study only considered people aged 30 to 65, though many individuals under 30 and over 65 have type 2 diabetes. It would be interesting to see if the support for physical activity changes when the patients are in younger or older age categories.

## **Conclusion**

Based on the findings from this study, it appears that health care providers understand the importance of physical activity in managing type 2 diabetes, however there are still gaps that could be addressed to facilitate an optimal environment for physical activity counseling in primary care. Counseling tasks which require a lot of time and specific knowledge of physical activity are done by few health care providers. Similarly, over 8 out of 10 health care providers could not identify the CDA guidelines without prompting. Thus clinics could benefit from finding strategies to increase the support in these two areas. Furthermore, it appears that there is still a disconnect between health care provider perceived support and patient perceived support. Developing policies and processes to reduce this disconnect and promote understanding would benefit the health care system, health care providers and patients with type 2 diabetes through a reduction of health care system costs, increased interprofessional collaboration and improved quality of care.

### **Recommendations for Future Research**

Based on the findings of this study, the following recommendations are made for future research:

- Research on the physical activity support in non-team-based primary care clinics as many people with type 2 diabetes attend these clinics and it would provide a more holistic understanding of the support delivered in Manitoba.
- Research on the quality of the written reports of physical activity counseling in team-based clinics providing diabetes education.
- Introduce a kinesiologist to a primary care clinic and see if there is a difference in physical activity support pre- to post- intervention, and on total physical activity level of patients.
- Research on the difference in physical activity support in clinics that already have a kinesiologist as a member of their team as compared to clinics without a kinesiologist as a member of the team.
- Conduct qualitative studies to determine the types of support that patients would value most when beginning to increase activity level.

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### **Appendices List**

- A) Team Manager informed consent
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## **Appendix A: Team Manager Informed Consent**

**Research Project Title:** Physical activity supports provided by health care providers to patients with Type 2 diabetes

**Researcher:** Jill Hnatiuk, BKin, MSc Student, Kinesiology, University of Manitoba

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**This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.**

1. The purpose of the study is to determine physical activity supports provided by a range of health care providers to patients with Type 2 diabetes. The information you provide about your clinic will help to explain the current status of health care provider support for physical activity in the primary care system in Winnipeg.
2. Your participation in the study will be as follows:
  - a. You will be asked a series of questions by the researcher, in-person, at your convenience. The questions will be about the operations of your clinic and the services provided to people with Type 2 diabetes. This is a one-time only interview and should not take more than 10-20 minutes to complete.
3. This study does not involve any risks. You are free to cease participation in the study at any time without penalty.
4. Any information you provide during the study will be kept strictly confidential and any data collected during the study will be stored securely at the University of Manitoba, for a period of three years.
5. Data from your clinic will serve as background information to provide a better understanding of the health care provider physical activity support in your particular clinic. The clinic data will not be linked to individual health care



provider data or patient data. Results will be presented as grouped data only and will describe the range of clinic types involved in the study.

6. Once the study is complete, you will be provided with a summary of the results. After you have read through them, the results should be made available to the health care providers and patients involved in the study through the clinic receptionist. If you'd like a copy for yourself please contact the researcher or her advisor directly.

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

Ms. Jill Hnatiuk

Telephone: 474-7997

Dr. Elizabeth Ready

Telephone: 474-8641

**This research has been approved by the Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or email [margaret\\_bowman@umanitoba.ca](mailto:margaret_bowman@umanitoba.ca). A copy of this consent form has been given to you to keep for your records and reference.**

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**Participant's Signature**

---

**Date**

---

**Researcher and/or Delegate's Signature**

---

**Date**

## **Appendix B: Health Care Provider Informed Consent**

**Research Project Title:** Physical activity support provided by health care providers to patients with Type 2 diabetes

**Researcher:** Jill Hnatiuk, BKin, MSc Student, Kinesiology, University of Manitoba

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**This consent form is to verify that you are aware of what the research is about and what your participation will involve. If you do not understand any part of the description below, or if there is something that is not included in the form, please feel free to ask for more information. A copy of this form will be left with you for your records and reference. Please read this form carefully and take the time to understand the information described completely.**

1. The purpose of the study is to determine physical activity supports provided by health care providers to patients with Type 2 diabetes. The information you provide will help to explain the current status of health care provider support for physical activity in the primary care system in Winnipeg.
2. Your participation in the study will be as follows:
  - a. You will be asked a series of questions by the researcher, in-person, at your convenience. The questions will be about your physical activity support provided to patients and demographic data. This is a one-time only interview and you will not be contacted for further research in conjunction with this project. The interview should not take more than 10 minutes to complete.
3. This study does not involve any risks. You are free to cease participation in the study at any time without penalty.
4. Any personal information you provide during the study will be kept strictly confidential. An identification number will be assigned to subjects in the study so that any data collected will not be associated with health care provider names. Only the researcher and her advisor will have access to the sheet connecting your name to your identification number. All data will be stored securely at the University of Manitoba, for a period of three years. Only group data will be published, there will no indication of what clinic you work at.

5. Once the study is complete, a summary of the results will be provided to each clinic. You may access these results through the clinic receptionist at your convenience or by contacting the researcher or her advisor directly.
6. Participants will be eligible for a prize draw for a gift certificate to a Winnipeg restaurant and *in motion* merchandise.

**Your signature below indicates that you have understood and agree to all the information regarding participation in this research project. This form does not waive any legal rights nor release the researchers, sponsors or involved institutions from their legal and professional responsibilities. You are free to omit any questions and withdraw from the study at any time without consequence. If you have any questions about any part of the study please feel free to ask for clarification.**

Ms. Jill Hnatiuk

Telephone: 474-7997

Dr. Elizabeth Ready

Telephone: 474-8641

**This research has been approved by the Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or email [margaret\\_bowman@umanitoba.ca](mailto:margaret_bowman@umanitoba.ca). A copy of this consent form has been given to you to keep for your records and reference.**

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Researcher and/or Delegate's Signature

\_\_\_\_\_  
Date

## Appendix C: Patient Informed Consent

**Research Project Title:** Physical activity supports provided by health care providers to patients with Type 2 diabetes

**Researcher:** Jill Hnatiuk, BKin, MSc Student, Kinesiology, University of Manitoba

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**This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.**

1. The purpose of the study is to determine physical activity supports provided by a range of health care providers to patients with Type 2 diabetes. The information you provide will help to explain the current status of health care provider support for physical activity in the primary care system in Winnipeg.
2. Your participation in the study will be as follows:
  - a. You will be asked a series of questions by the researcher, in-person, before or after your visit to your health care provider. The questions will be about the physical activity support provided by your health care providers, as well as demographic data about yourself. This is a one-time only survey and you will not be contacted for further research in conjunction with this project. The interview should not take more than 10 minutes to complete.
3. This study does not involve any risks. You are free to cease participation in the study at any time without penalty.
4. Any personal information you provide during the study will be kept strictly confidential. An identification number will be assigned to subjects in the study so that any data collected will not be associated with patient names. Only the researcher and her advisor will have access to the sheet connecting your name to your identification number. All data will be stored securely at the University of Manitoba, for a period of three years. Only group data will be published, there will no indication of what clinic you attend.
5. This project has absolutely no affiliation with the clinic you attend. Your participation in this study will not be disclosed to your health care provider and will not affect the quality of treatment you receive from them.

6. Once the study is complete, a summary of the results will be provided to each clinic. You may access these results through the clinic receptionist at your convenience or by contacting the researcher or her advisor directly.
7. Participants will be eligible for a prize draw for a gift certificate to a Winnipeg restaurant and *in motion* merchandise.

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

Ms. Jill Hnatiuk

Telephone: 474-7997

Dr. Elizabeth Ready

Telephone: 474-8641

**This research has been approved by the Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or e-mail [margaret\\_bowman@umanitoba.ca](mailto:margaret_bowman@umanitoba.ca). A copy of this consent form has been given to you to keep for your records and reference.**

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**Participant's Signature**

---

**Date**

---

**Researcher and/or Delegate's Signature**

---

**Date**

## Appendix D: Letter to Executive Directors/Team Managers- December 2008



**Jill Hnatiuk, BKin**  
 308 Max Bell Centre  
 University of Manitoba  
 Winnipeg, Manitoba, R3T 2N2  
 W: 474-7997 C: 785-3466  
 umhnatiu@cc.umanitoba.ca



Dear Sir or Madame,

I am a Master of Science student in Kinesiology at the University of Manitoba, and I am developing my thesis study to address the integration of physical activity into primary health care. To make my research more relevant and meaningful, I am hoping that you will agree to provide some input, and to consider including your clinic as a research site. Below is a short description of my potential research project. It includes a brief rationale for conducting the study, describes what it would involve for you, the health care providers and the patients at the clinics, and identifies the potential outcomes for those involved. This is a preliminary description only, as your input will help me to design a better, more feasible study.

### *Background Information & Summary of Potential Research Project*

Type 2 diabetes has an increasingly high prevalence in Manitoba. Nearly 67,000 people are living with the disease and thousands more remain currently undiagnosed. An effective way to prevent and manage Type 2 diabetes is through increased physical activity. The Canadian Diabetes Association (CDA) has recognized the importance of physical activity in reducing obesity and improving lipid profiles, high blood pressure and glycemic control in its 2008 Clinical Guidelines, which include specific exercise recommendations. In Winnipeg, there is a need to examine the physical activity services and supports currently available from primary care teams in order to improve overall health care delivery and subsequently, the health status of those with Type 2 diabetes. My proposed research project will assess the range and scope of physical activity information provided (i.e. no information to a fully individualized prescription and follow-up), as compared to the CDA guidelines and to the information patients report receiving. The data will be collected via quantitative surveys of health care providers and patients at the various clinics. The survey questions will likely be developed by myself, my supervisor, Dr. Elizabeth Ready and my committee members in conjunction with the you, the Executive Directors and Team Managers of the clinics agreeing to take part. The data will be analyzed using one-way ANOVA and chi-squared analyses.

The study will require minimal time for you, the health care providers and the patients. You will have the opportunity to be involved in designing the survey to ensure the information found is both useful and feasible in practice. The health care providers and

patients will be appropriately informed of the study as per the Education/Nursing Research Ethics Board guidelines and the WRHA Ethics guidelines before agreeing to participate and will not be required to make any additional contributions after completing the survey. The study will be approved by the Education/Nursing Research Ethics Board. The information obtained through this survey will be confidential and will not in any way identify the clinics, the staff or the patients, but rather will be discussed as grouped data.

This study will provide each clinic with important information regarding the existing delivery of physical activity information for patients with Type 2 diabetes. A complete report will be given to each clinic at the end of the study and this information can be used to guide the delivery of services towards best practice. Furthermore, throughout the study the health care providers and patients will be exposed to increased information about physical activity from those with an exercise background, potentially leading to increased knowledge about regular physical activity, additional reference materials and contacts within the field.

Please contact me or my thesis advisor if you would like to discuss any aspects of my project. Dr. Ready may be reached at 474-8641 (until January 31<sup>st</sup>), or at [readyae@cc.umanitoba.ca](mailto:readyae@cc.umanitoba.ca). Thank you.





5. Is the physical activity support given to patients recorded or documented in your clinic? Yes/No

a. If yes, how is this data recorded? \_\_\_\_\_

6. When did your clinic become associated with the WRHA?

**Appendix F: Health Care Provider Interview Script****ID Number**\_\_\_\_\_

Please consider the following case study.

An individual with Type 2 diabetes arrives at your clinic for an appointment. He/she is middle-aged, moderately overweight and has attended your clinic for several months now. One year ago he/she was diagnosed with Type 2 diabetes but has no other serious medical conditions.

1. Would you incorporate physical activity into the diabetes management plan?  
Yes/No
2. If yes, tell me everything you would discuss with this patient about physical activity.
3. Assuming you continue to see this patient, is there anything else you would recommend regarding physical activity at this visit or at subsequent visits?  
Yes/No
4. What type of records do you keep regarding conversations about physical activity with your patients (if any)?

I am now going to ask you a series of questions about physical activity which may help to prompt your memory about the services you provide. Please answer yes or no to the following questions, assuming the above case study is used as the reference patient.

Would you...

5. Ask about the patient's current physical activity level? Yes/No
  6. Ask about the patient's readiness to become more physically active? Yes/No
  7. Talk about how motivated the patient is to exercise? Yes/No
  8. Talk about the things that might prevent the patient from becoming physically active? Yes/No
  9. Discuss the connection between physical activity and the management of the patient's diabetes? Yes/No
  10. Help the patient to set physical activity goals? Yes/No
  11. Talk about people close to the patient who could help or support his/her decision to become more physically active? Yes/No
  12. Distribute written materials for the patient to take home? Yes/No
    - a. If yes, which ones do you distribute?
- 
13. Give the patient a general exercise plan (that is, one that is not designed specifically for them)? Yes/No
  14. Conduct a baseline fitness assessment? Yes/No
    - a. If yes, what fitness parameters would you assess?
      - Cardiovascular fitness (eg. step test, bike test)
      - Strength and/or muscle endurance
      - Waist circumference (or other body composition assessment)
      - Flexibility
  15. If yes, would you provide feedback to your patient about his/her fitness assessment score? Yes/No
  16. Develop a written exercise plan, specific to the patient? Yes/No
  17. Refer the patient to a fitness professional? Yes/No
    - a. If yes, what type of professional would you refer him/her to?
- 
18. Discuss physical activity resources available in the patient's community? Yes/No
  19. Refer the patient to a physical activity program offered in the community? Yes/No
  20. Ask the patient to schedule a follow-up visit to discuss physical activity levels? Yes/No

**[Depending on unprompted responses to the case study, ask either questions 21 & 24 or questions 22-24]**

21. You mentioned Canada's Physical Activity Guide earlier, can you tell me what the guidelines recommend in terms of frequency \_\_\_\_\_, intensity \_\_\_\_\_, duration \_\_\_\_\_ and type(s) \_\_\_\_\_ of activity?

OR

22. Are you aware of Canada's Physical Activity Guide guidelines? Yes/No
23. If yes, can you tell me what the guidelines recommend in terms of frequency \_\_\_\_\_, intensity \_\_\_\_\_, duration \_\_\_\_\_ and type(s) \_\_\_\_\_ of activity?
24. Do you use Canada's Physical Activity Guide guidelines in practice with your patients with Type 2 diabetes? Yes/No

**[Depending on unprompted responses to the case study, ask either questions 25 & 28 or questions 26-28]**

25. You mentioned the Canadian Diabetes Association guidelines earlier, can you tell me what the guidelines recommend in terms of frequency \_\_\_\_\_, intensity \_\_\_\_\_, duration \_\_\_\_\_ and type(s) \_\_\_\_\_ of activity?

OR

26. Are you aware of the Canadian Diabetes Association guidelines for physical activity? Yes/No
27. If yes, can you tell me what the guidelines recommend in terms of frequency \_\_\_\_\_, intensity \_\_\_\_\_, duration \_\_\_\_\_ and type(s) \_\_\_\_\_ of activity?
28. Do you use the Canadian Diabetes Association guidelines for physical activity in practice? Yes/No

**Demographic Data:**

29. Are you male or female? \_\_\_\_\_
30. Where did you receive your professional education and training (specific to your current job)?  
Manitoba      Other province in Canada      Other country
31. What professional licenses or certifications do you hold (specific to your current job)? \_\_\_\_\_
32. What is your current professional title (eg. physician, nurse, dietician, etc.)?  
\_\_\_\_\_
33. How many years have you been practicing (specific to your current job)?  
\_\_\_\_\_
34. CLINIC \_\_\_\_\_

## Appendix G: Patient Interview Script

ID Number \_\_\_\_\_

1. Have your health care providers in this clinic incorporated physical activity into your diabetes management plan? Yes/No (If no, skip to question 6).
2. What type of health care provider(s) have discussed physical activity with you since your diagnosis (eg. physician, nurse, dietician, social worker, etc.)?  
\_\_\_\_\_
3. Who is the health care provider who has discussed physical activity with you the most (eg. physician, nurse, dietician, social worker, etc.)?  
\_\_\_\_\_

For the following questions, please answer based on the actions from the *main* health care provider (the response to question 3 you just identified), who assists you in managing lifestyle choices related to your diabetes.

4. Tell me everything your main physical activity health care provider has discussed with you about physical activity since your diagnosis with Type 2 diabetes.
5. Can you recall anything else he/she has recommended regarding physical activity either when you were first diagnosed, or at subsequent visits? Yes/No

I am now going to ask you a series of questions about physical activity which may help to prompt your memory about the services provided to you. Please answer yes or no to the following questions (keep the same health care provider in mind as in the first questions).

Has your health care provider...

6. Asked about your current physical activity level ? Yes/No
7. Asked about your readiness to become physically active? Yes/No
8. Talked about how motivated you are to exercise? Yes/No
9. Talked about the things that might prevent you from becoming physically active?  
Yes/No
10. Discussed the connection between physical activity and the management of  
diabetes? Yes/No
11. Helped you to set physical activity goals? Yes/No
12. Talked about people close to you who could help or support your decision to  
become physically active? Yes/No
13. Distributed written materials for you to take home? Yes/No
  - a. If yes, which ones did he/she give you? \_\_\_\_\_
14. Given you a general exercise plan (that is, one that is not designed specifically for  
you)? Yes/No
15. Conducted a baseline fitness assessment? Yes/No
  - a. If yes, what parameters did he/she assess?
    - Cardiovascular fitness (eg. step test, bike test)
    - Strength and/or muscle endurance
    - Waist circumference (or other body composition assessment)
    - Flexibility
    - Don't know
16. If yes, did your health care provider provide feedback to you about your fitness  
assessment score? Yes/No
17. Developed a written exercise plan that was specifically designed for you?  
Yes/No
18. Referred you to a fitness professional? Yes/No
  - a. If yes, what type of professional did he/she refer you to?  
\_\_\_\_\_
19. Discussed physical activity resources available in your community? Yes/No

20. Referred you to a physical activity program offered in your community?

Yes/No

21. Asked you to schedule a follow-up visit to discuss your physical activity levels?

Yes/No

**[Depending on unprompted responses to the case study, ask either questions 22 & 25 or questions 23-25]**

22. You mentioned Canada's Physical Activity Guide earlier, can you tell me what the guidelines recommend in terms of frequency\_\_\_\_\_, intensity\_\_\_\_\_, duration\_\_\_\_\_ and type(s)\_\_\_\_\_ of activity?

OR

23. Are you aware of Canada's Physical Activity Guide Guidelines? Yes/No

24. If yes, can you tell me what the guidelines recommend in terms of frequency\_\_\_\_\_, intensity\_\_\_\_\_, duration\_\_\_\_\_ and type(s)\_\_\_\_\_ of activity?

25. Did your health care provider tell you about Canada's Physical Activity Guide?

Yes/No

**[Depending on unprompted responses to the case study, ask either questions 26 & 29 or questions 27-29]**

26. You mentioned the Canadian Diabetes Association guidelines earlier, can you tell me what the guidelines recommend in terms of frequency\_\_\_\_\_, intensity\_\_\_\_\_, duration\_\_\_\_\_ and type(s)\_\_\_\_\_ of activity?

OR

27. Are you aware of the Canadian Diabetes Association guidelines for physical activity? Yes/No



28. If yes, can you tell me what the guidelines recommend in terms of  
 frequency\_\_\_\_\_,  
 intensity\_\_\_\_\_,  
 duration\_\_\_\_\_ and  
 type(s)\_\_\_\_\_ of activity?
29. Did your health care provider tell you about the Canadian Diabetes Association  
 guidelines for physical activity? Yes/No

**Demographic Data:**

30. Are you male or female? \_\_\_\_\_
31. Please circle the category corresponding to your education level:  
 Less than high school Finished high school Some post-secondary Finished post-  
 secondary Professional/Graduate school
32. What is your marital status?  
 Married/Common law Divorced/Separated Single  
 Widowed
33. What is your employment status?  
 Working full-time Working part-time Working in the home (not for pay)  
 Unemployed Retired Other  
 (specify):\_\_\_\_\_
34. When was your last visit to a health care provider where physical activity was  
 addressed during the session (select the health care provider on which you based  
 your responses for this interview)?  
 Less than 1 month ago 2-6 months ago 7-12 months  
 ago More than 1 year ago

I will now ask you some questions about your physical activity during the past week (ie: last [insert day of the week] until yesterday. For these questions, please consider light activity to be a slight increase in breathing, heartbeat, and body temperature (eg. leisurely walking, gardening), moderate activity to be a moderate increase in breathing, heartbeat, and body temperature (eg. brisk walking, biking, dancing) and vigorous activity to be a

heavy increase in breathing, a rapid heart rate and sweating (eg. jogging, hockey, aerobics).

35. In the last week, how many times did you do any vigorous physical activity?
  - a. What do you estimate was the total time that you spent doing this vigorous physical activity in the last week? \_\_\_\_\_minutes
36. In the last week, how many times did you do any moderate physical activity?
  - a. What do you estimate was the total time that you spent doing this moderate physical activity in the last week? \_\_\_\_\_minutes
37. In the last week, how many times did you do any light physical activity?
  - a. What do you estimate was the total time that you spent doing this light physical activity in the last week? \_\_\_\_\_minutes
38. What types of activity do you undertake in a typical week?  
 Aerobic/Endurance    Strength training/Resistance    Flexibility/Stretching
39. Have you changed your physical activity level since your diagnosis with Type 2 diabetes?    Yes/No
  - a. If yes, how has your physical activity level changed?
  - b. If yes, what influenced your behaviour change?
  - c. Did any of the following play a role in your behaviour change?  
 Health care provider            CDA guidelines                    CPAG guidelines  
 Family/Friends  
 Health care clinic    Community programs/resources

40. CLINIC \_\_\_\_\_

## **Appendix H: Health Care Provider Questionnaire Scoring**

The following scoring system will be used to answer the specific objectives outlined in Chapter 1.

### **Physical activity support scores (reflects the amount and type of physical activity supports):**

- **Behaviour Change    Score of 0-6 (1 point each yes)**
  - Question # 6-11
- **Assessment/Prescription    Score of 0-5 (1 point each yes)**
  - Question # 5, 14-16, 20
- **Information/Referrals/Community Resources    Score of 0-4 (1 point each yes)**
  - Question # 12,13,17-19
- **Total physical activity support score (0-18)**

### **Identification and description of the CDA guidelines and CPAG when prompted and unprompted:**

CDA-	CPAG-
Identifies unprompted- Question 2	Identifies unprompted- Question 2
Describes unprompted- Question 2	Describes unprompted- Question 2
Use unprompted- Question 2	Use unprompted- Question 2
Identifies prompted- Question 26	Identifies prompted- Question 22
Describes prompted- Question 27	Describes prompted- Question 23
Use prompted- Question 28	Use prompted- Question 24

## Appendix I: Patient Questionnaire Scoring

The following scoring system will be used to answer the specific objectives outlined in Chapter 1.

### Physical activity support score (reflects the amount and type of physical activity supports):

- **Behaviour Change**    **Score of 0-6 (1 point each yes)**
  - Question # 7-12
- **Assessment/Prescription**    **Score of 0-5 (1 point each yes)**
  - Question # 6, 15-17, 21
- **Information/Referrals/Community Resources**    **Score of 0-4 (1 point each yes)**
  - Question # 13, 14, 18-20

### Total physical activity support score (0-18)

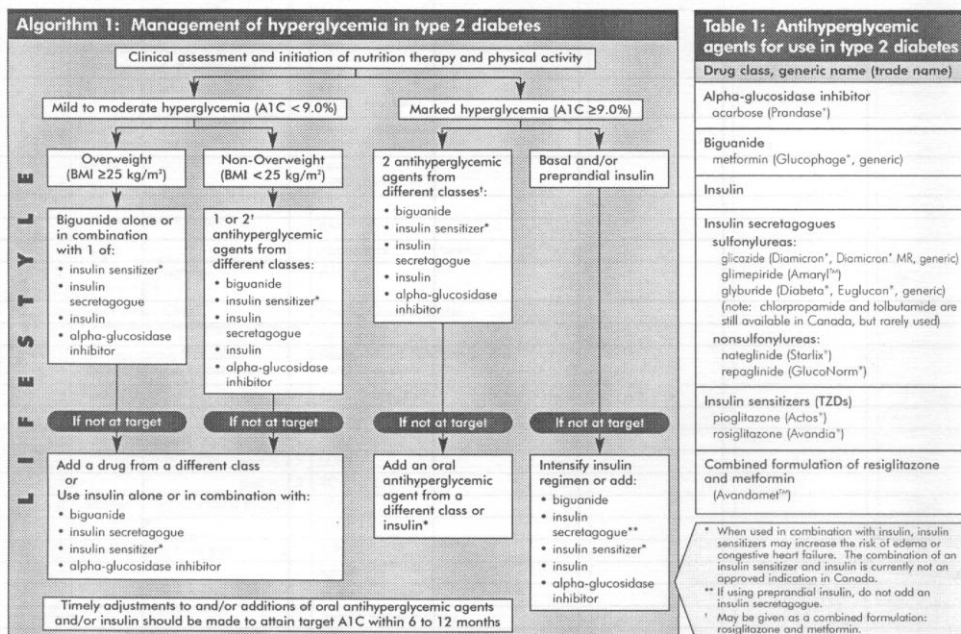
### Identification and description of the CDA guidelines and CPAG when prompted and unprompted:

CDA-	CPAG-
Identifies unprompted- Question 2	Identifies unprompted- Question 2
Describes unprompted- Question 2	Describes unprompted- Question 2
Use unprompted- Question 2	Use unprompted-Question 2
Identifies prompted- Question 27	Identifies prompted- Question 23
Describes prompted- Question 28	Describes prompted- Question 24
HCP use prompted- Question 29	HCP use prompted- Question 25

## Appendix J: WRHA Diabetes Flow Sheet



### PRIMARY CARE TYPE 2 DIABETES ASSESSMENT



Supplementary Information for Assessment Form		
1. Lifestyle	<p>People with Type 2 Diabetes (DM2) should be encouraged to adopt a healthy lifestyle to lower risk of CVD: healthy eating habits, healthy weight, regular exercise and smoking cessation. (p S60)</p> <p><b>Regular Physical Activity:</b> Minimum 150 minutes moderate aerobic activity per week over 3 non-consecutive days Perform resistance exercise 3x/week (p S25)</p> <p><b>Nutrition:</b> Encourage patients to follow Canada's Guidelines for Healthy Eating. Encourage low-glycemic index foods. Restrict combined saturated fats and trans fatty acids to &lt; 10% of energy. Referral to registered dietitian. (p S29)</p> <p><b>Alcohol:</b> Limit to &lt; or equal to 2 drinks/day. &lt; 14 drinks/week for men; &lt; 9 drinks/week for women (p S29)</p>	
2. Glycemic Control	<p>See algorithm 1 and table 1 for management of hyperglycemia. Targets for glycemic control: A1c &lt; 7.0%; FPG 4.0 - 7.0 and 2-hour post-prandial 5.0 - 10.0 Lower targets may be considered in some patients. (p S19)</p>	
3. Lipids	<p>A fasting lipid profile should be conducted at time of diagnosis and then every 1 - 3 years as clinically indicated. More frequent testing should be done if treatment for dyslipidemia is initiated. Values based on high risk See table 2 for treatment/target levels for dyslipidemia. (p S60)</p>	
4. Nephropathy	See algorithm 2 and tables 4 and 5, for guidelines with nephropathy screening and medication use. (p S67 & S69)	
5. Neuropathy/ Foot Care	<p><b>Neuropathy:</b> Screening for peripheral neuropathy should be done annually to identify those at high risk of developing foot ulcers. Begin at diagnosis with DM2. Screen with 10g-monofilament test for sensitivity loss at the great toe or loss of vibratory sensitivity at the great toe. (p S72)</p> <p><b>Foot Care:</b> Foot exams in adults by both patients and health care providers should be an integral component of DM management. Exam should include assessment of structural abnormalities, neuropathy, vascular disease, ulcerations and evidence of infection. Should be performed at least annually in all people with DM. People at high risk require foot care education, proper footwear, counseling to avoid foot trauma, smoking cessation and early referrals if problems occur. (p S74)</p>	
6. Retinopathy	With DM2, screening and evaluation by an experienced professional (ophthalmologist if proliferative or severe non-proliferative retinopathy) should be performed at time of diagnosis. Interval for fu dependent on degree of retinopathy. In those with no or minimal retinopathy, recommended interval is 1-2 years. (p S77)	
7. Sexual Health	All men with DM2 should be periodically screened for Erectile Dysfunction with a sexual function history, starting at diagnosis. (p S81)	
8. Psychosocial	Individuals with DM should be regularly screened for psychosocial problems, depression and anxiety disorders by direct questioning or with a standardized questionnaire. (p S51)	
9. Cardiovascular	<p><b>Blood pressure:</b> Should be measured at q visit. Targets: systolic &lt; 130mmHg or diastolic &lt; 80mmHg. See table 3 for recommendations. (p S63)</p> <p><b>EKG/stress test:</b> An exercise ECG stress test should be considered for previously sedentary individuals with DM at high risk for CVD who wish to undertake exercise more vigorous than walking. (p S25)</p> <p><b>Aspirin:</b> Unless contraindicated, low dose ASA therapy (80 to 325 mg/day is recommended in all patients with DM with evidence of CVD, as well as for those individuals with atherosclerotic risk factors that increase their likelihood of CV events. (p S63)</p>	

**Table 4: Stages of renal involvement according to the urinary albumin level**

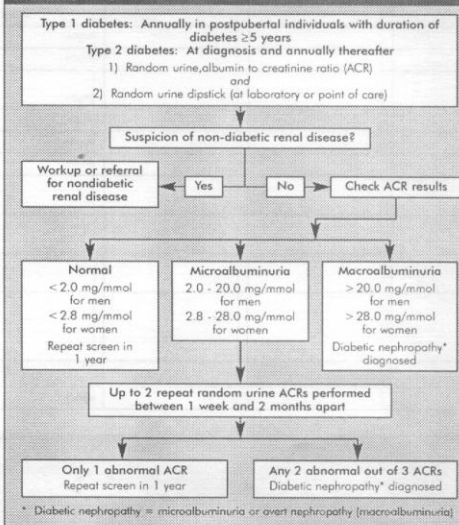
Stage of nephropathy	Urine dipstick for protein	Urine ACR (mg/mmol)	24-hour urine collection for albumin*
Normal	Negative	< 2.0 (men) < 2.8 (women)	< 30 mg/day
Microalbuminuria	Negative	2.0 - 20.0 (men) 2.8 - 28.0 (women)	30 - 300 mg/day
Overt nephropathy (macroalbuminuria)	Positive	> 20.0 (men) > 28.0 (women) > 66.7 (men) > 93.3 (women)	> 300 mg/day > 1000 mg/day

\* Values are for urinary albumin, not total urinary protein, which will be higher than urinary albumin levels

**Table 5: Nephropathy Recommendations**

- The best possible glycemic control and, if necessary, intensive diabetes management should be instituted in people with type 1 or type 2 diabetes for the prevention, onset and delay in progression of early nephropathy [Grade A, Level 1A (35, 50, 51)].
- Screening for diabetic nephropathy should be conducted using a random urine ACR [Grade D, Consensus]. Postpubertal individuals with type 1 diabetes of ≥ 5 years' duration should be screened at diagnosis of diabetes and yearly thereafter [Grade D, Consensus].
- Serum creatinine levels should be measured and creatinine clearance estimated annually in those patients with diabetes without albuminuria and at least every 6 months in those with albuminuria [Grade D, Consensus].
- Individuals with albuminuria should receive treatment to protect renal function, even in the absence of hypertension
  - In people with type 1 diabetes and albuminuria, an ACE inhibitor should be given to reduce urinary albumin and prevent progression of nephropathy [Grade A, Level 1A (39)]. An ARB should be considered in patients unable to tolerate an ACE inhibitor [Grade D, Consensus].
  - In people with type 2 diabetes, albuminuria and creatinine clearance > 60 mL/minute, an ACE inhibitor [Grade A, Level 1A (40)] or an ARB [Grade A, Level 1A (41)] should be given to reduce urinary albumin and prevent progression of nephropathy [Grade A, Level 1A (40, 41)].
  - In people with type 2 diabetes, albuminuria and creatinine clearance ≤ 60 mL/minute, an ARB should be given to prevent progression of nephropathy [Grade A, Level 1A (42, 43)].
- Patients placed on an ACE inhibitor or an ARB should have their serum creatinine and potassium levels checked within 2 weeks of initiation of therapy and periodically thereafter [Grade D, Consensus].
- The use of nondihydropyridine CCBs (diltiazem, verapamil) may be considered to reduce urinary albumin excretion in proteinuric hypertensive patients [Grade B, Level 2 (38)].
- A referral to a nephrologist or internist with an expertise in diabetic nephropathy should be considered if the ACR is > 75 mg/mmol, there is persistent hyperkalemia, there is a > 30% increase in serum creatinine within 3 months of starting an ACE inhibitor or ARB, or the creatinine clearance is < 60 mL/minute [Grade D, Consensus].

**Algorithm 2: Screening for diabetic nephropathy and nondiabetic renal disease**



## PRIMARY CARE TYPE 2 DIABETES ASSESSMENT

	#	Guideline	Procedure	Date			
Lifestyle	1	Regular Physical Activity: • minimum 150 minutes moderate activity per week over at least 3 non-consecutive days (see over)	Review Activity Level (initial when done)				
		Nutrition Counseling: (see over)	Review (initial when done)				
		Smoking: • encourage cessation	Review Options (initial when done)				
		Alcohol: (see over)	Review (initial when done)				
		Body Mass Index (BMI): • target 18.5 - 24.9/kg/m <sup>2</sup>	Weight value				
Glycemic Control		Height:	BMI value				
			Abdominal Circumference value				
	2	A1c every 3 months: • target < 7%	A1c value				
		Yearly Meter Check: • within 20% of simultaneous lab value	Fasting Glucose Meter value				
Lipids			Lab Comparison value				
		Self Monitoring Principles: • at least OD checks (see over)	Review Blood Glucose Records (initial when done)				
	3	Fasting Lipid Profile: • at diagnosis goal < 4.0 • every 1 - 3 years or more frequently if dyslipidemic (see over)	Total Cholesterol value				
			Triglycerides value				
			HDL-C value				
Nephropathy			LDL-C value				
			TC: HDL-C Ratio value				
	4	Albumin Creatinine Ratio (ACR): • at diagnosis • according to guideline • see algorithm 2 and tables 4 and 5	ACR				
			24h CrCl				
Neuropathy			BUN/Cr				
			K/Na				
Retinopathy	5	Peripheral Neuropathy: • screen yearly (see over)	(initial when done)				
		Foot Exam: • yearly and more frequently if at high risk (see over)	(initial if sensation intact)				
Sexual			Lower extremity exam (initial when done)				
	6	Dilated Retinal Exam: • at time of diagnosis and every 1 - 2 years as indicated (see over)	(initial if referred)				
Psychosocial	7	Men: Erectile Dysfunction: • periodic screen (see over) Women: • screen for sexual function	Screen with Sexual Health History (initial if required and done)				
	8	Screen for Psychosocial Problems, Depression and Anxiety (see over)	Direct Questioning or a Standardized Questionnaire (initial when done)				
Cardiovascular	9	Blood Pressure • goal < 130/80 at every visit (see over)	Document BP value				
		EKG/Stress Test: (see over)	(initial if done)				
Consultation		Dietitian	(initial if required and done)				
		Diabetes Education	(initial if required and done)				
		Foot Care	(initial if required and done)				
		Mental Health Specialist	(initial if required and done)				
		Endocrinologist Referral	(initial if required and done)				
		Nephrologist Referral	(initial if required and done)				
		Ophthalmologist Referral	(initial if required and done)				
	Cardiologist Referral	(initial if required and done)					

## Appendix K: ANOVA/ T-Test Results

### ANOVA

#### Health Care Provider Physical Activity Support Score (unprompted & prompted):

Health care provider type on number of behaviour change supports: Not significant

Health care provider type on number of assessment/prescription supports: Not significant

Health care provider type on number of information/referral/community resources supports: Not significant

Health care provider type on number of physical activity supports total: Not significant

### T-TEST

#### Health Care Provider/Patient Response Consistency:

Unprompted HCP vs. patient

**Group Statistics**

	Respon dant	N	Mean	Std. Deviation	Std. Error Mean
Unprompted	1	47	5.2979	1.76826	.25793
	2	23	2.0435	1.14726	.23922

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Unprompted	Equal variances assumed	6.553	.013	8.023	68	.000	3.25439	.40564	2.44496	4.06383
	Equal variances not assumed			9.251	62.491	.000	3.25439	.35178	2.55130	3.95749



## Unprompted Follow-up HCP vs. patient

Group Statistics

	Respon dant	N	Mean	Std. Deviation	Std. Error Mean
Unprompted Follow-up	1	40	2.7500	1.33493	.21107
	2	23	.4348	.89575	.18678

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Unprompted Follow-up	Equal variances assumed	3.753	.057	7.402	61	.000	2.31522	.31279	1.68976	2.94068
	Equal variances not assumed			8.214	59.412	.000	2.31522	.28185	1.75133	2.87911

Prompted HCP vs. Patient

**Group Statistics**

	Respon dant	N	Mean	Std. Deviation	Std. Error Mean
Prompted	1	48	9.8958	2.17568	.31403
	2	26	6.0769	2.63701	.51716

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Prompt ed	Equal variances assumed	1.270	.263	6.685	72	.000	3.81891	.57131	2.68003	4.95779
	Equal variances not assumed			6.312	43.676	.000	3.81891	.60504	2.59928	5.03854

**Appendix L: Individual physical activity level of patients in the past week****Individual physical activity level of patients (n=25)**