The Role of Physiotherapists and Kinesiologists in Physical Activity Interventions for Diabetes Management in Primary Care Settings: A Modified Delphi Study

By

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Abstract

Introduction: With an ever-growing prevalence, diabetes is a significant burden on the health care system and primary care which is where most diabetes care takes place. Physical activity is an effective and underutilized intervention in diabetes prevention and management. However, exercise specialists like physiotherapists and kinesiologists are not commonly members of diabetes care teams. Effective interprofessional collaboration with exercise specialists for diabetes care requires role clarity.

Purpose: To promote effective interprofessional collaboration in primary care settings for diabetes care and physical activity by, (a) establishing the competencies of entry-level physiotherapists and kinesiologists for physical activity as an intervention for diabetes in primary care settings and (b) developing a referral pathway for physical activity interventions based on the distinct discipline-specific competencies for use by interprofessional primary care teams.

Methods: Eleven physiotherapy and three kinesiology subject matter experts participated in two rounds of Delphi surveys to develop discipline and context specific competencies. These competencies were used to draft clinical tools (competency profiles and referral pathway), that were member-checked and modified based on focus group findings. Descriptive statistics and content analysis were used to analyze quantitative and qualitative data respectively.

Results: There was consensus on 38 physiotherapy and 27 kinesiology competencies that highlighted the complexity of physical activity interventions for diabetes and the distinct roles of physiotherapists and kinesiologists in this practice area. Physiotherapy competencies highlight their unique role in supporting people with all types of diabetes to engage in physical activity despite complex medical or physical barriers. Focus group feedback resulted in modifications to the layout of the referral pathway to reflect that both professions can provide physical activity

interventions for people with complex personal and environmental barriers or less complex medical or physical care needs. Kinesiologists may require additional training or mentorship, especially when working with people with type 1 diabetes or who are pregnant.

Conclusions: The developed clinical tools support improved interprofessional collaboration by clarifying physiotherapy and kinesiology roles in physical activity interventions for diabetes and highlighting how the two distinct professions can contribute to addressing the growing diabetes epidemic in primary care.

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Dedication

To Kaydon, Tyler, Ryan and Harley.

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Introduction

Diabetes mellitus is a growing epidemic in Canada with nearly one third of Canadians living with diabetes or prediabetes (Diabetes Canada, 2020). The rising rates of diabetes, and their associated comorbidities, are resulting in primary care health care needs that are more time consuming and complex (Health Council of Canada, 2010). Clinical outcomes for people living with diabetes indicate that providers are struggling to meet treatment targets (Leiter et al., 2013). Exercise is known to be a highly effective treatment for the prevention and management of diabetes (Balducci et al., 2010; Chen et al., 2021; Pan et al., 1997; Sigal et al., 2018; Umpierre et al., 2011), but is underutilized in primary care settings (Dillman et al., 2010). Exercise has the potential to improve glycemic control (Umpierre et al., 2011), blood pressure, lipid profiles, body weight, insulin sensitivity, decrease medication and insulin use (Balducci et al., 2010; Sigal et al., 2018) and ultimately reduce or prevent the vascular complications that occur with diabetes (Chen et al., 2021; Sigal et al., 2018).

Unfortunately, physicians and diabetes educators, who provide the most diabetes care in primary care settings, are struggling to support safe and effective physical activity interventions for diabetes. Insulin use, pregnancy and comorbidities like cardiovascular disease or obesity can make physical activity interventions more challenging for people living with diabetes and their providers (Brazeau et al., 2008; Padayachee & Coombes, 2015; Palakodeti et al., 2015). Physicians and diabetes educators have knowledge deficits about exercise, especially when treating patients on insulin or with more complex disease presentations (Baillot et al., 2018; Powell et al., 2016). Exercise specialists like physiotherapists and kinesiologists have expertise in exercise prescription and counseling and thus may be better positioned to meet the patient

needs for physical activity assessment and intervention. However, only 10% of primary care patients are referred to exercise specialists (Petrella et al., 2007).

With nearly half of all adults physically inactive (Diabetes Canada, 2020), there is an urgent need for comprehensive and effective exercise interventions in primary care settings where most diabetes care takes place (Clement et al., 2018; Lau, 2014). For primary care teams to be able to effectively work with exercise professionals including making appropriate referrals, a good understanding of the role and competencies of exercise professionals in primary care diabetes care is required (Interprofessional Education Collaborative Expert Panel, 2011; Reeves et al., 2017). This thesis addresses this gap by establishing the competencies of entry-level physiotherapists and kinesiologists in physical activity interventions for diabetes in primary care settings, and by developing clinical tools to translate this knowledge to interprofessional primary care teams so that they can improve team delivery of diabetes care.

Literature Review and Rationale for the Thesis

Primary Care and Chronic Disease Management

Primary care is the foundation of Canada's health system, serving as the first point of care for most Canadians accessing health care services (Health Canada, 2005). Traditionally provided by family physicians and more recently nurse practitioners, primary care is the provision of health promotion and preventative care as well as diagnosis and treatment of acute and chronic illness or injuries (Health Canada, 2005). Despite the broad mandate of primary care, high chronic disease rates and the time it takes to provide interventions for them means that chronic disease management takes up a significant portion of primary care services in Canada (Health Council of Canada, 2010).

Chronic disease, including diabetes, is the leading cause of death worldwide (World Health Organization, 2010b) and can have a significant impact on quality of life, function and ability to participate in activity (Health Council of Canada, 2007). It is estimated that 44% of Canadian adults are living with a chronic disease (Public Health Agency of Canada, 2019). For older adults (65 years of age and above), that proportion increases dramatically to 73% (Public Health Agency of Canada, 2020b). The burden of chronic disease in primary care is expected to increase substantially over the next two decades as a direct result of Canada's aging population. With increasing life expectancy and an aging baby boomer generation, the older adult age demographic is expected to increase from one fifth of the population to nearly a quarter by 2040 (Public Health Agency of Canada, 2020a).

Canadians living with chronic disease account for nearly two thirds of all primary care visits (Canadian Institute for Health Information, 2014). Increasing demand will have a significant impact on primary care in Canada where primary care providers are already struggling to meet the clinical guidelines for disease management (Canadian Institute for Health Information, 2014; Leiter et al., 2013). A survey of family physicians found that four out of five physicians reported that the management of patients with chronic disease is becoming increasingly time consuming and complex (Health Council of Canada, 2010). Electronic medical record data suggests that many patients are not receiving the health parameter monitoring that is recommended (Canadian Institute for Health Information, 2014) or meeting the outcome targets (Leiter et al., 2013). The growing burden of chronic disease and its significant impact on primary health care demonstrates the urgent need for best practices in Canada.

Interprofessional Collaboration and Primary Care Reform

Effective management of chronic disease requires interprofessional collaboration (IPC) (Bookey-Bassett et al., 2017; World Health Organization, 2010a) which the World Health Organization (2010a) defines as occurring "when multiple health workers from different professional backgrounds work together with patients, families, carers [*sic*], and communities to deliver the highest quality of care" (p. 7). In the health care sector, there are many documented benefits to effective interprofessional collaboration including better patient outcomes (improved screening and biometric targets) (Reiss-Brennan et al., 2016), improved patient and provider satisfaction (Health Canada, 2005), and decreased acute care costs (decreased emergency room visits and hospitalizations) (Reiss-Brennan et al., 2016). Conversely, poor collaboration can result in negative health and safety outcomes for patients (Reeves et al., 2017).

For the past two decades, there has been a strong push in Canada to incorporate interdisciplinary teams in primary care to improve the prevention and management of chronic disease (Health Canada, 2005). In 2000, the Government of Canada invested $800 million in the Primary Health Care Transition Fund (PHCTF) targeting initiatives that would improve primary care services ensuring "that Canadians receive the most appropriate care, from the most appropriate provider, when and where they need it" (Health Canada, 2005, p. 4).

A common challenge to providing effective interprofessional care is poorly defined professional roles that impede care coordination and collaboration (Reeves et al., 2017). Health professionals are guided in their practice by professional competencies, which are "integrated enactment of knowledge, skills, and values/attitudes that define the domains of work of a particular health profession applied in specific care contexts" (Interprofessional Education Collaborative Expert Panel, 2011, p. 2). Some of these professional competencies overlap

between interprofessional team members which can create tension within teams (Interprofessional Education Collaborative Expert Panel, 2011). Understanding roles and responsibilities, or role clarity, is consistently identified in interprofessional competency frameworks as a key feature needed for successful IPC (Canadian Interprofessional Health Collaborative, 2010; Interprofessional Education Collaborative Expert Panel, 2011). The Canadian Interprofessional Health Collaborative's (CIHC) *A National Competency Framework* (2010) outlines competencies required for good interprofessional collaboration organized in six domains: (a) interprofessional communication, (b) patient/client/family/community-centered care, (c) role clarification, (d) team functioning, (e) collaborative leadership, and (f) interprofessional conflict resolution. Although this thesis will primarily focus on role clarification, all six IPC competency domains are interdependent in practice. Effective IPC requires health care professionals to understand their own role and be able to communicate it effectively to members of their team (Canadian Interprofessional Health Collaborative, 2010; Interprofessional Education Collaborative Expert Panel, 2011). Being able to do so can have a positive impact on not only the role clarification IPC domain but may positively influence other IPC domains such as interprofessional communication, interprofessional conflict resolution and patient/client/family/community-centered care.

Referral pathways are a tool that can be used to help primary care teams better understand the common (shared) and complementary (divergent) competencies (Barr, 1998) of interprofessional team members. Referral pathways assist healthcare providers to determine when to refer to other members of the team, and which team member might best serve the care needs of the patient (Denost et al., 2020). When healthcare providers have a clear understanding

of roles and responsibilities, care resources can be maximized to ensure safe, effective, timely and client-centered care (Interprofessional Education Collaborative Expert Panel, 2011).

In sum, it is widely accepted that IPC is needed to serve the complex and multiple needs of primary care patients living with chronic disease. Efficacious IPC, however, not only requires the presence of an interdisciplinary team, but effective interprofessional teamwork, including clearly defined roles.

Diabetes

Diabetes mellitus is among the top five most common chronic diseases in Canada (Public Health Agency of Canada, 2019) and is one example of a chronic disease requiring an effective team approach for successful disease management. Pervasive in primary care practices, diabetes is a metabolic disorder characterized by hyperglycemia resulting from impaired or absent insulin production and/or ineffective insulin action (Punthakee et al., 2018). Nearly one third of Canadians are living with diabetes or prediabetes and the prevalence of diabetes is expected to increase by 28% over the next decade, affecting over 13 million Canadians (Diabetes Canada, 2020). Amongst Indigenous peoples, diabetes prevalence is even higher with First Nations adults living off reserve being 5.9 times more likely to have diabetes than non-Indigenous adults (Diabetes Canada, 2020). Since the all-cause mortality rate is twice as high in people living with diabetes as the general population, diabetes has significant health implications (Diabetes Canada, 2020; Public Health Agency of Canada, 2011).

The three most common etiologic classifications of diabetes are type 1, type 2 and gestational diabetes. The diagnostic criteria are outlined in Table 1 but will not be discussed in greater detail in this thesis.

Table 1

Diagnostic Criteria for Diabetes

Type	A1C (%)	FPG (mmol/L)	Random PG	1hPG in 50g GCT (mmol/L)	1hPG in 75g OGTT (mmol/L)	2hPG in a 75g OGTT (mmol/L)
Prediabetes	6.0-6.4	6.1-6.9				7.8-11.0
Diabetes[a] (Type 1 and 2)	≥6.5	≥7.0	≥11.1			≥11.1
Gestational diabetes[b]		≥5.3		≥11.1	≥10.6	≥9.0

Note. Diagnosis is made if one of these values are met. A1C = glycated hemoglobin; FPG = fasting (no caloric intake for eight hours) plasma glucose; Random PG = random plasma glucose; 1hPG = one-hour plasma glucose; GCT = glucose challenge test; OGTT = oral glucose tolerance test; 2hPG = two-hour plasma glucose.

[a] If person is asymptomatic, a repeat confirmatory test is needed for diagnosis.

[b] Preferred approach for gestational diabetes screening is to do a 50g GCT (non-fasting) at 24-28 weeks of gestation and if required (1hPG in 50g GCT = 7.8-11.0 mmol/L) a 75g OGTT should be done

(Feig et al., 2018; Punthakee et al., 2018)

Type 1 diabetes is associated with an auto-immune destruction of insulin producing pancreatic beta cells (Atkinson et al., 2014; Punthakee et al., 2018). Primarily diagnosed in childhood or adolescence, people living with type 1 diabetes require lifetime use of exogenous insulin and represent approximately 10% of the Canadian diabetes population (Atkinson et al., 2014; Punthakee et al., 2018). Type 2 diabetes occurs when the pancreas does not produce enough insulin or the body is not effective in using the insulin (insulin resistance) and represents the other 90% of the diabetic population (Punthakee et al., 2018; Wilcox, 2005). Prediabetes refers

to impaired glycemic control not yet at diagnostic levels; individuals with prediabetes are at substantial risk of developing diabetes and cardiovascular disease (Punthakee et al., 2018). Unlike type 1, type 2 diabetes is strongly associated with family history and generally thought of as preventable with lifestyle modifications such as healthy eating and exercise (International Diabetes Federation, 2020). More than 90% of people with type 2 diabetes are overweight or obese and although historically diagnosed in adulthood, type 2 diabetes in adolescence is increasing in prevalence paralleling the rising obesity epidemic (Punthakee et al., 2018).

Gestational diabetes mellitus (GDM) is the onset of glucose intolerance during pregnancy usually between 24 and 28 weeks of gestation (Padayachee & Coombes, 2015). Up to 20 percent of women develop gestational diabetes with pregnancy and risk factors include family history of diabetes, obesity and advanced maternal age (Feig et al., 2018). Despite typical resolution of hyperglycemia post-partum, GDM increases a woman's lifetime risk of developing diabetes, hypertension and cardiovascular disease (Mussa et al., 2021). Hyperglycemia during pregnancy (whether from pre-existing type 1 or 2 diabetes or from GDM) has health implications for the fetus, and the child. Fetal risks include miscarriage, neonatal hypoglycemia and macrosomia (Feig et al., 2018; Padayachee & Coombes, 2015). Children exposed to hyperglycemia in utero are more likely to develop childhood obesity and diabetes later in life (Padayachee & Coombes, 2015). Therefore, the importance of effective diabetes management during pregnancy cannot be overstated as the negative impact from poor management extends to the next generation.

The generational impact of gestational diabetes or pre-existing diabetes in pregnancy is just one example of the complex interactions of genetic, environmental and social factors that influence diabetes prevalence. Certain populations are disproportionately affected by diabetes including people of Asian, African, Arab and Latin American descent (Diabetes Canada, 2020).

Diabetes prevalence is 4.9 and 5.2 times higher in people with lower income and lower levels of education respectively (Diabetes Canada, 2020). Disproportionately high diabetes rates in Indigenous peoples are further influenced by the ongoing impact of colonization that maintains socioeconomic disadvantage and creates barriers to accessing healthcare (Crowshoe et al., 2018). These statistics, among others (Y. Bird et al., 2015; Kim et al., 2015), highlight the fact that while in theory type 2 diabetes is largely preventable with lifestyle modifications, the impact of the social determinants of health, such as wealth distribution, healthcare access and food security, cannot be disregarded.

Regardless of the cause, the primary physiological change in all types of diabetes is hyperglycemia which results in damage to both large and small blood vessels over time (Punthakee et al., 2018). The most common microvascular complications are retinopathy (eye damage), nephropathy (kidney damage), and neuropathy (loss of sensation, motor function or pain) (Punthakee et al., 2018). Common macrovascular complications include heart disease and stroke (Punthakee et al., 2018). Diabetes is the leading cause of vision loss and contributes to 30% of strokes, 50% of kidney failure and 70% of lower limb amputations (Diabetes Canada, 2020). People living with diabetes require more visits to their primary care provider and specialists and are three times more likely to be hospitalized (Public Health Agency of Canada, 2011). The burden of diabetes rests not only with the person living with diabetes, but with the health care system as a whole; in 2020, Canadians spent $3.8 billion on healthcare costs related to diabetes and people living with diabetes spent between $1,100 and $2,600 out of pocket for diabetes related expenses (Diabetes Canada, 2020).

With the number of Canadians living with diabetes increasing and the majority of cases being theoretically preventable with lifestyle modifications, there is an urgent need to address

this issue throughout healthcare systems. I will next discuss how diabetes is being cared for in our primary care system.

Diabetes Management in Primary Care

A person living with diabetes requires ongoing education and support across the lifespan from an interprofessional team as their care needs will change over time due to disease progression and the development of complications (Clement et al., 2018). With the elevating prevalence of diabetes and the limited number of physician specialists in Canada, 80% of diabetes care is carried out in primary care settings (Clement et al., 2018; Lau, 2014). Diabetes care is multi-faceted, but the two primary objectives are to minimize hyperglycemia and prevent vascular complications (Lipscombe et al., 2018). The complex nature of diabetes can make treatment targets difficult to achieve despite progress in research and pharmaceuticals. For example, patients in primary care are often overweight or obese (86%), have hypertension (64%), and have one or more macrovascular and/or microvascular complication(s) (26% and 25% respectively) (Leiter et al., 2013). People with diabetes are also more likely to have musculoskeletal complications such as low back pain, adhesive capsulitis, structural foot deformities as well as sensory and motor neuropathy (Harris-Hayes et al., 2019).

The challenges of managing diabetes were made evident in a large cross-sectional observational survey of primary care patients across Canada (n = 5123) where fewer than 13% of patients were attaining recommended diabetes outcomes (Leiter et al., 2013). These recommended outcomes include glycated hemoglobin (A1C) which is an average measurement of blood glucose over a three-month period. A1C measures how much glucose has accumulated on the hemoglobin protein found in red blood cells (Nathan et al., 2008). Red blood cells live approximately three months, therefore, higher blood glucose levels over that period of time will

result in more glucose build up on hemoglobin. A reflection of overall glycemic control, A1C is clinically important as it is predictive of cardiovascular events and microvascular complications (Punthakee et al., 2018). Expressed as a percentage, diabetes is diagnosed at A1C values equal to or greater than 6.5%. Leiter et al.'s (2013) study found that most patients did not achieve treatment targets for A1C ($\leq$7.0%), low density lipoprotein (LDL) ($\leq$ 2.0 mmol/L) and blood pressure (less than 130/80 mmhg). While the recruitment strategy for participants in this study may have resulted in an overrepresentation of those on insulin, since they were recruited from primary care practices on a single day, these results are still concerning.

In sum, primary care settings are struggling to effectively meet the complex care needs of patients living with diabetes. Improving diabetes management is of utmost importance in primary care settings.

Diabetes and Exercise

There are three pillars of diabetes management: healthy diet, physical activity, and pharmacological intervention (Punthakee et al., 2018). Physical activity is an underutilized intervention in diabetes management with promising implications for the prevention of gestational and type 2 diabetes and the management of gestational, type 1 and 2 diabetes (Bohn et al., 2015; Chen et al., 2021; Padayachee & Coombes, 2015; Sigal et al., 2018). Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure above basal levels (Caspersen et al., 1985) such as steps throughout the day or gardening. Exercise is a subcategory of physical activity and is defined as planned and structured physical activity (Caspersen et al., 1985) such as walking, riding a bike or playing a sport.

There are several body systems through which exercise can positively impact the underlying physiological mechanisms of diabetes. The most well-established is through the

skeletal muscle system where acute and chronic adaptations improve glucose uptake and insulin sensitivity (Stanford & Goodyear, 2014). Postprandially, blood glucose homeostasis is primarily achieved through the transportation of glucose into skeletal muscles (glucose uptake) where it is used for energy or stored in the form of glycogen for later use by working muscles (Huang & Czech, 2007). Glucose transporter proteins, most notably one isoform (GLUT-4), facilitate this process and are mediated by two distinct pathways: insulin-dependent and contraction-dependent (Colberg et al., 2010; Huang & Czech, 2007; Yang et al., 2019).

The insulin-dependent pathway is dominant at rest, where insulin stimulates glucose uptake via GLUT-4 into skeletal muscles (Colberg et al., 2010; Yang et al., 2019). In people with diabetes, this pathway is impaired by insulin resistance or insufficient insulin production, resulting in hyperglycemia (Colberg et al., 2010; Yang et al., 2019). Fortunately, the muscle contractions that occur during physical activity also act as a stimulus for GLUT-4 proteins, facilitating glucose uptake into working muscles. This contraction-dependent pathway is insulin-independent and therefore, unaffected by diabetes (Colberg et al., 2010; Yang et al., 2019). The depletion of muscle glycogen stores from an acute exercise bout increases glucose uptake via the insulin-dependent pathway for more than 24 hours and can leave the contraction-dependent pathway active for hours after the activity has concluded (Colberg et al., 2010). The contraction-mediated pathway is a valuable mechanism that can be utilized by people living with diabetes where the insulin-dependent pathway is impaired.

There are exercise benefits that are immediate (acute), occurring with a single bout of physical activity and others that occur over time with repeated regular exercise (exercise training) (S. R. Bird & Hawley, 2016). Acutely, exercise increases inulin sensitivity for up to 72 hours (S. R. Bird & Hawley, 2016; Colberg et al., 2010). During exercise, increased blood flow

and recruitment of capillaries increases the length of time that skeletal muscle tissues are exposed to insulin and glucose, improving glucose uptake (Ebeling et al., 1993; Richter & Hargreaves, 2013). Both aerobic and resistance exercise increases glucose disposal through insulin and contraction-mediated pathways (Colberg et al., 2010). The overall cumulative effect is dependent on the intensity and duration of the exercise event (Colberg et al., 2010). With exercise training, the acute benefits of a single bout are further amplified by chronic skeletal muscle adaptations (Colberg et al., 2010). Regular aerobic or resistance training increases GLUT-4 protein expression, improving the concentration and activity of glucose transporting proteins in skeletal muscles (Colberg et al., 2010; Stanford & Goodyear, 2014). The increased muscle mass seen with resistance training is thought to enhance insulin sensitivity through the increased quantity of insulin receptors (Colberg et al., 2010; Yang et al., 2019). These acute and chronic adaptations of skeletal muscles are the underlying mechanism by which exercise is directly beneficial in the prevention and management of diabetes.

The following section will review the evidence supporting exercise as an intervention for prediabetes, type 2 diabetes and, although less extensively studied, type 1 diabetes and gestational diabetes. As this is a large body of literature, in this section I will focus on systematic reviews and sentinel high quality studies that have contributed to our understanding of the relationships between exercise and diabetes.

Efficacy of Exercise in Prediabetes Management. It is generally accepted that exercise is effective in preventing the development of type 2 diabetes in the general population as well as in high-risk populations such as those who are overweight or have prediabetes (Knowler et al., 2002; Pan et al., 1997). Two landmark randomized control trials helped to firmly establish the

preventative effect of exercise and the enduring nature of those benefits decades later (Chen et al., 2021; Gong et al., 2019; Knowler et al., 2002; Pan et al., 1997).

The first was the Diabetes Prevention Program (DPP) clinical trial from the United States which studied 3,234 overweight adults and compared metformin (a first-line glucose-lowering medication) to an intensive lifestyle intervention (ILI) (Knowler et al., 2002). The metformin group and placebo group received standard lifestyle recommendations in addition to their twice daily metformin or placebo pills, respectively. Participants in the ILI group received intensive exercise, dietary and behavior change education both individually and as a group over 24 weeks. Treatment goals for the ILI group focused on losing 7% of their body weight by eating low-calorie, low-fat foods and obtaining at least 150 minutes of moderate intensity activity each week. Physical activity participation was measured in average MET-hours per week, calculated using the Modifiable Activity Questionnaire based on self-reported physical activity logs.

Following the initial 24-weeks of intervention, 50% of participants in the ILI group had achieved their target weight loss and 74% were meeting physical activity targets (Knowler et al., 2002). These outcomes were not maintained throughout the remainder of the trial however and at the conclusion (an average of 2.8 years from the beginning of the trial), 38% of ILI participants had maintained the 7% weight loss and only 58% were meeting physical activity targets. Despite this, the intensive lifestyle intervention was found to reduce diabetes incidence by 58% (95% confidence interval (CI), [48, 66]) and metformin reduced incidence by 31% [17, 43] compared to placebo (Knowler et al., 2002). Authors concluded that while both metformin and lifestyle interventions were able to reduce diabetes incidence, healthy eating and physical activity were superior.

Following the DPP trial, the Diabetes Prevention Program Outcomes Study (DPPOS) continued to follow participants (Diabetes Prevention Program Research Group, 2009). Given the clear benefits of the intensive lifestyle intervention, all groups were offered the opportunity to participate in the 16-session lifestyle education program that the ILI group received in the DPP trial as well as quarterly group sessions. Some participants from the placebo (57%), metformin (58%) and lifestyle group (40%) took at least some of the lifestyle education sessions offered. Ten-years from the start of the original DPP trial, those who participated in the original lifestyle intervention had a 34% (95% CI, [24, 42]) reduction in incidence of diabetes while the original metformin group had only an 18% [7, 28] reduction compared to the original placebo despite comparable weight loss in all groups. This follow-up with 88% of the original cohort demonstrated that exercise and dietary interventions can have lasting effects that are superior to a medication intervention (Diabetes Prevention Program Research Group, 2009).

The second sentinel study was the Da Qing Impaired Glucose Tolerance (IGT) and Diabetes study in China (Pan et al., 1997). It was significant because it examined the effects of exercise and dietary interventions separately and combined. The intervention groups received individual and group counselling sessions throughout the six-year trial period that were tailored to their age, body mass index (BMI), and presence of cardiovascular disease or arthritis. Participants who received the exercise interventions saw the greatest reduction in risk of developing diabetes. After adjusting for differences in baseline fasting glucose and body mass index, there was a 46% ($p < .0005$) reduction with exercise intervention, a 31% ($p < .03$) reduction with dietary intervention and 42% ($p < .005$) reduction with the combined exercise and dietary intervention. The differences in diabetes incidence between the exercise, dietary or combined diet and exercise groups were not statistically significant.

Thirty years later, the cardiovascular protective benefits of the lifestyle interventions were illustrated by longitudinal data of 94% of participants from the Da Qing IGT trial (Chen et al., 2021; Gong et al., 2019). The combined intervention groups had a 26% reduction (p = .0060) in cardiovascular events, 35% (p = .025) reduction in microvascular complications and 26% (p = .0015) lowered all-cause mortality compared to the control group (Gong et al., 2019). During the original trial, nearly one third of participants in the lifestyle intervention groups returned to normoglycemia (no longer had prediabetes) and they saw the greatest long-term benefits with 37% (95% CI, [0.47, 0.85]) reduction in cardiovascular disease and 66% [0.20, 0.56] reduction in microvascular complications compared with those who went on to develop diabetes (Chen et al., 2021). The 7.5-year (95% CI, [1.91, 12.99]) delay in onset of cardiovascular disease and 18.5-year [1.0, 10.38] delay in microvascular complications seen by these participants have significant health and functional implications. These two landmark studies, in addition to others (Chow et al., 2016; Kosaka et al., 2005; Lindström et al., 2003; Saito et al., 2011; Smith et al., 2016), demonstrated that exercise interventions can be more efficacious than pharmaceutical interventions and therefore comprise a critical component of diabetes prevention.

Efficacy of Exercise in Diabetes Management. Exercise is a foundational pillar of diabetes management because not only does it address the diabetes pathology itself, but also the multimorbidity commonly seen in people with diabetes. Unlike insulin and many other pharmacological interventions, exercise has a multifactorial effect on cardiovascular disease. Poor cardiorespiratory fitness, impaired fasting glucose, dyslipidemia, and being overweight are all independent risk factors for cardiovascular disease (Barry & McCullough, 2009). Exercise not only reduces A1C, but it also mediates reductions in lipid profiles, contributes to weight loss and

improves cardiorespiratory fitness (Balducci et al., 2010; Barry & McCullough, 2009; Bohn et al., 2015; Sigal et al., 2018; Umpierre et al., 2011).

The current Canadian diabetes Clinical Practice Guidelines are based on a rigorous review of existing literature and recommend people living with diabetes accumulate 150 minutes of moderate to vigorous aerobic exercise each week as well as engage in resistance exercises two or three times a week (Sigal et al., 2018). Aerobic exercise “involves continuous, rhythmic movements of large muscle groups, such as walking, bicycling, swimming or jogging, normally lasting for at least 10 minutes at a time” (Sigal et al., 2018, p. s54) and resistance exercise is "brief repetitive exercise using weights, weight machines, resistance bands or one's own body weight (e.g., push-ups) to increase muscle strength and/or endurance” (Sigal et al., 2018, p. s54).

Evidence suggests that there is no one type of exercise that is more effective than another in the treatment of diabetes. A systematic review and meta-analysis of nearly 50 studies and 8538 participants found that aerobic exercise, resistance exercise or the combination of both all lowered A1C by –0.67% (95% CI, [-0.84, –0.49]) when compared with control. There was no statistically significant difference between the three exercise modalities (Umpierre et al., 2011).

However, there is high quality evidence showing that exercise benefits are dose dependent, meaning that more exercise is better. While any length of exercise is better than no exercise, participants with physical activity levels greater than 150 minutes per week resulted in more significant absolute A1C reductions and accordingly activity levels below the recommendations resulted in smaller improvements, -0.89% (95% CI, [-1.26 - 0.51]) and -0.36% [-0.50, -0.23] respectively (Umpierre et al., 2011). A Canadian study found that A1C reductions from exercise interventions were greatest in those with a higher baseline A1C (Sigal et al., 2007)

indicating that those with poor glycemic control have the most to gain from exercise interventions.

Although not as extensively studied, there is evidence to suggest that people with type 1 diabetes also experience improved glycemic control and cardiovascular risk factor reduction when regularly engaging in exercise. A large cross-sectional secondary analysis study of 18,028 adults with type 1 diabetes in Germany and Austria looked at clinical and self-reported physical activity data (Bohn et al., 2015). The authors found an inverse association between physical activity and insulin dose, A1C, diastolic blood pressure, lipids and body mass index. While no causality can be drawn from this study due to its design, there appears to be a relationship between physical activity levels, glycemic control, and cardiovascular risk factors in people with type 1 diabetes.

Efficacy of Exercise in Gestational Diabetes Prevention and Management. There is high quality evidence supporting the efficacy of physical activity in gestational diabetes (GDM) prevention but there is limited evidence in relation to the dose-response (Dipietro et al., 2019). An umbrella review summarized findings from 14 meta-analyses of physical activity in pre-pregnancy and early pregnancy and found that higher levels were associated with statistically significant reductions in GDM in nine of the 14 meta-analyses with four others showing non-significant reductions (Dipietro et al., 2019). The largest meta-analyses in the umbrella review looked at 23 studies and found that women with the highest reported levels of moderate intensity physical activity lowered their risk of developing GDM by approximately 20% when performed either before (RR=0.78; 95% CI, [0.61, 1.00]) or during pregnancy (RR=0.80; 95% CI, [0.64, 1.00]) (Aune et al., 2016). Women who performed moderate intensity physical activity both before and during pregnancy had a 59% (RR=0.41; 95% CI, [0.23, 0.73]) reduced risk of

developing GDM compared to women with no reported physical activity (Aune et al., 2016). Dipietro et al. (2019) found that while there is evidence to support the greater total time and intensity of physical activity is more likely to decrease risk of GDM, the quality of the evidence was low given the heterogeneity of the physical activity prescribed.

There is only a small body of evidence regarding exercise interventions in women with GDM, but a few high-quality studies have demonstrated the efficacy of exercise in glycemic control. Bung et al. (1991) randomized 41 women with GDM who did not achieve normoglycemia following a one-week trial of diet intervention to either an exercise and diet group (EXE) or insulin and diet group (INS). Participants were mostly sedentary at the start of the trial, 27 – 34 weeks of gestation and were randomized into groups by age and percentage of body fat. The EXE group were encouraged to be physically active and attended three supervised exercise sessions per week where they performed 45 minutes of cycling at 50% max aerobic capacity, broken up into three 15-minute bouts. Of the 17 participants who completed the trial, there was no statistically significant difference in mean weekly blood glucose values between the EXE group (M=5.2 mmol/L, SD=0.3) and the INS group (M=4.9, SD=0.3). With no body composition difference between groups either, this study found moderate intensity aerobic exercise was as effective as insulin in maintaining euglycemia (Bung et al., 1991).

A Canadian study found similar results with circuit type resistance training (Brankston et al., 2004). Thirty-eight women between 26 and 32 weeks of gestation were randomized into either diet alone or diet and exercise intervention groups. After three supervised introductory exercise sessions, the exercise group was asked to complete three sessions a week of eight exercises using rubber bands in a circuit, with less than one minute rest in between, at a "somewhat hard" intensity level. There was a statistically significant delayed need for insulin in

the exercise group (3.71 weeks, SD=3.1, $p < .05$) compared to the diet alone group (1.11 weeks, SD=0.8, $p < .05$) and the amount of insulin needed was also significantly lower (0.22 units/kg, SD=0.2, $p < .05$) in the exercise group than in the diet group (0.48 units/kg, SD=0.3, $p < .05$). Although there was no statistically significant difference between the two groups regarding the incidence of insulin use, when they looked at only a subgroup, that being women with a pre-pregnancy body mass index was >25 kg/m^2, there was a significant difference. Amongst this subgroup, only three of the 10 women in the exercise group required insulin compared to eight of the 10 women in the diet alone group ($p < .05$) (Brankston et al., 2004).

These studies demonstrate that in addition to the already well-established benefits of physical activity in pregnancy, exercise is also effective in preventing the development of gestational diabetes. For those with GDM, there is good evidence that physical activity can have meaningful effect in maintaining normoglycemia with the potential to eliminate, delay or reduce the need for insulin in women with GDM.

Physical Activity Interventions in Primary Care. The benefits of exercise in the prevention and management of diabetes have been well established yet nearly half of all Canadians are inactive (Diabetes Canada, 2020). This suggests that the work currently being done in primary care settings to encourage patients to be active may not be effective. There is little high-quality literature describing current physical activity interventions in primary care settings. There are two main forms of physical activity interventions being performed in primary care: physical activity counselling (PAC) and structured exercise interventions. Physical activity counselling is the main form of physical activity intervention provided in Canada and occurs when health care providers give verbal or written advice about physical activity or exercise (Baillot et al., 2018; Petrella et al., 2007). Structured exercise intervention, more common in

European countries, occurs when people engage in exercise in a gym or recreational facility, that may or may not be attached to a primary care setting (Pavey et al., 2012). This section will review quantitative and qualitative literature related to current primary care physical activity intervention practices, barriers to effective exercise interventions as well as the potential role of exercise specialists.

Physical Activity Counselling in Primary Care. The literature has documented many challenges to effective physical activity counselling (PAC). Research on PAC has centered around physicians, nurses, and diabetes educators. Canada has nearly 2,200 Certified Diabetes Educators (CDE) who are health care professionals with extensive knowledge and experience in diabetes care who work in various practice settings including primary care (Boivin, 2019). Diabetes educators are often involved in self-management education and primarily consist of pharmacists, nurses, and dietitians in Canada (Boivin, 2019; Sherr & Lipman, 2015). While it is a small body of literature, what is available suggests that physicians, nurses, and diabetes educators have knowledge deficits regarding physical activity counseling for people living with diabetes, especially for those on insulin or with other comorbidities (Baillot et al., 2018; Petrella et al., 2007; Powell et al., 2016). This section will highlight the evidence related to barriers to effective physical activity counselling.

Primary care physicians are well positioned to offer PAC, however less than 16% of Canadian physicians provide written advice to their patients (Petrella et al., 2007). Physicians cite lack of time, resources, and lack of client interest as barriers to more frequent PAC (O'Brien et al., 2017). There is also some evidence to suggest that the quality of physical activity advice given may be lacking (Baillot et al., 2018; O'Brien et al., 2017). For example, a Quebec study found that despite primary care nurses and physicians feeling confident in their ability to provide

PAC, less than half were knowledgeable about physical activity benefits and the recommended exercise guidelines (Baillot et al., 2018). Given the paucity of PAC by primary care physicians and the self-identified barriers, it is surprising that only 10% of patients are referred to other team members for physical activity counselling (Petrella et al., 2007).

Diabetes educators are known for their ability to effectively provide counselling on a variety of diabetes related topics (Sherr & Lipman, 2015), yet on the subject of physical activity, they feel underqualified or ineffective (Dillman et al., 2010; Jansink et al., 2010; Powell et al., 2016). Studies found that diabetes educators from the Netherlands (n = 12) (Jansink et al., 2010) and the United States (n = 119) (Powell et al., 2016) reported limited knowledge about the effects of exercise on glycemic control and apprehension about safely counselling those with comorbidities about exercise. Similar findings were reported from a Canadian study of diabetes educators (n = 119) who despite recognizing the importance of physical activity counselling, felt they lacked the confidence and knowledge to do so effectively, especially for those with comorbidities (Dillman et al., 2010). Authors from these physical activity counselling studies emphasize the need to find strategies to improve the quantity and quality of PAC and suggest improved education or training for physicians and diabetes educators or finding ways to increase collaboration with exercise professionals (Dillman et al., 2010; O'Brien et al., 2017; Petrella et al., 2007; Powell et al., 2016).

Health care provider knowledge and confidence is even more important when we consider physical activity counselling for people who are insulin dependent or have one or more comorbidity. As described earlier, comorbidities and diabetes related complications are common amongst people living with diabetes (Diabetes Canada, 2020; Leiter et al., 2013) and they can impact one's ability to be physically active. A longitudinal cohort study of 6,853 inactive

patients with type 2 diabetes examined predictors of remaining inactive (Palakodeti et al., 2015). Authors found that obesity and concurrent medical issues such as chronic kidney disease and depression were associated with remaining inactive (Palakodeti et al., 2015).

For people living with type 1 diabetes, more education is needed on how to exercise safely while using insulin (Brazeau et al., 2008; Kennedy et al., 2018). A survey of 100 people with type 1 diabetes found that only half were knowledgeable about the pharmacokinetics of their insulin or strategies to prevent hypoglycemia (Brazeau et al., 2008). As a result, these participants were fearful to exercise. These findings were supported in another study of people who were newly diagnosed (less than three months) with type 1 diabetes (Kennedy et al., 2018). Half of participants in this study reported decreasing their physical activity since diagnosis, some even with the encouragement of their healthcare provider. Authors from both these studies conclude that people with type 1 diabetes would benefit from more information and support around how to manage insulin and carbohydrate intake when exercising and that health care provider knowledge may be lacking in this area.

In sum, despite the evidence that exercise has a vital role in diabetes management, physicians and diabetes educators who currently provide PAC, lack knowledge and confidence in providing advice to people living with diabetes. Comorbidities, patient specific barriers, and the complexity of diabetes as a disease make PAC a complex interaction in primary care.

Structured Exercise Interventions. The other form of physical activity intervention that is common in primary care literature is structured exercise interventions. Most structured exercise intervention studies use the term exercise specialist for the person delivering the exercise intervention (Balducci et al., 2010; Pi-Sunyer, 2014). Often this term is not defined and personal trainers, who have completed a short training process, are not necessarily differentiated

from university educated professionals with wide-ranging educational backgrounds and expertise such as kinesiologists, exercise physiologists and physiotherapists (Turner et al., 2019). Certification requirements of some of these professionals vary between countries and even between provinces in Canada (Canadian Kinesiology Alliance, 2020). Because of this lack of clarity in the literature, for the purposes of this review, I will use the term exercise specialist, but caution should be used when generalizing this information.

The majority of the literature related to structured exercise interventions in primary care comes from the United Kingdom. Publicly funded Exercise Referral Schemes (ERS) have been used since the 1990s to identify patients in primary care who are inactive and refer them to a third-party service for an exercise program (Pavey et al., 2012). Despite their long history, there is still uncertainty about which components are important in an effective structured exercise intervention (Pavey et al., 2012; Williams et al., 2007). A systematic review of 18 studies in the United Kingdom found that ERS were only minimally effective in increasing physical activity, needing 17 patients to be referred for one patient to become moderately active (Williams et al., 2007). Of the four control trials in this review that collected biomedical outcomes, there were no statistically significant changes in blood pressure, resting heart rate or exercise performance. In part, authors blame poor uptake and adherence rates, which varied widely between studies, for the poor outcomes. Between 29-92% of people attended a first session (uptake) and <50% completed the full course of sessions (adherence) (Williams et al., 2007). Authors recommend the need to identify patient readiness prior to referral to increase uptake and exercise programs that are more individualized to participant needs to improve adherence to ERS. Authors caution about the high heterogeneity amongst the studies reviewed as well as variability in the format of exercise programs, making it hard to evaluate ERS as a whole.

Physical Activity Counselling Versus Structured Exercise Interventions. A pervasive issue in this body of evidence is the heterogeneity of exercise interventions in the literature. Physical activity counselling efficacy may be dependent on the knowledge of the health care provider and the quality of advice provided. In the same way, structured exercise can vary substantially in the exercise dose administered (frequency, intensity, type and duration) and the health care provider's expertise. Despite this lack of consistency, I have attempted to summarize the literature regarding these two types of interventions based on the intervention descriptions provided by the authors.

Structured exercise interventions have been found to be superior to PAC (Balducci et al., 2010; Umpierre et al., 2011). An international systematic review and meta-analysis of nearly 50 studies and 8538 participants found when physical activity interventions were delivered to participants in a structured and supervised manner, a -0.67% (95% CI, [-0.84, -0.49]) reduction in A1C was seen (Umpierre et al., 2011). However, when they were provided with physical activity advice alone, there was no statistically significant improvement in glycemic control (Umpierre et al., 2011). A high-level randomized control trial, the Italian Diabetes and Exercise Study (IDES) (n = 606) found similar results (Balducci et al., 2010). Participants who received the structured supervised exercise intervention showed a mean A1C reduction of -0.30% (95% CI, [-0.49, -0.10]) compared to those who received exercise counselling alone (Balducci et al., 2010). The structured exercise intervention group were also found to have statistically significant improvements in cardiovascular risk factors like blood pressure, lipids, and body composition. Improved glycemic control resulted in 13% of participants no longer requiring insulin therapy and 5% reduced the number of oral agents needed. Participants in both the systematic review and

the IDES study were excluded if they had any physical limitations to physical activity (Balducci et al., 2010; Umpierre et al., 2011).

Unlike IDES and Umpierre's systematic review, the structured exercise programs (ERS) in Europe did not consistently demonstrate the same benefits, and it is important to try to understand why. Given the diverse exercise programs offered in ERS, one recent systematic review looked at 27 studies from eight countries to examine facilitators and barriers to improving physical activity uptake and adherence (Albert et al., 2020). While there was significant heterogeneity amongst the studies and some lacked methodological details, authors found that there was a relationship between adherence and the type of support provided during and after the intervention and specifically that inclusion of physiotherapists or exercise physiologists enhanced positive outcomes. They suggest exercise specialists' ability to offer exercise modifications or advice may be important, as 48% of participants had cardiovascular disease, 40% were overweight or obese and 29% had musculoskeletal conditions (Albert et al., 2020). Given the underwhelming results of efficacy of ERS, it is promising that exercise interventions by exercise specialists may promote sustainable increases in physical activity in both the general population and those with diabetes.

In sum, exercise interventions are more effective when delivered in a structured, supervised manner compared to physical activity counselling alone. However, especially for those with medical or physical conditions, the support of exercise specialists with a certain level of knowledge and skill may be a significant facilitating factor in successful exercise interventions.

Gaps in the Literature and Rationale for the Study

Aging patient populations and the increasing prevalence of diabetes and other chronic diseases are making care more time consuming and complex for primary care providers (Health Council of Canada, 2010). Clinical outcomes for people living with diabetes indicate that providers are struggling to meet treatment targets (Leiter et al., 2013). Failure to meet these targets have known negative health implications on patient health and disability (Punthakee et al., 2018).

Exercise is a potent treatment for the prevention and management of diabetes (Chen et al., 2021; Umpierre et al., 2011), yet it is one of the most underutilized in primary care settings (Petrella et al., 2007). There are provider and patient barriers to providing effective exercise interventions in primary care settings (Baillot et al., 2018; Brazeau et al., 2008). With nearly half of all adults physically inactive (Diabetes Canada, 2020), there is an urgent need for comprehensive and effective physical activity interventions in primary care settings where most diabetes care takes place.

Front line primary care providers have knowledge deficits about exercise guidelines (Baillot et al., 2018; Dillman et al., 2010). Even diabetes educators feel unprepared to offer physical activity counselling safely and effectively to patients on insulin or with more complex disease presentations (Dillman et al., 2010; Powell et al., 2016). This is understandable given that most people with diabetes have at least one other medical condition such as cardiovascular disease or musculoskeletal conditions which can influence exercise intervention recommendations and implementation (Harris-Hayes et al., 2019; Leiter et al., 2013).

A potential solution to this gap in care is the inclusion and integration of exercise specialists like physiotherapists and kinesiologists in primary care teams. While general exercise

interventions in primary care have been underwhelming, those that included university educated physiotherapists and kinesiologists improved exercise participation and patient outcomes (Albert et al., 2020) suggesting that professional competencies are important. For primary care teams to be able to effectively work with exercise professionals including making appropriate referrals, a good understanding of the role and competencies of exercise professionals in primary care diabetes care is required (Canadian Interprofessional Health Collaborative, 2010; Interprofessional Education Collaborative Expert Panel, 2011).

Purpose of the Study

The overarching aim of this convergent mixed methods study was to promote effective primary care interprofessional collaboration in the area of diabetes care and physical activity. Specific objectives of this project to contribute to that aim were to:

1. Establish competencies of entry-level physiotherapists related to physical activity as an intervention for diabetes in primary care settings.
2. Establish competencies of entry-level kinesiologists related to physical activity as an intervention for diabetes in primary care settings.
3. Integrate the findings from objectives one and two to understand the common and distinct competencies of physiotherapists and kinesiologists related to physical activity as an intervention for diabetes in primary care.
4. Develop a primary care referral pathway for diabetes care by exercise specialists based on competencies for use by interprofessional primary care teams.

Methods

Research Ethics Board Approval

University of Manitoba's Health Research Ethics Board (HREB) approved this study on February 14, 2022 (HS25352 (H2022:044)).

Research Paradigm and Methodology: Pragmatism and Mixed Methods

This research project is situated in the pragmatist paradigm. At the core of pragmatism philosophy is the belief that truth is relative and subject to change (Given, 2012). Sitting between realist and idealist ontologies, pragmatists believe reality is insufficiently understood by solely objective or subjective means (Given, 2012). Pragmatism seeks practical solutions to a specific problem (Given, 2012) and does not limit itself to only quantitative or qualitative methods (Creswell, 2014). Taking this problem driven approach, pragmatists utilize whichever methods are best suited to answer their research question (Creswell, 2014).

This convergent mixed methods project benefits from the strengths of both qualitative and quantitative methods to gain knowledge about the competencies of physiotherapists and kinesiologists (Fetters et al., 2013; Shorten & Smith, 2017). Qualitative and quantitative data was integrated during the collection and analysis phases to develop context specific competencies of physiotherapists and kinesiologists and a practical tool (referral pathway) that can be used by clinicians and policy makers to promote effective interprofessional teamwork. In line with the pragmatic paradigm, I acknowledge that the data collected was a snapshot of the phenomenon of interest and is personally and contextually specific to participants and influenced by those of the researcher.

The qualitative component of this project was informed by qualitative descriptive methodology as described by Sandelowski (2000). Qualitative description is a good fit for

research questions that seek to provide a comprehensive account of a particular process using common language (Bradshaw et al., 2017; Lambert & Lambert, 2012; Sandelowski, 2000). The competencies of physiotherapists and kinesiologists have been established (Canadian Kinesiology Alliance, n.d.-a; National Physiotherapy Advisory Group, 2017) but how they are enacted within the context of diabetes care in primary care settings have not been studied. Unlike other well-known qualitative methodologies like phenomenology, which call for more in-depth interpretation, qualitative description findings stay close to the data (Sandelowski, 2000), which is appropriate for this study that seeks to build on existing competencies. This methodology aligns well with the pragmatic paradigm as these competencies will be subject to change over time and in different contexts.

Method: Modified Delphi and Focus Groups

Using a modified Delphi method and focus groups as described by Keeney et al. (2010), this study explores the common (shared) and complementary (divergent) competencies (Barr, 1998) of physiotherapists and kinesiologists in diabetes care in primary care settings. The Delphi method, first developed by Rand corporation in the late 1940s, is a well-established technique used in a variety of research fields (Hsu & Sandford, 2007; Keeney et al., 2010) where the consensus of experts is used to increase understanding on a topic where information is contradictory or lacking (Hasson et al., 2000).

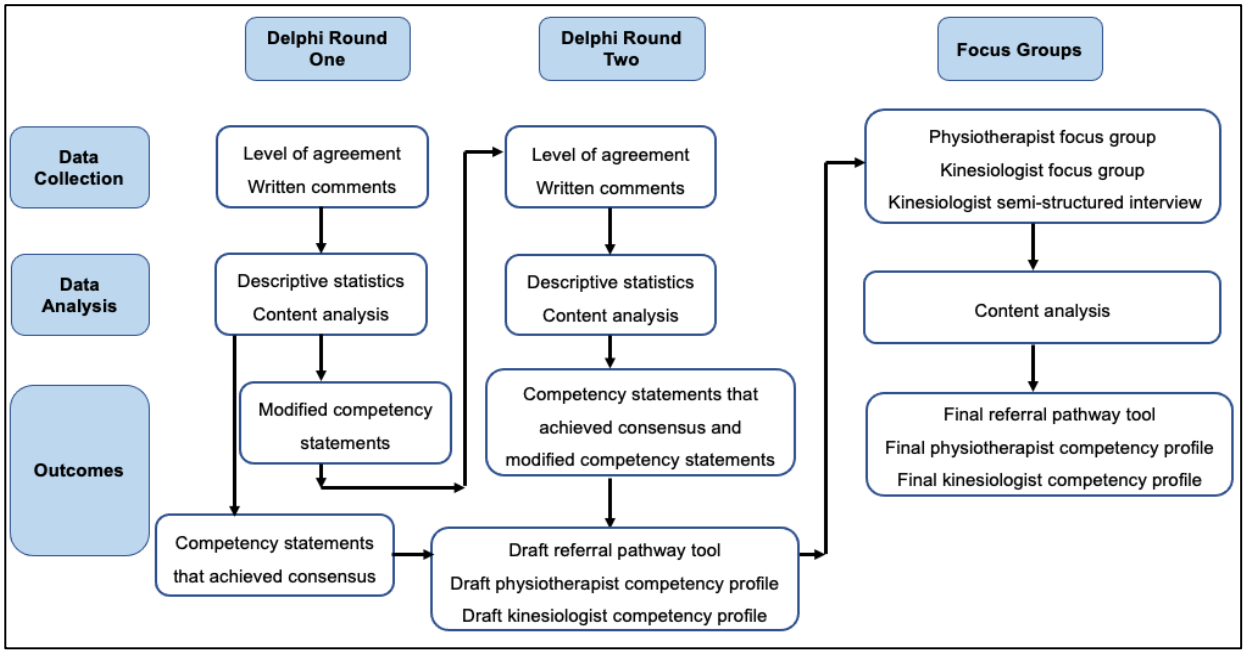
Using iterative rounds of surveys, the Delphi method seeks to establish agreement on an issue where no agreement previously existed and is based on the premise that the opinion of many is more valid than that of one (Hsu & Sandford, 2007; Keeney et al., 2010). In healthcare, the Delphi method has been used to establish competencies both within disciplines and interprofessionally (Litchman et al., 2020; Procter & Hunt, 1994; Roberts-Davis & Read, 2001;

Tognetto et al., 2019). This method was chosen for this study as little is known about the role of physiotherapists and kinesiologists specific to diabetes care in primary care settings and aligns well with both the pragmatic paradigm and qualitative descriptive methodology. Key features of the Delphi method are obtaining expert opinion through iterative rounds and providing anonymized, controlled feedback (Keeney et al., 2010). Controlled feedback is the process of providing participants with a summary of the group's responses from the previous round, allowing each participant the opportunity to reconsider and/or clarify their opinion on a particular issue (Hsu & Sandford, 2007). The Delphi method increased our understanding of the role and scope of these exercise specialists and facilitated the development of a primary care referral pathway tool.

The Delphi protocol involved two Delphi Survey rounds to establish the competencies of physiotherapists and kinesiologists. During the survey rounds, physiotherapist and kinesiologist data was collected and analyzed separately. Each of these data sets (physiotherapist and kinesiologist) contained both qualitative and quantitative data. The qualitative and quantitative data within those data sets were analyzed first on their own, then considered together in order to decide whether a competency statement should be modified for the next round. This approach is consistent with data integration at the methods level as described by Fetters et al. (2013). Following the final survey round, physiotherapist and kinesiologist data was compared. Comparison of the data provided an appreciation of the difference between physiotherapists and kinesiologist competencies and a referral pathway tool was developed. Focus groups were used to perform member-checking on the competencies that were developed through the two Delphi survey rounds and validate the referral pathway tool they informed. The data collection and analysis stages are highlighted in Figure 1.

Figure 1

Data Collection and Analysis Stages



Modifications to the format of the Delphi are common in the literature (Hasson et al., 2000), and I used two primary modifications in my method. The first was the addition of focus groups following the two Delphi rounds as recommended by Hasson and Keeney (2011). Interviews or focus groups are a way to clarify and increase confidence in the Delphi survey findings (Hasson & Keeney, 2011). Focus groups were chosen to encourage the robust discussion of diverse subject experts (Freeman, 2006). The opportunity to gain rich feedback about the final competency statements and the referral pathway tool helped to broaden our understanding of the role of physiotherapists and kinesiologists in this clinical practice context. Since the Delphi survey results were subject to the researcher's interpretation of the data, this final step of focus groups allowed for validation of the survey results and the tool developed to reflect those survey results.

The second modification was that rather than using the Classic Delphi method of asking the respondents to generate suggestions from scratch, I developed the initial draft version of competencies based on the existing literature (Canadian Kinesiology Alliance, n.d.-a; Diabetes Canada Clinical Practice Guidelines Expert Committee, 2018; National Physiotherapy Advisory Group, 2017; The Canadian Diabetes Educator Certification Board, 2020). Since physiotherapist and kinesiologist competencies have already been established, expert opinion was not needed to develop competencies from the ground up. Rather, I was seeking consensus on how these competencies related to a specific disease, treatment intervention and practice setting. This process of developing the initial competencies will be further explained in the data collection and analysis section later in this thesis.

Recruitment and Sampling

Delphi studies rely on the opinion of experts and therefore selecting the right sample of expert participants, both the number and quality, is crucial to this design (Hsu & Sandford, 2007). While there is some criticism of the use of the term expert, most authors agree that experts are participants who would be considered highly competent in the subject area or issue under investigation (Hasson et al., 2000; Hsu & Sandford, 2007). Specific criteria or self-reported expertise are two acceptable methods of determining expert status and both were used in this study (Keeney et al., 2010).

The sample sizes in Delphi studies vary significantly from under 15 to thousands of participants (Hasson et al., 2000; Hsu & Sandford, 2007; Keeney et al., 2010). There is no consensus on the ideal size of a sample in relation to the target population (Hasson et al., 2000; Hsu & Sandford, 2007; Keeney et al., 2010). Without clear direction, Keeney et al. (2010) recommend researchers consider the quality of the sample and its ability to appropriately answer

the research question. Heterogeneity of the sample is encouraged to ensure all opinions are captured; however, a more diverse sample may require a larger number of participants to increase validity of results (Hsu & Sandford, 2007; Keeney et al., 2010). Delphi studies require sustained engagement of participants over several weeks and rounds. Larger sample sizes require more investigator resources and can result in higher attrition rates (Hsu & Sandford, 2007; Keeney et al., 2010). All these factors were taken into account when selecting eligibility criteria, recruitment strategies and sample size as well as consideration for the time and resource limitations of completing this project as part of a master's degree.

Sampling

Participants were targeted for their expertise in diabetes management using purposive sampling of physiotherapy and kinesiology experts. Given the emerging role of exercise specialists in primary care, the number of expert clinicians working in diabetes care is limited. A 2016 study of Canadian physiotherapists working in various practice settings found that less than one third provided diabetes management counselling as part of their practice (Doehring et al., 2016). Of the nearly 2,200 Certified Diabetes Educators (CDE) in Canada (Boivin, 2019), only three were physiotherapists and eight kinesiologists at the time of recruitment (Canadian Diabetes Educator Certification Board, personal communication, December 20, 2021). Ontario is the only province in Canada where kinesiologists are self-regulated, a requirement of CDE certification, therefore no other provinces have CDE kinesiologists. Given this limited sampling pool and the benefits of heterogenous sampling, clinicians, researchers and academics were included in my recruitment strategy.

Eligibility Criteria

Inclusion Criteria for Physiotherapists. Participants had to be English speaking physiotherapists registered with a Canadian provincial regulatory body and have answered yes to at least one of the following questions:

- Have you certified with the Canadian Diabetes Educator Certification Board as a diabetes educator within the last five years?
- Have you worked for two or more years in primary care clinics with self-reported high prevalence of clients with diabetes?
- Have you worked for two or more years in a specialist (amputees, renal, endocrinology) clinic with self-reported high prevalence of clients with diabetes?
- Are you a self-reported academic or researcher with expertise in diabetes?

Inclusion Criteria for Kinesiologists. Participants had to be English speaking kinesiologists affiliated with the Canadian Kinesiology Alliance or registered with the College of Kinesiologists of Ontario and answered yes to at least one of the following:

- Have you certified with the Canadian Diabetes Educator Certification Board as a diabetes educator within the last five years?
- Have you worked for two or more years in primary care clinics with self-reported high prevalence of clients with diabetes?
- Have you worked for two or more years in a specialist (amputees, renal, endocrinology) clinic with self-reported high prevalence of clients with diabetes?
- Are you a self-reported academic or researcher with expertise in diabetes?

Recruitment

Recruitment began in April 2022 and concluded in June 2022. Physiotherapists and kinesiologists were recruited via email through 17 Canadian university programs, eight professional organizations and by direct email of 12 subject matter experts (eight authors and four CDEs).

Table 2

Organizations Which Distributed Recruitment Email

Organization Type (Distributed to)	Organization	Province/Territory
Regulatory Organizations (Registrants)	Saskatchewan College of Physical Therapist	Saskatchewan
	College of Physiotherapists of Manitoba	Manitoba
	Nova Scotia College of Physiotherapists	Nova Scotia
Professional Associations (Members)	Canadian Physiotherapy Association	All[a]
	British Columbia Association of Kinesiologists	British Columbia
	Kinesiology Association of Saskatchewan	Saskatchewan
	Alberta Kinesiology Association	Alberta
	Manitoba Kinesiology Association	Manitoba
Physiotherapy Programs (Faculty)	University of Alberta	Alberta
	University of Manitoba	Manitoba
	McMaster University	Ontario
	Queen's University	Ontario
	Dalhousie University	Nova Scotia
Kinesiology Programs (Faculty)	University of the Fraser Valley	British Columbia
	University of Alberta	Alberta
	University of Calgary	Alberta
	University of Saskatchewan	Saskatchewan
	University of Manitoba	Manitoba
	University of Windsor	Ontario
	York University	Ontario
	University of Ontario Institute of Technology	Ontario
	Laurentian University	Ontario
	Dalhousie University	Nova Scotia
	St. Francis Xavier University	Nova Scotia
	University of Prince Edward Island	PEI

[a] To division members only

I emailed the deans or department heads of the physiotherapy and kinesiology programs at Canadian universities, regulatory colleges and professional associations requesting the recruitment email (Appendix A) be shared with any faculty, registrants or members, respectively (see full list of distribution requests in Appendix B). Listed authors of Physical activity and diabetes (Sigal et al., 2018) and *Building competency in diabetes education: Physical activity and exercise'* (Fowles et al., 2012) and kinesiologist CDEs were contacted directly via email as their professional background and email addresses were publicly available. A reminder email was sent two weeks after the initial email was sent out (Appendix C).

The secondary recruitment strategy used snowball sampling, requesting potential participants to forward the invitation to any colleagues that fit the eligibility criteria. Finally, invitations to participate were also posted on my social media pages and shared with national and provincial professional organizations.

Recruitment emails contained the name and purpose of the study, eligibility criteria and a summary of what would be involved for the participant. Social media postings (Appendix D) invited physiotherapists and kinesiologists with a special interest in diabetes care to inquire more about a research study about the role of exercise specialists in diabetes care. All recruitment materials asked interested physiotherapists and kinesiologists to contact the primary investigator via email where they were screened to ensure they fit the eligibility criteria. Potential participants were then sent participant information and consent forms via email that included a written description of the project, eligibility criteria, study procedures, and risks/benefits to participation (Appendix E and F). Potential participants were asked to read the material and if interested in participating, provide consent by replying to the email. One reminder email was sent to potential participants two weeks after the initial email.

Data Collection and Analysis

There were three stages of data collection in this study, Delphi survey round one, Delphi survey round two and focus groups. The following will describe the data collection and analysis methods of each stage, as well as the development of the initial draft of competency statements prior to the Delphi rounds and the draft clinical tools developed after the Delphi rounds (discipline specific competency profiles and the referral pathway tool). Throughout the study, data collection was done separately for physiotherapists and kinesiologists, but data was integrated at certain stages of analysis and will be specified below.

Preparation Phase

The preparation phase consisted of developing the draft discipline-specific competency statements related to physical activity as an intervention for diabetes in primary care settings for the first Delphi survey round.

Physiotherapy Competencies. I developed the competency statements for physiotherapists by modifying the National Physiotherapy Advisory Group's (NPAG) *Competency profile for physiotherapists in Canada* (2017). These modifications were informed by Diabetes Canada's Clinical Practice Guidelines (CPGs) (Diabetes Canada Clinical Practice Guidelines Expert Committee, 2018) and the competency profile of Certified Diabetes Educators (CDEs) from the Canadian Diabetes Educator Certification Board (CDECB) (The Canadian Diabetes Educator Certification Board, 2020).

The NPAG's competency profile for physiotherapists (2017) outlines 34 entry-to-practice competencies of physiotherapists using seven domains: physical therapy expertise, communication, collaboration, management, leadership, scholarship, and professionalism. Each competency statement has two or more entry-to-practice milestones which are the specific

abilities related to that competency that is expected of an entry-level physiotherapist. This profile was chosen as it was developed in collaboration with both the Canadian Alliance of Physiotherapy Regulators (CAPR) and the Canadian Council of Physiotherapy University Programs (CCPUP). Competencies were generated by both clinical and educational experts and validated by a geographically diverse group of 1000 practicing physiotherapists (National Physiotherapy Advisory Group, 2017).

Diabetes Canada's Clinical Practice Guidelines (CPGs) (2018) are evidence-based guidelines intended to guide clinical practice in diabetes prevention and management. The CPGs are updated every five years following a rigorous systematic review process. Although the intended clinical users are all health care professionals providing diabetes care, the guidelines have a particular focus on diabetes care in primary care settings (Houlden, 2018). The CDECB competency profile consists of eight domains (pathophysiology, nutrition, medications, self-care management, microvascular and macrovascular complications, psychosocial/lifestyle, special considerations and education/research) and is the basis for the CDE certification exam in Canada (The Canadian Diabetes Educator Certification Board, 2020). This profile encompasses the disease-specific competencies needed to meet the broad care needs of people living with diabetes.

The first step to developing the draft physiotherapist competencies was to determine which of the NPAG (2017) competency statements and milestones were relevant to the intervention, population and practice setting of interest for this study. Inclusion and exclusion criteria were applied to each milestone to determine if it should be included in the physiotherapist's draft competencies for Delphi survey round one. For the milestone to be included, it needed to be relevant to physical activity interventions, people living with diabetes

and physiotherapists providing care in primary care settings. Milestones were excluded if they related to managing organizational resources or personal or professional development that did not directly benefit the client living with diabetes. For example,

Excluded NPAG milestones	Reasoning
1.2 Employ safe client handling techniques	Not relevant to primary care
4.4 Participate in organizational quality improvement initiatives	Related to workplace maintenance and improvement
7.5 Balance personal and professional demands	Related to personal or professional development

Some competency statements were dropped because none of the milestones required specific changes to be relevant to physical activity interventions for diabetes care by physiotherapists in primary care settings (e.g., communication domain). In total, forty-seven milestones were excluded.

Milestones that met the inclusion and exclusion criteria were then modified into draft competency statements that reflected the intervention, population and clinical context of this study. For example,

NPAG milestone	Draft physiotherapist competency statement
6.4 Access emerging information relevant to area of practice	Accesses emerging information relevant to physical activity and diabetes management and determines potential for applicability in primary care settings

Similar milestones were combined to create fewer, more comprehensive statements, for example,

NPAG milestone	Draft physiotherapist competency statement
6.5 Contribute to the education of peers and other healthcare providers	Identify the learning needs of other healthcare providers related to physical activity and contribute to and assess the effectiveness of learning activities
6.5 Identify the physiotherapy-related learning needs of others	
6.5 Assess effectiveness of learning activities	

A few milestones were expanded into multiple competency statements to add specificity. For example,

NPAG milestone	Draft physiotherapist competency statement
1.2 Identify client specific precautions, contraindications and risks	Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia
	Identifies client-specific precautions, contraindications and risks to physical activity participation from diabetes related comorbidities (e.g., foot ulcer, pre-proliferative retinopathy, autonomic neurological dysfunction)
	Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes

When determining the level of specificity needed for each draft competency statement, the NPAG (2017) and Canadian Kinesiology Alliance (CKA, n.d.-a) competency profiles were considered together. Where CKA competencies were found to be vague, milestones would be modified into multiple more specific competency statements. This specificity allowed for subject matter experts to provide clarification during the Delphi rounds with regard to the specific skills and abilities held by members of their profession. This was to meet this study's objective number three of understanding the distinct competencies between physiotherapists and kinesiologists.

The diabetes competencies were further refined through an iterative process with regular meetings with CB where decisions were discussed and revised as needed (Appendix G). Following this iterative process, the remaining one competency statement from each of the leadership and management domains were felt to be more appropriately categorized under the domains collaboration and professionalism respectively. The result was 40 physiotherapist diabetes competencies organized in four domains from the initial 140 NPAG milestones from seven domains.

Kinesiology Competencies. The competency statements for kinesiologists were developed by modifying the NPAG physiotherapist competency profile (2017) and was informed

by the CKA competency profile (Canadian Kinesiology Alliance, n.d.-a), Diabetes Canada's CPGs (Diabetes Canada Clinical Practice Guidelines Expert Committee, 2018) and the Canadian Diabetes Educator Certification Board's (CDECB) competency profile (The Canadian Diabetes Educator Certification Board, 2020).

Ontario is the only province where kinesiology is a regulated profession therefore, there is no comprehensive document of professional competencies held by all kinesiologists. Lacking a national regulatory body, eligibility for membership to the CKA was selected as a conceptual definition of a kinesiologist for this study. The CKA represents 10 provincial associations with a purpose to "advance, promote, and advocate for kinesiology in Canada through meaningful partnerships and alliances" (Canadian Kinesiology Alliance, n.d.-b) and has 5,000 affiliated kinesiologists (Canadian Kinesiology Alliance, n.d.-d). To become a member, one must hold a four-year university degree in kinesiology or equivalent with course credit in certain areas of study and hold liability insurance (Canadian Kinesiology Alliance, n.d.-c). The CKA competency list consists of educational requirements including eight required courses and 14 elective courses (Canadian Kinesiology Alliance, n.d.-c). The CKA competency profile consists of 54 competencies across five domains: knowledge, kinesiology practical experience, professionalism/professional practice, communication and collaboration, and professional development (Canadian Kinesiology Alliance, n.d.-a).

Since the NPAG physiotherapist competency profile (2017) is more comprehensive and evidence-based than CKA kinesiologist competency profile (n.d.-a), it was selected to be the basic framework to develop the competency statements for the kinesiology competencies as well. It would also allow for direct comparison to the physiotherapy competencies for role differentiation during the later stages of this study (Fetters et al., 2013).

The NPAG milestones had already been modified to reflect the intervention, patient population and practice setting when creating the draft physiotherapy competencies. The next step was to modify them to reflect the entry-level kinesiologist. I began by taking each physiotherapist draft competency statement and compared it to the CKA competency profile. Statements were either left unchanged, excluded or modified based on the 54 CKA competency statements (Appendix H). For example,

Draft physiotherapist competency statement	Draft kinesiologist competency statement
Monitor client's response to physical activity intervention, reassess client's needs and modify physical activity intervention plan as indicated	Monitor client's response to physical activity intervention, reassess client's needs and modify physical activity intervention plan as indicated
Performs foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity	*Excluded as not in CKA competency profile*
Establishes a physical activity goal in collaboration with client and develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors	Develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors

When it was unclear from the CKA competencies whether kinesiologists held a diabetes specific competency, physiotherapist competencies were left unmodified and included in the kinesiologist competency profile to allow for kinesiologist subject experts to provide input. For example, the CKA competencies below refer to being able to understand the effects or impact of pathology or disease, but it was unclear how this would be applied clinically. Therefore, the following physiotherapist diabetes competency statement was left unchanged and included in the draft kinesiologist competency statements,

Draft physiotherapist competency statement	CKA competency statement
Identifies client-specific precautions, contraindications and risks to physical activity participation from pre-proliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or	3. Able to apply knowledge of exercise physiology to the prevention and treatment of chronic disease and other disorders and to the maintenance and enhancement of human movement and performance

pregnancy related complications in women with gestational diabetes	6. Able to apply knowledge of pathology of musculoskeletal, neurological, cardiopulmonary, neoplastic, and metabolic disorders and conditions
	8. Able to understand how chronic diseases and conditions impact and limit functional capacity
	11. Able to understand the physiological effects of medications on human movement and performance
	28. Able to design customized exercise prescription for individuals with pathology, including but not limited to flexibility; strength, endurance, balance, and cardiorespiratory training; and corrective movement patterning
	29. Able to monitor, reassess, and adjust prescriptions/treatment plans based on patient/client responses

The final step was to return to each individual CKA competency statement and compare it to both the initial 140 NPAG milestones and the kinesiology draft competencies to ensure no competencies were missing. The kinesiologist draft competencies were refined iteratively with regular meetings with CB where decisions could be challenged. The result was 29 kinesiologist diabetes competencies.

Delphi Survey Pilot Testing. Once the physiotherapist and kinesiologist draft competency statements were developed, the Delphi surveys were created using a web-based survey platform in REDCap (Harris et al., 2019). The Delphi surveys were pilot tested for both clarity and functionality. Three physiotherapists (two primary care clinicians and an academic researcher) and one kinesiologist (an academic researcher) completed the survey online and offered feedback via email. Minor changes were made to the participant instructions and the functionality of the online survey based on their feedback.

Delphi Survey Round One

Data Collection. Round one of the Delphi surveys consisted of a demographic section followed by the developed discipline specific competency statements (Appendix K and L). In the first round 14 participants (11 physiotherapists and three kinesiologists) were sent the link to the web-based survey and 12 (nine physiotherapists and three kinesiologists) completed it in full. Kinesiologist participants began the first Delphi round two weeks later than physiotherapists as their recruitment period was extended to maximize recruitment. Surveys were sent via email to participants, and they were asked to complete the survey within two weeks. Reminder emails were sent out one week, two days and one day prior to the deadline.

The demographic section collected information on personal characteristics (geographic location, ancestry, gender), educational background (formal education, certifications related to diabetes, years as a Certified Diabetes Educator), clinical experience (practice setting, patient population, years practicing as a clinician), academic experience (academic title, years working as an academic), and research experience (years working as a researcher, years working in diabetes research).

The competency statement section asked participants to rate their level of agreement with each competency statement using a five-point Likert scale (strongly agree [scored as a 1] to strongly disagree [scored as a 5]). In addition, there was a comments box following every competency statement, where participants could write suggested modifications to the competency statement. At the end of the survey, participants were provided with a final comments section where they were asked to identify any missing competencies or anything else they would like to share.

Data Analysis. Likert scale data from the Delphi survey rounds were analyzed at the ordinal level using descriptive statistics; median level of agreement and range for each competency statement. The acceptable level of agreement for Delphi studies has been widely debated and the acceptable level of agreement in the literature ranges from 51% to 100% agreement (Hasson & Keeney, 2011; Hsu & Sandford, 2007; Keeney et al., 2010). This study followed guidance from other health care competency and referral pathway studies (Denost et al., 2020; Roberts-Davis & Read, 2001) and defined consensus as 70% of participants rating their level of agreement as 'four and five' or 'one and two' on a five-point Likert scale.

Written comments from the Delphi surveys were analyzed using content analysis as described by Elo and Kyngäs (2008). Content analysis is commonly used in Delphi studies (Hasson & Keeney, 2011; Keeney et al., 2010) and is a "systematic and objective means of describing and quantifying phenomena" (Elo & Kyngäs, 2008, p. 108). Content analysis has three stages: preparation, organizing and reporting. The preparation phase consists of selecting the unit of analysis and immersing oneself in the data by reading through it several times to become familiar with it. The unit of analysis at this stage was all the experts' comments related to an individual competency statement and I read through them several times.

The second phase of content analysis is organizing the data into categories (Elo & Kyngäs, 2008). Data within each unit of analysis was grouped together according to similar ideas and concepts. Then the data within each concept was examined for whether it represented the population, intervention and practice setting outlined in the objectives of this study. Regardless of the quantity of ideas, any concepts that did not relate to physical activity, diabetes or primary care were excluded. I considered the remaining concepts and determined if that idea/concept indicated the competency statement needed to be modified or eliminated for round two. These

decisions also took into consideration the frequency of the data. For example, if an idea or concept from a single participant was incongruent with the ideas/concepts provided by several other participants, competency statement rewrites followed the idea/concept which appeared with greater frequency for round two consideration. In the rare case where equal disagreements existed in the data, demographic data of participants was considered such as practice setting or percentage of people living with diabetes in their practice.

The final phase of the content analysis is the reporting of findings (Elo & Kyngäs, 2008), which included the rewritten competencies that did not achieve the pre-defined level of consensus in the round one surveys. Throughout the data analysis process, I maintained an audit trail of coding decisions and had regular meetings with CB where decisions were challenged to enhance rigor of analysis.

Delphi Survey Round Two

Data Collection. Since the pre-determined level of consensus was not achieved with all competency statements for both physiotherapists and kinesiologists, a second Delphi survey round was conducted and included only those statements with remaining disagreement or where changes had been made (14 physiotherapist competencies and nine kinesiologist competencies) (Appendix M and N). The modified competency statements were returned to participants via email for round two. Included in the survey were individuals' previous ratings for each competency statement from round one, along with the median and range of rating scores from all participants. This gave participants the opportunity to reconsider their opinion while remaining anonymous to other participants. Once again, participants were asked to rate their level of agreement using the five-points Likert scale and add any additional feedback such as why they might have changed their opinion or stayed consistent.

Participants had two weeks to complete the survey and reminders were sent out one week, two days and one day prior to the deadline. Additional instructions were included in the second Delphi round explaining how to interpret median and range scores as well as some discipline-specific instructions reminding participants how to rate the competency statements.

Two additional physiotherapists participated in the second Delphi survey round. One had not received the first round due to a clerical error in their email address, and the second had missed the deadline to complete the first round. Both participants had a perspective that was not otherwise represented by other participants. To ensure that these new participants had enough information and context to complete Delphi round two, I provided them with additional information beyond that provided to the other round two participants. They were given a modified version of the instructions from the first round about the purpose of the Delphi rounds and a list of competency statements that had already achieved consensus in the first round (and therefore were not included in the second Delphi survey). These respondents completed the demographic survey and the second Delphi survey and were encouraged to email me directly if they had comments or disagreed with previously agreed upon statements from round one.

Data Analysis. The analysis process used for Delphi round one was repeated for round two. No further survey rounds were pursued for competency statements that did not achieve consensus because the literature suggests that an additional third Delphi round would have been unlikely to show a significant increase in consensus (Hsu & Sandford, 2007) and may have induced sample fatigue (Hasson et al., 2000).

Clinical Tool Development

The findings from Delphi survey round two were used to develop draft versions of the clinical tools outlined in the objectives of this study including:

- a draft physiotherapist competency profile,
- a draft kinesiologist competency profile, and
- a draft referral pathway tool for use in primary care settings.

The purpose of developing these drafts was to be able to share them with participants and discuss them in the focus groups to ascertain face validity of the tools.

Draft Competency Profile Development. These documents were developed for use by all members of interprofessional primary care teams to understand the abilities of entry-level physiotherapists and kinesiologists in the specific clinical context of physical activity interventions for diabetes management in primary care. The competency profiles included the competency statements that resulted from the Delphi survey rounds as well as a preamble containing information that would be helpful for interprofessional team members to understand the competencies. The preamble included a brief description of how the profile was developed and the intended purpose of the documents which is to provide guidance including,

- informing decision making related to the inclusion of exercise specialists on primary care teams for diabetes management,
- enhancing interprofessional collaboration by improving role clarity of exercise specialists, and
- encouraging referrals to exercise specialists for physical activity interventions for diabetes prevention and management.

In the same way the National Physiotherapy Advisory Group (NPAG) and the Canadian Kinesiology Alliance (CKA) competency profiles (Canadian Kinesiology Alliance, n.d.-a; National Physiotherapy Advisory Group, 2017) are organized by domains to improve comprehension, my developed competency profiles were organized in this way as well. The

NPAG domains have definitions that describe their seven domains to the reader. As described in the *Data Collection and Analysis* section of this thesis, only four of those domains were relevant to the clinical context of this study, physical activity interventions for diabetes in primary care. With permission from NPAG, their domain definitions were modified to reflect the context specific physiotherapist competencies that were developed during the Delphi rounds. Since some skills and abilities from NPAG domains communication, management and leadership were incorporated into the four domains used in this study, the definitions were merged where appropriate. The original domains and modifications are shown in Table 2.

Table 3

Physiotherapy Domain Definition Development

NPAG domain definition	Proposed physiotherapy domain definition
Domain 1: Physiotherapy Expertise As experts in mobility and function, physiotherapists use clinical reasoning that integrates unique knowledge, skills and attitudes to provide quality care and enhance the health and wellbeing of their clients.	Domain 1: Physiotherapy Expertise
	Ensures physical and emotional safety of client As experts in exercise, mobility and function, physiotherapists ensure the physical and emotional safety of clients while participating in physical activity by using clinical reasoning that integrates unique knowledge and skills to enhance the health and wellbeing of their clients
	Conducts client assessment As experts in exercise, mobility and function, physiotherapists conduct comprehensive subjective and objective assessments that identify barriers and facilitators to physical activity interventions for diabetes management
	Develops, implements, monitors and evaluates an intervention plan As experts in exercise, mobility and function, physiotherapists integrate unique knowledge, skills and attitudes to provide client centered physical activity interventions
Domain 2 Communication	Domain 2: Collaboration

As communicators, physiotherapists use effective strategies to exchange information and to enhance therapeutic and professional relationships Domain 3: Collaboration As collaborators, physiotherapists work effectively with others to provide inter- and intraprofessional care Domain 4: Management As managers, physiotherapists manage self, time, resources and priorities to ensure safe, effective and sustainable services	As collaborators, physiotherapists use effective communication strategies to exchange information, enhance therapeutic and professional relationships, and work effectively with others to provide inter- and intraprofessional care that is effective and sustainable
Domain 6: Scholarship As scholars, physiotherapists demonstrate a commitment to excellence in practice through continuous learning, the education of others, the evaluation of evidence, and contributions to scholarship	Domain 3: Scholarship As scholars, physiotherapists demonstrate a commitment to excellence in practice through continuous learning, the education of others, and the evaluation of evidence
Domain 5: Leadership As leaders, physiotherapists envision and advocate for a health system that enhances the wellbeing of society Domain 6: Professionalism As autonomous, self-regulated professionals, physiotherapists are committed to working in the best interest of clients and society, and to maintaining high standards of behaviour.	Domain 4: Professionalism As autonomous, self-regulated professionals, physiotherapists are committed to maintaining high standards of behavior and working in the best interest of clients and society including, envisioning and advocating for a health system that enhances the wellbeing of society

For the kinesiologist competency profile, domain definitions were modified from the *Essential Competencies of Practice for Kinesiologists in Ontario* (College of Kinesiologists of Ontario, 2014) with their permission, and I worked to maintain consistency with the physiotherapy domain definitions as appropriate. The CKA competency statements (Canadian Kinesiology Alliance, n.d.-a) do not have definitions for the domains, but their profile was based on that of the College of Kinesiologists of Ontario (COKO) (College of Kinesiologists of

Ontario, 2014) which do have definitions for competency domains (referred to as units). *The Essential Competencies of Practice for Kinesiologists in Ontario* from COKO (2014) was developed and validated using a process including literature review, environmental scan, stakeholder consultations and focus groups. It is comprised of 45 competencies within five units. The original COKO unit definitions and modifications are shown in Table 3.

Table 4

Kinesiology Domain Definition Development

College of Kinesiologists of Ontario unit definition	Proposed kinesiology domain definition
Unit 1: Foundational Knowledge Uses foundational knowledge of human movement, performance, and function to enhance and promote human health and recovery from illness and injury Unit 2: Professional Practice Applies and integrates knowledge, skills and judgment to provide competent services through the continuum of care.	Domain 1: Kinesiology Expertise
	Ensures physical and emotional safety of client
	Kinesiologists integrate knowledge, skills and judgment to ensure the physical and emotional safety of client's while participating in physical activity for diabetes management
	Conducts client assessment
	Kinesiologists integrate knowledge, skills and judgement to conduct assessments that identify barriers and facilitators to physical activity interventions for diabetes management
	Develops, implements, monitors and evaluates an interventions plan
	Kinesiologists apply and integrate knowledge, skills and judgement to provide competent physical activity interventions for diabetes management through the continuum of care
Unit 4: Communication, Collaboration and Advocacy Uses effective communication and collaboration with others to achieve common goals and enhance relationships in the provision of kinesiology services	Domain 2: Collaboration
	Kinesiologists use effective communication and collaboration with others to achieve common goals and enhance relationships in the provision of kinesiology services
Unit 5: Professional Development Engages in self-reflection, continuing education and development for ongoing competence	Domain 3: Scholarship
	Kinesiologists engage in self-reflection, continuing education and development for ongoing competence

Unit 3: Professionalism and Ethics	Domain 4: Professionalism
Assumes professional responsibility to provide safe, ethical and effective kinesiology services	Kinesiologists assume professional responsibility to provide safe, ethical and effective kinesiology services

Draft Referral Pathway Development. The findings from the Delphi survey rounds were used to develop a draft referral pathway tool which is a type of clinical pathway. While clinical practice guidelines provide general recommendations for best practice, clinical pathways aim to operationalize them in a meaningful way for clinicians (Rotter et al., 2019). While there is no standardized approach to referral pathway development, Rotter et al. (2019) suggests a clinical pathway should be a based on the best available evidence and outline a pathway for care based on criteria to address a particular clinical problem for a specific population. I took this approach to developing the draft referral pathway and will next describe the steps I took to incorporate the findings related to the skills and abilities of physiotherapists and kinesiologists with the clinical practice guideline recommendations for physical activity for people living with diabetes.

I began by comparing the findings from the Delphi survey rounds. When comparing the physiotherapist and kinesiologist competencies side by side, it became apparent that the idea of complexity of care and risk associated with engaging in physical activity were important concepts to be included in the referral pathway tool. To determine how best to integrate these concepts into the pathway, I looked at previous work done by Stout et al. (2019) who created an exercise referral clinical pathway for oncology and used five domains to inform appropriate exercise referrals for people living with cancer; cardiometabolic status, oncologic factors, age and comorbidity, behavioural characteristics and environmental elements (Stout et al., 2020). Using this concept, I developed four health dimensions to describe the factors influencing the risk and complexity of physical activity interventions for diabetes care: diabetes complications,

medical considerations, mobility, and personal/environmental factors. These health dimensions were included in the draft referral pathway to ensure primary care clinicians are considering the complexity or risk associated with physical activity when deciding if a referral is needed for physical activity intervention and if so, which exercise specialist would best meet the identified care needs.

The next step in the methods was member-checking the draft competency profiles and establishing face validity of the draft referral pathway tool.

Focus Groups

The purpose of the focus groups was to clarify and increase confidence in the Delphi survey results thereby increasing the trustworthiness of this study and the developed clinical tools.

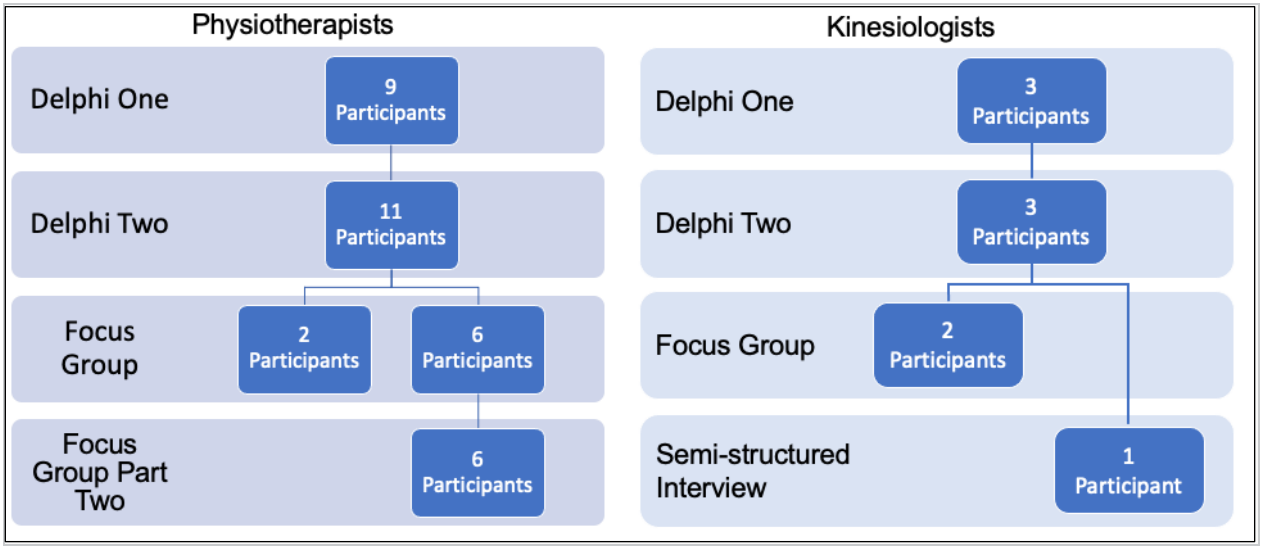
Data Collection. Following the development of the draft competency profiles and draft referral pathway tool, separate focus groups (physiotherapists and kinesiologists) were used to obtain feedback on, (a) how well the competency statements developed through the Delphi rounds represent the competencies of entry-level exercise specialists related to physical activity intervention for diabetes in primary care (member-checking) and (b) how well the referral pathway tool represents those competencies (face validity). Focus groups were chosen to allow for the free flow of information and ideas from the expert panel (Keeney et al., 2010; Roberts-Davis & Read, 2001).

Six physiotherapists attended one focus group and two others attended one later that same day. The larger focus group did not get through the full discussion guide. All participants from that group willingly agreed to attend a second 60-minute session two weeks later, to finish the discussion and all attended. All kinesiologists were not available at the same time therefore, two

kinesiologists participated in a 90-minute focus group while one other engaged in a 60-minute semi-structured interview with the primary investigator (Figure 2).

Figure 2

Participants per Stage



Participants were sent a copy of their discipline specific draft competency profile as well as the draft referral pathway tool one week prior to the focus groups for their review. The focus groups and interview followed a semi-structured discussion guide that was developed and revised in collaboration with CB (Appendix O). PowerPoint slides were used to walk participants through all the competency statements one by one and questions related to the accuracy of the competencies and the referral pathway tool as well as their usefulness in practice.

The primary investigator facilitated the focus groups and the interview and CB assisted with technical support and facilitation during the focus groups. Discussion questions began with open-ended general questions before becoming more specific. This format was intended to

encourage participants to freely express their opinions without feeling directed by the moderator to provide a 'correct' answer (Vaughn et al., 2013).

Focus groups took place over video conferencing as the investigator and some of the participants lived in different provinces. Audio-video recordings were collected and transcribed using Microsoft Teams and were verified for accuracy by the primary investigator. Field notes were used to record the investigators' impressions and record non-verbal communication.

Data Analysis. Focus group transcripts were analyzed using content analysis as described above in the Delphi rounds data analysis description (Elo & Kyngäs, 2008). The unit of analysis at this stage was physiotherapists or kinesiologists' focus group or interview transcripts and I read the transcripts in full to get a general appreciation of the data. NVivo, a qualitative data analysis software was used to organize and categorize the data (QSR International Pty Ltd., 2018).

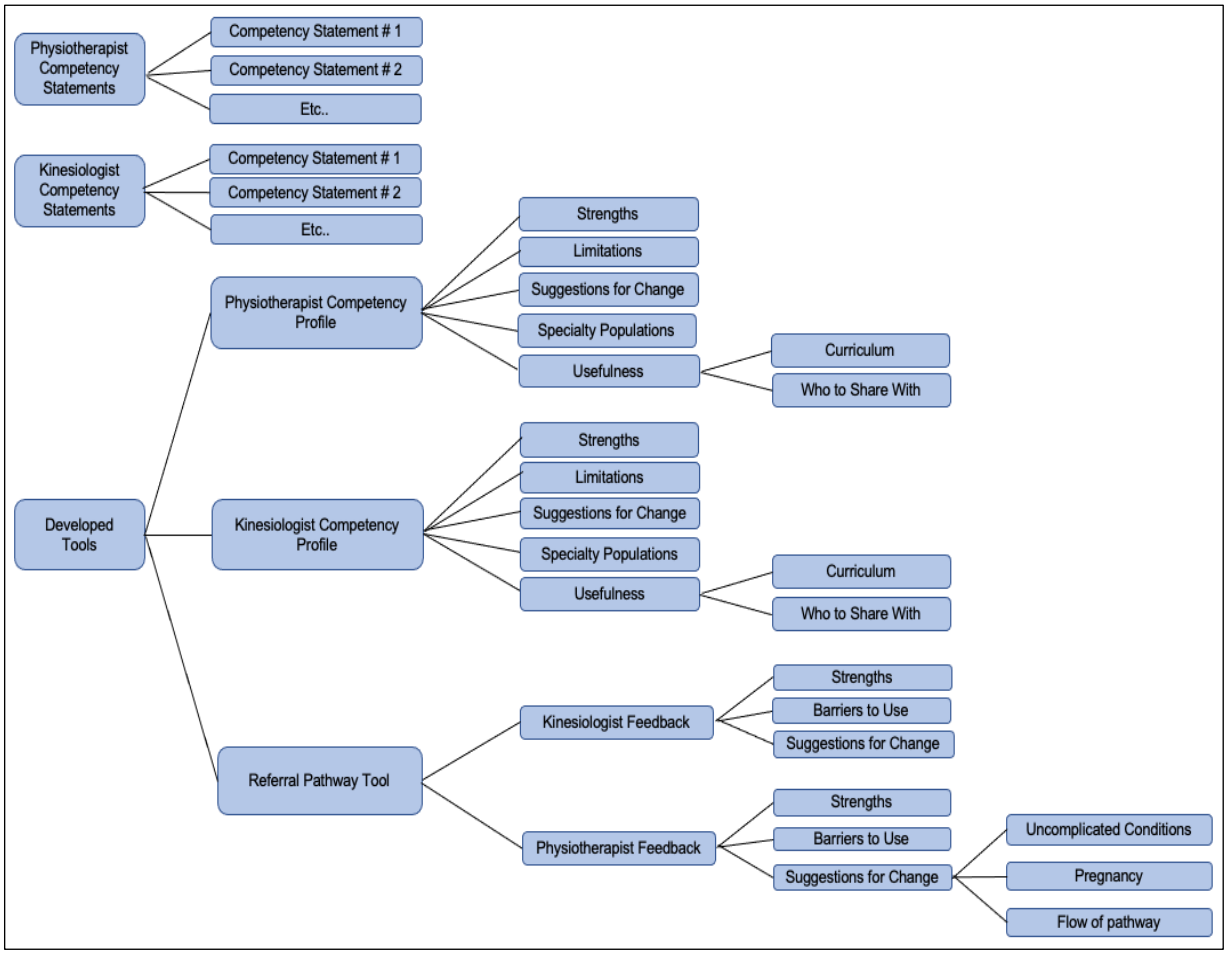
The second phase of organizing the data was done using a coding technique. Coding is a process of attaching words or short phrases to sections of the data. There were two purposes to the coding. The first was member-checking to ensure the competencies that participants had agreed upon accurately represented their opinions and the second was to determine the face validity of the referral pathway tool.

Since the analysis had two purposes, I started by organizing the data into broad categories using an initial framework that supported the two goals of analysis. Initial categories divided the data into those relevant to the revision of individual competency statements and those that provided information about the strengths, limitations and usefulness of the developed tools (draft competency profiles and referral pathway). Next, I looked within these categories and inductively coded the data to understand the detailed content within it. An iterative process of

grouping related codes into broader categories was carried out until no more 'collapsing' seemed reasonable. Coding meetings between myself and CB were held regularly during this phase, to allow for discussions about coding decisions and to negotiate any disagreements in the interpretation of data. A detailed audit trail of coding decisions was maintained to enhance rigor of analysis. The initial broad categories used and the coding structure that was developed was iteratively revisited and revised as required to accurately represent the data (Figure 3). Ultimately these findings were used to inform some modifications to the draft competency profiles and the draft referral pathway tool and to identify their strengths, limitations and usefulness.

Figure 3

Coding Tree of Focus Groups and Interview Data Analysis



Trustworthiness

Despite its wide use, the reliability and validity of the Delphi technique has not been established in the literature (Hasson et al., 2000; Hsu & Sandford, 2007; Keeney et al., 2010). Variability in how Delphi studies are conducted has led to methodological concerns (Hasson et al., 2000; Keeney et al., 2010) and with the absence of widely accepted guidelines, I have been thoughtful and rigorous in the implementation of the Delphi technique as recommended by Hasson et al. (2000). Because the Delphi technique incorporates a qualitative component and we used focus groups to validate the findings, we will use the concept of trustworthiness from qualitative paradigms in this study to describe the steps taken to ensure validity and reliability.

To enhance trustworthiness, I took steps to ensure the credibility, dependability, confirmability, and transferability of the findings. Credibility was enhanced by data triangulation from qualitative and quantitative data collected in the two Delphi rounds. The development of competency statements was based on iterative rounds with participants. The focus group phase served as member-checking, ensuring that findings accurately reflected the opinions of the expert panel. Dependability was addressed by ensuring the expert panel of participants were a diverse group of experts in diabetes management and primary care. By including researchers, academics, and clinicians from western, central and eastern provinces who work in both urban and remote northern Indigenous communities, we captured a representative sample of experts in diabetes care in primary care settings. Confirmability was addressed by keeping a detailed audit trail throughout the project. Transferability was enhanced through demographic description of the participants who contributed to the pathway development that will allow the reader and user of the clinical tools to consider the competency profiles and referral pathway in their own context.

Findings

Response Rate

The first Delphi survey was completed by nine of 11 physiotherapists (81.8% response rate) and three of three kinesiologists (100% response rate). The second Delphi survey was completed by 11 of 11 physiotherapists and three of three kinesiologists with a 100% response rate.

Demographics

Participant demographic characteristics are displayed in Table 4. Most physiotherapist participants were working as clinicians (91%) in either primary care settings (73%), general hospitals (18%), or amputee clinics (18%) with most having 10 or more years of clinical experience (90%) and over half with more than 20 years' experience (54%). Clinical experience ranged from large urban settings to remote northern Indigenous communities. While most participants' highest level of education was a bachelor's degree (64%), some had research-based master's degrees or doctorates (PhD) (18% each). There was also representation from participants working as researchers (9%) and academics (18%), with at least two participants who are educators in Master of Physical Therapy programs. The highest proportion of participants were from Manitoba (82%) with the remainder from Nova Scotia (9%) and Alberta (9%). One physiotherapist participant described their ancestry as South Asian, one Canadian Métis, and one Philippines ancestry. Two participants chose not to answer, and the rest used terms like White or European descent to describe their ancestry.

Similar to physiotherapist participants, most kinesiologists' highest level of education was a bachelor's degree (67%), with one holding a doctorate (PhD). Two participants were clinicians (one a certified diabetes educator) while the other worked as an academic and

researcher with more than 10 years' experience in diabetes research and experience as an educator in a kinesiology program. Clinicians worked in primary care or diabetes education programs and the provinces of Ontario, Nova Scotia and Alberta were represented. All kinesiologist participants described their ancestry as White.

Table 5

Demographic Information of Participants

Characteristics	Physiotherapists n=11 n (%)	Kinesiologists n=3 n (%)
Highest degree obtained		
Bachelor	7 (64)	2 (67)
Doctorate (PhD)	2 (18)	1 (33)
Research-based master	2 (18)	
Other certifications[a]		
Registered yoga teacher	1 (9)	
Wound care courses	1 (9)	
Total contact casting for Charcot foot	1 (9)	
Certified Diabetes Educator (CDE)		1 (33)
Clinical Exercise Physiologist (CEP)		1 (33)
Current work[a]		
Clinicians	10 (91)	2 (67)
Academics	2 (18)	1 (33)
Researchers	1 (9)	1 (33)
Clinical practice setting[a]		
Primary care	8 (73)	1 (33)
Amputee clinic	2 (18)	
General hospital	2 (18)	
Hospital outpatient physiotherapy	1 (9)	
Orthopedic clinic	1 (9)	
Consulting outreach program	1 (9)	
Diabetes education program		1 (33)
Experience as a clinician		
5-10 years	1 (9)	2 (67)
10-20 years	4 (36)	1 (33)
>20 years	6 (54)	
Experience as an academic		
<1 year	1 (9)	

10-20 years	2 (18)	
>20 years		1 (33)
Experience as a researcher		
<1 year	1 (9)	
1-3 years	1 (9)	
3-5 years	1 (9)	1 (33)
5-10 years	1 (9)	
10-20 years	1 (9)	
>20 years		1 (33)
Experience in diabetes research		
<1 year	1 (9)	
1-3 years	1 (9)	
10-20 years	1 (9)	1 (33)
Gender[b]		
Female	7 (64)	2 (67)
Male	2 (18)	1 (33)
Did not answer	2 (18)	
Province/Territory		
Manitoba	9 (82)	
Nova Scotia	1 (9)	1 (33)
Alberta	1 (9)	1 (33)
Ontario		1 (33)

[a] Participants could choose all that applies

[b] Gender data was collected using an open text box

Competency Statement Agreement Findings

Competency statements were evaluated by participants and refined based on their feedback throughout the two Delphi rounds and the focus groups. Table 5 for physiotherapists and Table 6 for kinesiologists show the level of agreement, median and range of responses for each competency statement and their evolution throughout this study.

Table 6

Evolution of Physiotherapist Competencies

Delphi round one (n=9)		Delphi round two (n=11)		Post focus group (n=9)
Competency statement	Agreement % Range (Mdn)	Competency statement	Agreement % Range (Mdn)	Final competency Statement
Physiotherapy expertise: Ensures physical and emotional safety of client				
Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia	88.8 3 (1)			
Identifies client-specific precautions, contraindications and risks to physical activity participation from pre-proliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes	77.7 3 (2)	Identifies client-specific precautions, contraindications and risks to physical activity participation from sensory, motor or autonomic neuropathies, retinopathy, nephropathy, active or previous history of foot ulcer, or pregnancy related complications in women with gestational diabetes	81.8 2 (2)	Identifies client-specific precautions, contraindications and risks to physical activity participation from cardiovascular complications, sensory, motor or autonomic neuropathies, falls risk, retinopathy, nephropathy, active or previous history of foot ulcer, or pregnancy related complications in women with gestational diabetes
Identifies client-specific precautions, contraindications and risks to physical activity	100 1 (1)			

participation from non-diabetes related comorbidities in people living with diabetes				
Monitors relevant parameters including blood pressure, oximetry, heart rate, and respiratory rate during assessment and physical activity intervention that enhances the client's safety and comfort	100 1 (1)			
Identifies need for and makes recommendations for ambulatory, assistive, adaptive, and protective devices to support client's safety and comfort when participating in physical activity	100 1 (1)			Identifies need for and makes recommendations for ambulatory, assistive, adaptive, and protective devices (including footwear) to support client's safety and comfort when participating in physical activity
Performs foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity	66.6 2 (2)	Identifies need for and is able to perform a foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity for diabetes management	100 1 (1)	Identifies need for and is able to perform a foot assessment including peripheral circulation, sensory testing, skin integrity and biomechanics of the foot and lower extremity to ensure client's safety and comfort when participating in physical activity for diabetes management
Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action	88.8 2 (1)			

Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider	77.7 3 (1)	Identifies and responds appropriately to non-glycemic related adverse responses to physical activity interventions for diabetes management	100 1 (1)	
Physiotherapy expertise: Conducts client assessment				
Interviews clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management	77.7 3 (1)	Interviews clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management	72.7 2 (1)	Interviews clients to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management
Interviews clients to determine their knowledge of diabetes, current self-management skills, and stage of behavior change and adjusts assessment and treatment plan accordingly	66.6 2 (2)	Interviews clients to determine their personal health literacy, current self-management skills and stage of behavior change, as it relates to physical activity, and adjusts assessment, treatment plan and self-management education and support accordingly	100 1 (2)	Interviews clients to determine their personal health literacy, current self-management skills and current state of readiness, as it relates to physical activity, and adjusts assessment, treatment plan and self-management education and support accordingly
Obtains information about client's status from lab work, diagnostic imaging, electrocardiogram or pulmonary function test results relevant to physical activity for diabetes management	88.8 2 (2)			

Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications	77.7 2 (2)	Identifies risk factors such as low physical activity levels, comorbidities, smoking, nutrition, and alcohol/drug use that place pre-diabetes and diabetes populations at high risk for developing diabetes or developing diabetes related complications, respectively	100 1 (1)	Identifies risk factors such as sedentary behavior, low physical activity levels, comorbidities, smoking, nutrition, and alcohol/drug use that place pre-diabetes and diabetes populations at high risk for developing diabetes or developing diabetes related complications, respectively
As a primary care practitioner, identifies yellow, orange or red flags and makes appropriate referrals to other team members and/or makes appropriate changes to assessment and treatment plans for physical activity interventions for diabetes care	100 1 (1)			
Identifies wounds that may benefit from referral to other services, and advises clients accordingly	88.8 2 (1)	Identifies wounds or Charcot foot that may benefit from referral to other services, and advises client's accordingly	90.9 2 (2)	Identifies acute and chronic changes such as inflammation, wounds or deformities that may indicate inappropriate fitting footwear or assistive, adaptive and protective devices and may benefit from referral to other services, and advises clients accordingly
Identifies inappropriately fitting prothesis that may benefit from referral to other services, and advises clients accordingly	100 1 (1)			*Statement dropped*
Selects and performs appropriate tests and measures to identify current fitness level and potential	88.8 2 (2)			Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to

barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain				physical activity for diabetes management related to impaired skin integrity, chronic pain, or vascular, respiratory, neurological, or musculoskeletal impairments Identifies cognitive, mental health, social or financial barriers to physical activity for diabetes management that may benefit from referral to other services.
Interprets assessment findings and develops a physiotherapy diagnosis and working prognosis in order to design appropriate physical activity intervention for diabetes management	77.7 2 (1)	Interprets assessment findings and develops a physiotherapy diagnosis and working prognosis in order to design appropriate physical activity intervention for diabetes management	90.9 2 (1)	
Physiotherapy expertise: Develops, implements, monitors and evaluates an intervention				
Establishes a physical activity goal for diabetes management in collaboration with client and develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors	88.8 2 (1)			Establishes a physical activity goal for diabetes management in collaboration with client and develops an intervention plan appropriate to the client's goals, current state of readiness, current health status and that is in alignment with the client's resources and abilities
Educates clients living with type 1, type 2 and gestational diabetes about the benefits and risks of various physical activities with	88.8 2 (1)			Educates clients about the benefits and risks of various physical activities with consideration for individual's existing comorbidities

consideration for individual's existing comorbidities				
Implements and monitors customized physical activity intervention including aerobic, aquatic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life	88.8 2 (1)			Implements and monitors customized physical activity intervention including aerobic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life
Assists clients to develop self-management skills in physical activity, foot care and nutrition counselling to support physical activity for diabetes management	100 1 (2)			Provides self-management education and support to clients, families and communities to support physical activity for diabetes management including footwear and nutrition
Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia	77.7 3 (2)	Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia including, treating acute hypoglycemia and collaboration with other primary care team members for insulin adjustments as appropriate	90.9 3 (2)	Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or antihyperglycemic medications with a risk of hypoglycemia including, treating acute hypoglycemia and collaboration with other primary care team members for insulin adjustments as appropriate
Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including oxygen titration,	77.7 2 (2)	Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic	90.9 2 (2)	Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions which could include oxygen titration,

breathing strategies, energy conservation, pelvic floor exercises, wound care, sensory training/retraining, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills		interventions which could include oxygen titration, breathing strategies, energy conservation, pelvic floor exercises, wound care, sensory training/retraining, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills	breathing strategies, energy conservation, pelvic floor exercises, sensory training/retraining, falls prevention, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills
Monitors skin, wounds, blisters and scars during physical activity for diabetes management and responds appropriately with basic wound hygiene and self-management education	100 1 (1)		Monitors skin, wounds, blisters and scars during physical activity for diabetes management and responds appropriately with basic wound hygiene, self-management education and support, and if needed, referral to other services
Monitors client's response to physical activity intervention for diabetes management, reassesses client's needs and modifies physical activity intervention plan as indicated	100 1 (1)		Monitors client's physical, cardiovascular, respiratory, neurological and metabolic response to physical activity intervention for diabetes management, reassesses client's needs and modifies physical activity intervention plan as indicated
Identifies opportunities for group physical activity programming for diabetes management	88.8 4 (1)		Identifies opportunities for group physical activity programming for diabetes management and plans, delivers and evaluates physical activity programs when appropriate, given available resources.

Plans, delivers and evaluates group physical activity programming for diabetes management	77.7 4 (1)	Plans, delivers and evaluates group physical activity programming for diabetes management when appropriate, given available resources	81.8 4 (1)	*Statement dropped*
		Collaboration		
Employs a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, with the client as a key member of the diabetes management care team	100 1 (1)			Employs a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, with the client, their family and/or community as key members of the diabetes management care team
Facilitates collaborative relationships with interprofessional diabetes care team	100 1 (1)			
Provides services that balance waitlists, client needs and available resources including delegating care to and supervising personnel involved in physiotherapy service delivery for diabetes care	100 1 (2)			
Identifies the learning needs related to physical activity and diabetes management of other healthcare providers and contributes to and assesses the effectiveness of learning activities	88.8 4 (2)			
		Scholarship		

Able to access and critically appraise emerging information relevant to physical activity and diabetes management and determine potential for applicability in primary care settings	66.6 2 (2)	Able to access and critically appraise emerging information about physical activity and diabetes and determine potential for applicability in primary care settings	90.9 2 (2)	
Uses a structured evidence-informed approach incorporating best available evidence, client context and personal knowledge and experience into clinical decision making for diabetes care	88.8 2 (1)			
		Professionalism		
Advocates for the value of physiotherapy services to overcome barriers and facilitate improved physical activity interventions in diabetes care in primary care settings	88.8 2 (1)			
Has been granted a "physiotherapist" designation by their provincial regulatory body which, through delegated authority from the provincial government, ensures ethical, competency and professional standards of practice are maintained using mechanisms including a public registry of individual physiotherapists and a robust complaint, investigative	77.7 2 (1)	*This competency statement has been removed from list as it was not deemed to be specific to physical activity interventions for diabetes management in primary care. It will be included as part of background information to accompany referral pathway tool as a differentiating factor between physiotherapists	90.9 2 (2)	*Statement dropped*

and disciplinary program with input from members of the public		and kinesiologists. Please rate your level of agreement with this decision.		
Recognizes and addresses real, potential or perceived conflicts of interest with pharmaceutical companies and fitness facilities/vendors	77.7 3 (2)	Recognizes and addresses real, potential or perceived conflicts of interest with pharmaceutical companies and/or fitness facilities/vendors when providing physical activity interventions, education or recommendations to clients	90.9 2 (2)	
Demonstrates awareness of the social determinants of health in diabetes management and advocates for physical activity opportunities and support that are sustainable, socially, and culturally appropriate and geographically accessible to clients year-round	100 1 (1)			
Recognizes, explores and acknowledges the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples	100 1 (1)			Recognizes that the cause of current high rates of diabetes amongst Indigenous peoples is complex and is strongly associated with the legacy of colonization and provides care that is congruent with Indigenous social and cultural contexts
Incorporates a purposeful process of learning and continuous self-reflection recognizing one’s own concepts of health, diabetes care and assumptions about Indigenous	100 1 (1)			Incorporates a purposeful process of self-reflection and learning into one's clinical practice to promote cultural safety by, recognizing one’s own assumptions and respecting an

peoples and respecting an Indigenous person's preferences and barriers to re-connecting and integrating cultural resources and traditional approaches to care		Indigenous person's concept of health and their preferences or barriers to engaging in clinical interactions or traditional healing resources
Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management as required by licensing body	88.8 3 (1)	Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management as required by regulatory licensing body

Table 7

Evolution of Kinesiologist Competencies

Delphi round one (n=3)		Delphi round two (n=3)		Post focus group and interview (n=3)
Competency statement	Agreement (%) Range (Mdn)	Competency statement	Agreement (%) Range (Mdn)	Final competency statement
Kinesiology expertise: Ensures physical and emotional safety of client				
Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia	100 1 (1)			Supports clients to participate in physical activity considering client-specific precautions, contraindications or risks related to acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia[†]
Identifies client-specific precautions, contraindications and risks to physical activity participation from pre-proliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes	66.6 2 (2)	Identifies client-specific precautions, contraindications and risks to physical activity participation from pre-proliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes	- 33.3 1 (3)	*Statement dropped*

Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes	100 0 (1)			Supports clients to participate in physical activity considering client-specific precautions, contraindications or risks related to comorbidities
Monitors relevant parameters including blood pressure, oximetry, heart rate, respiratory rate during assessment and physical activity interventions that enhances the client's safety and comfort	100 1 (2)			
Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action	66.6 2 (2)	Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action	33.3 1 (3)	Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action[†]
Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider	100 1 (2)			
	Kinesiology expertise: Conducts client assessment			
Interview clients living with type 1, type 2 or gestational diabetes to obtain relevant information	100 1 (1)			Interviews clients living with diabetes to obtain relevant information about diabetes, other health conditions, and

about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management				personal and environmental factors relevant to physical activity for diabetes management
Interviews client to determine their knowledge of diabetes, current self-management skills, and stage of behavior change and adjusts assessment and treatment plan accordingly	100 1 (2)			Interviews clients to determine their knowledge of diabetes, current self-management skills, and current state of readiness and adjusts assessment and treatment plan accordingly
Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications.	100 0 (1)			
Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health	66.6 4 (2)	Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or	-66.6 1 (4)	Selects and performs appropriate tests and measures to identify current fitness levels and potential barriers to physical activity for diabetes management and makes appropriate referrals when clinically indicated

disorders, musculoskeletal injury or chronic pain		neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain	
Able to understand, evaluate, and interpret assessment findings and referral documentation to form a clinical impression	100 1 (1)		
Kinesiology expertise: Develops, implements, monitors and evaluates an intervention			
Develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors	100 0 (1)		Develops an intervention plan appropriate to the client's goals, current state of readiness, current health status and personal and environmental factors
Educates clients living with type 1, type 2 and gestational diabetes about the benefits of various physical activities	100 0 (1)		Educates clients living with pre-diabetes and diabetes about the benefits of various physical activities
Implements and monitors customized physical activity intervention including aerobic, aquatic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life	100 1 (1)		Implements and monitors customized physical activity intervention including aerobic, strength, flexibility, and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life‡
Assist clients to develop self-management skills in physical activity and nutrition counselling	100 1 (2)		

to support physical activity for diabetes management				
Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia	66.6 2 (2)	Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or anti-hyperglycemic medications with a risk of hypoglycemia	66.6 1 (2)	Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or anti-hyperglycemic medications with a risk of hypoglycemia†
Support clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including ice, heat, exercise taping, transcutaneous electrical nerve stimulation, and ultrasound	33.3 3 (3)	Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including ice, heat, exercise, and taping	0 0 (3)	Supports clients with comorbidities to perform physical activity for diabetes management through appropriate modifications of a therapeutic exercise program
Monitor client's response to physical activity intervention for diabetes management, reassess client's needs and modifies physical activity intervention plan as indicated	100 1 (2)			Monitors client's response to physical activity intervention for diabetes management, reassesses client's needs and modifies physical activity intervention plan as indicated‡
Identify opportunities for group physical activity programming for diabetes management	100 1 (1)			Identifies opportunities for group physical activity programming for diabetes management and plans, delivers and evaluates programs
Plan, deliver and evaluate group physical activity programming for diabetes management	100 1 (2)			*Statement dropped*
Collaboration				

Act in a manner that respects client's diversity, autonomy and is in the best interest of the client when delivering physical activity interventions for diabetes management	100 1 (2)			
Facilitate collaborative relationships with interprofessional diabetes care team	66.6 2 (1)	Fosters collaborative relationships with interprofessional diabetes care team	66.6 4 (2)	Fosters collaborative relationships with interprofessional diabetes care team
		Scholarship		
Able to use best practice guidelines including the interpretation and application of current evidence-based knowledge into clinical decision making for physical activity intervention in diabetes care	100 1 (1)			
		Professionalism		
Able to facilitate client access to kinesiology services and resources to physical activity interventions in diabetes care in primary care	100 1 (1)			
Complies with the code of ethics established by their professional body and is committed to continuing competency	66.6 2 (1)	Complies with the code of ethics established by their professional body and is committed to continuing competency	100 1 (2)	
Recognizes and addresses conflicts of interest with pharmaceutical companies and fitness facilities/vendors	66.6 2 (1)	Recognizes and addresses conflicts of interest with pharmaceutical	33.3 2 (3)	Recognizes and addresses conflicts of interest with pharmaceutical companies and fitness facilities/vendors

		companies and fitness facilities/vendors		
Demonstrates awareness of social determinants of health in diabetes management	100 1 (1)			Demonstrates awareness of the social determinants of health and understands its influence on diabetes management
Recognize, explore and acknowledge the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples	33.3 2 (3)	Recognizes, explores and acknowledges the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples	33.3 1 (3)	Recognizes that the cause of current high rates of diabetes amongst Indigenous peoples is complex and is strongly associated with the legacy of colonization and provides care that is congruent with Indigenous social and cultural contexts
Understands and works within own professional knowledge, competence and skill set	100 1 (1)			Understands and works within own professional knowledge, competence, and skill set in diabetes management

Note. Negative (-) agreement indicates that the level of agreement was in the direction of disagreement [4 (disagrees) or 5 (strongly disagrees)].

Delphi Round One Findings

In the first Delphi round, there was a significant level of agreement for 37 of the 40 physiotherapist competency statements. Since only three statements had less than 70% agreement (the pre-defined percentage for consensus), I increased the definition of consensus to 80% agreement to increase confidence in the Delphi survey results. Other studies such as Roberts-Davis & Read (2001) have done the same when the level of agreement was higher than anticipated. The decision to change agreement to >80% resulted in an increase from three physiotherapist competency statements not achieving consensus to 13. The change from >70% agreement to >80% agreement had no effect on the number of kinesiology competency statements with consensus as three kinesiologist participants meant that, if even one participant was not in agreement with the rest, consensus could not be achieved (66% agreement). Twenty of the 29 proposed kinesiology competency statements achieved consensus.

Participant comments about competency statements primarily related to suggestions for change to improve reading clarity of the statements or adding or removing specific skills from the statements. To address the feedback from the first Delphi survey, I modified the wording in 14 competency statements (11 physiotherapist and three kinesiologist), one physiotherapist statement was removed as participants thought it was not specific to the intervention, population and practice setting of interest and an additional physiotherapy competency statement that had achieved consensus was modified slightly to address feedback from a related competency statement. The remaining eight competency statements (two physiotherapist and six kinesiologist) that did not achieve consensus were left unchanged as there were either no comments as to why participants disagreed with the statement or comments were incongruent with their Likert scale rating.

Delphi Round Two Findings

In Delphi survey round two, all physiotherapist competency statements achieved consensus except for one, which was unable to be modified as participants did not provide any written comments about why they did not agree. One of the nine kinesiology competency statements in this round achieved consensus. One competency statement was removed, even though only 33% disagreed with it, as both investigators felt that qualitative data findings indicated that all participants did not feel this was a competency held by entry-level kinesiologists. Two competencies were modified based on qualitative feedback and the rest were left unmodified as qualitative data was either unclear or incongruent with participants' level of agreement ratings.

Focus Group Findings

Focus group feedback from physiotherapist participants resulted in refinement of 23 physiotherapy competency statements. Changes were made based on discussion that identified specific enactment of skills that were missing from the competency profile, clarified wording to more accurately reflect the skills and abilities of entry-level physiotherapists and identified minor errors like redundancies. One competency statement was split into two different statements as participants felt it reflected two different ideas and in two instances, two competency statements with similar concepts were combined. The final result was the following physiotherapist competency profile with 38 competency statements (Figure 4).

Figure 4

Physiotherapist Competency Profile

Physical Activity for Diabetes Management in Primary Care
Competency Profile for Entry-Level Physiotherapists

The following competency profile describes the abilities of entry-level physiotherapists related to the specific clinical context of physical activity interventions for diabetes management in primary care settings.

Physiotherapists are regulated by licensing bodies who ensure ethical, competency and professional standards of practice are maintained using mechanisms including:

- public registry of individual physiotherapists
- a robust complaint, investigative and disciplinary program with input from members of the public

The entry-level physiotherapist has completed their education, is licensed by a provincial regulatory body to practice in Canada as a clinician and is at the starting point of continuing professional development.

The competency statements in this document are intended to provide guidance in several ways to all members of interprofessional primary care teams, including:

- informing decision making related to the inclusion of physiotherapists on primary care teams for diabetes management,
- enhancing interprofessional collaboration by improving role clarity of physiotherapists, and
- encouraging referrals to physiotherapists for physical activity intervention for diabetes prevention and management.

Competency Profile

This competency profile relates to physical activity interventions for individuals living with pre-diabetes, type 1 diabetes, type 2 diabetes and gestational diabetes.

Domain 1: PHYSIOTHERAPY EXPERTISE

Ensures physical and emotional safety of client

As experts in exercise, mobility and function, physiotherapists ensure the physical and emotional safety of clients while participating in physical activity by using clinical reasoning that integrates unique knowledge and skills to enhance the health and wellbeing of their clients.

1. Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia
2. Identifies client-specific precautions, contraindications and risks to physical activity participation from cardiovascular complications, sensory, motor or autonomic neuropathies, falls risk, retinopathy, nephropathy, active or previous history of foot ulcer, or pregnancy related complications in women with gestational diabetes
3. Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes
4. Monitors relevant parameters including blood pressure, oximetry, heart rate, and respiratory rate during assessment and physical activity intervention that enhances the client's safety and comfort
5. Identifies need for and makes recommendations for ambulatory, assistive, adaptive, and protective devices (including footwear) to support client's safety and comfort when participating in physical activity
6. Identifies need for and is able to perform a foot assessment including peripheral circulation, sensory testing and skin integrity and biomechanics of the foot and lower extremity to ensure client's safety and comfort when participating in physical activity for diabetes management
7. Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action
8. Identifies and responds appropriately to non-glycemic related adverse responses to physical activity interventions for diabetes management

Conducts client assessment

As experts in exercise, mobility and function, physiotherapists conduct comprehensive subjective and objective assessments that identify barriers and facilitators to physical activity interventions for diabetes management

9. Interviews clients to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management
10. Interviews clients to determine their personal health literacy, current self-management skills and current state of readiness, as it relates to physical activity, and adjusts assessment, treatment plan and self-management education and support accordingly
11. Obtains information about client's status from lab work, diagnostic imaging, electrocardiogram or pulmonary function test results relevant to physical activity for diabetes management
12. Identifies risk factors such as sedentary behavior, low physical activity levels, comorbidities, smoking, nutrition, and alcohol/drug use that place pre-diabetes and diabetes populations at high risk for developing diabetes or developing diabetes related complications, respectively
13. As a primary care practitioner, identifies yellow, orange or red flags and makes appropriate referrals to other team members and/or makes appropriate changes to assessment and treatment plans for physical activity interventions for diabetes care
14. Identifies acute and chronic changes such as inflammation wounds or deformities that may indicate inappropriate fitting footwear or assistive, adaptive and protective devices and may benefit from referral to other services, and advises clients accordingly
15. Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management related to impaired skin integrity, chronic pain, vascular, respiratory, neurological, or musculoskeletal impairments
16. Identifies cognitive, mental health, social or financial barriers to physical activity for diabetes management that may benefit from referral to other services
17. Interprets assessment findings and develops a physiotherapy diagnosis and working prognosis in order to design appropriate physical activity intervention for diabetes management

Develops, implements, monitors and evaluates an intervention plan

As experts in exercise, mobility and function, physiotherapists integrate unique knowledge, skills and attitudes to provide client centered physical activity interventions

18. Establishes a physical activity goal for diabetes management in collaboration with client, and develops an intervention plan appropriate to the client's goals, current state of readiness, current health status and that is in alignment with the client's resources and abilities
19. Educates clients about the benefits and risks of various physical activities with consideration for individual's existing comorbidities
20. Implements and monitors customized physical activity intervention including aerobic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life
21. Provides self-management education and support to clients, families and communities to support physical activity for diabetes management including footwear and nutrition.
22. Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or anti-hyperglycemic medications with a risk of hypoglycemia including, treating acute hypoglycemia and collaboration with other primary care team members for insulin adjustments as appropriate
23. Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions which could include oxygen titration, breathing strategies, energy conservation, pelvic floor exercises, sensory training/retraining, falls prevention, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills
24. Monitors skin, wounds, blisters and scars during physical activity for diabetes management and responds appropriately with basic wound hygiene, self-management education, and if needed, referral to other services
25. Monitors client's physical, cardiovascular, respiratory, neurological and metabolic response to physical activity intervention for diabetes management, reassesses client's needs and modifies physical activity intervention plan as indicated
26. Identifies opportunities for group physical activity programming for diabetes management and plans, delivers and evaluates physical activity programs when appropriate, given available resources

Domain 2: COLLABORATION

As collaborators, physiotherapists use effective communication strategies to exchange information, enhance therapeutic and professional relationships, and work effectively with others to provide inter- and intraprofessional care that is effective and sustainable.

27. Employs a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, with the client, their family and/or community as key members of the diabetes management care team
28. Facilitates collaborative relationships with interprofessional diabetes care team
29. Provides services that balance waitlists, client needs and available resources including delegating care to and supervising personnel involved in physiotherapy service delivery for diabetes care
30. Identifies the learning needs related to physical activity and diabetes management of other healthcare providers and contributes to and assesses the effectiveness of learning activities

Domain 3: SCHOLARSHIP

As scholars, physiotherapists demonstrate a commitment to excellence in practice through continuous learning, the education of others, and the evaluation of evidence.

31. Able to access and critically appraise emerging information about physical activity and diabetes and determine potential for applicability in primary care settings
32. Uses a structured evidence-informed approach incorporating best available evidence, client context and personal knowledge and experience into clinical decision making for diabetes care

Domain 4: PROFESSIONALISM

As autonomous, self-regulated professionals, physiotherapists are committed to maintaining high standards of behavior and working in the best interest of clients and society including, envisioning and advocating for a health system that enhances the wellbeing of society

33. Advocates for the value of physiotherapy services to overcome barriers and facilitate improved physical activity interventions in diabetes care in primary care settings
34. Recognizes and addresses real, potential or perceived conflicts of interest with pharmaceutical companies and/or fitness facilities/vendors when providing physical activity interventions, education or recommendations to clients
35. Demonstrates awareness of the social determinants of health in diabetes management and advocates for physical activity opportunities and support that are sustainable, socially, and culturally appropriate and geographically accessible to clients year round

36. Recognizes that the cause of current high rates of diabetes amongst Indigenous peoples is complex and is strongly associated with the legacy of colonization and provides care that is congruent with Indigenous social and cultural contexts.
37. Incorporates a purposeful process of self-reflection and learning into one's clinical practice to promote cultural safety by, recognizing one's own assumptions and respecting an Indigenous person's concept of health and their preferences or barriers to engaging in clinical interactions or traditional healing resources
38. Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management as required by provincial regulatory licensing body

Definitions

Ambulatory devices: *canes, crutches, walkers, walking poles, wheelchairs*[1]
Assistive, adaptive, protective devices: *splints, taping/wrapping, bandaging, braces, orthotics, garments, collars*[1]
Diversity: *refers to variation among people including, but not limited to, variation based upon factors such as race, ethnicity, colour, religion, age, sex, sexual orientation, marital status, family status, and disability*[1]
Personal health literacy: *"is the degree to which individuals have the ability to find, understand, and use information and services to inform health related decisions and actions for themselves and others"* [2]
Personnel involved in physiotherapy service delivery: *includes support personnel, assistants, volunteers, and other healthcare providers, who may provide physiotherapy services under the direction and supervision of a physiotherapist*[1]
Physiotherapy diagnosis: *a conclusion about physical function based on a subjective and objective assessment and analysis by a physiotherapist to investigate the cause or nature of a client's condition or problem*[1]
Physiotherapy services: *services provided by or under the direction of a physiotherapist. This includes client assessment and intervention, and related communication with and reporting to various parties for the purposes of delivering client care*[1]
Yellow flags: *maladaptive pain coping strategies*
Orange flags: *psychiatric symptoms*
Red flags: *signs of serious pathology*[3]

Acknowledgements

A diverse group of subject matter experts from Alberta, Manitoba and Nova Scotia contributed content expertise in the development of this competency profile for physiotherapists delivering physical activity interventions for diabetes management in primary care settings. Their thoughtful contributions over a 5-month period have enhanced the confidence that this competency profile accurately reflects the competencies of physiotherapists in primary care settings.

Competency Profile Development

Following best practices for gathering expert knowledge, the Delphi method was used to establish this competency profile, followed by a focus group to validate the document.

The National Physiotherapy Advisory Group's (NPAG) Competency Profile for Physiotherapists in Canada[1] was used as the basic framework for the initial competency statements. Informed by the literature on best practices in diabetes care, including the Diabetes Canada Clinical Practice Guidelines[4], NPAG competency statements that were relevant to physical activity interventions for diabetes care in primary care settings were modified to reflect the intervention, patient population and clinical context. The modified competencies primarily fell into 4 of the 7 domains: physiotherapy expertise, collaboration, scholarship, and professionalism.

Eleven subject matter experts (clinicians, researchers and educators), recruited from across Canada, revised the competency statements through two iterative Delphi survey rounds. The draft of competencies was validated through focus groups consisting of a smaller group of the same subject matter experts.
To see the full competency profile for physiotherapists across all practice settings and interventions see NPAG Competency Profile for Physiotherapists in Canada (2017).

References

1. National Physiotherapy Advisory Group. *Competency Profile for Physiotherapist in Canada*.; 2017. Accessed September 8, 2021. https://www.peac-aepc.ca/pdfs/Resources/Competency%20Profiles/Competency%20Profile%20for%20PTs%202017%20EN.pdf
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Kinesiologist participant feedback resulted in changes to 17 competency statements. One statement was combined with a similar competency statement, wording was modified in 11 statements to more accurately reflect the skills and abilities of entry-level kinesiologists and annotations were added to five statements indicating that kinesiologists would require additional training and mentorship by primary care teams to become competent.

These annotations were added as participants felt that entry-level kinesiologists required additional training and mentorship to identify, consider and manage hypoglycemic, pseudo-hypoglycemia and acute hyperglycemia in relation to physical activity interventions for people living with all types of diabetes and for implementation and monitoring of physical activity in people living with type 1 diabetes. Gestational diabetes was excluded from the profile as participants felt physical activity interventions for pregnant people was not a competency of entry-level kinesiologists. The final result was the following kinesiologist competency profile with 27 competency statements (Figure 5).

Figure 5

Kinesiologist Competency Profile

Physical Activity for Diabetes Management in Primary Care
Competency Profile for Entry-Level Kinesiologists

The following competency profile describes the abilities of entry-level kinesiologists related to the specific clinical context of physical activity interventions for diabetes management in primary care settings.

Unlike most other health professions, kinesiologists are not a self-regulated profession across Canada* and therefore, the skills and abilities of individual kinesiologists may vary significantly. In the development of these competencies, we focused on kinesiologists who are affiliated with the Canadian Kinesiology Alliance (CKA). The CKA is the largest professional organization for kinesiologists in Canada and, in lieu of a regulatory body, it strives to support some of those functions for kinesiologists.

The entry-level CKA affiliated kinesiologist has completed a degree in an approved kinesiology program at a Canadian university (or equivalent) and is at the starting point of continuing professional development.

The competency statements in this document are intended to provide guidance in several ways to all members of interprofessional primary care teams, including:

- informing decision making related to the inclusion of kinesiologists on primary care teams for diabetes management,
- enhancing interprofessional collaboration by improving role clarity of kinesiologists, and
- encouraging referrals to kinesiologists for physical activity intervention for diabetes prevention and management.

NOTE: Some kinesiologists may choose to pursue additional education/training that may expand their competencies and scope of practice related to physical activity interventions for diabetes. Most notable would be the Canadian Society of Exercise Physiology (CSEP) Clinical Exercise Physiologist® certification, whose scope of practice can be found here [4]

* Ontario is the only province where Kinesiology is a regulated health profession and is regulated by the College of Kinesiologists of Ontario (COKO).

Competency Profile

This competency profile relates to physical activity management for individuals living with pre-diabetes, type 1 diabetes and type 2 diabetes. Kinesiologists would require additional training to work with people who are pregnant.

Some competencies would require that the kinesiologist have additional training and mentorship with the primary care diabetes team to become competent.

† Additional training required for all clients living with diabetes
‡ Additional training required for clients living with type 1 diabetes only

Domain 1: KINESIOLOGY EXPERTISE

Ensures physical and emotional safety of client

Kinesiologists integrate knowledge, skills and judgment to ensure the physical and emotional safety of clients while participating in physical activity for diabetes management

1. Supports clients to participate in physical activity considering client-specific precautions, contraindications or risks related to acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia†
2. Supports clients to participate in physical activity considering client-specific precautions, contraindications or risks related to comorbidities
3. Monitors relevant parameters including blood pressure, oximetry, heart rate, respiratory rate during assessment and physical activity interventions that enhances the client's safety and comfort
4. Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action†
5. Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider

Conducts client assessment

Kinesiologists integrate knowledge, skills and judgment to conduct assessments that identify barriers and facilitators to physical activity interventions for diabetes management

6. Interviews clients living with diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management

7. Interviews clients to determine their knowledge of diabetes, current self-management skills, and current state of readiness and adjusts assessment and treatment plan accordingly
8. Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications
9. Selects and performs appropriate tests and measures to identify current fitness levels and potential barriers to physical activity for diabetes management and makes appropriate referrals when clinically indicated
10. Able to understand, evaluate, and interpret assessment findings and referral documentation to form a clinical impression

Develops, implements, monitors and evaluates an intervention plan

Kinesiologists apply and integrate knowledge, skills and judgment to provide competent physical activity interventions for diabetes management through the continuum of care

11. Develops an intervention plan appropriate to the client's goals, current state of readiness, current health status and personal and environmental factors
12. Educates clients living with pre-diabetes and diabetes about the benefits of various physical activities
13. Implements and monitors customized physical activity intervention including aerobic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life‡
14. Assists clients to develop self-management skills in physical activity and nutrition counselling to support physical activity for diabetes management
15. Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or anti-hyperglycemic medications with a risk of hypoglycemia†
16. Supports clients with comorbidities to perform physical activity for diabetes management through appropriate modification of a therapeutic exercise program
17. Monitors client's response to physical activity intervention for diabetes management, reassesses client's needs and modifies physical activity intervention plan as indicated‡
18. Identifies opportunities for group physical activity programming for diabetes management and plans, delivers and evaluates programs

Domain 2: COLLABORATION

Kinesiologists use effective communication and collaboration with others to achieve common goals and enhance relationships in the provision of kinesiology services

19. Acts in a manner that respects client's diversity, autonomy and is in the best interest of the client when delivering physical activity interventions for diabetes management
20. Fosters collaborative relationships with interprofessional diabetes care team

Domain 3: SCHOLARSHIP

Kinesiologists engage in self-reflection, continuing education and development for ongoing competence

21. Able to use best practice guidelines including the interpretation and application of current evidence-based knowledge into clinical decision making for physical activity intervention in diabetes care

Domain 4: PROFESSIONALISM

Kinesiologists assume professional responsibility to provide safe, ethical and effective kinesiology services

22. Able to facilitate client access to kinesiology services and resources to physical activity interventions in diabetes care in primary care
23. Complies with the code of ethics established by their professional body and is committed to continuing competency
24. Recognizes and addresses conflicts of interest with pharmaceutical companies and fitness facilities/vendors
25. Demonstrates awareness of the social determinants of health and understands its influence on diabetes management
26. Recognizes that the cause of current high rates of diabetes amongst Indigenous peoples is complex and is strongly associated with the legacy of colonization and provides care that is congruent with Indigenous social and cultural contexts
27. Understands and works within own professional knowledge, competence, and skill set in diabetes management

Definitions

Diversity: refers to variation among people including, but not limited to, variation based upon factors such as race, ethnicity, colour, religion, age, sex, sexual orientation, marital status, family status, and disability [1]

Acknowledgements

A diverse group of subject matter experts from Alberta, Ontario and Nova Scotia contributed content expertise in the development of this competency profile for kinesiologists delivering physical activity interventions for diabetes management in primary care settings. Their thoughtful contributions over a 5-month period have enhanced the confidence that this competency profile accurately reflects the competencies of CKA affiliated kinesiologists in primary care settings.

Competency Profile Development

Following best practices for gathering expert knowledge, the Delphi method was used to establish this competency profile, followed by a focus group to validate the document.

The National Physiotherapy Advisory Group (NPAG) Competency Profile for Physiotherapists in Canada[1] was used as the basic framework for the initial competency statements. The Canadian Kinesiology Alliance Competency Profile[2], the Essential Competencies of Practice for Kinesiologists in Ontario[3] and, the literature on best practices in diabetes care, including the Diabetes Canada Clinical Practice Guidelines[5] informed modifications to the competency statements. NPAG competency statements that were relevant to physical activity interventions for diabetes care in primary care settings were modified to reflect kinesiologists and the intervention, patient population and clinical context. The modified competencies primarily fell into 4 of the 7 domains: kinesiology expertise, collaboration, scholarship, and professionalism.

Three subject matter experts (clinicians, researchers and educators), recruited from across Canada, revised the competency statements through two iterative Delphi survey rounds. The draft of competencies was validated through an interview and a focus group of the same subject matter experts.

To see the full competency profile for CKA affiliated kinesiologists across all practice settings and interventions see CKA Competency Profile (2021).
More information about the practice of kinesiology in Ontario can be found on the COKO website including the latest full competency profile at www.coko.ca.

References

1. National Physiotherapy Advisory Group. *Competency Profile for Physiotherapist in Canada*.; 2017. Accessed September 8, 2021. https://www.peac-aepc.ca/pdfs/Resources/Competency%20Profiles/Competency%20Profile%20for%20PTs%202017%20EN.pdf
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Face Validity of Referral Pathway Tool

Feedback about the referral pathway tool allowed for modification to the layout of the referral pathway to make it more readable. The pathway was modified to show that:

- Although physiotherapists have expertise in working with clients with complex medical considerations, they can also work with clients whose needs are less complex.
- Kinesiologists would require additional training and mentorship to work with clients living with type 1 diabetes, pre-existing diabetes and pregnancy or gestational diabetes.
- Both kinesiologists and physiotherapists have expertise in working with clients with complex personal or environmental factors.

Otherwise, both physiotherapists and kinesiologists felt the referral pathway accurately reflected the competencies of their respective entry-level clinicians. Figure 6 shows the final version of the referral pathway tool.

Figure 6

Referral Pathway Tool

Physical Activity for Diabetes Management in Primary Care
Referral Pathway Tool

This referral pathway tool is designed to support interprofessional primary care teams in decision making about appropriate physical activity interventions for diabetes management, based on client-specific characteristics.

This tool can be used by any member of the primary care team for people living with:

- Type 1 diabetes
- Type 2 diabetes
- Gestational diabetes
- Pre-diabetes
- Risk factors for developing diabetes

This referral pathway tool will initiate a dialogue with clients about the importance of physical activity in diabetes prevention and management. It will guide clinicians to determine if the person would benefit from the specialized care of a health care professional with expertise in exercise and, if so, whether a **physiotherapist** or **kinesiologist** would best suit the care needs of the client.

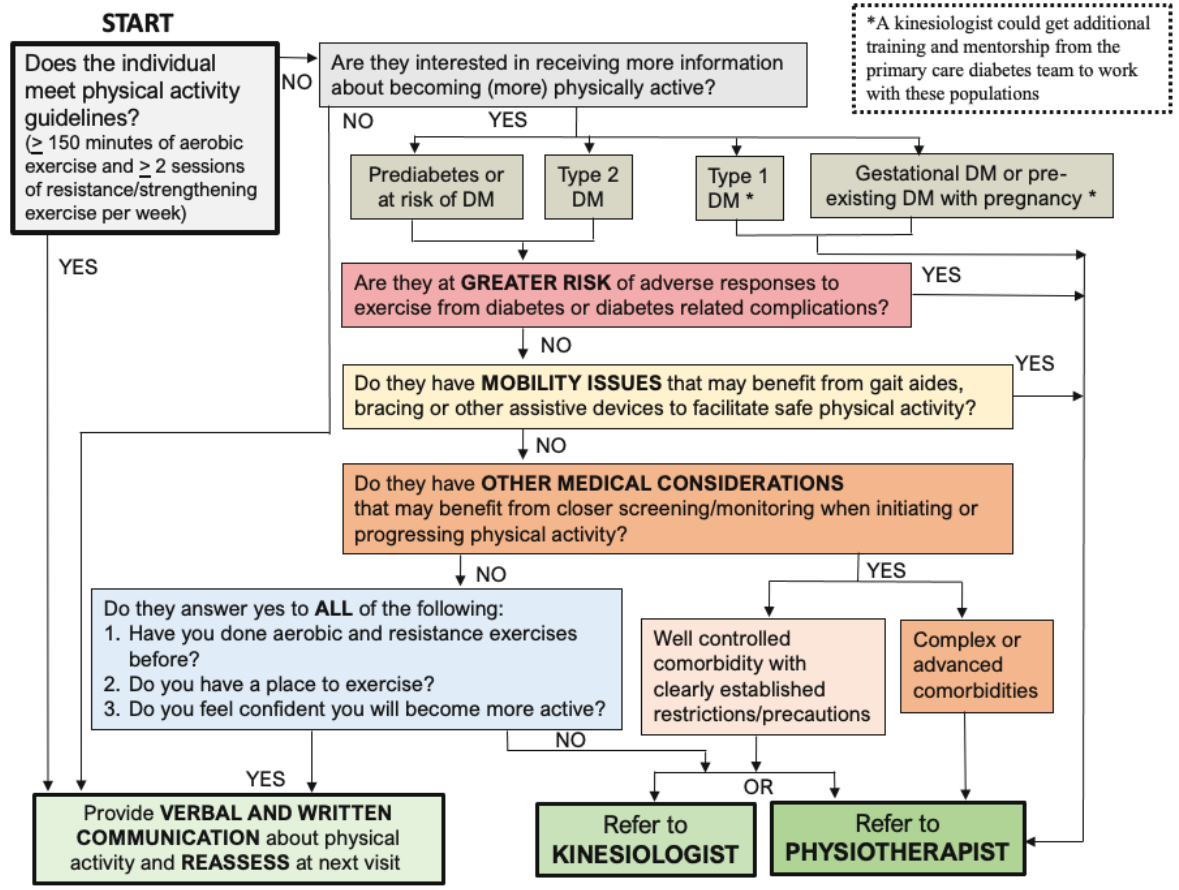
Four health dimensions influence the complexity of physical activity interventions for diabetes care: diabetes complications, other medical considerations, mobility, and personal and environmental factors. The interaction both within and between these dimensions can add to the challenges in delivering safe and effective physical activity interventions for this population and necessitate a referral to a **physiotherapist** or **kinesiologist**.

Physiotherapists and kinesiologists differ in both education and regulation:

Physiotherapy education is standardized across Canada and is at the clinical master's level. **Kinesiology education** is at the under-graduate level and is not consistently standardized across Canada.

Physiotherapists have been granted a "physiotherapist" designation by their provincial regulatory body ensuring ethical, competency and professional standards of practice are maintained. **Kinesiologists** who have voluntarily affiliated with the Canadian Kinesiology Alliance have a degree in kinesiology, have signed a code of ethics, participate in continuing competency and maintain professional liability insurance. Other than in Ontario, kinesiologists are not regulated by a provincial regulatory body and therefore, the skills and abilities of individual kinesiologists may vary significantly in other provinces.

Physical Activity for Diabetes Management
Primary Care Referral Pathway Tool



Health Dimensions

Diabetes Complications
- **Greater risk:** sensory, motor or autonomic neuropathy, active or previous foot ulcer, high risk of hypoglycemia (recurrent hypoglycemia, MDI)
- **Lower risk:** sensory loss with protective sensation intact, low risk for hypoglycemia, already physically active

Mobility
- **Likely to benefit:** antalgic gait, foot deformities, Charcot foot, frail, multi-factor falls risk, amputation, prosthesis user
- **Less likely to benefit** current gait aid user, decreased balance related to age or inactivity

Medical Considerations
- **Complex or advanced comorbidities or conditions:** pregnancy, advanced cardiovascular disease, recent hospitalization, chronic pain, undiagnosed pain, oxygen support, dialysis, active cancer treatment
- **Well controlled/clearly established restrictions/precautions:** stable COPD, osteoarthritis, hypertension, obesity

Personal/environmental Factors
- **More complex:** psychosocial factors, fear, lack of culturally or socially appropriate resources, geographically remote (need to utilize assistants or community members to deliver services)
- **Less complex:** lack of time, energy, motivation, lack of equipment, lack of experience, financial status, self-efficacy

Strengths of Developed Clinical Tools

Participants identified strengths of the competency profiles and referral pathway tool. First, participants felt these tools fill an identified gap in primary care; the need for role clarity of physiotherapists and kinesiologists in this practice area. The specificity of these tools, when compared to more general competency profiles (Canadian Kinesiology Alliance, n.d.-a; National Physiotherapy Advisory Group, 2017), was identified as a strength, helping exercise specialists understand their own role, understand each other's roles and communicate those roles effectively to employers and other primary care team members.

The second strength identified was that the tools captured the breadth of physiotherapy and kinesiology scopes of practice in physical activity interventions for people living with diabetes. That exercise specialists not only provide the exercise recommendations (i.e., aerobic and resistance training), but support clients to increase physical activity levels (e.g., steps per day) and can adjust interventions to meet their care needs. Physiotherapists felt their competency profile highlighted the complexity of providing physical activity interventions for those living with diabetes, specifically, physiotherapists' ability to integrate a person's medical complexities, physical abilities and community resources when prescribing physical activity.

Lastly, physiotherapist and kinesiologist participants felt that the referral pathway tool was a decision tool that would be easy-to-follow for clinicians and would support appropriate referrals to exercise professionals in primary care.

Limitations of Developed Clinical Tools

There were a few limitations of the developed tools identified by participants. The first was that the competency profiles may be too long and detailed for clinical practice settings. While participants felt the competency profile provided good detail and had other uses, the

referral pathway tool was more likely to be useful clinically in primary care settings. They felt that if the tools were presented as one, health care providers may not use it due to its size and level of detail.

Secondly, while participants felt that most health care professionals would find the referral pathway tool useful and use it to guide physical activity interventions and referrals to exercise specialists, one kinesiology participant thought that physicians and nurse practitioners were less likely to use it due to time constraints.

Finally, the most significant limitation identified by kinesiologists was the incongruency between the CKA competencies and the education requirements to obtain those competencies in kinesiology education. With that in mind, kinesiologist participants evaluated the proposed competency statements with the assumption that CKA affiliated kinesiologists possess those competencies outlined by CKA despite their opinion that this is unlikely to be the case for all entry-level kinesiologists.

Usefulness of Developed Clinical Tools

As previously mentioned, an identified strength of the clinical tools was their usefulness in providing role clarity within primary care teams, both inter and intraprofessionally. Beyond this, participants also felt the clarification of roles achieved by these tools had the potential to impact decision makers, funders and primary care managers, influence practice direction from diabetes organizations and support curriculum development at the university and continuing education levels.

Decision Makers, Funders, Primary Care Managers

Participants from both disciplines felt these tools would help decision makers, interested in hiring exercise professionals, consider the skills and abilities of each profession and make an

informed decision. Physiotherapists identified that financial constraints can be a barrier when hiring clinicians and physiotherapists may be more expensive than kinesiologists. These tools would help decision makers understand the difference in education, skills and abilities of these two distinct professions and hire a clinician who will best meet the care needs of their client population. Community programs like the YMCA or funders were identified by kinesiologists as stakeholders who may benefit in a similar way from these tools.

Practice Direction for Diabetes Organizations

Kinesiologists felt that the competencies developed in this study would support advocacy efforts with Diabetes Canada, by clearly establishing the role of kinesiologists in physical activity interventions in primary care, which did not previously exist. Because the competencies in this study, unlike those developed by CKA (n.d.-a), were developed in a systematic, evidence informed way, participants felt that Diabetes Canada would be more receptive to making practice recommendations regarding the inclusion of exercise specialists on diabetes care teams. The ability to explicitly define exercise specialist's role to organizations like Diabetes Canada, the organization who develops clinical practice guidelines for diabetes management in Canada, was felt to be meaningful as most primary care practice direction is based on clinical practice guideline recommendations.

University and Continuing Education Curriculum Development

University curriculum was a recurring discussion point in focus groups and participants thought the developed tools could be useful in diabetes related curriculum development as well as curriculum for continuing education for clinicians.

Physiotherapists thought that university curriculum places more emphasis on chronic diseases that relate to musculoskeletal, neurological and cardiorespiratory conditions (like

osteoarthritis, Parkinson's or chronic obstructive pulmonary disease). Participants thought diabetes, an endocrine chronic disease, is not presented to students as a condition that can be managed by physiotherapists, but rather a comorbidity to be mindful of. While learning about amputations for example, diabetes related skills are taught in the context of contralateral limb protection after an amputation has already occurred instead of highlighting the role physiotherapists can play in amputation prevention during the earlier stages of diabetes.

Participants thought that the clinical tools developed in this study would be useful for future curriculum development expansion in relation to the prevention and management of diabetes through exercise intervention. They thought the tools demonstrate physiotherapist's role not only in the management of diabetes complications like cardiovascular disease or amputations, but also highlights their role in the prevention of diabetes through exercise and obesity management and the prevention of diabetes related complications.

For kinesiology participants, there was no agreement on whether the developed tools would be useful in curriculum development given the diversity of kinesiology programs across Canada. Participants did however think that the tools would be helpful as a way for clinicians to evaluate their own competence in this practice area and determine their own professional development needs.

Findings from the three stages of data collection and analysis in this study resulted in subject matter expert agreement on 38 physiotherapist competency statements and 27 kinesiologist competency statements related to physical activity interventions for diabetes care in primary care settings. Participants thought the tools developed from the competency statements (competency profiles and referral pathway tool) accurately reflected the skills and abilities of entry-level physiotherapists and kinesiologists and the breadth of their role in physical activity

interventions for diabetes care. With good face validity, participants thought these tools would support role clarity, advocacy and curriculum development and could be used by primary care teams, decision makers, educators and diabetes organizations.

Discussion

The purpose of this study was to establish the competencies of two exercise specialist professions for delivering physical activity interventions for diabetes management in primary care settings, and using those competencies, to develop a referral pathway tool to differentiate the roles of physiotherapists and kinesiologists. This study aimed to fill the gap in the literature regarding the role of exercise specialists in diabetes management in primary care in order to improve interprofessional collaboration amongst primary care teams.

This study provides a unique contribution to research and clinical care for the prevention and management of diabetes using physical activity interventions. The physiotherapist competency profile builds upon the existing national physiotherapist competency profile (National Physiotherapy Advisory Group, 2017) by outlining the specific competencies that physiotherapists bring to physical activity interventions for diabetes management in primary care, adding context specificity which did not previously exist. The kinesiologist competency profile, to my knowledge, is the first evidence informed national competency profile for kinesiologists related to diabetes care. The development of these two competency profiles in parallel demonstrated that there are differences in the roles of kinesiologists and physiotherapists with physical activity intervention for diabetes management in primary care settings. To date, most physical activity interventions studies have not been specific regarding the profession of the person delivering physical activity interventions (Balducci et al., 2010; Pi-Sunyer, 2014) using the generic term, exercise specialists. My study shows that it is important to be more specific

because while there are similarities between physiotherapists and kinesiologists, there are also differences in their professional competencies and the type of care they can provide to people living with diabetes. The developed referral pathway tool from this study is a unique clinical contribution to primary care teams by using client populations and characteristics to convey the distinct roles of physiotherapists and kinesiologists in order to promote appropriate referrals for physical activity interventions.

This study adds to previous literature about the role of physiotherapists in primary care. Other primary care work has focused on physiotherapists' efficacy and contributions in more traditional physiotherapy roles such as management of musculoskeletal conditions (Desjardins-Charbonneau et al., 2016; Langridge, 2019; Pinnington et al., 2004). Primary care studies found there is work to be done in educating providers (physicians and nurse practitioners) about the role of physiotherapists (Janssen et al., 2022). Previous work done by Janssen et al. (2022) found that physiotherapists thought prevention and management of type 2 diabetes was well within their scope of practice, but they described barriers to providing this care, including poor understanding from physicians about their role in diabetes care and poor access for people living with diabetes due to lengthy waitlists in publicly funded practice settings. Physiotherapist participants in Janssen's study (2022) thought physiotherapists were missing the opportunity to provide care before the complications of diabetes had a significant impact on an individual's overall function, a sentiment that was echoed by participants in my study who thought this concept was lacking in physiotherapy university curriculum.

For the profession of kinesiology, this study is the first step in establishing the role of kinesiologists in primary care, as I know of no other literature addressing this area other than commentary articles (Jattan & Kvern, 2018; Mang & Peters, 2021) and exercise intervention

studies (Fowles et al., 2014; Gornall et al., 2008; Klein et al., 2017). While this study was an important first step in defining the role of kinesiology in physical activity for diabetes care in primary care, due to the small sample size of kinesiologist participants (n=3), further research to validate these tools using a broader sample from across Canada would increase confidence in its validity.

The need for further validation of kinesiology competencies is especially true considering the diversity of kinesiology education in Canada and the participant identified concern that the requirements to become affiliated with the Canadian Kinesiology Alliance (CKA) does not equate with the CKA competencies. With needing only eight required courses and 14 electives from a possible 30 choices to become affiliated with CKA (Canadian Kinesiology Alliance, n.d.-c), the education of kinesiologists is not standardized across Canada and therefore the competencies of kinesiologists can vary. Additionally, it is not uncommon for kinesiologists to obtain additional certifications from the Canadian Society for Exercise Physiology (CSEP) that may expand or change their competencies in diabetes care. CSEP is a national organization whose mission is “to champion excellence in the application, certification and advancement of evidence-informed exercise science research and practice” (Canadian Society for Exercise Physiology, figure 1, 2023). While CSEP certifications have clearly defined scopes of practice for exercise intervention, they do not specifically address kinesiologist's role in diabetes care in primary care settings. Therefore, a limitation of this study is that due to the lack of consistency in kinesiologist education and the potential for additional certification, the developed tools may over- or under-represent the skills and abilities of some entry-level kinesiologists. Further research that builds on the kinesiologist competency profile developed in

this study could seek to describe the competencies of entry-level CSEP Exercise Physiologists in physical activity interventions for diabetes care in primary care.

This study adds to the research literature by providing evidence on the role of physiotherapists and kinesiologists in physical activity interventions for diabetes care. This topic has been absent in the literature to date, which is highlighted by their absence in the Clinical Practice Guidelines (CPG) (Diabetes Canada Clinical Practice Guidelines Expert Committee, 2018). Diabetes Canada's CPGs are the gold standard for diabetes management in primary care settings, providing practice direction to a diverse group of health care providers (Houlden, 2018). Unlike referrals to dietitians, which is recommended not just in the *Nutrition therapy* chapter (Sievenpiper et al., 2018), but throughout many of the CPG chapters (Clement et al., 2018; Feig et al., 2018; Prebtani et al., 2018), there are only a small number of vague references prompting providers to consider a referral to an exercise specialist for physical activity intervention support (Sigal et al., 2018). The *Physical activity and diabetes* chapter (2018) in the CPGs acknowledges the complexity of physical activity interventions and the potential risks to people living with diabetes when starting or engaging in exercise, but it falls short of recommending referrals to exercise specialists like physiotherapists and kinesiologists to support these complex interventions. When referring to resistance exercises, they recommend people living with diabetes could get guidance from a "qualified exercise specialist" and that "structured exercise programs supervised by qualified trainers should be implemented when feasible for people with type 2 diabetes" (Sigal et al., 2018, p. S60). There is no guidance given to primary care health care providers about the credentials of a "qualified exercise specialist" or "qualified trainer" or how to access them. The developed competency profiles and referral pathway tool developed in this study fills this gap in the literature by defining two types of exercise specialists,

physiotherapists and kinesiologists, and clearly establishing their role in physical activity interventions as key members of primary care diabetes care teams.

Implications for Policy Makers

There is no debate that exercise is effective for diabetes prevention, management and complication prevention, however activity levels of Canadians indicate it is an underutilized intervention (Diabetes Canada, 2020). Recent literature to address this issue in primary care has focused on how to build capacity of existing clinicians like physicians and nurse practitioners (O'Brien et al., 2017; Sallis, 2015). To date, the literature shows that these professions do not have the knowledge or confidence to provide exercise interventions effectively, especially for those using insulin or with comorbidities (Dillman et al., 2010; Jansink et al., 2010; Kennedy et al., 2018; Powell et al., 2016). This study articulates why physical activity interventions may be challenging for non-exercise specialist professionals by outlining the competencies associated with this role and how exercise professionals can fill this gap in care. The competency profiles and referral pathway tool can support policymakers and interprofessional team decision making around whether to include an exercise specialist clinician on a primary care team and determine whether a physiotherapist or kinesiologist would best fit the needs of community they serve given the existing capacity of their primary care team.

Implications for Clinicians

Primary care is an emerging role for physiotherapists and kinesiologists. For good interprofessional collaboration not only do other team members need to have a good understanding of one another's roles, but clinicians need to have a good understanding of their own role as well (Interprofessional Education Collaborative Expert Panel, 2011). The competency profiles developed in this study can guide practice, continuing competency and

discussion amongst team members when trying to determine who would best serve the needs of a client. For kinesiologists whose education is more diverse, the competency profile provides a framework for clinical practice and can provide guidance for mentorship or training needs depending on the educational background of the clinician.

For other members of the primary care team, the referral pathway tool serves two purposes: decision support on when to make a physical activity referral and which exercise specialists should receive the referral. Despite low levels of physical activity in people living with diabetes, less than 10 percent will be referred to an exercise professional (Petrella et al., 2007). The developed referral pathway tool prompts primary care providers to consider both whether the person living with diabetes is meeting the recommended physical activity levels and, if not, what medical, physical, personal or environmental barriers may be impacting their ability meet those targets.

Implications for People Living with Diabetes

People living with diabetes deserve to be able to access all available treatments to manage their disease, but physical activity interventions are not properly supported in primary care. Diabetes Canada CPGs recommend diabetes care be supported by nurses, pharmacists and registered dietitians (Clement et al., 2018) providing nutrition and pharmacological interventions, but physical activity interventions are also complex. Staying physically active while pregnant, managing a foot ulcer or navigating chronic conditions like hypertension or osteoarthritis are examples of complexities that clients or their care teams are left to navigate without the support of health care providers who have expertise in exercise.

This study highlights how physiotherapists and kinesiologists are well qualified to support people living with diabetes to engage in physical activity despite the many potential

barriers and risks. By advocating for and supporting the inclusion and integration of exercise specialists on primary care teams, people living with diabetes will benefit from improved access to a highly potent diabetes intervention, physical activity.

Implications for Educators

An interesting finding during focus group stages was the recurring discussion from subject matter experts around university curriculum. While physiotherapists and kinesiologists have many skills and abilities that meet the needs of people living with diabetes, particularly in the area of physical activity intervention, there is limited emphasis on exercise specialists' role in prevention and management of diabetes despite its rapidly growing prevalence. For example, the assessment and treatment of neuropathies is a core competency of physiotherapists, but findings from this study indicate that neuropathies that result from diabetes have less emphasis in curriculum than one from carpal tunnel syndrome, despite the arguably more significant consequences from diabetic neuropathies. For kinesiologists, while competent in developing and delivering physical activity programs, without the ability to recognize and treat hypoglycemia emergencies, which is not part of their curriculum, they would need additional training to be able to safely work with a large proportion of people living with diabetes.

The developed competency profiles for physiotherapists and kinesiologists can serve to guide curriculum development or clinical education opportunities for students in Canada. For physiotherapists, looking more broadly at how the skills and abilities or physiotherapists could support people living with diabetes at all stages of their care journey; prevention, management and complication management. For kinesiologists, ensuring their entry-level clinicians have not only a strong theoretical knowledge about physical activity, but also the clinical skills needed to safely implement that knowledge in a primary care setting.

Implications for Researchers

While the purpose of this study was not to evaluate the Delphi method, I had interesting findings in relation to the chosen modified Delphi method. The purpose of reviewing the competencies during the focus group that followed the Delphi rounds was to member-check the competencies, and I had anticipated that there would be very little modifications required at this stage, because consensus had already been achieved on most of the competencies through two Delphi survey rounds. However, discussion in the focus groups resulted in changing 33 of the 59 competency statements that achieved consensus in the Delphi rounds (22 physiotherapy competencies and 11 kinesiology competencies). This raises the question of the validity of Delphi studies when they involve only survey rounds (Keeney et al., 2010). Including focus groups following the survey rounds, captured both big and small concepts that were not seen in the survey rounds.

For kinesiologist participants, focus group discussion clarified that certain competency statements were appropriate when working with people living with prediabetes or type 2 diabetes, but certain clinical skills needed for people living with type 1 diabetes or gestational diabetes would be beyond entry-level clinicians' competencies. The robust interactive discussion in the focus group facilitated the development of an idea to add annotations as some mentorship and training would be sufficient to build those competencies. For physiotherapist participants, one focus group had so much discussion about previously agreed upon competency statements, that a second focus group was needed. While the changes were not as significant as that of the kinesiologists, participants were invested in ensuring the wording of each competency statement was accurate.

The findings from this study reaffirm what some authors have said previously, which is that Delphi survey results should be further refined through additional research methods (Keeney et al., 2010). It may be that the nuances of clinical practice were difficult to capture in open comment boxes or that the focus group discussion allowed an opportunity to include more global ideas that might have been missed otherwise (Hsu & Sandford, 2007; Keeney et al., 2010). For example, the inclusion of family and community in education and intervention competencies. Bringing experts together from diverse practice settings in the focus groups allowed for refinement of ideas and increased clarity and confidence in the Delphi results.

Another consideration that arose from this study was the lack of literature about the process of creating referral pathway tools. I wanted to make sure I had embedded knowledge translation in my study and planned to use a referral pathway tool to convey the similarities and differences in physiotherapy and kinesiology competencies. While there is literature on the definition (Lawal et al., 2016), implementation and integration of clinical pathway tools (Neame et al., 2019; Seckler et al., 2020), there is little guidance about the steps taken in their development. More research is needed regarding the best way to translate findings into a clinical pathway like a referral pathway tool that can be easily used in clinical practice. Therefore, next steps would be to study the implementation of the referral pathway tool developed in this study in primary care settings with an interprofessional primary care team.

Strengths

The first strength of this project was the quality of participants and their engagement in the research study. Participants were a heterogeneous group of clinicians in primary care, diabetes and amputee clinics, educators in physiotherapy and kinesiology university programs and academics and researchers with expertise in diabetes. With representation from four

provinces from East to West including participants who work with remote, northern and Indigenous communities, participants brought a variety of perspectives to this study. Additionally with 100% response rate from participants who began the study, participants were highly engaged throughout all stages. During focus groups all participants were actively involved in discussions and negotiated ideas to form consensus.

The second strength of this study was the steps taken to ensure trustworthiness of my findings. The data triangulation of quantitative and qualitative data through repeated rounds and member-checking of the findings increase confidence that the results accurately reflect the opinion of subject matter experts. A detailed audit trail and regular meetings with CB throughout all stages of data collection and analysis enhanced the rigor of data analysis by allowing my thoughts and ideas to be challenged and offered many opportunities for self-reflection about my own biases.

Limitations

The first limitation of this study was the limited pool of subject matter experts. Exercise specialists in diabetes care and primary care are both emerging roles and as such, there was a limited number of physiotherapists and kinesiologists that would meet my eligibility criteria. I also had challenges in reaching potential participants with recruitment material as some organizations either declined or did not distribute the recruitment emails.

A second limitation of this study was the limited number of kinesiologist participants. Although the sample was diverse, three participants is a small sample size especially given the diversity of kinesiology education across Canada. The constraints of a master's level project meant I was unable to wait for the delayed distribution of recruitment material by Canadian Diabetes Educator Certification Board or the Canadian Kinesiology Alliance to their

membership which would have increased our ability to reach more kinesiologists with recruitment material.

Another limitation is that the competency profiles and referral pathway tool are for entry-level clinicians and do not account for additional education/training that physiotherapists or kinesiologists may bring with them to a primary care team. Kinesiologists' diverse education across Canada means some may have additional competencies beyond the profile developed in this study. Regulated kinesiologists in Ontario for example, must pass an entry to practice exam (College of Kinesiologists of Ontario, n.d.) and the Canadian Society of Exercise Physiology has certifications that kinesiologists may obtain. Similarly, physiotherapists may obtain additional training/certification in wound care or diabetes education. Future research may work to differentiate the competencies of entry-level exercise specialists from CSEP Exercise Physiologists, registered CKO kinesiologists or Certified Diabetes Educators.

Another limitation of this study is that participants did not give feedback on the final versions of the clinical tools. Following the focus group stage, I made changes to the competency profiles and the referral pathway tool to address participants' feedback and improve the tools. Further member-checking would increase confidence in the validity of the final version of the clinical tools. Additionally, the usefulness of the referral pathway tool should be evaluated by other members of the primary care interprofessional team.

Lastly, participants' understanding of university curriculum in physiotherapy and kinesiology programs across Canada and their understanding of the term "entry-level" is a limitation of this study. Although some participants were university educators and others had experience with national committees related to entry-level competencies, many participants were clinicians who were not directly involved in curriculum. During survey rounds and focus groups,

participants referenced experiences with entry-level colleagues or student clinicians as their basis for determining the skills and abilities of entry-level clinicians and what was being taught in university programs. All participants in this study were considered experts in diabetes care, but their expertise regarding university curriculum likely varied between participants. Therefore, participant opinions should be considered in this context and future studies of entry-level physiotherapists and kinesiologists would be needed to determine the transferability of this study's findings. Future work might also explore current university curriculum in Canada and how it prepares entry-level clinicians to meet the physical activity needs of people living with diabetes in primary care settings.

Conclusion

The purpose of this study was to promote effective interprofessional collaboration in diabetes care within primary care teams by, (a) establishing the competencies of entry-level physiotherapists and kinesiologists in physical activity interventions for diabetes and (b) developing a primary care referral pathway tool to convey how these two professions are similar and distinct. The outcome was a physiotherapy competency profile, a kinesiology competency profile and a primary care referral pathway tool for physical activity interventions for diabetes care which offers guidance to primary care teams regarding when to make physical activity intervention referrals and which exercise professional would best fit the care needs of the client.

There was good agreement amongst participants on the final 38 physiotherapy and 27 kinesiology competency statements and the developed referral pathway tool. Both exercise specialists have the knowledge and skills to support people living with diabetes who have medical, physical or personal or environmental barriers to becoming (more) physically active, but physiotherapists are better able support people whose medical or physical needs are complex.

Entry-level physiotherapists have the skills and abilities to support people living with type 1 diabetes or people who are pregnant, but entry-level kinesiologists would require additional training or mentorship to be competent in all areas of physical activity intervention for these populations.

This study was the first to establish the specific competencies of physiotherapists and kinesiologists in diabetes care in primary care and the first to explore the differences between these professions. The findings highlight that physical activity interventions can be complex and that both exercise specialist professions have fundamental skills and abilities to support people living with diabetes in physical activity interventions. However, the findings also underscore that physiotherapy and kinesiology are unique health professions with entry-level clinicians possessing distinct skills and abilities which influences the type of care they can provide in primary care settings. This study highlights the importance of physiotherapists and kinesiologists as vital members of primary care teams for diabetes care, but also, the need for specificity when referring to “exercise specialists” in clinical practice guidelines, amongst primary care teams and in future research related to physical activity interventions for diabetes care.

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Appendix A

Recruitment Email

Dear Physiotherapist or Kinesiologist,

My name is Carly Proctor, and I am a Master of Science student in the College of Rehabilitation Sciences (CoRS) at the University of Manitoba. I am conducting a research project called "***Role of physiotherapists and kinesiologists in physical activity interventions for diabetes management in primary care settings: A modified Delphi study"*** under the supervision of Dr. Cara Brown.

The purpose of this study is to define the competencies of entry-level physiotherapists and kinesiologists in physical activity interventions for diabetes care in primary care. Using those competencies, develop a referral pathway tool for diabetes care by exercise specialists that could be used by primary care teams with the purpose of promoting interprofessional collaboration for diabetes care.

We invite you to participate if you are an English-speaking physiotherapist registered with a Canadian provincial regulatory body or a kinesiologist affiliated with the Canadian Kinesiology Alliance and can answer **YES** to any of the following:

1. Have you certified with the Canadian Diabetes Educator Certification Board as a diabetes educator within the last five years?
2. Have you worked for 2 or more years in primary care clinics with high prevalence of clients with diabetes?
3. Have you worked for 2 or more years in a specialist (amputees, renal, endocrinology) clinic with high prevalence of clients with diabetes?
4. Are you an academic or researcher with expertise in diabetes?

Your participation would involve responding to two online surveys between April and June, 2022 that overall, will take approximately 1 hour and 15 minutes to complete. Following the surveys, some participants will be invited to participate in a 90-minute focus group to discuss the results of the surveys and the referral pathway tool for diabetes care by exercise specialists for use in primary care.

If you know anyone who may be interested in participating in this study and may fit the eligibility criteria above, please forward them this invitation.

If you would be interested in participating or if you have questions about this study, please do not hesitate to contact the principal investigator Carly Proctor at **umproct0@myumanitoba.ca.**

Thank you for your consideration!

Carly Proctor

Appendix B

Organizations Requested to Distribute Recruitment Email

Organizations which did not distribute	Organizations which distributed
Regulatory Organizations	
College of Physical Therapists of British Columbia	Nova Scotia College of Physiotherapists
Ordre Professionnel de la Physiotherapie du Quebec	Saskatchewan College of Physical Therapist
Physiotherapy Alberta College and Association	College of Physiotherapists of Manitoba
College of Physiotherapists of New Brunswick	
College of Physiotherapists of Ontario	
Prince Edward Island College of Physiotherapy	
Newfoundland and Labrador College of Physiotherapists	
College of Kinesiologists of Ontario	
Professional associations	
Canadian Diabetes Educator Certification Board	Canadian Physiotherapy Association[a]
Canadian Kinesiology Alliance	Kinesiology Association of Saskatchewan
Fédération des Kinésiologues du Québec	British Columbia Association of Kinesiologists
Kinesiology PEI	Alberta Kinesiology Association
Ontario Kinesiology Association	Manitoba Kinesiology Association
New Brunswick Kinesiology Association	
Kinesiology Association of Nova Scotia	
Newfoundland and Labrador Kinesiology Association	
Canadian Society for Exercise Physiology	
Physiotherapy programs[b]	
McGill University	University of Manitoba
Laval University	Dalhousie University
University of British Colombia	McMaster University
University of Ottawa	Queen's University
University of Toronto	University of Alberta
University of Saskatchewan	
Western University	
Kinesiology programs[b]	
University of Guelph	University of Windsor
Lakehead University	University of Prince Edward Island
University of Winnipeg	University of Alberta
Mount Royal University	University of Calgary
Douglas College	University of the Fraser Valley
University of Lethbridge	University of Manitoba
Camosun College	University of Saskatchewan

University of BC	Dalhousie University
University of Victoria	St. Francis Xavier University
University of Regina	York University
Brock University	University of Ontario Institute of Technology
Simon Fraser University	Laurentian University
McMaster University	
Nipissing University	
Queen's University	
Redeemer University College	
Sheridan College	
University of Ottawa	
University of Toronto	
University of Waterloo	
University of Western Ontario	
Wilfred Laurier	
Concordia University	
Laval University	
McGill University	
University of New Brunswick	
Memorial University of Newfoundland	
Acadia University	

[a] To division members only

[b] Distributed to faculty

Appendix C

Recruitment Reminder Email

Dear Physiotherapist or Kinesiologist,

Two weeks ago, you received an email from me regarding your participation in a research project called "***Role of physiotherapists and kinesiologists in physical activity interventions for diabetes management in primary care settings: A modified Delphi study"***

The purpose of this study is to define the competencies of entry-level physiotherapists and kinesiologists in physical activity interventions for diabetes care in primary care. Using those competencies, develop a referral pathway tool for diabetes care by exercise specialists that could be used by primary care teams with the purpose of promoting interprofessional collaboration for diabetes care.

If you do not fit the eligibility criteria or have already reached out to participate in this study, please disregard this email. If you do fit the criteria, we ask you to please consider participating in this study.

If interested or if you have questions about this study, please do not hesitate to contact the principal investigator Carly Proctor at umproct0@myumanitoba.ca.

Thank you for your consideration!

Carly Proctor

Appendix D

Social Media Advertisements

Figure D1

Social Media Advertisement One

Figure D2

Social Media Advertisement Two

Figure D3

Social Media Advertisement Three

Appendix E

Physiotherapy Research Participant Information and Consent Form

Thank you for your interest in participating in this study.

Title: **Role of Physiotherapists and Kinesiologists in Physical Activity Interventions for Diabetes Management in Primary Care Settings: A Modified Delphi Study**

Principal Investigator:
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Sponsor: N/A
Funder: Self-funded

You are being asked to participate in a multi-staged study.

Purpose of the Study

Modified Delphi: The first phase is a modified Delphi which is a structured polling of an expert panel through iterative survey rounds with the aim of gaining consensus on a given topic.

The purpose of this modified Delphi is to establish the common and distinct competencies of entry-level physiotherapists and kinesiologists in physical activity for diabetes in primary care settings and to use the results to develop a referral pathway tool for diabetes care by exercise specialists for use by interprofessional primary care teams.

Focus Group: The second phase of this study will use focus groups for data collection. Focus groups are group discussions with people who know something about the topic of interest. Focus groups are ways of finding out people's thoughts and ideas about a specific topic.

The purpose of the focus group is to determine how well the competency statements developed in the modified Delphi phase represent entry-level physiotherapist's competencies in physical activity for diabetes in primary care settings and to determine the accuracy of the referral pathway tool and its usefulness in practice.

Participant Selection

You are being asked to participate in this multi-staged study because you have self-identified as being an English-speaking physiotherapist registered with a Canadian provincial regulatory body and answered **YES** to one of the following:

1. Have you certified with the Canadian Diabetes Educator Certification Board as a diabetes educator within the last five years?
2. Have you worked for 2 or more years in primary care clinics with high prevalence of clients with diabetes?
3. Have you worked for 2 or more years in a specialist (amputees, renal, endocrinology) clinic with high prevalence of clients with diabetes?
4. Are you an academic or researcher with expertise in diabetes?

Approximately 12 physiotherapists will participate in the modified Delphi phase of the study and 6-8 of those will be asked to participate in the focus group phase of the study.

Study Procedures

If you take part in this study, you will have the following procedures:

Step 1: Self-Screening and Consent

- Email consent statement back to principal investigator after reading and taking the time to consider the eligibility criteria, participant information and the consent form

Step 2: Demographic Questionnaire and Delphi Round One Survey

- You will have two weeks to complete an online survey which will take approximately 45 minutes to complete and will have two sections; Delphi round one and a demographic questionnaire
  - The first Delphi survey will consist of a series of competency statements for entry-level physiotherapists related to physical activity for diabetes in primary care. You will be asked to rate your level of agreement with each competency statement and be given the opportunity to add any additional written comments.
  - The demographic questionnaire will include a series of questions related to your personal characteristics such as gender and ethnicity, your clinical or academic role, education and experience related to diabetes care.

Step 3: Possible Delphi Round Two Survey

- Unless most participants agree with all competency statements, a second Delphi survey will be sent to you three weeks later and will take approximately 30 minutes to complete.
- Competency statements will be modified or added to reflect your feedback and the feedback of other participants. Only competency statements that were not agreed upon in the first Delphi survey will be included in the round two survey.
- Your previous level of agreement rating and the average and range of responses from all physiotherapists' ratings will be included for each competency statement in the round two survey.

- You will be asked to rate your level of agreement with the remaining competency statements, and you will be given the opportunity to add any written feedback. You will have two weeks to complete the Delphi round two survey online.

Step 4: Focus Group

- Following the survey phase of this study, a smaller sample of physiotherapist participants will participate in a 90-minute focus group.
- The focus group will be one session and will be done virtually using Microsoft Teams.
- Carly Proctor will facilitate the focus group and help guide the group discussion. Dr. Cara Brown will be the notetaker. She will record her observations, monitor the time, and help with any technical issues.
- You will be provided with and asked to review the final list of physiotherapist competency statements and the referral pathway tool one week before the focus group session.
- The group will be asked some questions related to each competency statement as well as the referral pathway tool. These questions will help us to understand how well the competency statements reflect entry-level physiotherapist competencies in this area of practice and the usefulness of the referral pathway tool.
- This phase of the project will use Microsoft Teams platform to collect data; this includes recording audio and video data and creating initial transcripts. Teams is an externally hosted cloud-based service. A link to their privacy policy is available here https://www.microsoft.com/en-ca/trust-center/privacy. While the University of Manitoba Health Research Ethics Board has approved using the platform to collect data for this study, there is a small risk of a privacy breach for data collected on external servers.
- At the start of the session everyone will be asked to respect the privacy of the other group members. All participants will be asked not to disclose anything said within the context of the discussion, but it is important to understand that other people in the group with you may not keep all information private and confidential.
- All data collected will be uploaded from Microsoft Teams to password protected project files on the College of Rehabilitation Sciences' R: drive at University of Manitoba and will only be accessible by the study's investigators. Once the data is uploaded, the original sources will be deleted.

Participation in this study will be over a 3-month period, likely between April and June of 2022. Data will be kept for 5 years for publication purposes, after which, all computer files will be deleted.

Risks and Discomforts

The risks of participating are low. Your responses to the survey questions will be anonymous to other participants however, given the limited number of physiotherapists involved in clinical diabetes care, education and research, participant descriptions in the results of the study may allow some readers to be able to identify you as a participant.

Benefits

There may or may not be direct benefit to you from participating in this study. The information learned from this study will result in a primary care referral pathway for diabetes care by exercise specialists for use in interprofessional primary care teams and we hope it will promote effective interprofessional collaboration.

Costs

There will be no cost to you for participating in this study.

Payment for participation

Electronic gift cards will be provided at the end of your participation in this study. You will be given a total of $15 if you complete the first Delphi round only, $25 if you complete two Delphi rounds, or $35 if you complete both Delphi rounds and the focus group discussion.

Confidentiality

We will do everything possible to keep your personal information confidential. A list of names and email addresses of participants will be kept in a secure electronic file so we can send you reminders to complete the survey and a summary of the results of the study.

The collection and access to personal information will be in compliance with provincial and federal privacy legislation.

Information gathered in this research study may be published or presented in public forums, however your name and other identifying information will not be used or revealed. Despite efforts to keep your personal information confidential, absolute confidentiality cannot be guaranteed.

The Health Ethics Research Board of the University of Manitoba which is responsible for the protection of people in research has reviewed this study for ethical acceptability. They may review records related to the study for quality assurance purposes.

Voluntary Participation/Withdrawal from the Study

Your decision to take part in this study is voluntary. You may refuse to participate or you may withdraw from the study at any time.

Questions

If any questions come up during or after the study contact the principal investigator or co-investigator at:

Carly Proctor at (204) xxx-xxxx or umproct0@myumanitoba.ca

Dr. Cara Brown at (204) xxx-xxxx or Cara.brown@umanitoba.ca

For questions about your rights as a research participant, you may contact the University of Manitoba, Bannatyne Campus Research Ethics Board Office at (204) 789-3389.

Statement of Consent

Please take the time to read the following consent statement. If you are in agreement, in lieu of signing the form in person, please reply to this email and write your name and the date in the space marked below.

I have read this consent form. I have had the opportunity to discuss this research study with Carly Proctor or the co-investigators. I have had my questions answered by them in language I understand. The risks and benefits have been explained to me. I believe that I have not been unduly influenced by any study team member to participate in the research study by any statements or implied statements. Any relationship (such as employer, supervisor or family member) I may have with the study team has not affected my decision to participate. I have been given a copy of this consent form. I understand that my participation in this study is voluntary and that I may choose to withdraw at any time. I freely agree to participate in this research study.

I understand that information regarding my personal identity will be kept confidential, but that confidentiality is not guaranteed. I authorize the inspection of any of my records that relate to this study by The University of Manitoba Research Ethics Board for quality assurance purposes.

By writing my name below I am electronically signing this consent form. By consenting to participate, I have not waived any of the legal rights that I have as a participant in a research study.

Participant name: _____ Date _____
(day/month/year)

Appendix F

Kinesiology Research Participant Information and Consent Form

Thank you for your interest in participating in this study.

Title: **Role of Physiotherapists and Kinesiologists in Physical Activity Interventions for Diabetes Management in Primary Care Settings: A Modified Delphi Study**

Principal Investigator:
Carly Proctor
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Sponsor: N/A
Funder: Self-funded

You are being asked to participate in a multi-staged study.

Purpose of the Study

Modified Delphi: The first phase is a modified Delphi which is a structured polling of an expert panel through iterative survey rounds with the aim of gaining consensus on a given topic.

The purpose of this modified Delphi is to establish the common and distinct competencies of entry-level physiotherapists and kinesiologists in physical activity for diabetes in primary care settings and to use the results to develop a referral pathway tool for diabetes care by exercise specialists for use by interprofessional primary care teams.

Focus Group: The second phase of this study will use focus groups for data collection. Focus groups are group discussions with people who know something about the topic of interest. Focus groups are ways of finding out people's thoughts and ideas about a specific topic.

The purpose of the focus group is to determine how well the competency statements developed in the modified Delphi phase represent entry-level kinesiologist's competencies in physical activity for diabetes in primary care settings and to determine the accuracy of the referral pathway tool and its usefulness in practice.

Participant Selection

You are being asked to participate in this multi-staged study because you have self-identified as being an English-speaking kinesiologist affiliated with the Canadian Kinesiology Alliance or registered with the College of Kinesiologists of Ontario and answered **YES** to one of the following:

1. Have you certified with the Canadian Diabetes Educator Certification Board as a diabetes educator within the last five years?
2. Have you worked for 2 or more years in primary care clinics with high prevalence of clients with diabetes?
3. Have you worked for 2 or more years in a specialist (amputees, renal, endocrinology) clinic with high prevalence of clients with diabetes?
4. Are you an academic or researcher with expertise in diabetes?

Approximately 12 kinesiologists will participate in the modified Delphi phase of the study and 6-8 of those will be asked to participate in the focus group phase of the study.

Study Procedures

If you take part in this study, you will have the following procedures:

Step 1: Self-Screening and Consent

- Email consent statement back to principal investigator after reading and taking the time to consider the eligibility criteria, participant information and the consent form

Step 2: Demographic Questionnaire and Delphi Round One Survey

- You will have two weeks to complete an online survey which will take approximately 45 minutes to complete and will have two sections; Delphi round one and a demographic questionnaire
  - The first Delphi survey will consist of a series of competency statements for entry-level kinesiologists related to physical activity for diabetes in primary care. You will be asked to rate your level of agreement with each competency statement and be given the opportunity to add any additional written comments.
  - The demographic questionnaire will include a series of questions related to your personal characteristics such as gender and ethnicity, your clinical or academic role, education and experience related to diabetes care.

Step 3: Possible Delphi Round Two Survey

- Unless most participants agree with all competency statements, a second Delphi survey will be sent to you three weeks later and will take approximately 30 minutes to complete.
- Competency statements will be modified or added to reflect your feedback and the feedback of other participants. Only competency statements that were not agreed upon in the first Delphi survey will be included in the round two survey.

- Your previous level of agreement rating and the average and range of responses from all kinesiologists' ratings will be included for each competency statement in the round two survey.
- You will be asked to rate your level of agreement with the remaining competency statements, and you will be given the opportunity to add any written feedback. You will have two weeks to complete the Delphi round two survey online.

Step 4: Focus Group

- Following the survey phase of this study, a smaller sample of kinesiologist participants will participate in a 90-minute focus group.
- The focus group will be one session and will be done virtually using Microsoft Teams.
- Carly Proctor will facilitate the focus group and help guide the group discussion. Dr. Cara Brown will be the notetaker. She will record her observations, monitor the time, and help with any technical issues.
- You will be provided with and asked to review the final list of kinesiologist competency statements and the referral pathway tool one week before the focus group session.
- The group will be asked some questions related to each competency statement as well as the referral pathway tool. These questions will help us to understand how well the competency statements reflect entry-level kinesiologist competencies in this area of practice and the usefulness of the referral pathway tool.
- This phase of the project will use Microsoft Teams platform to collect data; this includes recording audio and video data and creating initial transcripts. Teams is an externally hosted cloud-based service. A link to their privacy policy is available here https://www.microsoft.com/en-ca/trust-center/privacy. While the University of Manitoba Health Research Ethics Board has approved using the platform to collect data for this study, there is a small risk of a privacy breach for data collected on external servers.
- At the start of the session everyone will be asked to respect the privacy of the other group members. All participants will be asked not to disclose anything said within the context of the discussion, but it is important to understand that other people in the group with you may not keep all information private and confidential.
- All data collected will be uploaded from Microsoft Teams to password protected project files on the College of Rehabilitation Sciences' R: drive at University of Manitoba and will only be accessible by the study's investigators. Once the data is uploaded, the original sources will be deleted.

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Risks and Discomforts

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diabetes care, education and research, participant descriptions in the results of the study may allow some readers to be able to identify you as a participant.

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There may or may not be direct benefit to you from participating in this study. The information learned from this study will result in a primary care referral pathway for diabetes care by exercise specialists for use in interprofessional primary care teams and we hope it will promote effective interprofessional collaboration.

Costs

There will be no cost to you for participating in this study.

Payment for participation

Electronic gift cards will be provided at the end of your participation in this study. You will be given a total of $15 if you complete the first Delphi round only, $25 if you complete two Delphi rounds, or $35 if you complete both Delphi rounds and the focus group discussion.

Confidentiality

We will do everything possible to keep your personal information confidential. A list of names and email addresses of participants will be kept in a secure electronic file so we can send you reminders to complete the survey and a summary of the results of the study.

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Information gathered in this research study may be published or presented in public forums, however your name and other identifying information will not be used or revealed. Despite efforts to keep your personal information confidential, absolute confidentiality cannot be guaranteed.

The Health Ethics Research Board of the University of Manitoba which is responsible for the protection of people in research has reviewed this study for ethical acceptability. They may review records related to the study for quality assurance purposes.

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Your decision to take part in this study is voluntary. You may refuse to participate or you may withdraw from the study at any time.

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If any questions come up during or after the study contact the principal investigator or co-investigator at:

Carly Proctor at (204) xxx-xxxx or umproct0@myumanitoba.ca
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I have read this consent form. I have had the opportunity to discuss this research study with Carly Proctor or the co-investigators. I have had my questions answered by them in language I understand. The risks and benefits have been explained to me. I believe that I have not been unduly influenced by any study team member to participate in the research study by any statements or implied statements. Any relationship (such as employer, supervisor or family member) I may have with the study team has not affected my decision to participate. I have been given a copy of this consent form. I understand that my participation in this study is voluntary and that I may choose to withdraw at any time. I freely agree to participate in this research study.

I understand that information regarding my personal identity will be kept confidential, but that confidentiality is not guaranteed. I authorize the inspection of any of my records that relate to this study by The University of Manitoba Research Ethics Board for quality assurance purposes.

By writing my name below I am electronically signing this consent form. By consenting to participate, I have not waived any of the legal rights that I have as a participant in a research study.

Participant name: _____ Date _____
(day/month/year)

Appendix G

Physiotherapy Competency Development for Delphi Round One

Table G1

Physiotherapy Competency Development – Step One

NPAG competency statements[a]	NPAG milestones[a]	Relevant	Decision	Modified physiotherapy statement
	Physiotherapy expertise domain			
1.1 Employ a client-centered approach	Act in a manner that respects client uniqueness, diversity and autonomy, and is in the client's best interest	Yes	Generalized in 1.1.1	1.1.1. Employ a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, and is in the client's best interest
	Actively involve the client in decision-making	Yes	Generalized in 1.1.1	
	Build and maintain rapport and trust with the client	Yes	Generalized in 1.1.1	
	Empower client to engage in their own care	Yes	Generalized in 1.1.1	
	Provide the client with relevant information throughout care	Yes	Generalized in 1.1.1	
	Ensure ongoing, informed client consent	Yes	Included in 7.1	
1.2 Ensure physical and emotional safety of client	Identify client specific precautions, contraindications and risks	Yes	Expanded into 1.2.1, 1.2.2 and 1.2.3	1.2.1 Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia

				1.2.2 Identifies client-specific precautions, contraindications and risks to physical activity participation from diabetes related comorbidities (e.g., foot ulcer, pre-proliferative retinopathy, autonomic neurological dysfunction)
				1.2.3 Identifies client-specific precautions, contraindications and risk to physical activity participation from other health conditions (e.g. arthritis, COPD, pregnancy related joint instability)
	Employ safe client handling techniques	No	Dropped	
	Apply assessment and intervention procedures in a manner that enhances the client's safety and comfort	Yes	Expanded into 1.2.4, 1.2.5 and 1.2.6	1.2.4 Monitors relevant parameters (BP, SP02, HR, RR) during assessment and physical activity interventions that enhances the client's safety and comfort
				1.2.5 Identifies need for and makes recommendations of assistive devices to support client's safety and comfort when participating in physical activity (i.e., braces, gait aids, splints, compression garments)
				1.2.6 Performs foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity
	Monitor and respond to client's physical and emotional state throughout care	Yes	Included in 1.5.9	

	Identify and respond to near misses and adverse events	Yes	Expanded into 1.2.7, 1.2.8 and 1.2.9	1.2.7 Identifies signs and symptoms of hypoglycemic emergency in response to physical activity and takes appropriate action
				1.2.8 Identifies signs and symptoms of hyperglycemic emergency (diabetic ketoacidosis or hyperosmolar hyperglycemia state) in response to physical activity and takes appropriate action
				1.2.9 Identifies other adverse events resulting from physical activity intervention (e.g., pain, deterioration, fatigue) and respond appropriately with exercise modifications and education
1.3 Conduct client assessment	Interview client to obtain relevant information about health conditions, and personal and environmental factors	Yes	Expanded into 1.3.1, 1.3.2, 1.3.3	1.3.1 Interview client to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management
				1.3.2 Interviews client to determine their stage of behavior change and adjusts assessment and treatment plan accordingly
				1.3.3 Interview client to obtain a nutritional history
	Determine client's expectations, and their relevance to physiotherapy	Yes	Modified to 1.3.4	1.3.4 Determine client's health goals and expectations
	Obtain relevant information about client's status from other sources	Yes	Expanded into 1.3.5 and 1.3.6	1.3.5 Obtain information about client's status from lab work, diagnostic imaging, ECG/EKG, and PFT results relevant to physical activity for diabetes management

				1.3.6 Obtain information about client's status relevant to physical activity for diabetes management from consultations with other health professionals
	Identify comorbidities that impact approach to assessment	Yes	Expanded into 1.3.7 and 1.3.8	1.3.7 Identify client's risk factors for diabetes and/or macrovascular or microvascular complications
				1.3.8 Identify comorbidities that impact approach to assessment
	Identify urgent health conditions that require immediate attention and take appropriate action	Yes	Expanded into 1.3.9 and 1.3.10	1.3.9 Identify the need for and perform first aid or CPR when indicated
				1.3.10 Identify clinical flags requiring assessment by another member of the health care team (e.g., cauda equina, stress fracture)
	Identify non-urgent health-related conditions that may benefit from referral to other services, and advise client accordingly	Yes	Expanded into 1.3.11 and 1.3.12	1.3.11 Identify wound that may benefit from referral to other services, and advise client accordingly
				1.3.12 Identify inappropriately fitting prothesis that may benefit from referral to other services, and advise client accordingly
	Select and perform appropriate tests and measures	Yes	Modified to 1.3.13	1.3.13 Select and perform appropriate tests and measures in order to design diabetes physical activity assessment and intervention
1.4 Establish a diagnosis and prognosis.	Interpret assessment findings and other relevant information	Yes	Modified into 1.4.1	1.4.1 Interpret assessment findings and other relevant information to determine client's body structure and function impairments, activity limitations and participation restrictions
	Identify client's body structure and function impairments, activity limitations and participation restrictions	Yes	Modified into 1.4.1	

	Develop a physiotherapy diagnosis	Yes	Modified into 1.4.2	1.4.2 Develop a physiotherapy diagnosis and working prognosis
	Develop a working prognosis	Yes	Modified into 1.4.2	
	Determine if physiotherapy is indicated	Yes	Included into 1.4.1 and 1.4.3	1.4.3 Determine if a referral to another health care provider is indicated at the same time or before initiating physical activity
	Determine if referral to another physiotherapist or another provider is indicated	Yes	Modified into 1.4.3	
1.5 Develop, implement, monitor and evaluate an intervention plan	Establish physiotherapy goals	Yes	Modified into 1.5.1	1.5.1 Establish a physical activity intervention goal in collaboration with client
	Determine an intervention plan	Yes	Modified into 1.5.2	1.5.2 Develops a physical activity intervention plan appropriate to the client's current stage of change, health status and personal and environmental factors
	Implement planned interventions	Yes	Modified into 1.5.3	1.5.3 Provides education about the benefits and risk of various physical activities for individuals with type 1, 2 and gestational diabetes
	Assist client to develop self-management skills	Yes	Modified into 1.5.4	1.5.4 Assist client to develop self-management skills to manage diabetes
	Monitor and respond to client status during interventions	Yes	Expanded to 1.5.5, 1.5.6, 1.5.7 and 1.5.8	1.5.5 Identifies strategies to manage the hypoglycemic effect of physical activity for client's who use insulin or hyperglycemic medications with a risk of hypoglycemia
				1.5.6 Monitors and responds to respiratory needs of clients who use oxygen by modifying or stopping exercise, providing breathing strategies or titrating oxygen

				1.5.7 Monitors and responds to the needs of pregnant clients if they develop musculoskeletal complications (e.g., diastasis recti or joint instability)
				1.5.8 Monitors skin, wounds, blisters and scars during physical activity and responds appropriately with basic wound hygiene and self-management education
	Reassess client status and needs as appropriate	Yes	Modified into 1.5.9	1.5.9 Reassess client's needs and modify physical activity intervention plan as indicated
	Modify intervention plan as indicated	Yes	Modified into 1.5.9	
1.6 Complete or transition care	Evaluate client outcomes and goal attainment	Yes	Modified into 1.6	1.6 Evaluate client outcomes in response to physical activity intervention and communicate to interprofessional care team
	Develop a discharge or transition of care plan	No	Dropped	
	Prepare client for discharge or transition of care	No	Dropped	
	Ensure effective transfer of information at transition	No	Dropped	
1.7 Plan, deliver and evaluate programs	Identify opportunities for group physiotherapy programming	Yes	Modified into 1.7.1	1.7.1 Identify opportunities for group physical activity programming for diabetes management
	Establish program goals and develop a plan	Yes	Modified into 1.7.2	1.7.2 Plan, deliver and evaluate group physical activity programming for diabetes management
	Implement program plan	Yes	Modified into 1.7.2	
	Evaluate program	Yes	Modified into 1.7.2	
Communication domain				

2.1 Use oral and non-verbal communication effectively	Listen actively, to build trust and foster exchange of information	No	Dropped	
	Give and receive feedback in a constructive manner	No	Dropped	
	Speak clearly and concisely	No	Dropped	
	Use and respond to body language appropriately	No	Dropped	
2.2 Use written communication effectively	Prepare comprehensive and accurate health records and other documents, appropriate to purpose	No	Dropped	
	Ensure written communication is legible	No	Dropped	
	Write in a clear, concise and organized fashion	No	Dropped	
2.3 Adapt communication approach to context	Adjust communication based on level of understanding of recipient	No	Dropped	
	Adjust communication strategy consistent with purpose and setting	No	Dropped	
	Ensure communication is timely	No	Dropped	
	Share information empathetically and respectfully	No	Dropped	
	Use appropriate terminology	No	Dropped	
2.4 Use communication tools and technologies effectively	Employ assistive and augmentative devices to enhance communication	No	Dropped	
	Use electronic technologies appropriately and responsibly	No	Dropped	
	Use images, videos and other media to enhance communication	No	Dropped	
Collaboration domain				
3.1 Promote an integrated	Engage client as a team member	Yes	Modified into 3.1	3.1 Promote collaboration with client as key member of diabetes management care team

approach to client services	Identify practice situations that may benefit from collaborative care	Yes	Modified into 3.1	
3.2 Facilitate collaborative relationships	Interact with others in a manner that promotes inclusion	Yes	Included in 3.1 and 3.2 and 1.1.1	3.2 Facilitate collaborative relationships with interprofessional diabetes care team
	Maintain mutually supportive working relationships	Yes	Included in 3.1 and 3.2 and 1.1.1	
	Negotiate shared and overlapping roles and responsibilities	Yes	Generalized in 3.2	
	Recognize and respect the roles of others	Yes	Generalized in 3.2	
	Share information about the physiotherapist's role and knowledge	Yes	Included in 5.3 and 3.2	
3.3 Contribute to effective teamwork	Share relevant information with the team	Yes	Generalized into 3.2	
	Participate and be respectful of all members' participation in collaborative decision-making	Yes	Generalized into 3.2	
	Participate in shared leadership	Yes	Generalized into 3.2	
	Participate in team evaluation and improvement initiatives	Yes	Generalized into 3.2	
	Respect accepted principles for teamwork	Yes	Generalized into 3.2	
3.4 Contribute to conflict resolution	Apply conflict resolution principles in a structured fashion.	Yes	Generalized into 3.2	
	Recognize conflict or potential conflict, and respond constructively	Yes	Generalized into 3.2	
Management domain				

4.1 Support organizational excellence	Address discrepancies between employer expectations and professional standards	No	Dropped	
	Comply with organizational policies, procedures and directives	No	Dropped	
	Follow proper business practices	No	Dropped	
	Support organizational mission and vision	No	Dropped	
4.2 Utilize resources efficiently and effectively	Address issues related to availability of equipment and supplies	Yes	Modified into 4.2	4.2 Provide services that balance waitlists, client needs and available resources including delegating care to and supervising other personnel
	Address issues related to waitlists, caseloads and access to services	Yes	Modified into 4.2	
	Manage own time effectively	Yes	Modified into 4.2	
	Provide services that balance client needs and available resources	Yes	Modified into 4.2	
4.3 Ensure a safe practice environment	Adapt work environment to enhance emotional safety	No	Dropped	
	Adhere to individual, team and system-level safety practices	No	Dropped	
	Apply best practices for infection control	No	Dropped	
	Ensure regular equipment cleaning and maintenance	No	Dropped	
	Identify risks and mitigate hazards in the workplace	No	Dropped	
	Maintain a clean, organized and accessible work environment	No	Dropped	
4.4 Engage in quality improvement activities	Apply quality improvement strategies in direct service provision	No	Dropped	
	Participate in organizational quality improvement initiatives	No	Dropped	

	Use outcome data to evaluate service delivery	No	Dropped	
4.5 Supervise others	Assess the competence of personnel involved in physiotherapy service delivery prior to assigning care	Yes	Generalized into 4.2	
	Assign care to personnel involved in physiotherapy service delivery, and monitor delivery	Yes	Generalized into 4.2	
	Contribute to orientation and training of personnel involved in physiotherapy service delivery	Yes	Generalized into 4.2	
	Provide guidance and feedback to personnel involved in physiotherapy service delivery	Yes	Generalized into 4.2	
4.6 Manage practice information safely and effectively	Ensure secure retention, storage, transfer and destruction of documents	No	Dropped	
	Maintain comprehensive, accurate and timely records of client and practice management	No	Dropped	
	Maintain confidentiality of records and data, with appropriate access	No	Dropped	
	Manage health records and other information in paper and electronic format	No	Dropped	
	Leadership domain			
5.1 Champion the health needs of clients	Advocate for accessibility and sustainability of physiotherapy and other services across the continuum of care	Yes	Modified into 5.1	5.1 Advocate for physical activity opportunities and support that are sustainable, socially and culturally appropriate and geographically accessible to clients year-round
	Foster client engagement in finding solutions to address health needs	Yes	Modified into 5.1	

	Promote a culture of client-centeredness	Yes	Modified into 5.1	
5.2 Promote innovation in healthcare	Advocate for new approaches to improve client care	Yes	Include in 4.2 and 5.1	
	Maintain awareness of emerging technologies, and advocate for their application to enhance physiotherapy services	Yes	Included in 4.2 and 6.4 and 5.3	
	Promote solutions to challenges encountered in physiotherapy practice	Yes	Included in 4.2, 6.4 and 5.3 and 5.1	
5.3 Contribute to leadership in the profession	Contribute to leadership activities in the workplace	Yes	Modified into 5.3	5.3 Advocate for the value of physiotherapy to overcome barriers and facilitate improved physical activity interventions in diabetes care in primary care settings
	Engage in activities to support advancement of the physiotherapy profession	Yes	Modified into 5.3	
	Promote the value of physiotherapy to client health	Yes	Modified into 5.3	
	Scholarship domain			
6.1 Use an evidence-informed approach in practice	Incorporate best available evidence into clinical decision-making	Yes	Modified into 6.1	6.1 Use a structured evidence-informed approach incorporating best available evidence, client context and personal knowledge and experience into clinical decision making
	Incorporate client context into clinical decision making	Yes	Modified into 6.1	
	Incorporate personal knowledge and experience into clinical decision-making	Yes	Modified into 6.1	
	Make decisions using an established clinical reasoning framework	Yes	Modified into 6.1	
	Use a structured approach to evaluate effectiveness of decisions	Yes	Modified into 6.1	
	Access reliable sources of information	Yes	Modified into 6.2	

6.2 Engage in scholarly inquiry	Critically appraise information	Yes	Modified into 6.2	6.2 Able to access and critically appraise reliable sources of information relevant to practice
	Formulate researchable questions relevant to practice	Yes	Modified into 6.2	
	Identify ethical considerations related to scholarly inquiry	No	Dropped	
	Contribute to knowledge management	No	Dropped	
	Contribute to research activities	No	Dropped	
6.3 Integrate self-reflection and external feedback to improve personal practice	Compare personal performance and behaviour with professional and organizational expectations	No	Dropped	
	Develop and implement a plan to address learning needs	No	Dropped	
	Identify learning needs based on self-reflection and external feedback	No	Dropped	
	Seek feedback from others on personal performance and behaviour	No	Dropped	
6.4 Maintain currency with developments relevant to area of practice	Access emerging information relevant to area of practice	Yes	Modified into 6.4	6.4 Accesses emerging information relevant to physical activity and diabetes management and determines potential for applicability in primary care settings
	Determine potential for applicability of emerging information to personal practice	Yes	Modified into 6.4	
6.5 Contribute to the learning of others	Contribute to the education of peers and other healthcare providers	Yes	Modified into 6.5	6.5 Identify the learning needs of other healthcare providers related to physical activity and contribute to and assess the effectiveness of learning activities.
	Identify the physiotherapy-related learning needs of others	Yes	Modified into 6.5	
	Assess effectiveness of learning activities	Yes	Modified into 6.5	
	Contribute to the clinical education of students	No	Dropped	
Professionalism domain				

7.1 Comply with legal and regulatory requirements	Comply with applicable federal and provincial / territorial legislation	Yes	Generalized in 7.1	7.1 Comply with legal and regulatory requirements
	Maintain confidentiality and privacy as appropriate	Yes	Generalized in 7.1	
	Comply with regulatory requirements	Yes	Generalized in 7.1	
7.2 Behave ethically	Address real, potential or perceived conflicts of interest	Yes	Modified	7.2 Recognize and address real, potential or perceived conflicts of interest
	Promote services in an ethical manner	Yes	Assumption with 7.4.2	
	Use an ethical framework to guide decision making	Yes	Assumption with 7.4.2	
7.3 Embrace social responsibility as a health professional	Demonstrate awareness of the social determinants of health and emerging trends that may impact physiotherapy practice	Yes	Modified	7.3 Demonstrates awareness of the social determinants of health and emerging trends that may impact diabetes care
	Maintain awareness of issues and advances affecting the health system locally, nationally and globally	Yes	Modified	7.4 Acknowledges the legacy of colonization and its ongoing adverse effects on indigenous health - needs to be stronger than acknowledge.
7.4 Act with professional integrity	Work within physiotherapy scope of practice and personal level of competence	Yes	Modified	7.4.1 Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management
	Maintain professional boundaries	Yes	Generalized	7.4.2 Act with professional integrity
	Maintain professional deportment	Yes	Generalized	
	Accept accountability for decisions and actions	Yes	Generalized	
	Behave in a manner that values diversity	Yes	Included in 1.1.1	
	Behave with honesty and respect for others	Yes	Included in 1.1.1	

	Respond constructively to changes affecting the workplace	No	Dropped
7.5 Maintain personal wellness consistent with the needs of practice	Balance personal and professional demands	No	Dropped
	Address physical, emotional and psychological factors negatively impacting workplace performance	No	Dropped

[a] (National Physiotherapy Advisory Group, 2017)

Table G2

Physiotherapy Competency Development – Step Two

NPAG competency statements[a]	Modified physiotherapy statement from step one	Decision	Delphi round one competency statement
	Physiotherapy expertise domain		
1.1 Employ a client-centered approach	1.1.1. Employ a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, and is in the client's best interest	Combined with 3.1	Employ a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, with the client as a key member of diabetes management care team
1.2 Ensure physical and emotional safety of client	1.2.1 Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia		Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia
	1.2.2 Identifies client-specific precautions, contraindications and risks to physical activity participation from diabetes related comorbidities (e.g., foot ulcer, pre-		Identifies client-specific precautions, contraindications and risks to physical activity participation from pre-proliferative, proliferative retinopathy,

	proliferative retinopathy, autonomic neurological dysfunction)		autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes
	1.2.3 Identifies client-specific precautions, contraindications and risk to physical activity participation from other health conditions (e.g., arthritis, COPD, pregnancy related joint instability)		Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes
	1.2.4 Monitors relevant parameters (BP, SP02, HR, RR) during assessment and physical activity interventions that enhances the client's safety and comfort		Monitors relevant parameters including blood pressure, oximetry, heart rate, respiratory rate during assessment and physical activity interventions that enhances the client's safety and comfort
	1.2.5 Identifies need for and makes recommendations of assistive devices to support client's safety and comfort when participating in physical activity (i.e., braces, gait aids, splints, compression garments)		Identifies need for and makes recommendations for ambulatory, assistive, adaptive, and protective devices to support client's safety and comfort when participating in physical activity
	1.2.6 Performs foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity		Performs foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity
	1.2.7 Identifies signs and symptoms of hypoglycemic emergency in response to physical activity and takes appropriate action	Combined	Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action
	1.2.8 Identifies signs and symptoms of hyperglycemic emergency (diabetic ketoacidosis or hyperosmolar hyperglycemia state) in response to		

	physical activity and takes appropriate action		
	1.2.9 Identifies other adverse events resulting from physical activity intervention (e.g., pain, deterioration, fatigue) and respond appropriately with exercise modifications and education		Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider
1.3 Conduct client assessment	1.3.1 Interview client to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management		Interview clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management
	1.3.2 Interviews client to determine their stage of behavior change and adjusts assessment and treatment plan accordingly		Interviews client to determine their knowledge of diabetes, current self-management skills, and stage of behavior change and adjusts assessment and treatment plan accordingly
	1.3.3 Interview client to obtain a nutritional history	Combined with 1.3.7	
	1.3.4 Determine client's health goals and expectations	Combined with 1.5.1	
	1.3.5 Obtain information about client's status from lab work, diagnostic imaging, ECG/EKG, and PFT results relevant to physical activity for diabetes management		Obtains information about client's status from lab work, diagnostic imaging, ECG/EKG or PFT results relevant to physical activity for diabetes management

	1.3.6 Obtain information about client's status relevant to physical activity for diabetes management from consultations with other health professionals	Included in collaboration	
	1.3.7 Identify client's risk factors for diabetes and/or macrovascular or microvascular complications	Combined	Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications.
	1.3.8 Identify comorbidities that impact approach to assessment		
	1.3.9 Identify the need for and perform first aid or CPR when indicated	Dropped as not specific to population, intervention or practice setting	
	1.3.10 Identify clinical flags requiring assessment by another member of the health care team (e.g., cauda equina, stress fracture)	Combined with 1.4.3	As primary care practitioner, identifies yellow, orange or red flags and makes appropriate referrals to other team members and/or makes appropriate changes to assessment and treatment plans for physical activity interventions for diabetes care
	1.3.11 Identify wound that may benefit from referral to other services, and advise client accordingly		Identify wound that may benefit from referral to other services, and advise client accordingly
	1.3.12 Identify inappropriately fitting prothesis that may benefit from referral to other services, and advise client accordingly		Identify inappropriately fitting prothesis that may benefit from referral to other services, and advise client accordingly

	1.3.13 Select and perform appropriate tests and measures in order to design diabetes physical activity assessment and intervention		Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain
1.4 Establish a diagnosis and prognosis.	1.4.1 Interpret assessment findings and other relevant information to determine client's body structure and function impairments, activity limitations and participation restrictions	Combined	Interprets assessment findings and develops a physiotherapy diagnosis and working prognosis in order to design appropriate physical activity intervention for diabetes management
	1.4.2 Develop a physiotherapy diagnosis and working prognosis		
	1.4.3 Determine if a referral to another health care provider is indicated at the same time or before initiating physical activity	Combined with 1.3.10	
1.5 Develop, implement, monitor and evaluate an intervention plan	1.5.1 Establish a physical activity intervention goal in collaboration with client	combined	Establishes a physical activity goal in collaboration with client and develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors
	1.5.2 Develops a physical activity intervention plan appropriate to the client's current stage of change, health status and personal and environmental factors		
	1.5.3 Provides education about the benefits and risk of various physical activities for individuals with type 1, 2 and gestational diabetes	Expanded into two competencies	Educates clients living with type 1, type 2 and gestational diabetes about the benefits and risks of various physical activities with consideration for individual's existing comorbidities

			Implements and monitors customized physical activity intervention including aerobic, aquatic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life
	1.5.4 Assist client to develop self-management skills to manage diabetes		Assist clients to develop self-management skills in physical activity, foot care and nutrition counselling to support physical activity for diabetes management
	1.5.5 Identifies strategies to manage the hypoglycemic effect of physical activity for client's who use insulin or hyperglycemic medications with a risk of hypoglycemia		Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia
	1.5.6 Monitors and responds to respiratory needs of clients who use oxygen by modifying or stopping exercise, providing breathing strategies or titrating oxygen	Combined	Support clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including oxygen titration, breathing strategies, energy conservation, pelvic floor exercises, wound care, sensory training/retraining, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills
	1.5.7 Monitors and responds to the needs of pregnant clients if they develop musculoskeletal complications (e.g., diastasis recti or joint instability)		
	1.5.8 Monitors skin, wounds, blisters and scars during physical activity and responds appropriately with basic wound hygiene and self-management education		Monitors skin, wounds, blisters and scars during physical activity and responds appropriately with basic wound hygiene and self-management education

	1.5.9 Reassess client's needs and modify physical activity intervention plan as indicated		Monitor client's response to physical activity intervention, reassess client's needs and modify physical activity intervention plan as indicated
1.6 Complete or transition care	1.6 Evaluate client outcomes in response to physical activity intervention and communicate to interprofessional care team	Combined with 3.2 and 1.5.9	
1.7 Plan, deliver and evaluate programs	1.7.1 Identify opportunities for group physical activity programming for diabetes management		Identify opportunities for group physical activity programming for diabetes management
	1.7.2 Plan, deliver and evaluate group physical activity programming for diabetes management		Plan, deliver and evaluate group physical activity programming for diabetes management
	Communication domain		
2.1 Use oral and non-verbal communication effectively	*Dropped in step one*		
2.2 Use written communication effectively			
2.3 Adapt communication approach to context			
2.4 Use communication tools and technologies effectively			
	Collaboration domain		
3.1 Promote an integrated approach to client services	3.1 Promote collaboration with client as key member of diabetes management care team	Combined with 1.1.1	

3.2 Facilitate collaborative relationships	3.2 Facilitate collaborative relationships with interprofessional diabetes care team	Facilitate collaborative relationships with interprofessional diabetes care team
3.3 Contribute to effective teamwork		
3.4 Contribute to conflict resolution		
	Management domain	
4.1 Support organizational excellence	*Dropped in step one*	
4.2 Utilize resources efficiently and effectively	4.2 Provide services that balance waitlists, client needs and available resources including delegating care to and supervising other personnel	Provide services that balance waitlists, client needs and available resources including delegating care to and supervising personnel involved in physiotherapy service delivery for diabetes care
4.3 Ensure a safe practice environment	*Dropped in step one*	
4.4 Engage in quality improvement activities		
4.5 Supervise others		
4.6 Manage practice information safely and effectively		
	Leadership domain	

5.1 Champion the health needs of clients	5.1 Advocate for physical activity opportunities and support that are sustainable, socially and culturally appropriate and geographically accessible to clients year-round	Combined with 7.3	
5.2 Promote innovation in healthcare	*Dropped in step one*		
5.3 Contribute to leadership in the profession	5.3 Advocate for the value of physiotherapy to overcome barriers and facilitate improved physical activity interventions in diabetes care in primary care settings		Advocate for the value of physiotherapy services to overcome barriers and facilitate improved physical activity interventions in diabetes care in primary care settings
	Scholarship domain		
6.1 Use an evidence-informed approach in practice	6.1 Use a structured evidence-informed approach incorporating best available evidence, client context and personal knowledge and experience into clinical decision making		Use a structured evidence-informed approach incorporating best available evidence, client context and personal knowledge and experience into clinical decision making for diabetes care
6.2 Engage in scholarly inquiry	6.2 Able to access and critically appraise reliable sources of information relevant to practice	Combined with 6.4	Able to access and critically appraise emerging information relevant to physical activity and diabetes management and determine potential for applicability in primary care settings.
6.3 Integrate self-reflection and external feedback to improve personal practice	*Dropped in step one*		
6.4 Maintain currency with developments relevant to area of practice	6.4 Accesses emerging information relevant to physical activity and diabetes management and determines potential for applicability in primary care settings	Combined with 6.2	

6.5 Contribute to the learning of others	6.5 Identify the learning needs of other healthcare providers related to physical activity and contribute to and assess the effectiveness of learning activities.		Identify the learning needs related to physical activity and diabetes management of other healthcare providers and contribute to and assess the effectiveness of learning activities
	Professionalism domain		
7.1 Comply with legal and regulatory requirements	7.1 Comply with legal and regulatory requirements		Has been granted a "physiotherapist" designation by their provincial regulatory body which, through delegated authority from the provincial government, ensures ethical, competency and professional standards of practice are maintained using mechanisms including a public registry of individual physiotherapists and a robust complaint, investigative and disciplinary program with input from members of the public
7.2 Behave ethically	7.2 Recognize and address real, potential or perceived conflicts of interest		Recognize and address real, potential or perceived conflicts of interest with pharmaceutical companies and fitness facilities/vendors
7.3 Embrace social responsibility as a health professional	7.3 Demonstrates awareness of the social determinants of health and emerging trends that may impact diabetes care	Expanded into two competencies and combined with 5.1	Demonstrates awareness of the social determinants of health in diabetes management and advocate for physical activity opportunities and support that are sustainable, socially, and culturally appropriate and geographically accessible to clients year-round
			Recognize, explore and acknowledge the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples

	7.4 Acknowledges the legacy of colonization and its ongoing adverse effects on indigenous health		Incorporates a purposeful process of learning and continuous self-reflection recognizing one's own concepts of health, diabetes care and assumptions about Indigenous peoples and respecting an Indigenous person's preferences and barriers to re-connecting and integrating cultural resources and traditional approaches to care
7.4 Act with professional integrity	7.4.1 Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management		Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management as required by licensing body
	7.4.2 Act with professional integrity	included in 7.1	
7.5 Maintain personal wellness consistent with the needs of practice	*Dropped in step one*		

[a] (National Physiotherapy Advisory Group, 2017)

Appendix H

Kinesiology Competency Development for Delphi Round One

NPAG competency statements[a]	Delphi round one physiotherapist competencies	Modified Kinesiology competencies
	Physiotherapy expertise domain	Kinesiology expertise domain
1.1 Employ a client-centered approach	Employ a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, with the client as a key member of diabetes management care team	Act in a manner that respects client's diversity, autonomy and is in the best interest of the client when delivering physical activity interventions for diabetes management
1.2 Ensure physical and emotional safety of client	Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia	Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia
	Identifies client-specific precautions, contraindications and risks to physical activity participation from pre-proliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes	Identifies client-specific precautions, contraindications and risks to physical activity participation from pre-proliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes
	Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes	Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes
	Monitors relevant parameters including blood pressure, oximetry, heart rate, respiratory rate during assessment and physical activity interventions that enhances the client's safety and comfort	Monitors relevant parameters including blood pressure, oximetry, heart rate, respiratory rate during assessment and physical activity interventions that enhances the client's safety and comfort

	Identifies need for and makes recommendations for ambulatory, assistive, adaptive, and protective devices to support client's safety and comfort when participating in physical activity	*Dropped as not in CKA competency profile*
	Performs foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity	*Dropped as not in CKA competency profile*
	Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action	Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action
	Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider	Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider
1.3 Conduct client assessment	Interview clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management	Interview clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management
	Interviews client to determine their knowledge of diabetes, current self-management skills, and stage of behavior change and adjusts assessment and treatment plan accordingly	Interviews client to determine their knowledge of diabetes, current self-management skills, and stage of behavior change and adjusts assessment and treatment plan accordingly
	Obtains information about client's status from lab work, diagnostic imaging, ECG/EKG or PFT results relevant to physical activity for diabetes management	*Dropped as not in CKA competency profile*

	Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications.	Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications.
	As primary care practitioner, identifies yellow, orange or red flags and makes appropriate referrals to other team members and/or makes appropriate changes to assessment and treatment plans for physical activity interventions for diabetes care	*Dropped as not in CKA competency profile*
	Identify wound that may benefit from referral to other services, and advise client accordingly	*Dropped as not in CKA competency profile*
	Identify inappropriately fitting prothesis that may benefit from referral to other services, and advise client accordingly	*Dropped as not in CKA competency profile*
	Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain	Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain
1.4 Establish a diagnosis and prognosis.	Interprets assessment findings and develops a physiotherapy diagnosis and working prognosis in order to design appropriate physical activity intervention for diabetes management	Able to understand, evaluate, and interpret assessment findings and referral documentation to form a clinical impression

1.5 Develop, implement, monitor and evaluate an intervention plan	Establishes a physical activity goal in collaboration with client and develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors	Develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors
	Educates clients living with type 1, type 2 and gestational diabetes about the benefits and risks of various physical activities with consideration for individual's existing comorbidities	Educates clients living with type 1, type 2 and gestational diabetes about the benefits of various physical activities
	Implements and monitors customized physical activity intervention including aerobic, aquatic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life	Implements and monitors customized physical activity intervention including aerobic, aquatic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life
	Assist clients to develop self-management skills in physical activity, foot care and nutrition counselling to support physical activity for diabetes management	Assist clients to develop self-management skills in physical activity and nutrition counselling to support physical activity for diabetes management
	Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia	Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia
	Support clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including oxygen titration, breathing strategies, energy conservation, pelvic floor exercises, wound care, sensory training/retraining, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills	Support clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including ice, heat, exercise taping, transcutaneous electrical nerve stimulation, and ultrasound

	Monitors skin, wounds, blisters and scars during physical activity and responds appropriately with basic wound hygiene and self-management education	*Dropped as not in CKA competency profile*
	Monitor client's response to physical activity intervention, reassess client's needs and modify physical activity intervention plan as indicated	Monitor client's response to physical activity intervention for diabetes management, reassess client's needs and modifies physical activity intervention plan as indicated
1.6 Complete or transition care		
1.7 Plan, deliver and evaluate programs	Identify opportunities for group physical activity programming for diabetes management	Identify opportunities for group physical activity programming for diabetes management
	Plan, deliver and evaluate group physical activity programming for diabetes management	Plan, deliver and evaluate group physical activity programming for diabetes management
Communication domain		
2.1 Use oral and non-verbal communication effectively		
2.2 Use written communication effectively		
2.3 Adapt communication approach to context		
2.4 Use communication tools and technologies effectively		
Collaboration domain		

3.1 Promote an integrated approach to client services		
3.2 Facilitate collaborative relationships	Facilitate collaborative relationships with interprofessional diabetes care team	Facilitate collaborative relationships with interprofessional diabetes care team
3.3 Contribute to effective teamwork		
3.4 Contribute to conflict resolution		
Management domain		
4.1 Support organizational excellence		
4.2 Utilize resources efficiently and effectively	Provide services that balance waitlists, client needs and available resources including delegating care to and supervising personnel involved in physiotherapy service delivery for diabetes care	*Dropped as not in CKA competency profile*
4.3 Ensure a safe practice environment		
4.4 Engage in quality improvement activities		
4.5 Supervise others		

4.6 Manage practice information safely and effectively		
	Leadership domain	
5.1 Champion the health needs of clients		
5.2 Promote innovation in healthcare		
5.3 Contribute to leadership in the profession	Advocate for the value of physiotherapy services to overcome barriers and facilitate improved physical activity interventions in diabetes care in primary care settings	Able to facilitate client access to kinesiology services and resources to physical activity interventions in diabetes care in primary care
	Scholarship domain	
6.1 Use an evidence-informed approach in practice	Use a structured evidence-informed approach incorporating best available evidence, client context and personal knowledge and experience into clinical decision making for diabetes care	Able to use best practice guidelines including the interpretation and application of current evidence-based knowledge into clinical decision making for physical activity intervention in diabetes care
6.2 Engage in scholarly inquiry	Able to access and critically appraise emerging information relevant to physical activity and diabetes management and determine potential for applicability in primary care settings.	
6.3 Integrate self-reflection and external feedback to improve		

personal practice		
6.4 Maintain currency with developments relevant to area of practice		
6.5 Contribute to the learning of others	Identify the learning needs related to physical activity and diabetes management of other healthcare providers and contribute to and assess the effectiveness of learning activities	*Dropped as not in CKA competency profile*
	Professionalism domain	
7.1 Comply with legal and regulatory requirements	Has been granted a "physiotherapist" designation by their provincial regulatory body which, through delegated authority from the provincial government, ensures ethical, competency and professional standards of practice are maintained using mechanisms including a public registry of individual physiotherapists and a robust complaint, investigative and disciplinary program with input from members of the public	Complies with the code of ethics established by their professional body and is committed to continuing competency
7.2 Behave ethically	Recognize and address real, potential or perceived conflicts of interest with pharmaceutical companies and fitness facilities/vendors	Recognize and address real, potential or perceived conflicts of interest with pharmaceutical companies and fitness facilities/vendors
7.3 Embrace social responsibility as a health professional	Demonstrates awareness of the social determinants of health in diabetes management and advocate for physical activity opportunities and support that are sustainable, socially, and culturally appropriate and geographically accessible to clients year-round	Demonstrates awareness of social determinants of health in diabetes management

	Recognize, explore and acknowledge the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples	Recognize, explore and acknowledge the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples
	Incorporates a purposeful process of learning and continuous self-reflection recognizing one's own concepts of health, diabetes care and assumptions about Indigenous peoples and respecting an Indigenous person's preferences and barriers to re-connecting and integrating cultural resources and traditional approaches to care	*Dropped as not in CKA competency profile*
7.4 Act with professional integrity	Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management as required by licensing body	Understands and works within own professional knowledge, competence and skill set
7.5 Maintain personal wellness consistent with the needs of practice		

[a](National Physiotherapy Advisory Group, 2017)

Appendix I

Physiotherapy Delphi Round One Survey

The purpose of this survey is to **establish the common and distinct competencies of entry-level physiotherapists and kinesiologists** in physical activity for diabetes in primary care settings. The results will be used to develop a referral pathway tool for diabetes care by exercise specialists, for use by interprofessional primary care teams.

The *Competency Profile for Physiotherapists in Canada* outlines the essential competencies of entry-level physiotherapists. These essential competencies are the "required ability of a physiotherapist" at the point of entry-to-practice[1].

For this survey, competency statements that were relevant to physical activity interventions for diabetes care in primary care settings were modified to reflect the intervention, patient population and clinical context. The modified competencies primarily fell into 4 of the 7 domains: Physiotherapy expertise, collaboration, scholarship, and professionalism.

The following section of the survey consists of 40 proposed competency statements for **entry-level physiotherapists related to physical activity intervention for diabetes care in primary care settings**.

You will be asked to **rate your level of agreement** with each competency statement. If applicable, include comments or suggestions about how you would modify the statement to better reflect the competencies held by **all entry-level physiotherapists**. You could either rephrase the statement or tell us what should be added, what should be removed or what should be changed. For example, in a competency statement about treatment modalities, you may agree with most of the statement, but think that not all entry-level physiotherapists would be proficient with one of the modalities mentioned. In the comments section you could write "*remove XX modality*" or you could rewrite the statement yourself with the modality removed. If you feel a competency statement should be added, please include it in your comments.

1. National Physiotherapy Advisory Group. (2017). *Competency profile for physiotherapist in Canada*. https://www.peac-aepc.ca/pdfs/Resources/Competency%20Profiles/Competency%20Profile%20for%20PTs%202017%20EN.pdf

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Domain: PHYSIOTHERAPY EXPERTISE
Ensures physical and emotional safety of client

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

1. Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

2. Identifies client-specific precautions, contraindications and risks to physical activity participation from preproliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

3. Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

4. Monitors relevant parameters including blood pressure, oximetry, heart rate, and respiratory rate during assessment and physical activity intervention that enhances the client's safety and comfort

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

5. Identifies need for and makes recommendations for ambulatory, assistive, adaptive, and protective devices to support client's safety and comfort when participating in physical activity

(<u>Ambulatory devices:</u> canes, crutches, walkers, walking poles, wheelchairs; Assistive, adaptive, protective devices: splints, taping/wrapping, bandaging, braces, orthotics, garments, collars)[1]

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

6. Performs foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

7. Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

8. Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PHYSIOTHERAPY EXPERTISE (continued)
Conducts client assessment

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

9. Interviews clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

10. Interviews clients to determine their knowledge of diabetes, current self-management skills, and stage of behavior change and adjusts assessment and treatment plan accordingly

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

11. Obtains information about client's status from lab work, diagnostic imaging, electrocardiogram or pulmonary function test results relevant to physical activity for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

12. Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

13. As a primary care practitioner, identifies yellow, orange or red flags and makes appropriate referrals to other team members and/or makes appropriate changes to assessment and treatment plans for physical activity interventions for diabetes care *(Red flags: signs of serious pathology; Orange flags: psychiatric symptoms; Yellow flags: maladaptive pain coping strategies)* [2]

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

14. Identifies wounds that may benefit from referral to other services, and advises clients accordingly

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

15. Identifies inappropriately fitting prothesis that may benefit from referral to other services, and advises clients accordingly

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

16. Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

17. Interprets assessment findings and develops a physiotherapy diagnosis and working prognosis in order to design appropriate physical activity intervention for diabetes management

(*Physiotherapy diagnosis: A conclusion about physical function based on a subjective and objective assessment and analysis by a physiotherapist to investigate the cause or nature of a client's condition or problem)*[1]

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PHYSIOTHERAPY EXPERTISE (continued)
Develops, implements, monitors and evaluates an intervention plan

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

18. Establishes a physical activity goal for diabetes management in collaboration with client and develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

19. Educates clients living with type 1, type 2 and gestational diabetes about the benefits and risks of various physical activities with consideration for individual's existing comorbidities

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

20. Implements and monitors customized physical activity intervention including aerobic, aquatic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

21. Assists clients to develop self-management skills in physical activity, foot care and nutrition counselling to support physical activity for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

22. Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

23. Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including oxygen titration, breathing strategies, energy conservation, pelvic floor exercises, wound care, sensory training/retraining, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

24. Monitors skin, wounds, blisters and scars during physical activity for diabetes management and responds appropriately with basic wound hygiene and self-management education

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

25. Monitors client’s response to physical activity intervention for diabetes management, reassesses client's needs and modifies physical activity intervention plan as indicated

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

26. Identifies opportunities for group physical activity programming for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

27. Plans, delivers and evaluates group physical activity programming for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: COLLABORATION

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

28. Employs a client-centered approach by acting in a manner that respects client uniqueness, diversity and autonomy, with the client as a key member of the diabetes management care team

(Diversity: refers to variation among people including, but not limited to, variation based upon factors such as race, ethnicity, colour, religion, age, sex, sexual orientation, marital status, family status, and disability)[1]

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

29. Facilitates collaborative relationships with interprofessional diabetes care team

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

30. Provides services that balance waitlists, client needs and available resources including delegating care to and supervising personnel involved in physiotherapy service delivery for diabetes care

(Personnel involved in physiotherapy service delivery: includes support personnel, assistants, volunteers, and other healthcare providers, who may provide physiotherapy services under the direction and supervision of a physiotherapist)[1]

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

31. Identifies the learning needs related to physical activity and diabetes management of other healthcare providers and contributes to and assesses the effectiveness of learning activities

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: SCHOLARSHIP

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.** If applicable, include comments or suggestions about how you would modify the statement.

32. Able to access and critically appraise emerging information relevant to physical activity and diabetes management and determine potential for applicability in primary care settings

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

33. Uses a structured evidence-informed approach incorporating best available evidence, client context and personal knowledge and experience into clinical decision making for diabetes care

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PROFESSIONALISM

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.** If applicable, include comments or suggestions about how you would modify the statement.

34. Advocates for the value of physiotherapy services to overcome barriers and facilitate improved physical activity interventions in diabetes care in primary care settings
(Physiotherapy services: services provided by or under the direction of a physiotherapist. This includes client assessment and intervention, and related communication with and reporting to various parties for the purposes of delivering client care)[1]

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

35. Has been granted a "physiotherapist" designation by their provincial regulatory body which, through delegated authority from the provincial government, ensures ethical, competency and professional standards of practice are maintained using mechanisms including a public registry of individual physiotherapists and a robust complaint, investigative and disciplinary program with input from members of the public

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

36. Recognizes and addresses real, potential or perceived conflicts of interest with pharmaceutical companies and fitness facilities/vendors

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]

Please explain your selection: [if selected any other response]

37. Demonstrates awareness of the social determinants of health in diabetes management and advocates for physical activity opportunities and support that are sustainable, socially, and culturally appropriate and geographically accessible to clients year round

[[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

38. Recognizes, explores and acknowledges the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

39. Incorporates a purposeful process of learning and continuous self-reflection recognizing one's own concepts of health, diabetes care and assumptions about Indigenous peoples and respecting an Indigenous person's preferences and barriers to re-connecting and integrating cultural resources and traditional approaches to care

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

40. Understands and works within physiotherapy scope of practice and personal level of competence in diabetes management as required by licensing body

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Three practice domains from the *Competency Profile for Physiotherapists in Canada* were not included in this survey (communication, management, and leadership). The competencies from these domains were either deemed to be not specifically relevant to physical activity interventions for diabetes care in primary care settings or were accounted for within the included domains in other competency statements.

Were there any competencies missing from this survey that you think should have been included related to communication, management, or leadership? If so please specify:

_____

_____

_____

1. National Physiotherapy Advisory Group. (2017). *Competency profile for physiotherapist in Canada*. https://www.peac-aepc.ca/pdfs/Resources/Competency%20Profiles/Competency%20Profile%20for%20PTs%202017%20EN.pdf
2. Nicholas, M. K., Linton, S. J., Watson, P. J., & Main, C. J. (2011). Early identification and management of psychological risk factors ("yellow flags") in patients with low back pain: A reappraisal. *Physical Therapy*, *91*(5), 737–753. https://doi.org/10.2522/PTJ.20100224

This is the end of the survey.

Once you click submit, you will not be able to return to the survey to make any further changes to your answers

Thank you for taking the time to complete the survey and for your collaboration in this research project!

Appendix J

Kinesiology Delphi Round One Survey

The purpose of this survey is to **establish the common and distinct competencies of entry-level physiotherapists and kinesiologists** in physical activity for diabetes in primary care settings. The results will be used to develop a referral pathway tool for diabetes care by exercise specialists, for use by interprofessional primary care teams.

The *Competency Profile for Physiotherapists in Canada* outlines the essential competencies of entry-level physiotherapists. These essential competencies are the "required ability of a physiotherapist" at the point of entry-to-practice[1]. The *Canadian Kinesiology Alliance (CKA) Competency Profile* outlines the "knowledge and skills an entry-level practitioner should possess" at the point of entry-to-practice[2].

For this survey, the *Competency Profile for Physiotherapists in Canada* was used as a framework and competency statements that were relevant to physical activity interventions for diabetes care in primary care settings were modified to reflect the intervention, patient population, clinical context and exercise professional (based on the CKA competency profile). The modified competencies primarily fell into 4 of the 7 domains: Kinesiology expertise, collaboration, scholarship, and professionalism.

The following section of the survey consists of 29 proposed competency statements for **entry-level kinesiologists (who are affiliated with the CKA) related to physical activity intervention for diabetes care in primary care settings**.

You will be asked to **rate your level of agreement** with each competency statement. If applicable, include comments or suggestions about how you would modify the statement to better reflect the competencies held by **all entry-level CKA affiliated kinesiologists**. You could either rephrase the statement or tell us what should be added, what should be removed or what should be changed. For example, in a competency statement about treatment modalities, you may agree with most of the statement but think that not all entry-level kinesiologists would be proficient with one of the modalities mentioned. In the comments section you could write "*remove XX modality*" or you could rewrite the statement yourself with the modality removed. If you feel a competency statement should be added, please include it in your comments.

1. National Physiotherapy Advisory Group. (2017). *Competency profile for physiotherapist in Canada*. https://www.peac-aepc.ca/pdfs/Resources/Competency%20Profiles/Competency%20Profile%20for%20PTs%202017%20EN.pdf
2. Canadian Kinesiology Alliance. (n.d.). *What are the requirements for affiliation?* Retrieved September 8, 2021, from https://www.cka.ca/en/requirements-affiliation

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Domain: KINESIOLOGY EXPERTISE
Ensures physical and emotional safety of client

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.**
If applicable, include comments or suggestions about how you would modify the statement.

1. Identifies client-specific precautions, contraindications and risks to physical activity participation from acute hyperglycemia, hypoglycemia or pseudo-hypoglycemia

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

2. Identifies client-specific precautions, contraindications and risks to physical activity participation from preproliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

3. Identifies client-specific precautions, contraindications and risks to physical activity participation from non-diabetes related comorbidities in people living with diabetes

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

4. Monitors relevant parameters including blood pressure, oximetry, heart rate, respiratory rate during assessment and physical activity interventions that enhances the client's safety and comfort

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

5. Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

6. Identifies and responds to non-glycemic adverse responses to physical activity interventions for diabetes management with exercise modifications, education and/or consultation with appropriate health care provider

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: KINESIOLOGY EXPERTISE (continued)

Conducts client assessment

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.** If applicable, include comments or suggestions about how you would modify the statement.

7. Interviews clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

8. Interviews client to determine their knowledge of diabetes, current self-management skills, and stage of behavior change and adjusts assessment and treatment plan accordingly

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

9. Identifies risk factors such as comorbidities, smoking, nutritional, alcohol/drug use, and activity level that place healthy or pre-diabetes populations at high risk for developing diabetes and those already living with diabetes, at high risk of developing diabetes related complications.

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

10. Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

11. Able to understand, evaluate, and interpret assessment findings and referral documentation to form a clinical impression

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: KINESIOLOGY EXPERTISE (continued)
Develops, implements, monitors and evaluates an intervention plan

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.** If applicable, include comments or suggestions about how you would modify the statement.

12. Develops an intervention plan appropriate to the client's goals, current stage of change, current health status and personal and environmental factors

[]	[]	[]	[]	[]

Strongly agree Agree Neutral Disagree Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

13. Educates clients living with type 1, type 2 and gestational diabetes about the benefits of various physical activities

[] [] [] [] []
Strongly agree Agree Neutral Disagree Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

14. Implements and monitors customized physical activity intervention including aerobic, aquatic, strength, flexibility and/or balance exercises designed to optimize glycemic control, cardiorespiratory fitness, diabetes complication risk and/or quality of life

[] [] [] [] []
Strongly agree Agree Neutral Disagree Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

15. Assists clients to develop self-management skills in physical activity and nutrition counselling to support physical activity for diabetes management

[] [] [] [] []
Strongly agree Agree Neutral Disagree Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

16. Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia

[] [] [] [] []
Strongly agree Agree Neutral Disagree Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

17. Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including ice, heat, exercise, taping, transcutaneous electrical nerve stimulation, and ultrasound.

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

18. Monitors client's response to physical activity intervention for diabetes management, reassesses client's needs and modifies physical activity intervention plan as indicated

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

19. Identifies opportunities for group physical activity programming for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

20. Plan, deliver and evaluate group physical activity programming for diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: COLLABORATION

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.** If applicable, include comments or suggestions about how you would modify the statement.

21. Acts in a manner that respects clients' diversity, autonomy and is in the best interest of the client when delivering physical activity interventions for diabetes management

(Diversity: refers to variation among people including, but not limited to, variation based upon factors such as race, ethnicity, colour, religion, age, sex, sexual orientation, marital status, family status, and disability)[1]

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

22. Facilitates collaborative relationships with interprofessional diabetes care team

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: SCHOLARSHIP

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.** If applicable, include comments or suggestions about how you would modify the statement.

23. Able to use best practice guidelines including the interpretation and application of current evidence-based knowledge into clinical decision making for physical activity intervention in diabetes care

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PROFESSIONALISM

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.** If applicable, include comments or suggestions about how you would modify the statement.

24. Able to facilitate client access to kinesiology services and resources to physical activity interventions in diabetes care in primary care

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

25. Complies with the code of ethics established by their professional body and is committed to continuing competency

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

26. Recognizes and addresses conflicts of interest with pharmaceutical companies and fitness facilities/vendors

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

27. Demonstrates awareness of the social determinants of health in diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

28. Recognizes, explores and acknowledges the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

29. Understands and works within own professional knowledge, competence, and skill set in diabetes management

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Three practice domains from the *Competency Profile for Physiotherapists in Canada* were not included in this survey (communication, management, and leadership). The competencies from these domains were either deemed to be not specifically relevant to physical activity interventions for diabetes care in primary care settings or were accounted for within the included domains in other competency statements.

Were there any competencies missing from this survey that you think should have been included related to communication, management, or leadership? If so please specify:

_____

_____

_____

1. National Physiotherapy Advisory Group. (2017). *Competency profile for physiotherapist in Canada*. https://www.peac-aepc.ca/pdfs/Resources/Competency%20Profiles/Competency%20Profile%20for%20PTs%202017%20EN.pdf

This is the end of the survey.
Once you click submit, you will not be able to return to the survey to make any further changes to your answers

Thank you for taking the time to complete the survey and for your collaboration in this research project!

Appendix K

Physiotherapy Delphi Round Two Survey

The following survey consists of 14 proposed competency statements for **entry-level physiotherapists related to physical activity interventions for diabetes care in primary care settings**.

Following Round 1, any competency statements that all or most of the expert physiotherapist panel agreed upon have been removed from the Round 2 survey. Those that did not achieve consensus and therefore need further review, have been modified based on your feedback and included in this survey.

To review, the purpose of this study is to understand both the similarities and the differences between the competencies of physiotherapists and kinesiologists in this practice area. The results will be used to develop a referral pathway tool for diabetes care by exercise specialists, for use by interprofessional primary care teams.

When rating your level of agreement, consider that the **final list of competency statements should capture the full range of skills and abilities that an entry-level physiotherapist would bring to a primary care practice setting**. Understanding that in clinical practice, how these competencies are enacted in a particular practice, will be dependent on the interprofessional team as a whole, and their collective skill set. For example, a physiotherapist who works in a large urban primary care setting with a nurse, dietitian and pharmacist, may work within a more focused scope of practice, as team members determine who would be best to perform a given task. In comparison, a physiotherapist who practices in a remote community, with fewer or less consistent interprofessional team members, may practice to a fuller scope, as there are less shared competencies amongst the team.

In Round 2, you will be asked to **rate your level of agreement** with each of the modified competency statements. If applicable, include comments or suggestions about how you would modify the statement to better reflect the competencies held by **all entry-level physiotherapists**.

You could either rephrase the statement or tell us what should be added, what should be removed or what should be changed. For example, in a competency statement about treatment modalities, you may agree with most of the statement, but think that not all entry-level physiotherapists would be proficient with one of the modalities mentioned. In the comments section you could write "*remove XX modality*" or you could rewrite the statement yourself with the modality removed. If you feel a competency statement should be added, please include it in your comments.

Feedback from Round 1:
Along with each of the following competency statements, you will find your previous rating of agreement, as well as the median (central tendency) and range (variability) of scores from the entire physiotherapist expert panel.

Each response from the Likert scale was given a value between 1-5.
Strongly agree (1), Agree (2), Neutral (3), Disagree (4), Strongly disagree (5)

The median of responses is the middle value when all the responses are arranged in order. For example, if 3 people voted strongly agree, 3 voted agree and 2 voted disagree, and 1 voted strongly disagree, the central tendency or median would be the middle value (**Example A**: median= 2 or Agree).

Example A:

1 1 1 2 2 2 3 3 4 4 5
Median= Agree

Range, on the other hand, shows the variability in responses for each statement. For example, if everyone strongly agreed or agreed with a competency statement, the range would be small, meaning the range of responses had low variability (**Example B**: 2-1).

Example B:

1 1 1 1 1 2 2 2 2 2 2
Highest value – lowest value
Range = Agree – Strongly agree

However, if most everyone strongly agreed and only one person strongly disagreed the range would be large, meaning the range of responses was highly variable (**Example C**: 5-1).

Example C:

1 1 1 1 1 1 1 5
Highest value – lowest value
Range = Strongly disagree – Strongly agree

Domain: PHYSIOTHERAPY EXPERTISE
Ensures physical and emotional safety of client

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

1. **Identifies client-specific precautions, contraindications and risks to physical activity participation from sensory, motor or autonomic neuropathies, retinopathy, nephropathy, active or previous history of foot ulcer, or pregnancy related complications in women with gestational diabetes**

Your previous rating:
Median: Agree (2)
Range: Disagree (4) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

2. **Identifies need for and is able to perform a foot assessment including peripheral circulation, sensory testing and skin integrity to ensure client's safety and comfort when participating in physical activity for diabetes management**

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

3. **Identifies and responds appropriately to non-glycemic related adverse responses to physical activity interventions for diabetes management**

Your previous rating:
Median: Strongly agree (1)
Range: Disagree (4) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PHYSIOTHERAPY EXPERTISE (continued)
Conducts client assessment

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

4. **Interviews clients living with type 1, type 2 or gestational diabetes to obtain relevant information about diabetes, other health conditions, and personal and environmental factors relevant to physical activity for diabetes management**

Your previous rating:
Median: Strongly agree (1)
Range: Disagree (4) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

5. **Interviews clients to determine their personal health literacy, current self-management skills and stage of behavior change, as it relates to physical activity, and adjusts assessment, treatment plan and self-management education and support accordingly**

Personal Health Literacy: "is the degree to which individuals have the ability to find, understand, and use information and services to inform health related decisions and actions for themselves and others" [1]

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

6. **Identifies risk factors such as low physical activity level, comorbidities, smoking, nutrition, and alcohol/drug use that place pre-diabetes and diabetes populations at high risk for developing diabetes or developing diabetes related complications, respectively**

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

7. **Identifies wounds or Charcot foot that may benefit from referral to other services, and advises client's accordingly**

Your previous rating:
Median: Strongly agree (1)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

8. **Interprets assessment findings and develops a physiotherapy diagnosis and working prognosis in order to design appropriate physical activity intervention for diabetes management**

(Physiotherapy diagnosis: A conclusion about physical function based on a subjective and objective assessment and analysis by a physiotherapist to investigate the cause or nature of a client's condition or problem)[2]

Your previous rating:
Median: Strongly agree (1)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PHYSIOTHERAPY EXPERTISE (continued)
Develops, implements, monitors and evaluates an intervention plan

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

9. **Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or hyperglycemic medications with a risk of hypoglycemia**

including, treating acute hypoglycemia and collaboration with other primary care team members for insulin adjustments as appropriate

Your previous rating:
Median: Agree (2)
Range: Disagree (4) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

10. **Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions which could include oxygen titration, breathing strategies, energy conservation, pelvic floor exercises, wound care, sensory training/retraining, electrophysical agents, spinal/peripheral joint mobilizations, neurodynamic techniques, and wheelchair skills**

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

11. **Plans, delivers and evaluates group physical activity programming for diabetes management when appropriate, given available resources**

Your previous rating:
Median: Strongly agree (1)
Range: Strongly disagree (5) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: SCHOLARSHIP

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

12. **Able to access and critically appraise emerging information about physical activity and diabetes and determine potential for applicability in primary care settings**

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PROFESSIONALISM

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL licensed entry-level physiotherapists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

13. **Has been granted a "physiotherapist" designation by their provincial regulatory body which, through delegated authority from the provincial government, ensures ethical, competency and professional standards of practice are maintained using mechanisms including a public registry of individual physiotherapists and a robust complaint, investigative and disciplinary program with input from members of the public**

Your previous rating:
Median: Strongly agree (1)
Range: Neutral (3) - Strongly agree (1)
** We are suggesting that the above competency statement be removed from the list of competency statements, as it is not specific to physical activity interventions for diabetes management in primary care. The information would, instead, be included as part of background information accompanying the referral pathway tool as it is a differentiating factor between physiotherapists and kinesiologists. Please rate your level of agreement with this decision below.**

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

14. Recognizes and addresses real, potential or perceived conflicts of interest with pharmaceutical companies and/or fitness facilities/vendors when providing physical activity interventions, education or recommendations to clients

Your previous rating:
Median: Agree (2)
Range: Disagree (4) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Do you have any additional comments to share?

_____

_____

1. Centers for Disease Control and Prevention. (2022, February 2). Health Literacy. https://www.cdc.gov/healthliteracy/learn/index.html
2. National Physiotherapy Advisory Group. (2017). *Competency profile for physiotherapists in Canada*. https://www.peac-aepc.ca/pdfs/Resources/Competency%20Profiles/Competency%20Profile%20for%20PTs%202017%20EN.pdf

This is the end of the survey.

Once you click submit, you will not be able to return to the survey to make any further change to your answers

Thank you for taking the time to complete the survey and for your collaboration in this research project!

Appendix L

Kinesiology Delphi Round Two Survey

The following survey consists of 9 proposed competency statements for **entry-level kinesiologists who are affiliated with the Canadian Kinesiology Alliance (CKA) related to physical activity intervention for diabetes care in primary care settings.**

Following Round 1, any competency statements that all or most of the expert kinesiologist panel agreed upon have been removed from the Round 2 survey. Those that did not achieve consensus and therefore need further review have been included in this survey.

The outcome of this project will be a referral pathway tool for diabetes care by exercise specialists, for use by interprofessional primary care teams. **An expert panel of physiotherapists has completed a similar survey with their own set of competencies.**

When rating your level of agreement, consider that the final list of competency statements should **represent the skills and abilities that ALL entry-level kinesiologists (affiliated with the CKA) bring to a primary care setting without additional education/training.** For example, when rating, you should not consider the skills and abilities acquired through extra certifications such as, Canadian Society of Exercise Physiology (CSEP) Clinical Exercise Physiologist (CEP) certification.

In Round 2, you will be asked to **rate your level of agreement** with each of the modified competency statements. If applicable, include comments or suggestions about how you would modify the statement to better reflect the competencies held by **all entry-level CKA kinesiologists**.

You could either rephrase the statement or tell us what should be added, what should be removed or what should be changed. For example, in a competency statement about treatment modalities, you may agree with most of the statement, but think that not all entry-level kinesiologists would be proficient with one of the modalities mentioned. In the comments section you could write "*remove XX modality*" or you could rewrite the statement yourself with the modality removed. If you feel a competency statement should be added, please include it in your comments.

The *Canadian Kinesiology Alliance (CKA) Competency Profile* outlines the "knowledge and skills an entry-level practitioner should possess" at the point of entry-to-practice[2].

Feedback from Round 1:
Along with each of the following competency statements, you will find your previous rating of agreement, as well as the median (central tendency) and range (variability) of scores from the entire kinesiologist expert panel.

Each response from the Likert scale was given a value between 1-5.
Strongly agree (1), Agree (2), Neutral (3), Disagree (4), Strongly disagree (5)

The median of responses is the middle value when all the responses are arranged in order. For example, if 3 people voted strongly agree, 3 voted agree and 2 voted disagree, and 1 voted strongly disagree, the central tendency or median would be the middle value (**Example A**: median= 2 or Agree).

Example A:

1 1 1 2 2 2 3 3 4 4 5

Median= Agree

Range, on the other hand, shows the variability in responses for each statement. For example, if everyone strongly agreed or agreed with a competency statement, the range would be small, meaning the range of responses had low variability (**Example B**: 2-1).

Example B:

1 1 1 1 1 2 2 2 2 2 2

Highest value – lowest value

Range = Agree – Strongly agree

However, if most everyone strongly agreed and only one person strongly disagreed the range would be large, meaning the range of responses was highly variable (**Example C**: 5-1).

Example C:

1 1 1 1 1 1 1 5

Highest value – lowest value

Range = Strongly disagree – Strongly agree

Domain: KINESIOLOGY EXPERTISE

Ensures physical and emotional safety of client

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

1. **Identifies client-specific precautions, contraindications and risks to physical activity participation from preproliferative, proliferative retinopathy, autonomic neurological dysfunction, foot ulcer or pregnancy related complications in women with gestational diabetes**

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

2. **Identifies signs and symptoms of hypoglycemic and hyperglycemic emergencies in response to physical activity and takes appropriate action**

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: KINESIOLOGY EXPERTISE (continued)
Conducts client assessment

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

3. **Selects and performs appropriate tests and measures to identify current fitness level and potential barriers to physical activity for diabetes management including pelvic ligament laxity, diastasis recti, impaired skin integrity, respiratory, vascular or neurological impairments, cognitive or mental health disorders, musculoskeletal injury or chronic pain**

Your previous rating:
Median: Agree (2)
Range: Strongly disagree (5) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: KINESIOLOGY EXPERTISE (continued)
Develops, implements, monitors and evaluates an intervention plan

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

4. **Identifies strategies to manage the hypoglycemic effect of physical activity for clients who use insulin or anti-hyperglycemic medications with a risk of hypoglycemia**

Your previous rating:
Median: Agree (2)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

5. **Supports clients with comorbidities to perform physical activity for diabetes management through therapeutic interventions including ice, heat, exercise, and taping.**

Your previous rating:
Median: Neutral (3)
Range: Strongly disagree (5) - Agree (2)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: COLLABORATION
Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

6. **Fosters collaborative relationships with interprofessional diabetes care team**

Your previous rating:
Median: Strongly agree (1)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Domain: PROFESSIONALISM

Please **rate your level of agreement** with the following competency statements related to the **skills and abilities held by ALL CKA affiliated entry-level kinesiologists.**
If applicable, include comments or suggestions about how you would modify the statement.

Median: The middle value when all the responses are arranged in order
Range: The variability in responses for each statement

7. **Complies with the code of ethics established by their professional body and is committed to continuing competency**

Your previous rating:
Median: Strongly agree (1)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

8. **Recognizes and addresses conflicts of interest with pharmaceutical companies and fitness facilities/vendors**

Your previous rating:
Median: Strongly agree (1)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

9. **Recognizes, explores and acknowledges the relationship between the legacy of colonization and current high rates of diabetes amongst Indigenous peoples**

Your previous rating:
Median: Neutral (3)
Range: Neutral (3) - Strongly agree (1)

[]	[]	[]	[]	[]
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Comments: [if selected strongly agree]
Please explain your selection: [if selected any other response]

Do you have any additional comments to share?

_____
_____

This is the end of the survey.

Once you click submit, you will not be able to return to the survey to make any further change to your answers

Thank you for taking the time to complete the survey and for your collaboration in this research project!

Appendix M

Physiotherapy Focus Group Discussion Guide

Welcome

Introduction of facilitator and notetaker

Thank you for your participation in this study thus far and for agreeing to participate in the focus group today. To review, the purpose of this study is to establish the common and distinct competencies of entry-level physiotherapists and kinesiologists in physical activity for diabetes in primary care settings and develop a referral pathway tool for diabetes care by exercise specialists for use by interprofessional primary care teams.

The purpose of the focus group today is to determine how well the final competency statements represent entry-level physiotherapist competencies in physical activity for diabetes in primary care and to determine the validity of the referral pathway tool and its usefulness in practice.

This focus group will last for 90 minutes and both audio and video will be recorded as a record of today's discussion.

Ground rules and note about confidentiality

QUESTIONS

Introductions

1. We will just start off with some introductions. We will go around the screen and ask everyone to give your first name and your current role.

Competency Statements

We are going to talk about the competency statements that were sent out on [insert date here]. We will talk about them generally to begin with and then go through them one by one to get feedback.

2. What was your overall impression of the competency statements?

Let's look at each of these statements one at a time.

[Start screen sharing first competency statement]

3. Thinking about entry-level physiotherapists in primary care settings, how well does this competency statement reflect their knowledge and skills related to physical activity in diabetes care?

[Next competency statement]

4. How well does this statement reflect their knowledge and skills?
    a. Repeat for remainder of competency statements
5. Is there anything else you would add?
6. Is there anything else you would change?

Referral Pathway Tool

Moving on to the referral pathway tool

[screen share referral pathway tool]

7. What was your overall impression of the referral pathway tool?
8. What do you like about the referral pathway tool?
    a. Does it differentiate between physiotherapists and kinesiologists?
    b. Is it easy to follow?
9. If you were making this tool, what would you do differently?
10. How do you think this tool would be received in primary care practices?
    a. How do you think it will be used?
    b. Which team members do you think will use it?
11. What do you think might be some challenges to using this tool in primary care?

Closing

Thanks for the great discussion. As we are coming to the end of our time together, I want to bring us back to the purpose of this project.

The objectives of this study were to define the competencies of entry level physiotherapists and kinesiologists in physical activity for diabetes management, and then develop a practical referral pathway tool that could be used by primary care teams with the purpose of promoting effective interprofessional collaboration for diabetes care.

The goal of this focus group was to find out how well the final competency statements reflect your expert opinion about the competencies of entry-level physiotherapists related to physical activity in diabetes care and the accuracy and usefulness of the referral pathway tool.

12. With that in mind, is there anything else we did not cover that we should have talked about today?

Appendix N

Kinesiology Focus Group Discussion Guide

Welcome

Introduction of facilitator and notetaker

Thank you for your participation in this study thus far and for agreeing to participate in the focus group today. To review, the purpose of this study is to establish the common and distinct competencies of entry-level physiotherapists and kinesiologists in physical activity for diabetes in primary care settings and develop a referral pathway tool for diabetes care by exercise specialists for use by interprofessional primary care teams.

The purpose of the focus group today is to determine how well the final competency statements represent entry-level kinesiologist competencies in physical activity for diabetes in primary care and to determine the validity of the referral pathway tool and its usefulness in practice.

This focus group will last for 90 minutes and both audio and video will be recorded as a record of today's discussion.

Ground rules and note about confidentiality

QUESTIONS

Introductions

1. We will just start off with some introductions. We will go around the screen and ask everyone to give your first name and your current role.

Competency Statements

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2. What was your overall impression of the competency statements?

Let's look at each of these statements one at a time.

[Start screen sharing first competency statement]

3. Thinking about entry-level kinesiologists in primary care settings, how well does this competency statement reflect their knowledge and skills related to physical activity in diabetes care?

[Next competency statement]

4. How well does this statement reflect their knowledge and skills?
    a. Repeat for remainder of competency statements
5. Is there anything else you would add?
6. Is there anything else you would change?

Referral Pathway Tool

Moving on to the referral pathway tool

[screen share referral pathway tool]

7. What was your overall impression of the referral pathway tool?
8. What do you like about the referral pathway tool?
    a. Does it differentiate between physiotherapists and kinesiologists?
    b. Is it easy to follow?
9. If you were making this tool, what would you do differently?
10. How do you think this tool would be received in primary care practices?
    a. How do you think it will be used?
    b. Which team members do you think will use it?
11. What do you think might be some challenges to using this tool in primary care?

Closing

Thanks for the great discussion. As we are coming to the end of our time together, I want to bring us back to the purpose of this project.

The objectives of this study were to define the competencies of entry level physiotherapists and kinesiologists in physical activity for diabetes management, and then develop a practical referral pathway tool that could be used by primary care teams with the purpose of promoting effective interprofessional collaboration for diabetes care.

The goal of this focus group was to find out how well the final competency statements reflect your expert opinion about the competencies of entry-level kinesiologist related to physical activity in diabetes care and the accuracy and usefulness of the referral pathway tool.

12. With that in mind, is there anything else we did not cover that we should have talked about today?